



REPUBLIC OF KENYA  
MINISTRY OF HEALTH

**KENYA NATIONAL CLINICAL NUTRITION  
AND DIETETICS REFERENCE MANUAL**

**FIRST EDITION**

**FEBRUARY 2010**

## FOREWORD

The strategic plan for the Ministry of Medical Services underlines medical services reform agenda as a lead strategy in the realization of the sectoral objectives outlined in the NHSSPII and Vision 2030. Central to this agenda is the need to strengthen health care service delivery focusing on equitable access, quality and responsiveness, efficiency and effectiveness. Given the strong association between malnutrition and increased risk of morbidity and mortality, hospitalization and time taken for patient to recuperate and the reduction in the cost of health care, the importance of nutrition care in the delivery of curative and rehabilitative health services cannot be overemphasized. Moreover, in line with the Kenya's Essential Package for Health, the ministry's strategic plan identifies the need for nutrition and dietetic services as well as provision of therapeutic and supplemental nutrition commodity for the management of malnourished patients as a core area of focus.

Irrespective of the cause of morbidity, all inpatient and outpatient clients require nutrition care services ranging from counseling and education to nutrition support therapies. The importance of these interventions is exemplified by the observation that, clinical nutrition is a core component of the national strategy on management of diabetes mellitus and accounts for up to 70% of the effort in management and prevention of the disease complications. In addition, the burden of infectious diseases, particularly HIV/AIDS and attendant opportunistic infections double the need for clinical nutrition care in our hospitals. With the core function of the Ministry being to ensure availability of essential medical care as needed, the Division of Clinical Nutrition and Dietetics has developed a Clinical Nutrition and Dietetics Manual that aims at enhancing availability of nutrition services at all levels. The roll out of this manual is one of the key steps that the Ministry is taking towards advancing the quality of clinical service delivery in hospitals countrywide. It is intended to help patients through improved care during hospitalization and recuperation at home.

Furthermore, the Ministry's strategic plan recommends the establishment of medicine and therapeutic committees in all health facilities. This manual will assist these committees in the integration and strengthening of nutrition services in a standardized manner. To fast track this process, facilities may find it useful to establish facility nutrition support team to advise the committee on in patient feeding and nutritional management of various diseases and conditions, prescription of appropriate foods and nutraceuticals and drug-nutrient interactions among other aspects. These teams will review the facility standard operating procedures and recommend strategies to ensure development towards attainment of international standards of nutrition service delivery. In addition, this manual will address important gaps in existing curriculums for training front line clinical staff trainees in nutrition support and therapy. The government fully appreciates contributions and participation by partners and other stakeholders in preparing this manual and for supporting ongoing nutrition care services in the country.

**Hon. Prof. Peter Anyang' Nyong'o EGH, MP**

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## ACKNOWLEDGEMENT

The Kenya National Manual for Clinical Nutrition and Dietetics was developed under the auspices of the Division of Clinical Nutrition and Dietetics. Experts from several organizations in Kenya carried out the preparation of the manual. The Drafting Committee' and members of the Clinical Nutrition and Dietetics Working Group is gratefully acknowledged. Members of the Working Group carried out synthesis and final drafting.

The manual development process received technical support from Dr A Muriithi National Professional Officer, Child and Adolescent Health and Nutrition WHO KCO. Dr W Maina, Head Department of Non Communicable Diseases provided technical input in sections on non communicable diseases. In addition, the following institutions participated in the drafting process; Department of Nutrition Kenyatta National Hospital, Department of Nutrition Moi Teaching and Referral Hospital, Department of Nutrition and Dietetics Aga Khan University Teaching Hospital, Nutrition unit NASCOP, Department of Human Nutrition and Dietetics of Egerton University, Department of Foods, Nutrition and Dietetics of Kenyatta University, Walter Reed South Rift Program and Capacity Kenya. Ministry of Medical Services, WHO Kenya Country Office, USAID Nutrition and HIV Program (USAID|NHP) through the Academy for Educational Development (AED) provided support for the manual development. The Ministry of Medical Services sincerely thanks these partners for their support.

The invaluable support from the office of the Permanent Secretary Ministry of Medical Services is greatly appreciated. The guidance and support provided by the Director of Medical Services, Dr F Kimani and the Head Department of Medicine Dr. B. Mogoia is also gratefully acknowledged. Last but not least, we wish to sincerely thank the entire editorial team and the reviewers for their tireless effort and dedication towards the finalization of this manual. God Bless you all.

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## ACRONYMS AND ABBREVIATIONS

µg	microgram
µg RE	microgram Retinal Equivalent
AA	Amino Acid
AED	Academy for Education and Development
AI	Adequate Intake
AIO	All in One
AMA	American Medical Association
ARDS	Acute Respiratory Distress Syndrome
ARVS	Antiretroviral drugs
ATP	Adenosine Tryphosphate
BCAA	Branched Chain Amino Acid
BCC	Behaviour Change Communication
BCG	Bacillus Calmette-Guerin
BMI	Body Mass Index
BMR	Basal Metabolic Rate
BP	Blood Pressure
BUN	Blood Urea Nitrogen
C: N	Calorie Nitrogen ratio
CB-DOTS	Community Based Direct Observation Therapy
CD4	Helper cells
CHD	Coronary heart disease
CHO	Carbohydrates
CNP	Critical Nutrition Practices
CPD	Continuous Professional Development
CPN	Central Parenteral Nutrition
CVD	Cardiovascular Disease
d	day
DHA	Docosahexaenoic Acid
DMS	Director of Medical Services
DRI	Dietary Reference Intake
EAA	Essential Amino Acid
EAR	Estimated Average Requirement
EFA	Essential Fatty Acid
EFAD	Essential Fatty Acid Deficiency
EN	Enteral Nutrition
F-100	Formula 100
F-75	Formula 75
FAO	Food and Agriculture Organization
FBF	

FBP	Food by Prescription
GERD	Gastroesophageal Reflux Disease
GI	Gastrointestinal
GIT	Gastrointestinal Tract
GOK	Government of Kenya
HB	Hemoglobin
HBE	Harris Benedict Equation
HBP	High Blood Pressure
HCL	Hydrochloric acid
HDL	High Density Lipoproteins
HIV	Human Immunodeficiency Virus
AIDS	Acquired Immunodeficiency Syndrome
IBD	Inflammatory Bowel Disease
ICU	Intensive Care Unit
IDA	Iron Deficiency Anemia
IEC	Information, Education and Communication
IMAM	Integrated Management of Acute Malnutrition
IMCI	Integrated Management of Childhood Illness
IPD	Inpatient Department
IU	International Unit
IUGR	Inter Uterine Growth Retardation
IV	Intravenous
JPEN	Journal of Parenteral and Enteral Nutrition
Kcal	Kilocalories
KEMRI	Kenya Medical Research Institute
KEPH	Kenya Essential Package for Health
kg	Kilogram
KMA	Kenya Medical Association
KMTC	Kenya Medical Training College
KNH	Kenyatta National Hospital
L	Litre
LBW	Low Birth Weight
LCFA	Long Chain Fatty Acid
LCT	Long Chain Triglycerides
LDL	Low Density Lipoproteins
LES	Lower Oesophageal Sphincter
M&E	Monitoring and Evaluation
MAM	Moderate Acute Malnutrition
MCFA	Medium Chain Fatty Acid
MCH	Maternal and Child Health
MCT	Medium Chain Triglyceride
mEq	Milli Equivalent
mg	Milligram

ml	Millilitre
Mmol-	Millimol
MoMS	Ministry of Medical Services
mOsm	Milliosmole
MTRH	Moi Teaching and Referral Hospital
MUAC	Mid Upper Arm Circumference
NaCL	Sodium Chloride
NASCOP	National Aids and Sexually Transmitted Diseases Control Program
NEAA	Non-Essential Amino Acid
NEC	Necrotising Enterocolitis
NG	Nosogastric
NGT	Nosogastric Tube
NHP	Nutrition and HIV Program
NHSSP II	National Health Sector Strategic Plan II
NICU	New Inborn Care Unit
NPE	Protein Energy
NRC	National Research Council
NSAIDS	Non-Steroidal Anti Inflammatory Drugs
NSIA	Non-Steroidal Anti-Inflammatory Agents
OIs	Opportunistic Infections
OPD	Out Patient Department
ORS	Oral Rehydration Salt
PEM	Protein Energy Malnutrition
PES	Problem Etiology Signs/symptoms
PICC	Peripherally Inserted Central Catheters
PLHIV	People Living with HIV
PLWHA	People Living with HIV and AIDs
PN	Parenteral Nutrition
PPN	Peripheral Parenteral Nutrition
PRO	Protein
Pts	Patients
PUFA	Poly-Unsaturated Fatty Acid
QC	Quality Control
RBCs	Red blood cells
RDA	Recommended Daily Allowance
REE	Rest Energy Equilibrium
Resomal	Rehydration Solution of Malnutrition
RTH	Ready to Hang
RT	Related To
RUTF	Ready to Use Therapeutic Feed
SAM	Severe Acute Malnutrition
SMBG	Self Monitoring of Blood Glucose
SOP	Standard Operating Procedure



SWS	Safe Water Solution
TB	Tuberculosis
TBSA	Total Burnt Surface Area
tbsp	Table Spoon
TE	Total Energy
TPN	Total Parenteral Nutrition
TV	Television
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
VAD	Vitamin A Deficiency
W/L	Weight for Length
WHO	World Health Organization
WHZ	Weight for Height Z-score
μmol	Micromol

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## CHAPTER ONE: INTRODUCTION

### CONTEXTUAL PERSPECTIVE

Nutrition refers to the processing of nutrient materials, principally food, and assimilation of nutrients for growth, maintenance of health and reproduction. It is a basic need that changes throughout the life-cycle and along the continuum of wellness and illness. In the context of human nutrition, nutrition is characterized by six process stages namely, ingestion, digestion, absorption, transport, assimilation, and excretion. Of interest therefore, is chemical composition of food and interactions of nutrients as well as culture, attitudes and behaviors' that influence dietary patterns. To this extent, the scope of nutrition practice and science is universally viewed from the perspectives of clinical nutrition and public health nutrition.

Clinical nutrition practice has emerged as an important discipline in modern medicine. It entails the use of diets and nutrients in prevention of diseases and as an essential component of the medical treatment. The practice is founded on knowledge relating to diagnosis of actual or high risk of diet-related diseases and diseases that affect intake, absorption and metabolism of dietary constituents. Overtime, with increasing evidence on the relationship between nutrition status and risk of several diseases and disorders, the nutrition and infection cycle, knowledge on synergistic and antagonistic drug-nutrient reactions, role of optimal nutrition and patient recuperation, clinical nutrition service is now globally recognized as an essential component of health care system and its operations. In this regard, it is noteworthy that the nutraceuticals industry has grown exponentially during the last decade and the need for clear guidelines on their application as curative and rehabilitative care services in the local context is required.



## NUTRITION SITUATION KENYA

About 50% of the Kenyan households are food insecure due to poverty and inadequate food production. The resulting nutrition insecurity is exacerbated by a large burden of morbidity. Consequently, about 20% and 30% of under-five year old children are underweight and stunted respectively. In the adult population, anecdotal evidence indicates significant rates of under nutrition rates with the dry plains reporting over 20% among rural population groups. Paradoxically, significant rates of obesity and associated diseases especially in urban settings have also been recognized. Vitamin, mineral and elemental deficiency disorders are also widespread. Currently, only vitamin A and iodine supplementation programs have been established. In this regard, anemia of nutritional origin remains a significant problem especially in children and women of reproductive age. This is best illustrated by the fact that close to half of all early childhood deaths in developing countries are associated with malnutrition. Similarly, a significant proportion of the relatively high maternal mortality rate is also attributed to nutritional diseases and disorders.

With this background, majority of Kenyans seeking help from health facilities are likely to be at risk of malnutrition and require nutrition therapy and nutrition support inform of education and counseling. The latter is required for all patients. Among outpatients, service utilization statistics from Health Management Information Systems (2008) indicate that the leading diagnosis for the under fives is Malaria at 33% followed by diseases of the respiratory system at 29% and diarrhea at 7%. Among adults malaria is still the leading diagnosis at 31%, followed by respiratory tract infections 25% and diseases of the skin at 7%. Worthy mentioning is the significant contribution of HIV infections and tuberculosis. Thus while, considerable efforts must be made to prevent nutritional disorders and diseases, clinical care in hospitals and homes are critical components of patient management in Kenya.

## POLICY PERSPECTIVES

In recognition of the widespread nutritional vulnerability among Kenyans, and the strong evidence on the importance of optimal nutrition in socio-economic development, nutrition service has been identified as a priority component in key government policies. In this regard, the National Health Sector Strategic Plan (2005-2010) identified nutrition as key component of the essential package in all phases of the life-cycle and at all levels of the health system. Furthermore, in order to ensure long term sustained development, Kenya's Vision 2030 sectoral objective of strengthening health care service delivery factored nutrition interventions and overall prevention of malnutrition among other non-communicable diseases as a component of the Social Sector Pillar. The policy decisions articulated in the Vision are in concurrence with the Millennium Development Goals and form the basis of Ministry of Medical Services Strategic Plan for the period 2008-2012.

To operationalize these policies in the public sector, the Scheme of Service for Nutrition Personnel in Public Service (Cap 242 and Cap 254) stipulates that implementation of the Nutrition Function shall among other responsibilities, provide direction and develop programs to improve clinical and public health nutrition services. With a dismal nutritionists and dietitians ratio of about two for every 100,000 population, it is not possible for these cadres to meet the needs of Kenyans. Since staffing of public health facilities and staff composition is largely dependent on the Kenya Essential Package for Health (KEPH) level, implementation of nutrition support services and nutrition therapy lies centrally on the frontline clinical staff. Clearly, a multi-disciplinary approach involving facility based teams with a physician, a clinical officer, a nutritionist or dietitian, a nurse, a pharmacist and a social worker as members is required for effective implementation of efficient and effective delivery of nutrition services. Where clinical nutritionist or dietitians are not available, the ability to deliver this service is dependent on the capacity of other cadres to manage nutritional deficits and disorders. In the current setting where curricula for other front line cadres are considerable weak in nutrition support and therapy, mechanisms to upgrade as part of continuing professional development is necessary. In the long term, a two prong approach in which, the nutritionist and dietitians staffing levels are improved and strengthening of nutrition education at all levels of pre-service training in medicine, pharmacy and nursing must be undertaken to ensure effective interdisciplinary participation.

The coming into force of the Nutritionists and Dieticians Act of 2007 creates a platform for nutrition and dietetics professionals to collaborate with Medical Practitioners and Dentists Board, Clinical officers council, Nursing Council of Kenya, Pharmacy and Poisons Board and the Kenya Medical Laboratory Technicians and Technologists Board in the establishment and enforcement of regulatory mechanisms for delivery of nutrition services. In addition, cooperation and collaboration between the nutritionists and dietician's professional association and professional bodies of other frontline cadres, namely Kenya Medical Association (KMA), Nursing Association, Clinical Officers Association, and Pharmacists Association in the delivery CPD to practicing members is a viable mechanism of accelerating full integration of nutrition services in patient care.

### **RATIONALE FOR THE MANUAL**

The leading causes of mortality and morbidity in Kenya include HIV/AIDS, tuberculosis, malaria, respiratory tract infections, road accidents, factory accidents, gastroenteritis and diabetes mellitus. These diagnoses underline the significance of infectious diseases among both inpatients and outpatients. Equally significant is observation that that HIV infection and related opportunistic diseases and complications account for close to 50% of bed occupancy in public facilities. Because of the nature of infectious diseases, many patients will invariably be undernourished on admission or at high risk of under nutrition. The implications of these diseases are best illustrated by the nutrition and infection cycle, whereby their interactions exacerbate malnutrition and disease severity. In HIV/AIDS and TB, the strategy of using specially formulation therapeutic and supplemental food formulations, for example food by prescription is being integrated in the management of affected patients. Nevertheless, all the diagnoses indicated here impose additional nutrition requirements whose delivery is dependent on the state of the patient at the time of admission. Thus the period of hospitalization require attention to increased nutritional needs as well as facilitate recovery from deficits and disorders that may have occurred before admission and to also ensure short convalescence.

## THE PURPOSE AND SCOPE OF THE MANUAL

In line with mandate of the Ministry of Medical Service, the purpose of this manual is to strengthen delivery of nutrition services and accelerate their integration in curative and rehabilitative care through the following:

- a). Provision of a framework for engaging health care workers, service providers and other stakeholders in planning, standardization and delivery of quality nutrition services;
- b). Defining actions that health workers and service providers need to take to improve alignment of nutrition services with curative and rehabilitative care services;
- c). Equipping health workers with knowledge on identification of nutritional risks and nutrition interventions for common clinical and nutrition related conditions;
- d). Provision of knowledge on common clinical conditions and the role of specific nutrients in disease management and;
- e). Establishment of a foundation for the development of guidelines and job aids, review of training curriculums and patient materials, and implement quality assurance.

This manual can be used in conjunction with the following important publications:

- Integrated Management of Acute Malnutrition Guidelines, June, 2008
- Out – patient Therapeutic Program manual,
- Kenyan National Guidelines for Nutrition and HIV/AIDS
- The Kenya National Technical Guidelines for Micronutrient Deficiency Control, 2008

## CHAPTER TWO: NUTRITION IN THE LIFE CYCLE

### NUTRITION CARE DURING PREGNANCY AND LACTATION

#### PREGNANCY

Pregnancy is a critical period in the life cycle because of many body changes that occur in the mother and the fetus. Good nutrition is important for a successful child delivery. Dietary advice relating to pregnancy is one of the major factors in determining the future well-being of a child conceived. Good nutrition during pregnancy reduces childhood morbidity and mortality, and minimizes the risks of maternal death associated with pregnancy. Several studies have shown that poor nutrition during pregnancy lead to physical, emotional and neurological disorders in the infant.

#### HIGH RISK PREGNANCY FACTORS INCLUDE;

1. **Maternal weight:** Both total weight gain and patterns of weight are important indicators of pregnancy outcomes. Weight should be gained gradually. Excessive weight gain is gaining more than one kilogram of body weight in a week ( $>1\text{kg/week}$ ) while inadequate weight gain is gaining less than one kilogram of body weight in one month ( $<1\text{kg/month}$ ).
2. **Pre-pregnancy BMI either  $< 19.8$  or  $> 26.0$ :** This may lead to nutrient deficiencies or toxicities and eating disorders.
3. **Socio-economic status:** Poverty, lack of family support, low level of education, limited food availability.
4. **Lifestyle habits:** Smoking, alcohol intake or other drug use. These are associated with low birth weights, stillbirths and birth defects.
5. **Age:** Teens 15 years or younger, women 35 years or older.
6. **Previous pregnancies may put the mother at a nutritional risk**
  - Many previous pregnancies (3 or more to mothers under age 20, 4 or more to mothers age 20 and older)
  - Short intervals between pregnancies ( $< 1$  year)
  - Previous history of pregnancy-related problems
  - Multiple pregnancies e.g. twins or triplets etc
  - Low or high birth weight of infants

## 7. *Maternal health:*

- Development of pregnancy related hypertension
- Development of gestational diabetes
- Diabetes, heart, respiratory and kidney diseases, certain genetic disorders, special diets and drugs

### GENERAL NUTRITION REQUIREMENTS IN PREGNANCY AND LACTATION

#### *Energy and Protein*

Dietary intake during pregnancy should provide the energy that will ensure the full term delivery of a healthy newborn baby of adequate size and appropriate body composition by a woman whose weight and body composition are consistent with long-term good health and well-being. The ideal situation is for a woman to enter pregnancy at a normal weight and good nutritional status. The energy requirement of pregnant woman is determined by several factors. These include the need to ensure adequate growth of the fetus, placenta and associated maternal tissues; to provide for increased metabolic demands of pregnancy in addition to maintaining adequate maternal weight, body composition and physical activity throughout gestational period as well as sufficient stores of nutrients for lactation. Special consideration must be made for women who are under or overweight when they enter pregnancy. A proper dietary balance is necessary to ensure sufficient intake for adequate growth without drawing from the mother's own tissues to maintain her pregnancy.

The increased energy needs during lactation is imposed by additional demands and needs for adequate milk production and secretion. The additional demands correspond to the energy cost of milk production. Fat stores accumulated during pregnancy may cover part of the additional energy needs in the first few months of lactation. The average energy requirement for normal women is 2150 kilocalories per day. Table 1 below shows recommended energy and protein requirements for women during pregnancy and lactation.

**Table 1: Total nutrient requirements for healthy pregnant and lactating women**

State	Trimester/ Period	Energy requirements	Protein requirements
Pregnancy	First trimester	36-40kcal/kg/day	0.8-1.0g/kg/d
		+150kcal/day	+0.7g/day
	Second trimester	+300kcal/day	+3.3g/day
	Third trimester	+300kcal/day	6g/day
Adolescent in pregnancy		40-43 kcal/kg/d	1.5g/kg/day add extra as per the trimester
Lactation	First 6mths then decrease gradually	+505kcal/day	+17.5g/day for the first 6mths of lactation +13g/day for next six months and 11g/day thereafter
	*Underweight women	+675kcal/day	+21g/day

*\*This includes women whose weight gain during pregnancy was low*

*Source: National food composition tables and the planning of satisfactory diets in Kenya (1993): WHO/FAO 2001*

*NB: It's important to realize that the food eaten in the diet is the main source of energy for the baby. The increased 300kilocalories can simply be met by drinking a cup of yogurt (110 calories), one slice of wholegrain bread (70 calories) and a baked potato (120 calories).*

#### **DESIRABLE BIRTH WEIGHT AND GESTATIONAL WEIGHT GAIN**

Poor maternal weight gain during pregnancy is associated with poor pregnancy and fetal outcomes such as pre-eclampsia, eclampsia, postpartum hemorrhage, need for assisted delivery low birth weight, intra uterine growth retardation (IUGR) and preterm birth among others. Weight gain during pregnancy comprise of products of conception (fetus, placenta, and amniotic fluids), growth of various tissues (uterus, breasts) and increase in blood volume, extra cellular fluid and maternal fat stores. The desirable amount of weight is associated with optimal pregnancy outcomes such as reduced maternal mortality and pregnancy related complications during pregnancy, labour and delivery. It should also allow adequate postpartum body weight and lactation performance; as well as optimal outcome for the infant including adequate foetal growth and maturation, prevention of gestational and perinatal morbidity and mortality.

The WHO recommends that healthy, well-nourished women should gain 10 to 14 kg during pregnancy. That is an average of 12 kg during the 9 months, increases the probability of delivering full-term infants with an average birth weight of 3.3 kg. This also reduces the risk of foetal and maternal complications. Table 2 shows recommended weight gain in pregnancy.

**Table 2: Recommended weight gain in Pregnancy**

<b>Pregnancy state (if pregnancy weight was):</b>	<b>Recommended weight gain in kg</b>
Normal	11.5-16.0
Underweight	12.5-18.0
Overweight	7-11.5
Obese	5-9.0

*Source: IOM and NRC*

Weight gain in the first trimester should be 1-3kg. Weight gain during second and third trimester should therefore be approximately ½ to 1kg per week. A higher weight gain is not desirable and is associated with pregnancy complications. Early postnatal nutrition interventions during the first two years of life is critical for brain development and has been shown to have a substantial impact on clinically important outcomes, including long term neurodevelopment.

#### **MICRONUTRIENT REQUIREMENTS FOR PREGNANT AND LACTATING MOTHERS**

During pregnancy and lactation there is increased need for micronutrient requirements. Pregnant women need extra Folate and vitamin B<sub>12</sub> due to the great increase in blood volume and the rapid growth of the fetus. Iron demands increase as the body conserves more than usual during pregnancy and the growing fetus draws on maternal iron stores. Minerals involved in building the skeleton- calcium, magnesium and phosphorus are in great demand. A normal adult woman would require 800mg calcium, 280mg magnesium and 800mg of phosphorus whereas in pregnancy the needs are high. Table 3 and Table 4 shows the micronutrient needs for pregnant and lactating mothers and the recommended micronutrient supplementation during pregnancy and lactation respectively.



**Table 3: Daily micronutrient requirements for pregnant and lactating mothers**

<b>Nutrient</b>	<b>Adult women</b>	<b>Pregnant women</b>	<b>Lactating mothers</b>
Vitamin A (µg RE)	500	800	850
Vitamin D (µg)	5	5	5
Vitamin E (mg α-TE)	8	10	12
Vitamin K (µg)	65	55	55
Vitamin C (mg)	45	55	95
Vitamin B <sub>1</sub> (mg)	1.1	1.4	1.5
Vitamin B <sub>2</sub> (mg)	1.1	1.4	1.6
Niacin (mg NE)	14	18	17
Vitamin B <sub>6</sub> (mg)	1.3	1.9	2.0
Folate (µg)	400	600	500
Vitamin (B <sub>12</sub> )	2.4	2.6	2.8
Calcium (mg)	1000	1200	1000
Phosphorus (mg)	800	1200	1200
Magnesium (mg)	280	320	355
Iron (mg)	15	30	15
Zinc (mg)	12	15	19
Iodine (µg)	150	200	200
Selenium (µg)	26	30	42

*Source: FAO/WHO 2001*

## MICRONUTRIENT SUPPLEMENTATION IN PREGNANCY AND LACTATION

Table 4: Micronutrient supplementation for pregnant and lactating mothers

Micronutrient	Target group	Dosage	Frequency	Timing and schedule
Vitamin A	Pregnant	-	-	-
	Lactating	200,000IU	Single dose	At delivery (should be given within 4 weeks of delivery)
folic acid	Pregnant	400 µg/0.4mg	Daily throughout pregnancy	From first month of pregnancy or on 1 <sup>st</sup> contact
	Lactating	280 µg		
Iron	Pregnant	60mg	Daily throughout pregnancy (critical for the first 90 days of pregnancy)	From first month of pregnancy or on 1 <sup>st</sup> contact
	Adolescent and adults including pregnant women with anaemia	120mg	Daily	3 months

Source: The Kenya National Technical Guidelines for Micronutrient Deficiency Control (2008)

### Fluids

Increased need for fluids due to increased amniotic fluid, blood volume, and increased urine flow. Fluids may be taken in the form of water, fruit juices, soups, milk and beverages.

### Fiber

Increased fiber intake is recommended to allow completion of digestion and absorption of nutrients and to manage constipation and other digestion problems.

### PREGNANCY RELATED COMPLICATIONS AND THEIR MANAGEMENT

- (i) **Morning sickness** – This is a condition characterized by nausea and may be caused by hormonal changes. Nutrition counseling on appropriate foods and management of this condition is recommended. Encourage the pregnant woman to eat foods such as dry biscuits/toast or light snacks etc.
- (ii) **Heart burn (Esophageal reflux)** – Occurs due to higher pressure exerted on the stomach. Encourage the expectant mother to;
  - Eat small frequent meals 5, 6 or more times a day
  - Eat slowly in a relaxed atmosphere
  - Avoid large meals before bedtime
  - Remain upright after eating
  - Avoid taking antacid unless recommended by a physician

- Wear loose-fitting clothes
- (iii) **Cravings and aversions** –may be for food or non-food substances. Encourage the pregnant mother to eat small but frequent meals, offer psychosocial counseling and discourage consumption of non food substances. These substances may lead to infections further compromising the pregnant woman’s nutrition status.
- (iv) **Constipation** - Affects emptying of the bowel and is characterized by irregular hard stool. To manage constipation do the following;
- Increase consumption of foods high in soluble fiber. i.e. whole grain breads and cereals
  - Perform regular physical exercise as allowed by physician
  - Increase fluid intake
  - Avoid taking laxatives unless recommended by a physician
  - Eat small frequent meals
- (v) **Diabetes mellitus** – It should be noted that expectant mothers whether diabetic or not should take the same amount of calories. If diabetic, refer to management of diabetic patient in page 168 while taking into account the calorie and protein requirement during pregnancy.
- (vi) **Anemia** – This is a common deficiency during pregnancy. Supplementation of iron, folacin or vitamin B<sub>12</sub> may be useful in addition to food consumption
- (vii) **Gastro-intestinal discomfort** – This is also a common complaint during pregnancy. In order to manage this condition counsel expectant mothers experiencing the condition to;
- Take small frequent meals
  - Avoid hunger
  - Take low fat-protein foods and simple carbohydrate foods
  - Drink fluids between meals rather than with meals to avoid delayed digestion
  - Avoid consumption of fried foods and spices or other foods that can lead discomfort especially gas forming foods such as beans, peas, etc
  - Drink small amount of fresh fruit juice every 1 to 2 hours
  - Avoid consumption of alcohol and caffeine containing beverages

### **Obesity in pregnancy**

*Counsel the mother on;*

- Controlling kilocalorie intake by restricting fats, sugar and empty calorie intake
- Encourage regular exercise
- Discourage weight reduction regimes

**Toxemia (pre-eclampsia)**-This is acute hypertension with proteinuria, oedema or both after the 20<sup>th</sup> week of pregnancy. For expectant women suffering from this condition;

- Restrict fat and sodium intake
- Ensure optimal protein intake in the absence of renal disease

**Oedema (that does not seem to develop to pre-eclampsia)**-this is accumulation of fluids in the body. For expectant women having edema:

- Sodium restriction or diuretics are not necessary
- Where oedema occurs on the legs, ensure that the mother sits with her legs placed on a raised surface

**Leg cramps**-This is neuro-muscular irritability caused by low serum calcium and high serum phosphate). For expectant women experiencing this condition:

- Encourage the client to reduce milk intake to reduce phosphorus intake
- Supplement with calcium
- Regular ingestion of aluminum hydroxide to prevent phosphate absorption is recommended

## EFFECTS OF NUTRITIONAL DEFICIENCY DURING PREGNANCY

Studies have shown that nutritional deficiencies during pregnancy have profound negative effect to the fetus. The table below shows effects of nutritional deficiency during pregnancy

Table 5: Effects of Nutritional Deficiency during Pregnancy

Nutrient	Deficiency
Protein	Reduced head circumference
Folate	Miscarriage and neural tube defects
Vitamin D	Low infant birth weight
Calcium	Decreased infant bone density
Iron	Low infant birth weight and premature birth
Iodine	Cretinism (varying degrees of mental and physical retardation)
Zinc	Congenital malformation

Source: Whitney et, al (1998)

## POTENTIAL HAZARDS OF PREGNANCY

The period of pregnancy is a critical period. There are several potential hazards to pregnancy. These include:

### *Vitamin mineral mega dose*

- For example excessive vitamin A is particularly famous for its role in malformations of the cranial nervous system
- Intake before the seventh week appears to be most damaging
- Vitamin A is not given as a supplement in the first trimester of pregnancy
- Pregnant women should take supplements only on the advice of a registered dieticians or physician

### *Caffeine*

- Caffeine crosses the placenta and the developing fetus has limited ability to metabolize it.
- Heavy caffeine use is defined as the use of 3-6 cups a day

### *Weight-loss dieting*

- Low carbohydrate diets that cause ketosis deprive the fetal brain of the needed glucose and may impair cognitive development. Such diets lack nutrients vital for fetal growth. Regardless of pre-pregnant weight; pregnant women should never intentionally lose weight.

***Pregnant mothers should be counseled on the following:***

- Alcohol abuse
- Chronic disease requiring special diet
- Drug addiction
- Weight gain
- Food faddism
- Cigarette smoking
- Unwanted pregnancies
- Birth spacing

**NUTRITION CARE DURING LACTATION**

A mother who chooses to breastfeed her infant should be encouraged to continue eating nutrient dense foods throughout lactation. Adequate diet is also needed to support the stamina, patience and self confidence that nursing an infant demands.

***Nutrition guidelines for lactating mothers:***

- During lactation nursing mothers tend to feel thirstier, owing to the fact that part of their water consumption is utilized by the body for the formation of milk. Increase water intake by one quarter per day to provide a total of 2.5 to 3 quarters per day
- Increase calorie consumption to about 2500 calories per day
- Encourage consumption of healthy foods rich in nutrients
- Encourage lactating mothers to eat more protein rich foods
- Provide small frequent meals
- Avoid smoking tobacco and consumption of alcohol
- Consult a physician/doctor before taking any kind of medication
- Provide folic acid and iron supplements (Refer to The Kenya National Technical Guidelines for Micronutrient Deficiency Control)

## INFANCY AND EARLY CHILDHOOD

### INFANT NUTRITION (UP TO ONE YEAR)

Nutritional requirements for healthy newborns vary widely according to birth weight, gestational age, rate of growth and environmental factors. Early life is a period of rapid growth with the weight of the normal infant doubling by four months of age. The protein requirements of infants are much higher than in older children. Fats are needed for essential fatty acids. Mineral requirements are critical at this stage for example iron is needed for hemoglobin formation and calcium for bone calcification.

### INFANTS 0-6 MONTHS

Exclusive breastfeeding is recommended for all infants 0 to 6 months of age. Mothers who choose to breastfeed their infants should be encouraged to exclusively breastfeed (give breast milk alone) for the first six months of life. This is because breast milk alone is adequate to meet the child's nutritional needs. After the sixth month of life breast milk alone becomes inadequate to meet the child's nutritional needs and therefore complementary foods (to complement breast milk) should be introduced to the child's diet. It should be noted that breastfeeding should be started in the first 0 to 30 minutes after delivery and should progress on an on-demand basis.

In the first six months of life mixed feeding (breastfeeding and introduction of other foods) is discouraged because of the following reasons;

- Introduction of other foods before sixth month of the child's life decreases the intensity and frequency of suckling and as a consequence, breast milk production is reduced
- Introduction of cereals can interfere with the absorption of breast milk iron, which is normally low in concentration
- Diarrhea may occur among populations living in unsanitary environments
- Pathogenic microorganisms may enter the child's tract during feeding causing infections
- Other long term risks such as obesity, hypertension, arteriosclerosis and food allergy may result if other feeds are introduced before the sixth month of the child's life

## 6-12 MONTHS -COMPLEMENTARY FEEDING STAGE

Complementary feeding means giving other foods in addition to breast milk. These other foods are called complementary foods.

- Complementary feeds should be introduced after 6 months
- Introduce one food at a time, beginning with pureed vegetables, fruits, or rice etc
- Include pureed cooked meat, fish and pulses (for example peas, beans and lentils) a couple of weeks after complementary have began
- Between 6 and 12 months, food should be given which allows the infant to learn to chew and accept a wide variety of food textures
- Offer small amount of food at first
- Naturally sweet fruits (such as bananas) should be used to sweeten foods rather than adding sugar

## NUTRIENT REQUIREMENTS FOR INFANTS AND YOUNG CHILDREN

### *Energy and protein*

Energy needs for young children are very high because of rapid growth and organs and metabolic processes are developing. Energy needs for growth have two components i.e. energy used to synthesize growing tissues and the energy deposited in those tissues. The infant's energy requirements per unit of body weight are 3-4 times greater than any other time of their life. An infant requires on average 108kcal/kg compared to an adult requiring 30-40kcal/kg. At 6-12 months there is decreased growth but increased activity. Table 6 and 7 below summarizes the energy requirements of infants and young children aged 0-5 years and recommended nutrient intake for children above 1year to 9years respectively. Table 8 on the other hand provides developmental milestones and guidelines for feeding children 0-18 months of age.

Table 6: Energy requirement for infants and young children 0 months to 5 years

Age	RDA Calories	RDA proteins
0-3 months	100-120kcl/kg	2.2g/kg
3-6 months	110-115kcl/kg	2.2g/kg
6-12 months	90-110kcl/kg	2.0g/kg
1-3 years	100-105kcl/kg	1.8g/kg
4-5 years	85-100kcl/kg	1.5g/kg

FAO/ WHO (1998)

### *Normal fluid requirements*

- 0 – 6 months: 150 ml/kg/day
- 7 – 12 months : 120 ml/kg/day



**Table 7: Recommended Nutrient Intakes for children above 1 to 9 years**

<b>Nutrient</b>	<b>1-3yrs</b>	<b>4-6yrs</b>	<b>7-9yrs</b>
Energy (kcal)	1300	1800	2400
Protein (g)	16	24	28
Vitamin A (µg RE)	400	500	700
Vitamin D (µg)	5	5	5
Vitamin E (mg α-TE)	6	7	7
Vitamin K (µg)	15	20	25
Vitamin C (mg)	30	30	35
Vitamin B <sub>1</sub> (mg)	0.5	0.6	0.9
Vitamin B <sub>2</sub> (mg)	0.5	0.6	0.9
Niacin (mg NE)	6	8	12
Vitamin B <sub>6</sub> (mg)	0.5	0.6	1.0
Folate (µgaffe/day)	160	200	300
Vitamin (B <sub>12</sub> )	0.9	1.2	1.8
Calcium (mg)	500	600	700
Phosphorus (mg)	800	800	800
Magnesium (mg)	60	70	100
Iron (mg)	10	10	10
Zinc (mg)	10	10	10
Iodine (µg)	75	110	100
Selenium (µg)	17	21	21

Table 8: Developmental milestones and guidelines for feeding children age 0 – 18 months

Age	Developmental milestones and feeding skills	Guidelines	Red Flags
Birth to 6 months	<ul style="list-style-type: none"> <li>• Sucks well on nipple</li> <li>• Finishes each feeding within 45 minutes by 4 months</li> <li>• Signs of hunger in newborns are increased alertness or activity mouthing or rooting. Crying is late indicator of hunger</li> </ul>	<ul style="list-style-type: none"> <li>• Exclusive breastfeeding is recommended for the first 6 months</li> <li>• Encourage parents to feed children on demand</li> <li>• Encourage parents to hold and position their babies correctly during feeding and make eye contact</li> <li>• If an infant is not breastfeeding infant formula is the most acceptable alternative</li> <li>• Avoid fruit juice water or any beverage other than breast milk</li> </ul>	<ul style="list-style-type: none"> <li>• Failure to thrive</li> <li>• Loss of more than 7% of birth weight for healthy full term babies</li> <li>• Infants fed using bottle</li> <li>• Liquids including water or solids other than breast milk given before 6 months</li> <li>• Inappropriate mixing of infant formula for those on exclusive replacement feeding</li> </ul>
6- 9 months	<ul style="list-style-type: none"> <li>• At 6 months babies are physiologically and developmentally ready for solid foods</li> <li>• Sits independently for a short time</li> <li>• Drinks from a cup held by an adult</li> <li>• Eats soft foods from a spoon or adults fingers</li> <li>• Initial refusal of new flavors and textures is not uncommon.</li> <li>• Finger feeding can be introduced</li> <li>• By 9 months picks up small items using thumb and first finger</li> </ul>	<ul style="list-style-type: none"> <li>• Continued breastfeeding is recommended</li> <li>• If not breastfed formula milk is the most acceptable alternative</li> <li>• At 6 months introduce iron rich foods</li> <li>• Introduce one new food at a time with an interval of 2-7 days before introducing another to allow the infant acquire the new taste and make it easier to identify the cause of an allergic reaction</li> <li>• Start small serving sizes</li> <li>• Provide complementary foods initially 2-3 times a day</li> <li>• Infants will indicate hunger or satiety. Forced feeding may promote negative associations with eating</li> <li>• Meal time environment should be free of distractions such as television</li> <li>• Offer foods with more texture progressing from puree to mashed and then soft finger foods</li> <li>• Provide vitamin A supplement (as per national guidelines)</li> <li>• Coffee, tea and hot chocolate should not be given</li> </ul>	<ul style="list-style-type: none"> <li>• Failure to thrive</li> <li>• Complementary foods have not been introduced at the end of 6 completed months</li> <li>• Infant is not eating willingly or parents imply that they force feed</li> <li>• Infant is drinking more than 125 ml of fruit juice per day</li> <li>• Lack of varieties on the foods given</li> </ul>

Age	Developmental milestones and feeding skills	Guidelines	Red Flags
9-12 months	<ul style="list-style-type: none"> <li>• Begins to take an active independent role in feeding</li> <li>• Assists with spoon, some become independent</li> <li>• Can hold cup and sip contents on their own</li> <li>• More willing to accept lumpy texture especially when self feeding</li> <li>• Initial refusal of new flavors and textures is common</li> <li>• Licks food from lower lip</li> </ul>	<ul style="list-style-type: none"> <li>• Continued breastfeeding is recommended</li> <li>• Increase frequency of feeding to 3-4 times a day</li> <li>• Encourage self feeding</li> <li>• Include baby at table for family mealtimes</li> <li>• Mealtimes should be free of distractions like TV and activities</li> </ul>	<ul style="list-style-type: none"> <li>• Failure to thrive</li> <li>• When continuously refuses lumpy or textured foods at 10 months</li> </ul>
12-18 months	<ul style="list-style-type: none"> <li>• Picks up and eats finger foods</li> <li>• Grasps spoon with whole hand</li> <li>• Holds cup with two hands</li> <li>• Holds and tips bottles</li> <li>• Compared with the first year of life, a decreased or sporadic appetite is common</li> <li>• Unfamiliar foods are often rejected for the first time</li> </ul>	<ul style="list-style-type: none"> <li>• Continued breastfeeding is encouraged</li> <li>• Whole cow's milk can complement breast milk</li> <li>• Encourage children to feed themselves at the beginning of the meal when they are hungry but help if they tire later in the meal</li> <li>• Child should be included at family meal times</li> <li>• Continue to provide 3-4 meals a day with snacks in between</li> <li>• By 12 months, babies should be eating a variety of foods from each of the food groups</li> <li>• De-worm ( as per the national guidelines)</li> <li>• Development of healthy eating skills is a shared responsibility: parents/caregivers should provide selection of nutritious age appropriate foods and decide when and where food is eaten; babies and children should decide how much they want to eat</li> </ul>	<ul style="list-style-type: none"> <li>• Failure to thrive</li> <li>• Lack of variety in child's diet</li> <li>• Excessive fluid consumption</li> <li>• Parents not recognizing and responding to child's verbal and non-verbal hunger signs</li> <li>• Consistently refuses lumpy or textured food</li> <li>• At 15 months does not finger or self feed</li> </ul>

Introduction of complementary food to an infant's diet after the sixth month is very crucial to ensure that the child continue to receive adequate nutrients essential for growth and development. The table below shows the quantity, variety, texture and frequency of complementary feeding at different stages of development.

**Table 9: Quantity, variety and frequency of complementary foods**

Age	Texture	Frequency	Amount of food an average child will eat in each meal
6-8 months	Start with thick porridge, well mashed food and continue with mashed family foods	2-3 meals per day plus frequent breast feeds, Depending on the child's appetite, 1-2 snacks may be offered	Start with 2-3 tablespoons per feed increasing gradually to ½ of a 250 ml cup
9-11 months	Finely chopped or mashed foods and foods that baby can pick up	3-4 meals plus breastfeeds. Depending on the child's appetite, 1-2 snacks may be offered	½ of a 250 ml cup or bowl
12-23 months	Family foods, chopped or mashed if necessary	Depending on the child's appetite, 1-2 snacks may be offered	¾ to one 250ml cup/bowl

Source: WHO/UNICEF (2006), *Infant and Young Child Feeding Counseling Guide*

If baby is not breastfed, give additional: 1-2 cups of milk per day, and 1-2 extra meals per day

**Note:** the amount of food included are recommended when the energy density of meals is about 0.8 to 1.0 kcal/g

### **Meal plan for one year old and above**

Young children should be provided with a varied selection of nutritious foods. By one year the child would have increased in length by 50%. At one year of age the obvious food to supply most of the nutrients the baby needs is still milk, 2-3 cups a day. Table 10 and 11 below shows a sample of meal plan for 1 year old child and 1-3 year old respectively.

**Table 10: A Sample meal plan for a one year old child**

Meal	Example
Breakfast	Whole milk, Cereal , Fruit
Snack	Whole milk, Fruit
Lunch	Whole milk, Mashed staple, Vegetables Minced meat/Mashed legume
Snack	Whole milk, Fruit
Supper	Whole milk, Cereal/proteins, vegetables

**Table 11: A sample meal plan for children 1-3 years of age**

<b>Meal</b>	<b>Examples</b>
Breakfast	Milk (fluid), Juice/fruit, Cereal/bread-enriched/wholegrain
Snack	Milk/(fluid); Juice fruit/vegetables; Bread, cereal-enriched/wholegrain cereals
Lunch	Milk/fluid; Meat/poultry/fish; Cheese, Egg; Cooked dry bean and peas; Peanut butter; Vegetable and fruits; Cereals or whole grain
Snack	Milk/(fluid)/Juice fruit/vegetables; Bread, cereal-enriched/wholegrain cereals
Supper	Milk/fluid; Meat/poultry/fish; Cheese, Egg; Cooked dry bean and peas; Peanut butter; Vegetable and fruits; Cereals or whole grain

### **NUTRITIONAL REQUIREMENTS FOR ADOLESCENCE**

The transition phase from childhood to adulthood is known as adolescent. During this stage there is increased physical, biochemical and emotional development. It is during this period that the final growth occurs. Even girls and boys who have an excellent food intake during their childhood are likely to succumb to poor nutrition during adolescent due to provision of poor and non nutritious foods. Adolescents feel independent and seek freedom to make their own decisions.

#### ***Nutritional problem of adolescents***

These include:

- Anemia
- Anorexia nervosa
- Early pregnancy
- Obesity
- Food habits

#### ***Nutritional requirements***

##### **Energy, Protein, Minerals and Vitamins Requirements**

Caloric needs increase with the metabolic demands of growth and energy expenditure. In general adolescent 10-15 years requires 40-60kcal/kg/day and 15-18yrs requires 35-40kcal/kg/day. Table 12 below shows adolescents nutrient and energy requirements.

**Table 12: Energy and nutrient requirements for adolescents**

<b>Adolescents 10-18yrs</b>		
<b>Nutrient</b>	<b>Male</b>	<b>Female</b>
Energy (kcal)	2500	2150
Protein (g)	0.9	0.9
Vitamin A (µg RE)	600	600
Vitamin D (µg)	5	5
Vitamin E (mg α-TE)	10	7.5
Vitamin K (µg)	35-65	35-65
Vitamin C (mg)	40	40
Vitamin B <sub>1</sub> (mg)	1.2	1.1
Vitamin B <sub>2</sub> (mg)	1.3	1.0
Niacin (mg NE)	16	16
Vitamin B <sub>6</sub> (mg)	1.3	1.2
Folate (µgDFE/day)	400	400
Vitamin (B <sub>12</sub> )	2.4	2.4
Calcium (mg)	1300	1300
Phosphorus (mg)	1200	1200
Magnesium (mg)	250	250
Iron (mg)	12	15
Zinc (mg)	15	12
Iodine (µg)	110	100
Selenium (µg)	34	26

*Source: WHO/FAO (2001)*

## ENERGY NEEDS OF ADULTS

### *Adults –Male; females*

Growth is no longer energy demanding in adulthood and basal metabolic rate (BMR) is relatively constant among population groups of a given age and gender. Habitual physical activity and body weight are the main determinants for the diversity in energy requirements for adult population with different lifestyles. The diversity in body size, body composition and habitual physical activity among adult populations with different geographic, cultural and economic background does not allow a universal application of energy requirements based on total energy expenditure in groups with specific lifestyles.

Dietary energy intake of a healthy, well-nourished population should allow for maintaining an adequate BMI at the population's usual level of energy expenditure. At the individual level, a normal range of 18.5 to 24.9 kg/m<sup>2</sup> BMI is generally accepted. At a population level, a median BMI of 21.0 was recently suggested by the joint WHO/FAO Expert Consultation on Diet, Nutrition and the Prevention of Chronic Diseases. The kilocalorie requirements may range from 2100-2950. Table 13 and 14 below shows energy requirements in consideration of BMI and physical activity and vitamin and mineral requirements for adults, respectively.

**Table 13: Recommended kilocalorie intake for adults with different nutrition status**

	<b>Sedentary</b>	<b>Moderate</b>	<b>Active</b>
<b>Overweight</b>	20 – 25 kcal/kg	25-30 kcal/kg	30-35 kcal/kg
<b>Normal</b>	25-30 kcal/kg	30-35 kcal/kg	35-40 kcal/kg
<b>Underweight</b>	30-35 kcal/kg	35-40 kcal/kg	40-45kcal/kg

*Source: WHO/FAO (2002)*

**Table 14: Mineral and Vitamins Requirement for adults**

<b>Nutrient</b>	<b>Adult women</b>	<b>Adult men</b>
Vitamin A (µg RE)	500	600
Vitamin D (µg)	5 (19-50) 10 (50+)	5 (19-50) 10 (50+)
Vitamin E (mg α-TE)	7.5	10
Vitamin K (µg)	55	65
Vitamin C (mg)	45	45
Vitamin B <sub>1</sub> (mg)	1.1	1.2
Vitamin B <sub>2</sub> (mg)	1.1	1.3
Niacin (mg NE)	14	16
Vitamin B <sub>6</sub> (mg)	1.3(19-50) 1.7 (50+)	1.3 (19-50) 1.5 (50+)
Folate (µg)	400	400
Vitamin (B <sub>12</sub> )	2.4	2.4
Calcium (mg)	1000	1000
Phosphorus (mg)	800	800
Magnesium (mg)	220	260
Iron (mg)	15	29
Zinc (mg)	12	14
Iodine (µg)	110	130
Selenium (µg)	26	34

Source: FAO/WHO (2001)



## GERIATRIC NUTRITION

Nutritional needs of the elderly are determined by multiple factors, including specific health problems and related organ system compromised; individual's level of activity, energy expenditure and caloric requirements; the ability to access, prepare, ingest, and digest food; and personal food preferences. The cornerstone of geriatric nutrition is a well-balanced diet. This provides optimal nutrition to help delay the leading causes of death: heart disease, cancer, and stroke. In addition, ongoing research indicates that dietary habits, such as restricting one's calorie intake and consuming antioxidants, may increase longevity.

## PSYCHOSOCIAL CHANGES

A number of changes may occur in the aging person's social and psychological status, potentially affecting appetite and nutrition status. These include:

- Depression, the most common cause of unexplained weight loss in older adults. It occurs in approximately 15% of adults over age 65, with a much higher incidence in those living in extended-care facilities
- Memory impairment caused by various types of **dementia**, **Alzheimer's disease**, or other neurological diseases rise dramatically, with half of all persons over age 85 affected. Weight loss and improper nutrition are potential problems
- Alcohol abuse is often unreported, especially since approximately one third of alcoholics age 65 years or older begin drinking later in life. Excessive alcohol intake (over 15% of total calories) increases morbidity and mortality, and leads to both physical and psychosocial problems
- Social isolation becomes more common because of declining income, health problems, loss of spouse or friends, and assistance needs. All of these may affect appetite and possibly nutritional status

## PHYSIOLOGICAL CHANGES AND NUTRITIONAL DEMANDS

The following are typical physiologic changes that occur in old age that can affect nutritional status:

- Body composition changes as fat replaces muscle, in a process called sarcopenia. Research shows that **exercise**, particularly weight training, slows down this process. Because of the decrease in lean body mass, basal metabolic rate declines (about 5% per decade during adulthood). Total caloric needs drop, and lowered protein reserves slow the body's ability to respond to injury or surgery. Body water decreases along with the decline in lean body mass.
- Gastrointestinal (GI) changes include a reduction in digestion and absorption. Digestive hormones and enzymes decrease, the intestinal mucosa deteriorates, and the gastric emptying time increases. As a result, two conditions are more likely to occur: pernicious anemia and constipation. Pernicious anaemia may result because of hypochlorhydria, which decreases **vitamin B<sub>12</sub>** absorption. Constipation, despite

- considerable laxative use among older people, may result from slower GI motility, inadequate fluid intake, or physical inactivity.
- Musculoskeletal changes occur. A progressive drop in bone mass starts when people are in their 30s or 40s; this accelerates for women during **menopause**, making the skeleton more vulnerable to **fractures** or **osteoporosis**. Adequate intake of **calcium** and **vitamin D** helps to retain bones intact
  - Geriatric nutrition must take into account sensory and oral changes. Decreases in all the senses, particularly in the **taste** buds that affect perception of salty and sweet tastes, may affect appetite. Xerostomia, lack of salivation, affects more than 70% of the elderly. Also, denture wearers chew less efficiently than those with natural teeth do.
  - Other organ changes may occur. Insulin secretion is decreased, which can lead to carbohydrate intolerance, renal function deteriorates in the 40s for some people.
  - Cardiovascular changes may occur. Reduced sodium intakes become important as **blood pressure** increases in women over age 80 (but, interestingly, it declines in older men). Serum cholesterol levels peak for men at age 60 but continue to rise in women until age 70.
  - *Immuno*-competence decreases with age. The lower immune function means less ability to fight infections and malignancies. **Vitamin E**, **zinc**, and some other supplements may increase immune function.

#### BASIC ENERGY AND NUTRIENT NEEDS

Calorie requirements decrease with age, although individuals vary greatly depending on their activity level and health status. Diets that fall below 1,800 calories a day may be low in protein, calcium, iron, and vitamins, so should feature nutrient-dense foods.

Protein needs of healthy older adults are the same as for other adults, with 0.8 to 1 g of protein per kg of body weight recommended. Older people without debilitating disease eat adequate protein, but those with infections or severe disease may become protein-malnourished due to increased protein requirements and poor appetite. Elderly individuals do better eating more complex carbohydrates, which increase fiber, vitamins, and minerals, and help with insulin sensitivity. Lactase-treated milk or fermented dairy products are suggested if lactose intolerance develops. Because caloric needs drop and heart disease is so prevalent, reducing total dietary fat and especially the amount of saturated fats is recommended.

Mineral deficiencies are uncommon in older adults, and recommended amounts are the same or similar to those for younger adults. Iron-deficiency anemia related to nutrition is rare, and more likely due to blood loss. Of the vitamins, vitamin D intakes are often lower than recommended, especially among homebound or institutionalized people who lack sun exposure (the most accessible source of vitamin D). The antioxidant vitamins, vitamin E, carotenoids, and vitamin C, continue to receive attention because of their potential to improve immune function and ward off diseases. Requirements for riboflavin, vitamin B<sub>6</sub> and B<sub>12</sub>, and zinc are increased in the elderly. However, needs for vitamin A decrease.

## WATER

In the elderly, there is total body water reduction. There is also diminished water conservation by the kidneys while some medicines lead to fluid loss. This is made worse by the fact that the elderly people take less fluids and their sense of thirst is diminished. The elderly also have trouble to get drinks and to go to bathroom in addition to loss of bladder control. These lead to dehydration, circulatory disorder, and kidney disorder. The intake of water should be > 1ml/kcal/ day.

## FIBER

Increased consumption of high fiber foods can reduce constipation. The use of refined sugars should be limited since they do not provide any nutritional value other than energy. The intake of complex carbohydrates and fibers should be increased. Decreased lactase secretion in elderly leads to lactose intolerance therefore they should use lactase- treated milk or fermented dairy products.

## COMMON ELDERLY PERSON NUTRITION-RELATED PROBLEMS

### *Malnutrition*

While most elderly people maintain adequate nutritional status, institutionalized and hospitalized older adults are at higher risk for malnutrition than individuals who are living independently. Cancer cachexia, the weak, emaciated condition resulting from cancer, accounts for about half of malnutrition cases in institutionalized adults.

### *Dysphagia*

The incidence of Dysphagia, or difficulty in swallowing, increases with age. Dysphagia results from conditions such as stroke, Alzheimer's or Parkinson's disease, multiple sclerosis, or physiological changes such as loss of teeth or poorly fitting dentures. Inadequate dietary intake because of Dysphagia can lead to weight loss, dehydration, and nutritional deficiencies.

### *Fluid and electrolyte imbalance*

Dehydration is the most common cause of fluid and electrolyte disturbances in older adults. Reduced thirst sensation and fluid intake, medications such as diuretics and **laxatives**, and increased fluid needs during illness contribute to dehydration. Adequate water-intake guidelines are 1 ml water/kcal energy consumed (for example, 1.8 L for a 1,800-calorie intake), or 25–30 ml/kg of weight for most individuals.

### *Skin integrity*

Skin breakdown is a common problem, particularly in bedridden or immunologically impaired people. The most common skin breakdown is the pressure ulcer, which occurs in 4% to 30% of hospitalized patients and 2% to 23% of residents of skilled-care nursing homes.

Pressure ulcers are graded or staged to classify the degree of tissue damage. Those with more serious Stage II to Stage IV ulcers have increased nutritional needs. Protein needs increase to 1–1.5 g protein/kg, caloric needs increase to 30–35 kcal/kg, and 25–35 cc fluid/kg is recommended.

## CHAPTER THREE: RELATIONSHIP BETWEEN DISEASE AND NUTRITION

### DISEASES AND NUTRITION

#### THE ROLE OF NUTRIENTS IN DISEASE PATHOPHYSIOLOGY

Nutrients are the raw materials that support physiologic and metabolic functions needed for maintenance of normal cellular activity. Malfunctioning of cellular activities due to an inadequate level of support from available nutrients is initially expressed in biochemical changes that will eventually develop into clinical symptoms characteristic of the particular roles of the nutrients involved. Nutrient deficiencies may develop because of inadequate intake, impaired absorption, increased demand, or increased excretion. Excessive intakes of some nutrients may promote deficiencies of others through impaired absorption, increased demand, or increased excretion. Figure 1 and 2 below illustrate the functions of nutrients in the body for both nourishment and pharmacological functions.

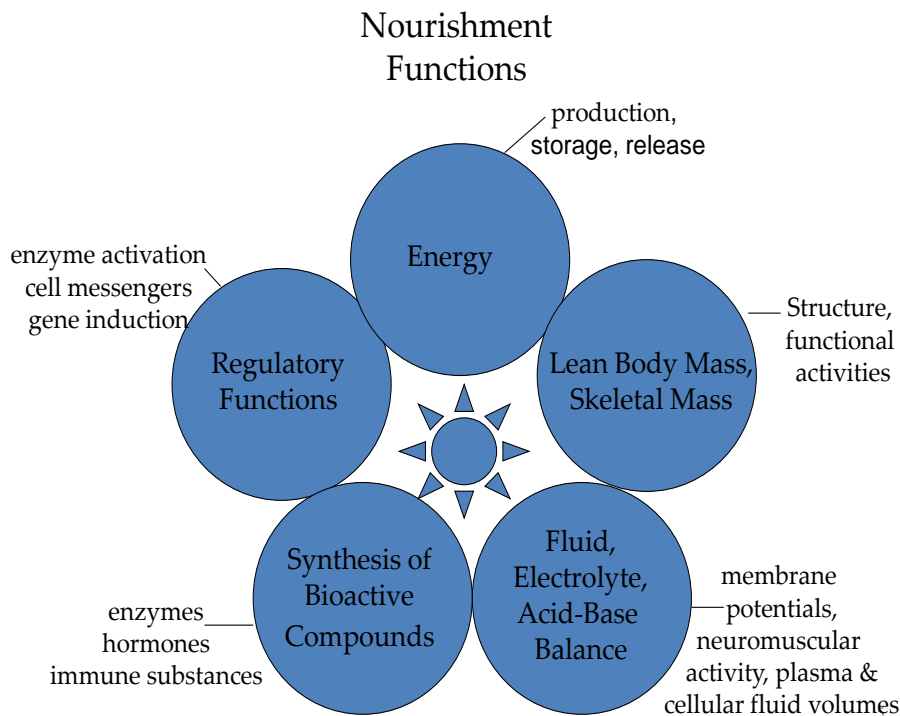
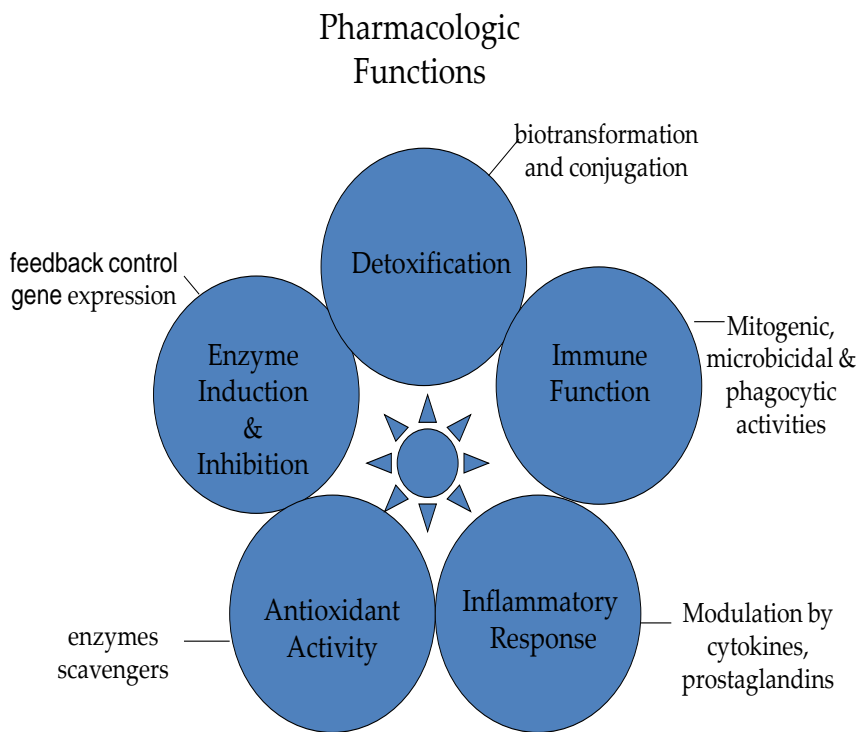


Figure 1: Nourishment function of nutrients



**Figure 2: Pharmacological functions of nutrients**

### Nutrients with Nourishment and Pharmacologic Functions

- Nutrients that support immune function-zinc, vitamin C, protein, vitamin A, vitamin B<sub>6</sub>, Folate
- Nutrients that provide antioxidant protection-vitamin C, carotenoids, vitamin E, selenium
- Nutrients that support synthesis of enzymes and bioactive compounds-amino acids, vitamin B<sub>6</sub>, fatty acids, selenium
- Nutrients involved in tissue synthesis-protein, energy, zinc, vitamin A, vitamin C, iron

Both excess and deficient nutrient intakes may contribute to development of chronic degenerative diseases. These diseases can be considered an expression of cumulative cellular damage due to environmental assaults for which the threshold of exposure at which damage is incurred is defined by genetics. Imbalances in dietary patterns are among the environmental factors that contribute to the development of chronic diseases. Either diet may be directly involved in the pathogenesis of the disease or it may exacerbate pathological changes due to other environmental factors.

## THE GOALS OF NUTRITION IN PREVENTION OF DISEASE ARE:

1. To optimize cellular activity and tissue/organ function
  - a. Provide sufficient amounts to satisfy daily demands of adequacy, balance and variety in food choices
  - b. Maintain adequate reserves for intermittent increased demand through habitual diet and dietary patterns
2. To reduce the metabolic burden imposed on cardiac, pulmonary, renal, hepatic, and musculoskeletal systems by environmental factors
  - a. Minimize workload of organ systems by reducing stress on organs involved in transport, metabolism and elimination of nutrients and metabolic waste.
  - b. Eliminate compensatory responses required to maintain normal function
3. To support cellular defenses that protect tissue integrity
  - a. Maintain immune system competence
  - b. Promote efficiency of detoxification systems by controlling levels of reactive chemical intermediates
  - c. Prevent oxidative damage that is involved in pathogenesis of most chronic diseases and reduction of efficiency of immune cells

## NUTRITION AND THE IMMUNE SYSTEM

### *Immune system*

- Protects the body from infectious agents and toxins
- Enables the body to repair damaged cells
- Rids the body of worn out cells

### Central Organs of the Immune System

#### *Skin*

- Physical barrier
- Glands secrete chemicals that can destroy microbes

#### *Mucous Membranes*

- Mucous contains chemicals and enzymes that destroy invading organisms
- Traps microbes

#### *GI Tract*

- Stomach acid destroys microbes
- Villi along lining keep invaders out

#### *Lymph Tissue (bone marrow, thymus, lymph nodes, spleen tonsils, adenoids, appendix)*

- Houses lymphocytes (cells of immune system)

### How the Immune System Works

- Any substance that triggers an immune response is an antigen (Bacteria, viruses, fungi, parasites, worn-out and malignant cells, tissues or cells from another person)
- White blood cells, phagocytes and lymphocytes (natural killer cells, T-cells, B-cells) destroy antigens
- Phagocytes – engulf antigens
- Lymphocytes – work on specific antigens (may release chemicals that destroy antigen or produce antibodies that mark cells for destruction)

### Nutrition and the Immune System

- Malnutrition weakens immune system
- First line of defence (skin, mucous, cells of GI tract) break-down allowing more antigens to invade inside the body
- Insufficient protein intake decreases immune cell number
- When T-cell number decreases regulatory T-cells decrease immune response is delayed
- Obesity affects the body's defence system
- Responses of T-cells and B-cells to antigens may be reduced
- Weight loss diets may also cause this same immune response
- Type of fat consumed can affect the immune system
- Total amount and type of fat in the diet affects immune system
- High-fat diets impair immune response
- Omega-6 fatty acids can suppress immune response, alter inflammatory response
- May increase risk of asthma
- Omega-3 fatty acids – decrease inflammation, increase immune response and limits tissue damage

### Role of some Nutrients

- Vitamin A – needed to make healthy skin, mucous and lymphocytes; deficiency can alter response of antibodies to antigens and cytokine responses
- Vitamin E – needed for phagocytosis, antibody production, lymphocyte responses
- Vitamin C – may decrease duration of virus symptoms
- Vitamin B<sub>6</sub> – antibody production, lymphocyte responses
- Zinc – T-cell production, lymphocyte responses, resistance to infections

## NUTRITION CARE PROCESS

To lay the groundwork and facilitate a clear definition of Nutrition Care Process, key terms were developed. These definitions provide a frame of reference for the specific components and their functions.

1. *Process* is a series of connected steps or actions to achieve an outcome and/or any activity or set of activities that transforms inputs to outputs.
2. *Process Approach* is the systematic identification and management of activities and the interactions between activities. A process approach emphasizes the importance of the following:
  - a. Understanding and meeting requirements;
  - b. Determining if the process adds value;
  - c. Determining process performance and effectiveness; and
  - d. Using objective measurement for continual improvement of the process
3. *Critical Thinking* integrates facts, informed opinions, active listening and observations. It is also a reasoning process in which ideas are produced and evaluated. It is defined as “*transcending the boundaries of formal education to explore a problem and form a hypothesis and a defensible conclusion*”. The use of critical thinking provides a unique strength that health care professionals bring to the Nutrition Care Process. Further characteristics of critical thinking include the ability to do the following:
  - a. Conceptualize;
  - b. Think rationally;
  - c. think creatively;
  - d. Be inquiring; and
  - e. Think autonomously
4. *Decision Making* is a critical process for choosing the best action to meet a desired goal.
5. *Problem Solving* is the process of the following:
  - a. Problem identification;
  - b. Solution formation;
  - c. Implementation; and
  - d. Evaluation of the results.
6. *Collaboration* is a process by which several individuals or groups with shared concerns are united to address an identified problem or need, leading to the accomplishment of what each could not do separately.



The Nutrition Care Process consists of four distinct, but interrelated and connected steps:

1. **Nutrition Assessment:** A systematic process of obtaining, verifying, and interpreting data in order to make decisions about the nature and cause of nutrition-related problems.
2. **Nutrition Diagnosis**, defined as:
  - a. Actual problems related to intake of energy, nutrients, fluids, bioactive substances through oral diet or nutrition support (Enteral or parenteral nutrition)
  - b. Nutritional findings/problems identified that relate to medical or physical conditions
  - c. Nutritional findings/problems identified that relate to knowledge, attitudes/beliefs, physical environment, or access to food and food safety
3. **Nutrition Intervention:** Purposely-planned actions designed with the intent of changing a nutrition-related behavior, risk factor, environmental condition, or aspect of health status for an individual, a target group, or population at large.
4. **Nutrition Monitoring and Evaluation:** use of selected outcome indicators (markers) that are relevant to the patient defined needs, nutrition diagnosis, nutrition goals, and disease state.

The Nutrition Care Process does not restrict practice but acknowledges the common dimensions of practice by the following:

- Defining a common language that allows nutrition practice to be more measurable;
- Creating a format that enables the process to generate quantitative and qualitative data that can then be analyzed and interpreted; and
- Serving as the structure to validate nutrition care and showing how the nutrition care that was provided does what it intends to do. Figure 3 below shows the nutrition care process algorithm. Table 15-18 further highlights the characteristics of each step of the nutrition care process i.e. assessment, diagnosis, intervention and monitoring and evaluation.



Figure 3: Nutrition Care Process Algorithm



**Table 15: Nutrition Assessment Process Steps**

Characteristics	Nutrition Assessment
<i>Data Sources/Tools</i>	<ul style="list-style-type: none"> <li>• Referral information and/or patient records</li> <li>• Patient/client interview</li> <li>• Statistical reports; administrative data</li> </ul>
<i>Types of Data Collected</i>	<ul style="list-style-type: none"> <li>• Nutritional Adequacy (dietary history/detailed nutrient intake)</li> <li>• Health Status (anthropometric and biochemical measurements, physical &amp; clinical conditions, physiological and disease status)</li> <li>• Functional and behavioral status (social and cognitive function, psychological and emotional factors, quality-of-life measures, change readiness)</li> </ul>
<i>Assessment Components</i>	<ul style="list-style-type: none"> <li>• Review dietary intake for factors that affect health conditions and nutrition risk</li> <li>• Evaluate health and disease condition for nutrition-related consequences</li> <li>• Evaluate psychosocial, functional, and behavioral factors related to food access, selection, preparation, physical activity, and understanding of health condition</li> <li>• Evaluate patient knowledge, readiness to learn, and potential for changing behaviors</li> <li>• Identify standards by which data will be compared</li> <li>• Identify possible problem areas for making nutrition diagnoses</li> </ul>
<i>Critical Thinking</i>	<ul style="list-style-type: none"> <li>• Observing for nonverbal and verbal cues that can guide and prompt effective interviewing methods;</li> <li>• Determining appropriate data to collect;</li> <li>• Selecting assessment tools and procedures (matching the assessment method to the situation);</li> <li>• Applying assessment tools in valid and reliable ways;</li> <li>• Distinguishing relevant from irrelevant data;</li> <li>• Validating the data;</li> <li>• Organizing &amp; categorizing the data in a meaningful framework that relates to nutrition problems; and</li> <li>• Determining when a problem requires consultation with or referral to another provider.</li> </ul>
<i>Documentation of Assessment</i>	<ul style="list-style-type: none"> <li>• Date and time of assessment;</li> <li>• Pertinent data collected and comparison with standards;</li> <li>• Patient/client/groups' perceptions, values, and motivation related to presenting problems;</li> <li>• Changes in patient/client/group's level of understanding, food-related behaviors, and other clinical outcomes for appropriate follow-up; and</li> <li>• Reason for discharge/discontinuation if appropriate</li> </ul>
<i>Determination for Continuation of Care</i>	<ul style="list-style-type: none"> <li>• If upon the completion of an initial or reassessment it is determined that the problem cannot be modified by further nutrition care, discharge or discontinuation from this episode of nutrition care may be appropriate</li> </ul>

**Table 16: Nutrition Diagnosis Process steps**

Characteristics	Nutrition Diagnosis
<i>Data Sources/Tools</i>	<ul style="list-style-type: none"> <li>Organized and clustered assessment data</li> <li>List(s) of nutrition diagnostic categories and nutrition diagnostic labels</li> </ul>
<i>Problem (Diagnostic Label)</i>	<ul style="list-style-type: none"> <li>Describes alterations in patient’s nutritional status</li> <li>Diagnostic labels include:               <ul style="list-style-type: none"> <li><u>Impaired</u> (nutrient utilization...)</li> <li><u>Altered</u> (GI function...)</li> <li><u>Inadequate/excessive</u> (calorie intake...)</li> <li><u>Inappropriate</u> (intake of types of carbohydrate)</li> <li>Swallowing difficulty</li> </ul> </li> </ul>
<i>Etiology (Cause/Contributing Factors)</i>	<ul style="list-style-type: none"> <li>Related factors that contribute to problem</li> <li>Identifies cause of the problem</li> <li>Helps determine whether nutrition intervention will improve problem</li> <li>Linked to problem by words “related to” (RT) E.g. Excessive calorie intake (problem) related to regular consumption of large portions of high-fat meals (etiology)</li> </ul>
<i>Signs/Symptoms (Defining characteristics)</i>	<ul style="list-style-type: none"> <li>Evidence that problem exists</li> <li>Linked to etiology by words “as evidenced by” e.g., Excessive calorie intake (problem) “related to” regular consumption of large portions of high-fat meals (etiology) <u>as evidenced by</u> diet history and weight status               <ul style="list-style-type: none"> <li>Excessive calorie intake (P)</li> <li>“related to” regular consumption of large portions of high-fat meals (E)</li> <li>“as evidenced by” diet history &amp; 6 kg wt gain over last 6 month (S &amp; S)</li> </ul> </li> <li>Nutrition Diagnosis Statement should be:               <ul style="list-style-type: none"> <li>Clear, concise</li> <li>Specific</li> <li>Related to one problem</li> <li>Accurate – related to one etiology</li> <li>Based on reliable, accurate assessment data</li> </ul> </li> </ul>
<i>Documentation of Assessment</i>	<ul style="list-style-type: none"> <li>Date and time of assessment;</li> <li>Written statement of nutrition diagnosis</li> </ul>
<i>Determination for Continuation of Care</i>	<ul style="list-style-type: none"> <li>Since the diagnosis step primarily involves naming and describing the problem, the determination for continuation of care seldom occurs at this step.</li> <li>Determination of the continuation of care is more appropriately made at an earlier point in the Nutrition Care Process.</li> </ul>

**Table 17: Nutrition Intervention Process Steps**

Characteristics	Nutrition Intervention
<i>Data Sources/Tools</i>	<ul style="list-style-type: none"> <li>• Evidence-based nutrition guides for practice and protocols</li> <li>• Current research literature</li> <li>• Current consensus guidelines and recommendations from other professional organizations</li> <li>• Current patient education materials at appropriate reading level and language</li> <li>• Behavior change theories (self-management training, motivational interviewing, behavior modification, modeling)</li> </ul>
<i>Planning the Nutrition Intervention</i>	<ul style="list-style-type: none"> <li>• Prioritize the nutrition diagnoses based on severity of problem</li> <li>• Consult other practice guides or job aids.</li> <li>• Determine patient-focused expected outcomes for each nutrition diagnosis</li> <li>• Confer with patient, other caregivers or policies and program standards</li> <li>• Define intervention plan (for example write a nutrition prescription)</li> <li>• Select specific intervention strategies that are focused on the etiology of the problem and that are known to be effective based on best current knowledge and evidence</li> <li>• Define time and frequency of care including intensity, duration, and follow-up.</li> <li>• Identify resources and/or referrals needed</li> </ul>
<i>Implementing the Nutrition Intervention</i>	<ul style="list-style-type: none"> <li>• Communicate the plan of nutrition care;</li> <li>• Carry out the plan of nutrition care; and</li> <li>• Continue data collection and modify the plan of care as needed.</li> <li>• Other characteristics that define quality implementation include: <ul style="list-style-type: none"> <li>○ Individualize the interventions to the setting and client;</li> <li>○ Collaborate with other colleagues and health care professionals;</li> <li>○ Follow up and verify that implementation is occurring and needs are being met; and</li> </ul> </li> <li>• Revise strategies as changes in condition/response occurs)</li> </ul>
<i>Critical Thinking</i>	<ul style="list-style-type: none"> <li>• Setting goals and prioritizing;</li> <li>• Transferring knowledge from one situation to another;</li> <li>• Defining the nutrition prescription or basic plan;</li> <li>• Making interdisciplinary connections;</li> <li>• Initiating behavioral and other interventions;</li> <li>• Matching intervention strategies with client needs, diagnoses, and values;</li> <li>• Choosing from among alternatives to determine a course of action; and</li> <li>• Specifying the time and frequency of care.</li> </ul>
<i>Documentation of Assessment</i>	<ul style="list-style-type: none"> <li>• Date and time;</li> <li>• Specific treatment goals and expected outcomes;</li> <li>• Recommended interventions, individualized for patient;</li> <li>• Any adjustments of plan and justifications;</li> <li>• Patient receptivity;</li> <li>• Referrals made and resources used;</li> <li>• Any other information relevant to providing care and monitoring progress over time;</li> <li>• Plans for follow-up and frequency of care; and</li> <li>• Rationale for discharge if appropriate</li> </ul>
<i>Determination for Continuation of Care</i>	<ul style="list-style-type: none"> <li>• If the patient has met intervention goals or is not at this time able/ready to make needed changes, the health service professional may include discharging the client from this episode of care as part of the planned intervention.</li> </ul>

**Table 18: Nutrition Monitoring and Evaluation Process Steps**

Characteristics	Nutrition Monitoring and Evaluation
<i>Data Sources/Tools</i>	<ul style="list-style-type: none"> <li>• Patient records</li> <li>• Anthropometric measurements, laboratory tests,</li> <li>• Patient (or guardian) interviews/surveys</li> <li>• telephone follow-up</li> <li>• <i>Reference guides</i> and other evidence-based sources</li> <li>• Data collection forms, spreadsheets</li> </ul>
<i>Monitoring progress</i>	<ul style="list-style-type: none"> <li>• Check patient understanding and compliance with plan;</li> <li>• Determine if the intervention is being implemented as prescribed;</li> <li>• Provide evidence that the plan/intervention strategy is or is not changing patient behavior or status;</li> <li>• Identify other positive or negative outcomes;</li> <li>• Gather information indicating reasons for lack of progress; and</li> <li>• Support conclusions with evidence.</li> </ul>
<i>Measuring and Evaluating Outcomes</i>	<ul style="list-style-type: none"> <li>• Select outcome indicators that are relevant to the nutrition diagnosis or signs or symptoms, nutrition goals, medical diagnosis, and outcomes and quality management goals.</li> <li>• Use standardized indicators to:               <ul style="list-style-type: none"> <li>○ Increase the validity and reliability of measurements of change; and</li> <li>○ Facilitate electronic charting, coding, and outcomes measurement</li> </ul> </li> <li>• Compare current findings with previous status, intervention goals, and/or reference standards</li> </ul>
<i>Critical Thinking</i>	<ul style="list-style-type: none"> <li>• Selecting appropriate indicators/measures;</li> <li>• Using appropriate reference standard for comparison;</li> <li>• Defining where patient/client/group is now in terms of expected outcomes;</li> <li>• Explaining variance from expected outcomes;</li> <li>• Determining factors that help or hinder progress; and</li> <li>• Deciding between discharge or continuation of nutrition care</li> </ul>
<i>Documentation of Assessment</i>	<ul style="list-style-type: none"> <li>• Date and time;</li> <li>• Specific indicators measured and results;</li> <li>• Progress toward goals (incremental small change can be significant therefore use of a Likert type scale may be more descriptive than a “met” or “not met” goal evaluation tool);</li> <li>• Factors facilitating or hampering progress;</li> <li>• Other positive or negative outcomes; and</li> <li>• Future plans for nutrition care, monitoring, and follow up or discharge.</li> </ul>
<i>Determination for Continuation of Care</i>	<ul style="list-style-type: none"> <li>• Based on the findings, a decision to actively continue care or discharge the patient from nutrition care (when necessary and appropriate nutrition care is completed or no further change is expected at this time).</li> <li>• If nutrition care is to be continued, the nutrition care process cycles back as necessary to assessment, diagnosis, and/or intervention for additional assessment, refinement of the diagnosis and adjustment and/or reinforcement of the plan.</li> <li>• If care does not continue, the patient may still be monitored for a change in status and reentry to nutrition care at a later date.</li> </ul>

## NUTRITION CARE AND SUPPORT FOR HOSPITALIZED PATIENT

To assist in control of hospital costs and to prioritize patients needing assistance, hospitals need to adopt a simple nutrition screening procedure to distinguish between patients not at nutritional risk and those at nutrition risk and therefore requiring more detailed nutrition assessment. Nutritional screening should be quick, simple and done for every patient within the first 24-48 hours of the patient entering the hospital. More intensive assessments should be done for those identified to be at nutritional risk. Figure 4 below outlines the steps to follow in nutrition care for all patients admitted to the health facility/clinic, while table 19 provides a sample of hospitalization nutrition screening tool, which can be adapted or modified by a health facility.

### NUTRITION CARE STEPS FOR HOSPITALIZED PATIENTS

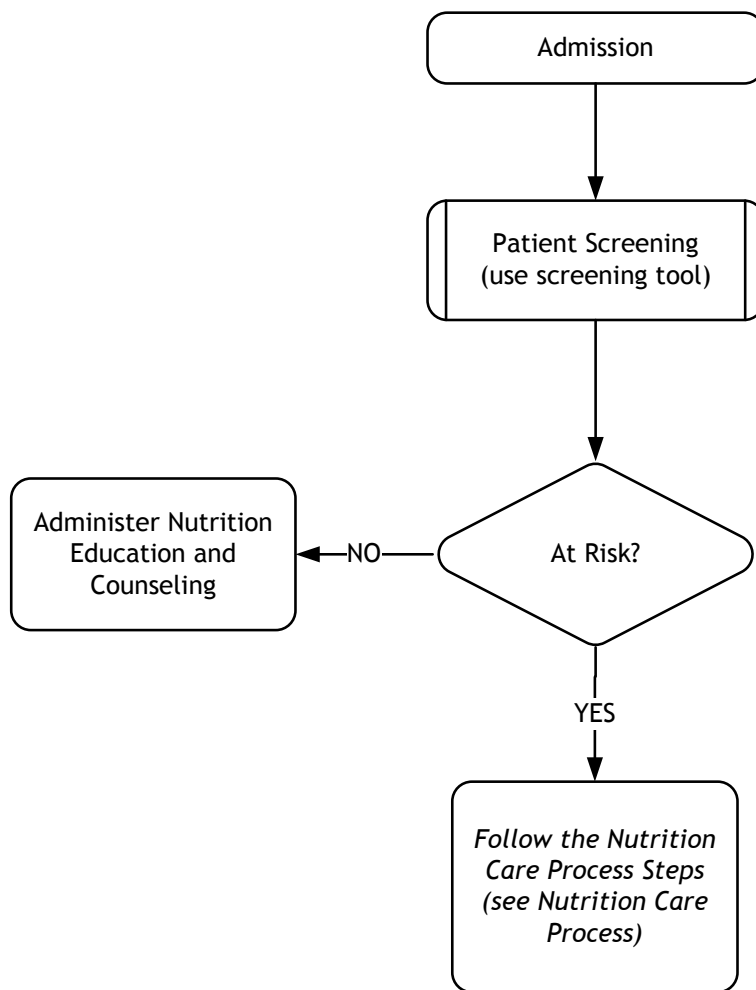


Figure 4: Nutrition care steps for hospitalized patients



Table 19: Sample Hospitalization Nutrition screening tool

Indicator	Yes (☑)	No (☑)
Significant decrease in body weight <ul style="list-style-type: none"> <li>• 5% weight loss in 30 days.</li> <li>• 10% weight loss in 6 months.</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>
1. Low body weight <ul style="list-style-type: none"> <li>• 20% or more below ideal body weight or BMI of 18.5 or less</li> <li>• Request for assistance with gaining/maintaining weight.</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>
2. Significant increase in weight; physical diagnosis of obesity <ul style="list-style-type: none"> <li>• Obesity: 20% or more above ideal body weight or BMI of 25 or greater.</li> <li>• Request for assistance with weight control.</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>
3. Abnormal body composition measures e.g. <ul style="list-style-type: none"> <li>• MUAC below 22 for adults.</li> <li>• MUAC below 11.5 children</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>
4. Medical or psychiatric diagnosis related to nutritional therapy e.g. nephritic syndrome, diabetes, cardiovascular, hepatic, pancreatic, gastric etc.	<input type="checkbox"/>	<input type="checkbox"/>
5. Chronic decrease in food intake	<input type="checkbox"/>	<input type="checkbox"/>
6. Chewing and/or swallowing difficulties.	<input type="checkbox"/>	<input type="checkbox"/>
7. Pregnancy	<input type="checkbox"/>	<input type="checkbox"/>
8. Abnormal laboratory values pertinent to nutritional status e.g. HB, Albumin, blood glucose etc.	<input type="checkbox"/>	<input type="checkbox"/>
9. Enteral or parenteral nutrition	<input type="checkbox"/>	<input type="checkbox"/>

## CHAPTER FOUR: MEDICAL NUTRITION THERAPY

### THERAPEUTIC DIETS

This chapter describes the different types of diets and nutrition interventions, their nutrient contribution and how to prescribe and interpret diet orders by nutritionists/dietitians.

Therapeutic diets can be grouped into two types namely:

- a. **Normal diet**
- b. **Modified diet**

#### NORMAL DIET

This is a regular diet either vegetarian or non vegetarian well balanced and adequate for nutrition. It is the foundation of all diets and is designed to provide adequate nutrition for optimal nutrition and health status in persons who do not require medical nutrition therapy. This diet is used when there is no required diet modification or restrictions. Individual requirements for specific nutrients may vary based on age, sex, height, weight, activity level and different physiological status.

Foods from the seven basic food groups (water, cereals and starch, vegetables, fruits, animal protein, plant protein, fats and oils and sugars and sweets) are used to make food choices in the design of the diet. Food choices should meet nutrient requirements, promote health, support active lives and reduce chronic disease risks. A normal diet consists of three (3) main meals and may include various snacks depending on individual needs. In planning the meal, there are six principles which should be considered.

- a. **Adequacy in all nutrients**

An adequate diet provides all nutrients to meet the recommended nutrient intake of healthy people.

- b. **Balance of foods and nutrients in the diet**

This means not over consuming any one food. The art of balance involves the use of enough but not too much or too little of each type of the seven food groups for example use some meat or meat alternatives for iron, use some milk or milk products for calcium and save some space for other foods. The concept of balance encompasses proportionality both between and among the groups.

- c. **Nutrient density**

This is the relative ratio obtained by dividing a food's contribution to the needs for a nutrient by its contribution to calorie needs. This is assessed by comparing the vitamin and mineral content of a food with the amount of

calories it provides. A food is nutrient dense if it provides a large amount of nutrient for a relatively small amount of calories.

**d. Energy density**

This is the amount of energy in kilocalories in a food compared with its weight. Examples of energy dense foods are nuts, cookies, and fried foods. Low energy density foods include fruits, vegetables and any food that incorporates a lot of water during cooking. They contribute to satiety without giving many calories.

**e. Moderation in the diet**

This mainly refers to portion size. This requires planning the entire day's diet so as not to under/over consume any one food. In planning the diets, the goal should be to moderate rather than eliminate intake of some foods

**f. Variety in food choice**

This means choosing a number of different foods within any given food group rather than eating the same food daily. People should vary their choices of food within each class of food from day to day. This makes meals more interesting, helps to ensure a diet contains sufficient nutrients as different foods in the same group contain different arrays of nutrients and gives one the advantage of added bonus in fruits and vegetables as each contain different phyto chemicals.

## DIET PLANNING GUIDE

To achieve the dietary ideals outlined above, there are several tools used for diet planning. Some of the commonly used tools are:

- Dietary Reference Intakes (DRI)
- Recommended Dietary Allowances (RDA)
- Daily Food Guide
- Food Guide Pyramid
- Exchange Lists

## DIETARY REFERENCE INTAKE

This is a set of four separate reference values used to plan and evaluate diets. These includes the updated Recommended Dietary Allowance (RDAs), Estimated Average Requirement (EAR), Adequate Intake (AI) and the Tolerable Upper and Lower Intake Level. Each of these reference values has a specific purpose and represents a different level of intake. They are used to plan menus for specific populations in different settings such as hospitals, nursing homes, feeding programs, schools etc. DRIs are not suitable for teaching people how to make healthy food choices. This is because people eat food not nutrients and therefore the nutrition education and even counseling should be in terms of food.

### RECOMMENDED DIETARY ALLOWANCES (RDA)

This refers to the average daily dietary intake levels sufficient to meet the nutrient requirement of 97-98% of healthy individuals in a particular life stage and gender group.

**Estimated Average Requirement (EAR)** is the nutrient intake estimated to meet the requirement of half of the healthy individuals in a particular life stage and gender group.

**Adequate Intake (AI)** is the level thought to meet or exceed the requirements of almost all members of a life stage/gender group. An AI is set when there are insufficient data to define an RDA.

**Tolerable Upper Intake Level** is the highest average daily intake level of a nutrient likely to pose no danger to most individuals in the group.

**Tolerable Lower Intake Level** is the lowest average daily intake level of a nutrient likely to pose no danger to most individuals in the group

### DAILY FOOD GUIDE

Daily food guide helps the planner achieve dietary adequacy, balance and variety. Table 20 below presents the daily food guide and includes most notable nutrients within each food group, the number of servings recommended, the size of servings, and the foods within each group categorized by nutrient density. It also gives the average range of servings per day for the different food groups

**Table 20: Food guide for regular diet**

Food group	Major nutrients	Servings per adult	Servings per child	One serving equivalent 1 cup/glass = 250 ml
<i>Water</i>		8		
<i>General starchy foods bread, cereals and other grains</i>	<ul style="list-style-type: none"> <li>• Carbohydrates</li> <li>• Vitamin (B1)</li> <li>• Iron,</li> <li>• Niacin</li> </ul>	6-11	6	<ul style="list-style-type: none"> <li>• 1 slice bread,</li> <li>• ½ cup cooked cereals, pastas or rice, ¾ to 1 cup</li> <li>• potatoes, green bananas,</li> <li>• 2 small 3 inch pancakes.</li> <li>• 1 cup ready to eat cereals</li> </ul>
<i>Milk and milk products</i>	<ul style="list-style-type: none"> <li>• Calcium</li> <li>• Riboflavin (Vit B2)</li> <li>• Vitamin B12,</li> <li>• Proteins,</li> <li>• fats</li> </ul>	2-4	2	<ul style="list-style-type: none"> <li>• 1 cup :               <ul style="list-style-type: none"> <li>○ fresh milk,</li> <li>○ fermented milk or</li> <li>○ yoghurt</li> </ul> </li> </ul>
<i>Meat or substitutes</i>	<ul style="list-style-type: none"> <li>• Protein,</li> <li>• Niacin,</li> <li>• iron</li> <li>• thiamine (Vit B1)</li> <li>• B6,</li> <li>• B12,</li> <li>• Zn,</li> <li>• Mg,</li> </ul>	2-3	2	<ul style="list-style-type: none"> <li>• 1oz. Or approximately 30g (6 small pieces meat.</li> <li>• Thigh of chicken</li> <li>• Portion of fish,</li> <li>• 1 egg,</li> <li>• ½ cup cooked dry beans or</li> <li>• 2 tablespoon peanut butter</li> </ul>
<i>Vegetables</i>	<ul style="list-style-type: none"> <li>• Vitamin A</li> <li>• Vitamin C</li> <li>• Vitamin K+,</li> <li>• fiber,</li> <li>• folate</li> <li>• potassium,</li> <li>• Magnesium</li> </ul>	3-5	3	<ul style="list-style-type: none"> <li>• ½ Cup cooked vegetables</li> <li>• 1 cup raw vegetables,</li> <li>• ½ cup fresh cooked legumes,</li> <li>• ¾ cup vegetable juice</li> </ul>
<i>Fruits</i>	<ul style="list-style-type: none"> <li>• Vitamin A</li> <li>• Vitamin C</li> <li>• Vitamin K+</li> <li>• Fiber</li> </ul>	2-4	2	<ul style="list-style-type: none"> <li>• ¾ Cup 100% fresh fruit juice,</li> <li>• ½ cup fresh diced fruit.</li> <li>• ¼ cup dried fruit.</li> <li>• One medium apple, banana, orange, 1 melon wedge</li> </ul>
<i>Fats and sugars</i>	<ul style="list-style-type: none"> <li>• Vitamins A, D, E, K,</li> <li>• Fats,</li> <li>• Carbohydrates</li> </ul>	Sparingly	Sparingly	<ul style="list-style-type: none"> <li>• Vegetable oil</li> <li>• Margarine,</li> <li>• Butter,</li> <li>• Cream, salad dressings,</li> <li>• Mayonnaise</li> <li>• Sweets,</li> <li>• Sugar</li> <li>• Honey</li> </ul>

## THE FOOD GUIDE PYRAMID

The food pyramid translates the food guide in table 20 into a graphic image. The broad base of the pyramid displays water followed by cereals; rice, pasta, bread and other foods made from grains. It also includes the roots and tubers. Fruits and vegetables make the next layer. Dairy products such as milk and yoghurt are included in the same tier as meats, poultry, eggs beans and nuts. The foods at the top of the pyramid which include fats, oils, sugars and sweets are to be consumed sparingly. Figure 5 below is a graphic representation of the food pyramid adapted from USDA.

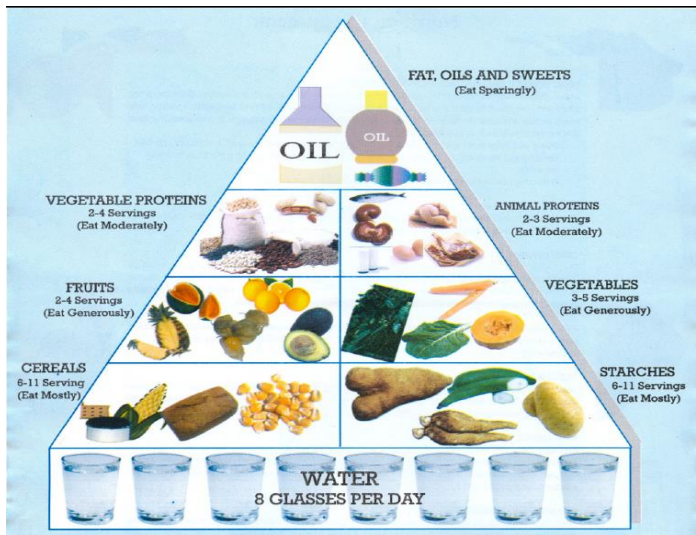


Figure 5: Food guide pyramid

## EXCHANGE LISTS

A food exchange list is a simple grouping of common foods according to generally equivalent nutritional values. This system is used for any situation requiring caloric and food value control. All the foods listed together are approximately equal in proteins, carbohydrates and fat value. Exchange lists provide additional help in achieving kilocalorie control and moderation. Originally developed for people with diabetes, exchange systems have proved so useful that they are now in general use for diet planning.

Unlike the food group plans which sort foods by their proteins, vitamins and mineral contents, the exchange list sorts' food by their proportion of carbohydrates, fats and proteins. Portion sizes are strictly defined so that the amount of energy provided by any food item is the same as that of any other item within a given list. All of the food portions in a given list provide approximately the same amounts of energy, nutrients (protein, fat and carbohydrates) and the same number of kilocalories. Any food on a list can be exchanged or traded for any other food on that same list without affecting a plan's balance or total kilocalories. The system organizes food into seven exchange lists.

1. Starch
2. Milk
3. Meat
4. Fruits
5. Vegetables
6. Fats
7. sugar

The number of kilocalories associated with each food is an average for the group. The number of kilocalories is calculated given the number of grams of carbohydrates, fats and proteins in a food (1g of carbohydrate or protein yields 4kcal while 1g of fat yields 9 kcal). To apply the system successfully, users must become familiar with portion sizes. Table 21 below shows exchanges for carbohydrates, proteins, fat and energy values that pertain to each list.

Table 21: Exchanges for carbohydrates, proteins, fats and energy values

List	Portion size per serving	Amount (ml or g)	CHO	PRO	Fats	Kcal/ serving
<b>Starch</b>	<ul style="list-style-type: none"> <li>• 1/3 cup arrowroots</li> <li>• 1/3 cup Ugali</li> <li>• 1 slice bread,</li> <li>• 1/3 cup cassava</li> <li>• 1/2 cup cooked bananas</li> <li>• 1/2 cup dried cooked beans</li> <li>• 1/2 cup cooked rice,</li> <li>• 1/2 cup cooked pasta,</li> <li>• 1/2 cup sweet potatoes,</li> <li>• 1/2 cup porridge,</li> <li>• 1/2 cup Irish potatoes,</li> <li>• 1/2 chapatti</li> </ul>	30g	<ul style="list-style-type: none"> <li>• 15</li> <li>• 15</li> <li>• 15</li> <li>• 15</li> <li>• 15</li> <li>• 15</li> <li>• 15</li> <li>• 15</li> <li>• 15</li> <li>• 15</li> <li>• 15</li> <li>• 15</li> </ul>	<ul style="list-style-type: none"> <li>• 2</li> <li>• 2</li> <li>• 2</li> <li>• 2</li> <li>• 2</li> <li>• 2</li> <li>• 2</li> <li>• 2</li> <li>• 2</li> <li>• 2</li> <li>• 2</li> <li>• 2</li> </ul>	<ul style="list-style-type: none"> <li>• -</li> <li>• -</li> <li>• -</li> <li>• -</li> <li>• -</li> <li>• -</li> <li>• -</li> <li>• -</li> <li>• -</li> <li>• -</li> <li>• -</li> <li>• -</li> </ul>	80
<b>Milk</b>	<ul style="list-style-type: none"> <li>• 1 cup fresh milk,</li> <li>• Nonfat</li> <li>• 1/4 cup ice cream,</li> <li>• Low fat</li> <li>• 75 ml or one scoop,</li> <li>• Whole</li> <li>• 1 cup yoghurt</li> </ul>	<ul style="list-style-type: none"> <li>• 250 ml</li> <li>• 250ml</li> <li>• 250ml</li> </ul>	<ul style="list-style-type: none"> <li>• 12</li> <li>• 12</li> <li>• 12</li> </ul>	<ul style="list-style-type: none"> <li>• 8</li> <li>• 8</li> <li>• 8</li> </ul>	<ul style="list-style-type: none"> <li>• Trace</li> <li>• 5</li> <li>• 8</li> </ul>	<ul style="list-style-type: none"> <li>• 90</li> <li>• 120</li> <li>• 150</li> </ul>
<b>Meat</b>	<ul style="list-style-type: none"> <li>• Size of matchbox meat,</li> <li>• Lean</li> <li>• palm size of fish,</li> <li>• Medium fat</li> <li>• a leg, thigh or breast chicken,</li> <li>• High fat</li> <li>• Egg</li> <li>• 2 tbsp peanut butter,</li> <li>• 1/2 cup fresh beans,</li> <li>• 1/2 cup Omena</li> </ul>	<ul style="list-style-type: none"> <li>• 30g</li> <li>• 30g</li> <li>• 30g</li> <li>• 30g</li> </ul>	<ul style="list-style-type: none"> <li>-</li> <li>-</li> <li>-</li> <li>-</li> </ul>	<ul style="list-style-type: none"> <li>• 7</li> <li>• 7</li> <li>• 7</li> <li>• 7</li> </ul>	<ul style="list-style-type: none"> <li>• 3</li> <li>• 5</li> <li>• 8</li> <li>• 3</li> </ul>	<ul style="list-style-type: none"> <li>• 55</li> <li>• 75</li> <li>• 100</li> <li>• 75</li> </ul>
<b>Vegetables</b>	<ul style="list-style-type: none"> <li>• 1/2 cup cooked vegetables,</li> <li>• 1 cup raw vegetables,</li> <li>• 1gram tomato,</li> </ul>	100-150g	5	2	-	25
<b>Fruits</b>	<ul style="list-style-type: none"> <li>• 1 small apple,</li> <li>• peach, orange or pear,</li> <li>• 1/2 cup orange, apple or grape fruit juice(pure juice)</li> <li>• 3/4 cup diced fruits</li> </ul>	Varies	15	-	-	60
<b>Fats</b>	<ul style="list-style-type: none"> <li>• 1 tsp margarine or oil,</li> <li>• 10 large peanuts,</li> <li>• 1/8 medium avocado,</li> <li>• 1 slice bacon,</li> <li>• 1 tbsp shredded coconut,</li> <li>• 1 tbsp cream cheese,</li> <li>• 1 tablespoon salad dressing,</li> <li>• 5 large olives</li> </ul>		-	-	5	45
<b>Sugar</b>	1 tsp		5			20



Table 22 below gives further information on how to interpret the number of servings required for low, moderate and high kilocalorie diets. This is essential when kilocalorie restriction is desired.

**Table 22: Number of servings per kilocalorie needs**

Food Group	Lower (1200-1600)	Moderate (1601-2200)	Higher(about 2800)
Grain Group servings	6	9	11
Vegetable Group Servings	3	4	5
Fruit Group servings	2	3	4
Milk Group Servings	2	3	3
Meat Group	5	6	7

### MODIFIED DIETS

In morbidity, nutritional homeostasis is altered. This creates special nutritional needs necessitating nutritional modification. Modified diets are normal diet qualitatively or quantitatively altered as per patients'/clients' special needs and in line with the general principles of meal planning.

#### *Factors that may determine dietary modification*

- a. Disease symptoms
- b. Severity of the symptom or disease (Condition of the patient)
- c. Nutritional status of the patient
- d. Metabolic changes involved
- e. Physiological state

### THERAPEUTIC MODIFICATION OF NORMAL DIET

#### MODIFICATION IN CONSISTENCY

##### CLEAR LIQUID DIET

#### **Purpose**

This is a diet modified to provide oral fluids to prevent dehydration and relieve thirst, small amounts of electrolytes and calories in a form that requires minimal digestion and stimulation of the gastrointestinal tract. It is indicated for short term use (24hrs to 48hrs as indicated in table 23. Nutritionally depleted patients should receive additional nutritional support through use of nutritionally complete minimal residue supplements or parenteral nutrition.

**NB: Additional modifications may be necessary when used in some clinical conditions such as cardiac disease or prior to some tests.**

**Table 23: Indication and characteristics for clear liquid diet**

Diet	Indications	Characteristics of the diet
<ul style="list-style-type: none"> <li>• E.g. Black tea, broth, strained fruit/ vegetable juices etc.</li> </ul>	<ul style="list-style-type: none"> <li>• Pre- and Post-operation,</li> <li>• As a transition from intravenous feeding to a full liquid diet,</li> <li>• When other liquids and solid foods are not tolerated,</li> <li>• During bowel preparation prior to diagnostic visualization or surgery</li> <li>• In the initial recovery phase after abdominal surgery</li> </ul>	<ul style="list-style-type: none"> <li>• Composed of water and carbohydrates.</li> <li>• Clear liquid at room temperature</li> <li>• Leaves minimal amount of residue in the Gastrointestinal (GI) tract.</li> <li>• Provides approximately 400-500kcal, 5-10g proteins, 100-120g CHO and no fat.</li> <li>• Should be of low concentration</li> <li>• Milk and milk drinks are omitted</li> <li>• Improve energy level by addition of sugar</li> <li>• Are nutritionally inadequate in all nutrients</li> </ul>

## FULL LIQUID DIET

### Purpose

The full liquid diet is designed to provide nourishment in liquid form and facilitate digestion and optimal utilization of nutrients in acutely ill patients who are unable to chew or swallow certain foods. The diet is often used as a transition between the clear liquid diet and a soft regular diet. Patients with hypercholesterolemia full liquid diet to be modified to have low fat by substituting high saturated fats with low fat dairy products and polyunsaturated fats and oils. Increasing protein and caloric value of full liquid diet becomes necessary when the diet is used for a period extending over 2-3 weeks. Table 24 below provides indications for and characteristics of full liquid diet.

**Table 24: Indications and characteristics of full liquid diet**

Diet	Indications	Characteristics of the diet
<ul style="list-style-type: none"> <li>• Soft desserts from milk and eggs,</li> <li>• Pureed and strained soups, ice creams, milk or yoghurt, etc.</li> </ul>	<ul style="list-style-type: none"> <li>• For post operative patients</li> <li>• For acutely ill patients or those with esophageal/GIT disorders and cannot tolerate solid foods</li> <li>• Following surgery of the face-neck area or dental or jaw wiring</li> </ul>	<ul style="list-style-type: none"> <li>• Foods should be liquid at room temperature</li> <li>• Free from condiments and spices</li> <li>• Provides between 1500-2000kcal/day</li> <li>• Large percentage is milk based foods; lactose intolerant individuals need special consideration.</li> <li>• The diet may be inadequate in micronutrients and fiber</li> </ul>

***Thick Liquid Diet (Blended or Semisolid Diet)***

This diet is moderately low in cellulose and connective tissue to facilitate easy digestion. Tender foods are used to prepare the diet. Most raw fruits and vegetables, coarse breads, cereals, tough meats and nuts are eliminated. Fried and highly seasoned foods are omitted.

**Purpose of the diet**

The blended liquid diet is designed to provide adequate calories, protein and fluid for the patients who are unable to chew, swallow or digest solid foods. The diet prescription should be individualized to meet medical condition and tolerance. Patients with wired jaws may use a syringe, spoon, or straw to facilitate passage of liquid through openings in the teeth, depending on the physician’s recommendation. Frequent feedings (six to eight feeds per day) facilitate ingestion of adequate calories and proteins. Depending on individual choice and tolerance, the diet can be used to provide adequate nutrients. Some patients experience palatability problems or may have difficulty consuming adequate volume of liquids, they may be unable to meet nutrient and fluid needs. In such situations supplementation may be necessary. Blended foods should be used immediately but can be refrigerated up to 48hrs or frozen immediately after blending to prevent growth of harmful bacteria. Table 25 below provides indications for and characteristics of thick liquid diet.

**Table 25: Indications and characteristics of thick liquid diet**

Diet	Indications	Characteristics of the diet
	<ul style="list-style-type: none"> <li>• After oral surgery or plastic surgery of the face or neck area with chewing or swallowing dysfunctions</li> <li>• For acutely ill patients and those with oral, esophageal or stomach disorders who are unable to tolerate solid foods due to stricture or anatomical irregularities</li> <li>• Those progressing from full liquid to a general diet.</li> <li>• Patients who are too weak to tolerate a general diet.</li> <li>• Those whose dentition is too poor to handle foods in a general diet.</li> <li>• -Those for whom a light diet has been indicated e.g. post operative</li> </ul>	<ul style="list-style-type: none"> <li>• Fluids and food blended to a liquid form</li> <li>• Viscosity ranges from the thickness of fruit juice to that of cream soup</li> <li>• All liquids can be used to blend foods. However, nutrient dense liquids with similar or little flavor are preferable. Use of broth, gravy, vegetable juices, cream soups, cheese and tomato sauces, milk and fruit juices is recommended</li> <li>• Multivitamin and mineral supplementation is recommended</li> </ul>

### SOFT OR LIGHT DIET

This diet is designed to provide nutrients for patients unable to physiologically tolerate a general diet in which mechanical ease in eating, digestion or both are desired. The diet should be individualized based on the type of illness or surgery and the patient's appetite, chewing and swallowing ability and food tolerance. Table 26 below shows indication for and characteristics of soft diet.

**Table 26: Indication and characteristics of soft diet**

Diet	Indications	Characteristics of the diet
<ul style="list-style-type: none"> <li>• Fruit juices or cooked fruits,</li> <li>• Well-cooked cereals, strained if necessary;</li> <li>• Fresh spinach</li> <li>• Amaranth (<i>Terere</i>);</li> <li>• Pumpkin leaves;</li> <li>• Managu</li> <li>• Strained peas;</li> <li>• Potatoes, baked, boiled, or mashed.</li> <li>• Fats: butter, thin cream.</li> <li>• Milk: plain, in scrambled egg, in cream soups, in simple desserts.</li> <li>• Eggs: soft-cooked, omelettes, custards. Simple desserts; custards, ice cream, gelatine desserts,</li> <li>• Cooked fruits or cereal puddings</li> </ul>	<ul style="list-style-type: none"> <li>• Post operative patients</li> <li>• Patients with mild gastro intestinal problems</li> <li>• Non-surgical patients whose dentition is too weak or whose dentition is inadequate to handle a general diet</li> <li>• For transition from thick liquid to a general diet</li> </ul>	<ul style="list-style-type: none"> <li>• Moderately low in cellulose and connective tissues</li> <li>• Tender foods</li> <li>• Fluids and solid foods may be lightly seasoned</li> <li>• Food texture ranges from smooth and creamy to moderately crispy</li> <li>• Most raw fruits and vegetables, course breads and cereals gas producing foods and tough meats are eliminated</li> <li>• Fried and highly seasoned foods, strong smelling foods should be omitted</li> </ul>

### MODIFICATION IN FIBER CONTENT

Fiber is the portion of carbohydrates not capable of being digested by enzymes in the human digestive tract, thus contributing to increased fecal output. There are two types of fiber; soluble and insoluble fiber. Diseases affecting digestive system generally require modification in fiber content. This can be high or low fiber diet.

#### FIBER RESTRICTED (LOW RESIDUE) DIET

This diet is composed of foods containing low amounts of fiber which leave relatively little residue for formation of fecal matter. Residue is the dietary elements that are not absorbed and the total post digestive luminal contents present following digestion. The

diet excludes certain raw fruits, raw vegetables, whole grains and nuts high in fiber and meats high in connective tissue. The diet is modified to meet the clients caloric, protein, fat as well as vitamins and minerals requirements.

**Purpose of the diet**

The fiber (low residue) restricted diet is designed to prevent blockage of an inflamed gastrointestinal tract and reduce the frequency and volume of fecal output while prolonging intestinal transit time. The table below shows indications for and characteristics of fiber restricted diet

**Table 27: Indications and characteristics for fiber restricted diet**

Diet	Indications	Characteristics of the diet
	<ul style="list-style-type: none"> <li>• Gastro-intestinal disorders colitis, colostomy</li> <li>• Inflammatory bowel disease, diarrhea, hemorrhoids, etc</li> <li>• Acute phase of diverticulosis</li> <li>• Ulcerative colitis in initial stage</li> <li>• Partial intestinal obstruction</li> <li>• Pre and post-operative periods of the large bowels</li> <li>• convalescents from surgery, trauma or other illnesses before returning to the regular diet</li> <li>• post - perennial suturing</li> </ul>	<ul style="list-style-type: none"> <li>• Low in complex carbohydrates</li> <li>• Has refined cereals and grains</li> <li>• Legumes, seeds and whole nuts should be omitted</li> </ul>

## HIGH FIBER DIET

This diet contains large amounts of fiber that cannot be digested. Fiber increases the frequency and volume of stools while decreasing transit time through the gastrointestinal tract. This promotes frequent bowel movement and results in softer stools. The recommended fiber intake for women aged 50 years and below is 21-25g/day and for men aged 50 years and below is 30-38g/day. Men over 50 years should consume at least 30g/day while women above 50 years should consume 21g/day.

### *Purpose*

The diet is designed to prevent constipation and slow development of hemorrhoids, reduce colonic pressure and prevent segmentation. The diet also reduces serum cholesterol levels by decreasing absorption of lipids, reduces transit time and can be used to control- glucose absorption for diabetic patients and overweight clients. Dietary fiber reduces the risk of cancer of the colon and rectum. The table below shows the indications for and characteristics of high fiber diet

**Table 28: Indications and characteristics of high fiber diet**

Diet	Indications	Characteristics of the diet
	<ul style="list-style-type: none"><li>• Gastro-intestinal disorders:</li><li>• Diverticular disease: high</li><li>• Cardiovascular disease (hypercholesterolemia):</li><li>• Cancer prevention:</li><li>• Diabetes mellitus:</li><li>• Weight reduction:</li></ul>	<ul style="list-style-type: none"><li>• High in complex carbohydrates</li><li>• Has less of refined cereals</li></ul>

*NB: Intake of excessive dietary fiber may bind and interfere with absorption of calcium, copper, iron, magnesium, selenium and zinc. This results in their deficiency. Therefore, excessive intake of dietary fiber is not recommended for children and malnourished adults.*

### *Modification in Energy Intake*

This may be high or low energy depending on the metabolic activity patterns and the weight of a patient.

### HIGH ENERGY DIET

High energy diet is recommended to provide an energy value above the total energy requirement per day in order to provide for regeneration of glycogen stores and spare protein for tissue regeneration. Energy dense foods are used to avoid complication of bulky diet. For effective metabolism, an extra of 500kcal of the RDA is recommended per day. If there is poor appetite small servings of highly reinforced foods should be given. The diet may be modified in consistency and flavor according to specific needs. Excessive amounts of low calorie foods, fried foods or others which may interfere with appetite are avoided. Indications for and characteristics of the high energy diet is as shown in the table below.

**Table 29: Indications and characteristics of high energy diet**

<b>Diet</b>	<b>Indications</b>	<b>Characteristics of the diet</b>
Energy dense foods include butter, sugar, honey and ghee which are added to the normal diet to increase energy content	<ul style="list-style-type: none"><li>• Hyperthyroidism</li><li>• wasting</li><li>• Typhoid</li><li>• Malaria</li><li>• HIV/AIDS</li><li>• All cases of prolonged degenerative illnesses</li></ul>	<ul style="list-style-type: none"><li>• Increased kilocalorie energy 35-40kcal/kg/day in adults</li></ul>



### CALORIE RESTRICTED DIET

These diets are prescribed for weight reduction. The recommended kilocalorie level is 20-25kcal/kg/day. The diet should comprise of complex carbohydrates and should provide 50-60% of the total calories. Fats should provide <30% of the total calorie.

#### Purpose

To provide adequate nutrition, maintain desirable body weight, maintain normal glucose and lipid levels and to prevent, delay and treat diabetic related complications. Table 30 below shows the indications for and characteristics of calorie restricted diet

Table 30: Indications and characteristics of calorie restricted diets

Diet	Indications	Characteristics of the diet
<ul style="list-style-type: none"><li>• Vegetables,</li><li>• carbohydrates</li></ul>	<ul style="list-style-type: none"><li>• Overweight and obesity</li><li>• Hypertension with excess weight</li><li>• Hyper lipidemia</li><li>• Diabetes mellitus with excessive weight</li><li>• Gout</li><li>• Gall bladder diseases preceding surgery</li></ul>	<ul style="list-style-type: none"><li>• The diet should provide 20-25kcal/kg Bodyweight/day</li><li>• Complex carbohydrates</li><li>• High in dietary fiber</li><li>• Proteins should be within the DRI</li></ul>

### MODIFICATION IN THE CONTENT OF ONE OR MORE NUTRIENTS

There are four ways to modify the content of one or more nutrients as listed below:

- Moderate fat diet/fat restricted diet
- High protein, high calorie diet
- High or low protein diet
- Low sodium diet
- High carbohydrates

### FAT RESTRICTED DIET

The diet is designed to restrict fat intake for patients who experience symptoms of nutrient losses when high fat foods are eaten. A fat restricted diet limits the amount of fat you can consume each day and may be prescribed conditions that make it difficult for the body to digest fat. Provision of fat restricted diet will minimize the unpleasant side effects of fat malabsorption such as diarrhea, gas and cramping. Table 31 below shows indications for and characteristics of fat restricted diet

**Table 31: Indications and characteristics of fat restricted diet**

Diet	Indications	Characteristics of the diet
	<ul style="list-style-type: none"> <li>• Gall bladder diseases</li> <li>• Biliary tract and lymphatic system</li> <li>• Hepatic cirrhosis (liver cirrhosis)</li> <li>• Pancreatic insufficiency</li> <li>• Malabsorption syndromes</li> <li>• Intestinal resections</li> <li>• Overweight and obesity</li> <li>• Cardiovascular diseases (CVDs)</li> <li>• bloating, diarrhea, steatorrhea</li> </ul>	<ul style="list-style-type: none"> <li>• The diet provides overall fat between 25-50g/kg/day</li> <li>• This diet is tailored to provide &lt;30% of total calorie and &lt; 10% saturated fat acids. Levels of restriction are as follows:               <ul style="list-style-type: none"> <li>• Mild restriction-25-30% of total calories</li> <li>• Moderate restriction-20-25% of total calories</li> <li>• Severe restriction-15-20% of total calories</li> </ul> </li> <li>• The base of the diet should be composed of grains, vegetables and fruits</li> <li>• Meat fish, poultry and eggs should be limited to 180g per day</li> </ul>

**Adequacy**

It is possible to meet nutrient requirements on this diet, but depending on how long you follow it and how much fat you can digest a supplement may be recommended. Patients with prolonged stearrhoea or diarrhea may develop vitamin or mineral deficiencies. Vitamin A, D, E and K are fat soluble which means they need fats to be absorbed and this requires advice from the nutritionist/dietitian or doctor.

**HIGH PROTEIN-HIGH CALORIE DIET**

This diet is tailored to provide higher amounts of calorie and protein than usual diet. It is prescribed where tissue regeneration is required. Its purpose is to help heal wounds, maintain or increase weight, promote growth, decrease respiratory complications, resist or fight infections and support the immune system. For a high protein diet, adequate energy from carbohydrates and fats must be supplied.

**Purpose**

The diet is designed to maintain a positive nitrogen balance, promote normal osmotic pressure, promote body tissue repair, prevent excessive muscle atrophy in chronic disease states and build or repair worn out tissues of severely malnourished individuals. This diet can also be used to meet increased energy and protein demands during illness, during certain periods like pregnancy and lactation. Table 32 below shows indication for and characteristics of the diet.

**Table 32: Indications and characteristics of high protein-high calorie diet**

Diet	Indications	Characteristics of the diet
	<ul style="list-style-type: none"> <li>• Febrile conditions</li> <li>• Cancer</li> <li>• Wounds</li> <li>• Burns</li> <li>• Tissue injuries and trauma</li> <li>• After surgery</li> <li>• Acute and chronic fever e.g. TB, Malaria and Typhoid.</li> <li>• Certain physiological alteration - pregnancy and lactation/infancy</li> </ul>	<ul style="list-style-type: none"> <li>• The diet must provide adequate protein carbohydrates ratio of (2:1).</li> <li>• The diet should provide i.e.35-40kcal/kg body weight/day 1.5-2.0g/kg body weight/day</li> <li>• Consist more of high biological value protein</li> </ul>

### LOW PROTEIN DIET

A low protein diet is temporarily indicated/ prescribed to avoid breakdown of tissue protein which can lead to undesirable levels of nitrogen constituents in the blood. It is essential that the calorie intake from carbohydrates be sufficient to avoid excessive breakdown of tissue protein. Low protein may range from (0.6g-0.8g/kg/day). Indications and characteristics of the diet are as shown in table 33 below.

**Table 33: Indications and characteristics of low protein diet**

Diet	Indications	Characteristics of the diet
	<ul style="list-style-type: none"> <li>• Hepatic coma</li> <li>• Acute and chronic renal failure</li> <li>• Liver cirrhosis</li> <li>• Acute and chronic glomerulonephritis</li> </ul>	<ul style="list-style-type: none"> <li>• Low biological value protein can be used during this time.</li> <li>• The amount can be reduced to 20-35gms per day.</li> </ul>

### LOW SODIUM DIET

Sodium is a mineral that naturally occurs in some foods. However it can also added to food in form of salt to help preserve them and add flavor. Limit sodium intake to less than 3000mg per day. RDI should be limited to 2400mg

3000mg (130mEq) -Eliminate or eat sparingly processed foods and beverages such as fast foods, salad dressings, smoked and salted meats. Omit 2000mg (87mEq)-prepared foods high in sodium do not allow salt in preparation of food or table.

1000 (45mEq) eliminate processed foods and prepared foods and beverages high in sodium. Omit many frozen foods and fast foods. Limit milk and milk products to 16oz per day. Do not allow any salt in food preparation or table use. This meal plan used in the inpatient setting for a short term basis

500 (22mEq) omit processed or canned foods high in sodium. Omit vegetables containing high amounts of natural sodium limit milk to 16 oz daily and meat to 5 oz daily and meat products. Use low sodium bread and distilled water for cooking where available.

Allow up to ¼ tsp table salt in cooking or at the table

### Purpose

The purpose of a low sodium diet is to aid control of blood pressure (BP) in salt sensitive people and to promote the loss of excessive fluids in edema and assist and manage hypertension. Table 34 below shows the indications for and characteristics of low sodium diet

Table 34: Indications and characteristics of low sodium diet

Diet	Indications	Characteristics of the diet
<ul style="list-style-type: none"><li>Unprocessed foods and beverages</li><li>Low sodium bread</li></ul>	<ul style="list-style-type: none"><li>Impaired liver functions</li><li>Cardiovascular diseases</li><li>Severe cardiac failure</li><li>Acute and chronic renal diseases</li></ul>	<ul style="list-style-type: none"><li>A diet low in processed foods and beverages</li><li>Diet should be low in canned foods, margarine, cheeses, and salad dressings.</li></ul>

### BLAND DIET

This is a diet modified to avoid irritation of any kind to the alimentary tract. Such diets are chemically, mechanically and thermally modified. In bland diet, strong spices, stimulants and strongly flavored vegetables and fruits that irritates should be avoided. The food should be served at room temperature.

#### EXCLUSION OF CERTAIN FOODS (ALLERGIES)

In allergic conditions certain specific foods to which the individual is extremely allergic should be excluded from the diet. Some people are allergic to protein foods like milk, eggs, peanut, soya and seafood.

#### INCREASING FREQUENCY OF FEEDING

In some disease conditions patients may not be able to eat very large amounts of food at one time. It may thus become essential to give smaller meals at frequent intervals as in the case of fevers, diarrhea and ulcers. In such cases provide small but frequent meals at each interval.

## ENTERAL AND PARENTERAL NUTRITION

This refers to the provision of food and nutrients to the patient when the conventional feeding methods are not adequate or cannot meet nutrition needs. These include Enteral and parenteral nutrition. Selection of the mode of feeding is dependent upon several factors. Figure 4.2 below outlines the factors to consider in selection of a feeding method.

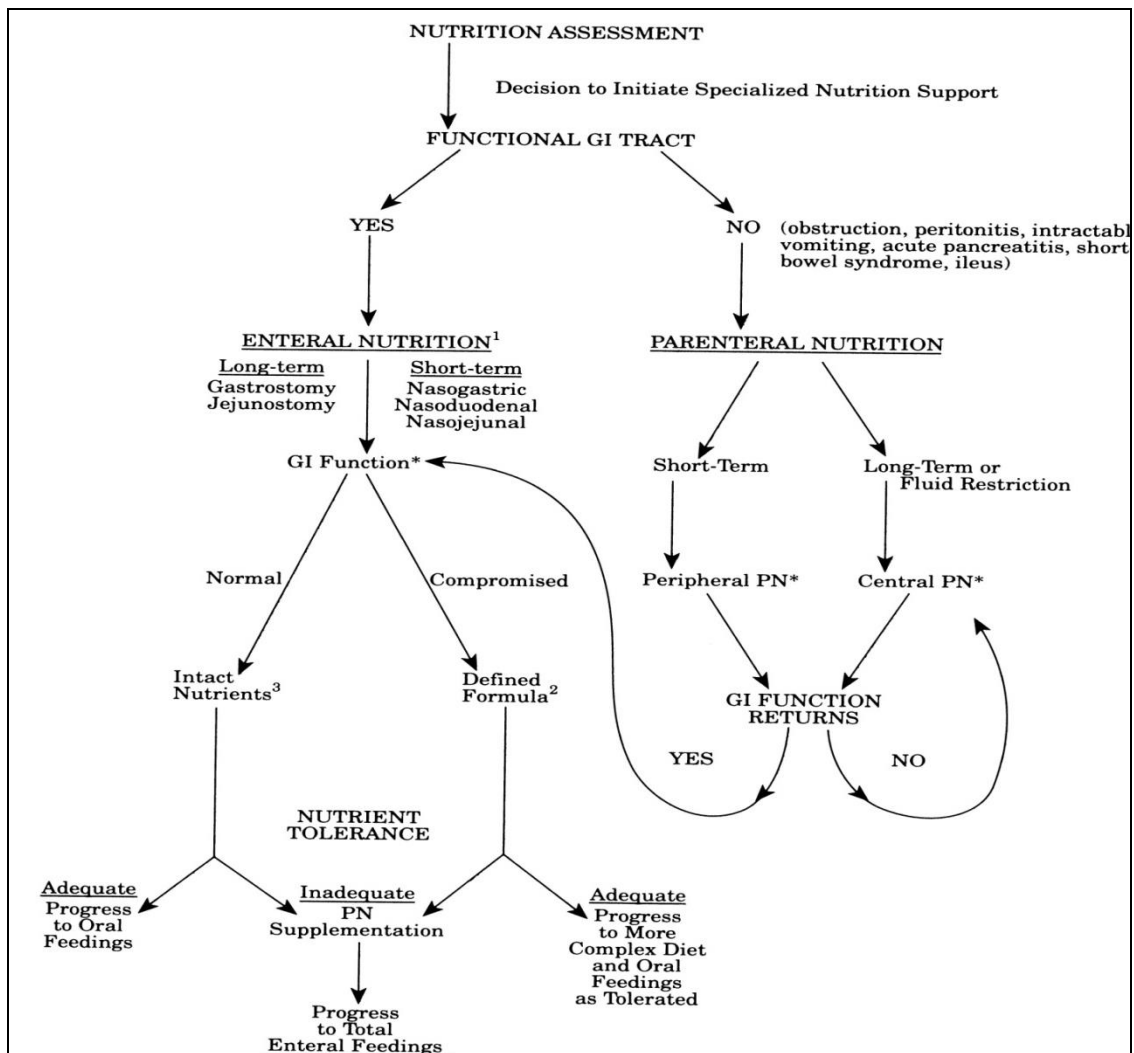


Figure 6: Choice of route of nutrition administration Adopted from JPEN 1993; 17 (4): 15A.

### ENTERAL NUTRITION

Enteral nutrition is a way of providing nutrition to the patients who are unable to consume an adequate oral intake but have at least a partially functional GI tract. Enteral nutrition may augment the diet or may be the sole source of nutrition. It is recommended for patients who have problems chewing, swallowing, prolonged lack of appetite, an obstruction, a fistula or altered motility in the upper GIT; are in coma or have very high nutrient needs.

## **TYPES OF ENTERAL NUTRITION FORMULA**

There are various types of enteral feeds available as ready to use or powdered mixes specifically designed to meet the needs of the patient. The formulas are commonly categorized by the complexity of the proteins they contain. There are two major types of Enteral feeds namely: standard and hydrolyzed.

### ***Standard Formulas***

These are also known as polymeric or intact formula. They are made from whole proteins as found in the diet (e.g. eggs, meat) or protein isolates [semi-purified high biological value proteins that have been extracted from milk, soybean or eggs]. Because they contain whole complex molecules of protein, carbohydrate and fat, standard formulas are used for patients who have normal digestive and absorptive capacity. They come in variety such as standard, high protein, high calorie and disease specific.

### ***Hydrolyzed Formulas***

Partially hydrolyzed formulas contain proteins that are partially digested into small peptides. Completely hydrolyzed formulas are commonly known as elemental formula and they contain protein in its simplest form; free amino acids. Hydrolyzed formulas also provide other nutrients in simpler forms that require little or no digestion e.g. very low fat in form of medium-chain triglycerides (MCT). Hydrolyzed formulas are meant for patients with impaired digestion or absorption such as people with inflammatory bowel syndrome, short gut syndrome and pancreatic disorders.

### ***Indications for Enteral Nutrition***

- During periods of decreased oral intake, anticipated less than 50% of required nutrient intake orally for 7-10 days as seen in severe dysphasia (difficulty swallowing), metabolic stress, major bowel resections, low-output fistulas and coma. Neurological disorders and psychological conditions.
- Malnourished patients expected to be unable to eat > 5 days
- Normally nourished patients expected to be unable to eat >5 days
- Adaptive phase of short bowel syndrome
- Following severe trauma or burns

### ***Contraindications***

- Intestinal obstruction that prohibits use of intestine
- Paralytic illness
- Intractable vomiting
- Peritonitis
- Severe diarrhea
- High output fistulas between the GI tract and the skin
- Severe acute pancreatitis
- Inability to gain access
- Aggressive therapy not warranted

### ***Determining nutrient requirements***

The type of formula, volume and hence the total nutrient required are determined by the patient's physiological condition. Several equations are available for estimating nutrient requirements of patients depending on their clinical condition.

The calorie to nitrogen ratio should be >150:1 (1g nitrogen is equivalent to 6.25g protein). If the C: N ratio is less than 200:1, then the protein supplied by such a feed will be inadequate for critically ill patients.

### **TUBE FEEDING**

This is the delivering of food by tube into the stomach or intestine. It is indicated whenever oral feeding is impossible or not allowed.

#### ***Tube feeding routes***

The decision regarding the type of feeding route/tube depends on the patient's medical status and the anticipated length of time that the tube feeding will be required.

#### **Mechanically inserted tubes;**

- Nasogastric tubes where by a feeding tube is pushed through the nose into the stomach
- Orogastric tubes whereby a feeding tube is pushed through the mouth into the stomach
- Nasoduodenal tubes – the tube is pushed through the nose past the pylorus into the duodenum
- Naso-jejunal tube – the tube is passed during the endoscopy from the nose past the pylorus into the jejunum



## Surgically inserted tubes

- **Oesophagostomy:** A surgical opening is made at the lower neck through which a feeding tube is inserted to the stomach
- **Gastrostomy:** A surgical opening is made directly into the stomach
- **Jejunostomy :** A surgical opening is made into the jejunum

Figure 7 below illustrates different routes of enteral nutrition administration, while table 35 shows methods of administration.

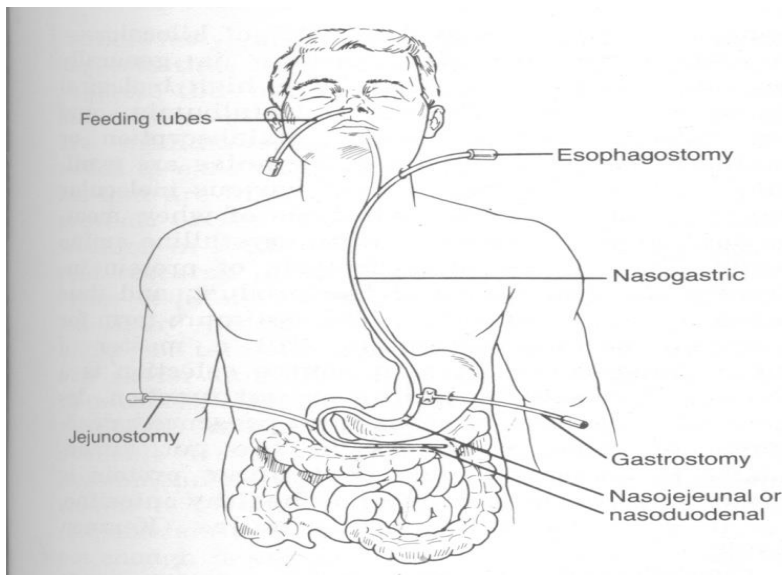


Figure 7: Different route of enteral nutrition administration

## Advantages of Enteral nutrition

- There is a stimulation of GI hormones and consequent regulated metabolism and utilization of nutrients.
- It ensures adequate nutrient supply to the mucosal wall, and protection against atrophy of intestinal Villi.
- It offers physiological protection against ulcers due to its buffering effect from gastric acids.

**Table 35: Methods of administration**

Method	Administration	Remarks
Bolus feeding	Initially – 50ml then increase gradually up to a maximum of 250 to 400ml over approximately 30 minutes, 3 to 4 hourly daily (in 24 hrs)	<ul style="list-style-type: none"> <li>• Most appropriate when feeding in to the stomach</li> <li>• Check aspirate before each feeding</li> <li>• Feeds may poorly tolerated causing nausea, vomiting, diarrhea, cramping or aspiration</li> </ul>
Intermittent slow gravity feeding.	400 – 500ml infused by gravity over approximately 20 -30 minutes to 1 hr. 3 to 4 hourly daily (in 24 hrs)	<ul style="list-style-type: none"> <li>• Patient retains freedom of movements in between feeds</li> <li>• Improved tolerance of feeds</li> </ul>
Continuous	Total volume of feed required is slowly administered; approximately 100ml/hour over 18 – 24hrs	<ul style="list-style-type: none"> <li>• Most suitable when feeding in to the duodenum or jejunum where elemental diets are most appropriate</li> <li>• May also be suitable for feeding in to the stomach</li> <li>• Method may slow peristalsis</li> <li>• Feeds are better tolerated</li> </ul>

**Tube feeding instructions**

- Tube feeding should be used at room temperatures, cold mixtures can cause diarrhea
- Ensure proper placement of tube and feed at slow constant rate
- Prescribed intervals and volumes of feeding should be adhered to
- Care should be taken to ensure that the tube feeds meet the patient’s nutrient requirements
- Prepared mixture should be well covered, properly labeled including time of preparation and stored in a refrigerator for up to 24 hours
- In the absence of refrigeration, quantities lasting only six to twelve hours should be prepared
- All feeding equipment should be cleaned before and after each feed
- Shake/stir well before use

## Commonly used equipment in enteral feeding

- Feed preparation equipment for kitchen made feeds and powder feeds include measuring jars and cups and spoons, mixing bowls, blender, flask, sterile water
- Ready to hang (RTH) feeds: giving sets for gravity or giving sets for the pump system, Enteral feeding pumps, dual port connector and a feeding bag where applicable
- Liquid diets in easy bags: giving sets (gravity or pump), feeding pump and/or dual port connector where applicable
- Feed delivery equipment; funnel especially in gastrostomy and Jejunostomy for controlling viscous flow, syringe for naso-gastric bolus or intermittent feeding and the feeding tubes where applicable

**NB:** Feeding pump is recommended as it eases feeding workload because it flows without constant supervision, enhances accuracy, hygiene and sanitation.

The table below shows methods of estimating daily fluid allowance

**Table 36: Methods of estimating daily fluid allowance**

Basis of estimation	Calculation
<u>Body weight</u>	
<u>Adults</u>	
• Young active :16 – 30 years	• 40 ml/kg
• Average: 25 – 55 years	• 32 ml/kg
• Older: 55 – 65 years	• 30 ml/kg
• Elderly:> 65 years	• 25 ml/kg
<u>Children</u>	
• 1 – 10kg	• 100 ml/kg.
• 11 – 20kg	• An additional 50ml per each kg > 10kg.
• 21kg or more	• An additional 25ml per each kg > 20kg
• Energy intake	• 1 ml per Kcal.
• Nitrogen plus energy intake	• 100 ml/g nitrogen intake plus 1 ml per Kcal*

\* Useful with high protein feeding

## Tube feeding complications

Sometimes a client does not respond to a tube feeding as expected. If the client continues to lose weight, for example health care professionals must find out why. Perhaps they have underestimated energy and nutrient requirements.

Commonly seen complications can be classified into: gastro-intestinal, mechanical, metabolic, and pulmonary. Table 37 and 38 provides a summary of the complications alongside prevention/management strategies.

Table 37: Gastrointestinal complications of tube feeding

Gastrointestinal complications	Prevention/management
Diarrhea	<ul style="list-style-type: none"> <li>• Slow feeding rate</li> <li>• Supplemental fluid and electrolytes</li> <li>• Use lactose free formula</li> <li>• Prevent formula contamination</li> <li>• Consider different formula</li> <li>• Check antibiotic/drug therapy</li> <li>• Check flow rate of feed</li> <li>• Consider Enteral nutrition with added fiber</li> <li>• Use ant diarrheal agent</li> <li>• Check osmolarity of feeds (&lt; 500mosl/l recommended)</li> </ul>
Constipation	<ul style="list-style-type: none"> <li>• Give supplemental fluid.</li> <li>• Check if fiber inadequate or excessive</li> <li>• Check physical activity</li> </ul>
Nausea or vomiting	<ul style="list-style-type: none"> <li>• Reduce flow rate</li> <li>• Discontinue feeding until underlying condition is managed</li> <li>• Change to polymeric feeds if on elemental diet</li> <li>• Check gastric emptying and review narcotic medications, initiate low fat diet, reduce flow rate</li> </ul>
Malabsorption/Mal-digestion	<ul style="list-style-type: none"> <li>• Identify the cause (crohn's disease, radiation enteritis, HIV, pancreatic insufficiency etc)</li> <li>• Select appropriate Enteral product</li> <li>• PN may be necessary in selected patients</li> </ul>
Abdominal distension	<ul style="list-style-type: none"> <li>• Assess the cause</li> <li>• Check feed temperature (give at room temperature)</li> <li>• Do not give rapid formula administration</li> </ul>

**Table 38: Other Medical Complications of tube feeding**

<b>Mechanical complications</b>	<b>Prevention/management</b>
Tube placement	<ul style="list-style-type: none"> <li>To be placed by trained personnel using defined protocol to reduce complications</li> </ul>
Feeding tube	<ul style="list-style-type: none"> <li>Use small bore feeding tube to minimize upper airway problems</li> </ul>
Tube clogging	<ul style="list-style-type: none"> <li>Select appropriate tube size</li> <li>Flash with water</li> <li>Dilute formula with water</li> </ul>
Dislocation of tube	<ul style="list-style-type: none"> <li>Ascertain tube placement before each feed</li> <li>Clearly mark tube at insertion</li> </ul>
Nasopharyngeal irritation	<ul style="list-style-type: none"> <li>Use small lumen tube.</li> <li>Use pliable tube</li> </ul>
Esophageal erosion	<ul style="list-style-type: none"> <li>Discontinue tube feeding</li> <li>Recommend parenteral nutrition</li> </ul>
<b>Metabolic complications</b>	<b>Prevention/management</b>
(Fluid and electrolyte imbalance, trace element, vitamin and mineral deficiencies, essential fatty acid deficiencies)	<ul style="list-style-type: none"> <li>Check adequacy of daily nutrient supply of macro and micronutrients during EN.</li> <li>Check possibility of Malabsorption</li> </ul>
Hyperglycemia	<ul style="list-style-type: none"> <li>Reduce flow rate.</li> <li>Give oral hypoglycemic agents or insulin.</li> <li>Change formula</li> </ul>
Tube feeding syndrome	<ul style="list-style-type: none"> <li>Reduce protein intake or increase water intake.</li> <li>For conscious patients education and counseling is needed</li> </ul>
Hypernatremia (dehydration)	<ul style="list-style-type: none"> <li>Increased water intake and reduce sodium</li> <li>Replace sodium loses</li> </ul>
Hyponatremia (over-hydration)	<ul style="list-style-type: none"> <li>Replace sodium loses</li> <li>Re-asses nutrient requirement, check volume administration, change to nutrient dense formula</li> </ul>
<b>Pulmonary complications</b>	<b>Prevention/management</b>
Pulmonary aspiration	<ul style="list-style-type: none"> <li>Incline head of bed 30° – 45° during feeding 1 hr after feeding.</li> <li>Check tube placement.</li> <li>Monitor symptoms of gastric reflux.</li> <li>Check abdominal distension.</li> <li>Check residual volumes before feeds.</li> <li>Change to jejunal feeding.</li> <li>Reduce volume of feed.</li> <li>Change from bolus to continuous feeding</li> </ul>

When a patient has been put on enteral feed, it is important that the administration is monitored regularly to avoid or identify any complications early and address them. The table below provides a checklist for monitoring clients/patients recently put on tube feeding.

**Table 39: Checklist for monitoring patients recently placed on tube feeding**

Action	Check
1. Before starting a new feeding	<ul style="list-style-type: none"> <li>• Complete a nutrition assessment</li> <li>• Check tube placement</li> </ul>
2. Before each intermittent feeding: 3. Every half hour 4. Every hour 5. Every 4 hours	<ul style="list-style-type: none"> <li>• Check gastric residual</li> <li>• Check gravity drip rate when applicable</li> <li>• Check pump drip rate, when applicable</li> <li>• Check vital signs, including blood pressure, temperature, pulse, and respiration</li> </ul>
6. Every 6 hours	<ul style="list-style-type: none"> <li>• Check blood glucose, monitoring blood glucose can be discontinued after 48hrs if test results are consistently negative in a non-diabetic client</li> </ul>
7. Every 4 to 6 hours of continuous feeding	<ul style="list-style-type: none"> <li>• Check gastric residual</li> </ul>
8. Every 8 hours	<ul style="list-style-type: none"> <li>• Check intake and output</li> <li>• Check specific gravity of urine</li> <li>• Check tube placement</li> <li>• Chart clients total intake of, acceptance of, and tolerance to tube feeding</li> </ul>
9. Every day	<ul style="list-style-type: none"> <li>• Weigh clients where applicable</li> <li>• Check electrolytes and BUN when needed</li> <li>• Clean feeding equipment</li> <li>• Check all laboratory equipment</li> </ul>
10. Every 7 to 10 days	<ul style="list-style-type: none"> <li>• Check all laboratory Findings</li> <li>• Re-assess nutrition status</li> </ul>
11. As needed	<ul style="list-style-type: none"> <li>• Observe client for any undesirable responses to tube feeding; for example delayed gastric emptying, nausea, vomiting, and diarrhea</li> <li>• Check nitrogen balance</li> <li>• Check laboratory data</li> <li>• Chart significant details</li> </ul>

As had been highlighted earlier there are different enteral formula classifications. Table 40 below shows the enteral formula classifications.

Table 40: Enteral formula classifications

Enteral formula	Sub-category	characteristics	Indications
Polymeric	Standard	Similar to average diet.	Normal digestion
	High nitrogen	Protein > 15% of total Kcal.	Catabolism Wound healing
	Calorie dense	2 Kcal/ml	Fluid restriction Volume intolerance Electrolyte abnormalities
	Fiber containing	Fiber 5 – 15/l	Regulation of bowel function
Monomer	Partially hydrolyzed elemental peptide based	One or more nutrients are hydrolyzed, composition varies.	Impaired digestive and absorptive capacity
Disease specific	Renal	Whole protein with modified electrolyte content in a caloric dense formula.	Renal failure
	Hepatic	High BCAA, low AA,	Hepatic encephalopathy
	Pulmonary	High % of calories from fat.	ARDS
	Diabetic	Low carbohydrate	Diabetes mellitus
Immune enhancing Formulas	Critically ill	Arginine*, glutamine, omega-3 fatty acids, anti-oxidants	Critically ill.

*\* is contraindicated in critical illness*

There a wide range of enteral feeds available in the market. The table below further highlights some examples of enteral feed formulations. However, it is worth noting that this is not a complete list of all the formula’s currently available in the market.

Table 41: Examples of enteral feed formulations

Feed	Composition – 100g powder	Indications
Infant feeding formulas	<ul style="list-style-type: none"> <li>• CHO-55.9% mainly lactose and maltodextrin.</li> <li>• PRO-14.4% mainly whey protein and casein.</li> <li>• FAT-24.0% MCT, milk, fat, corn oil, soybean.</li> </ul>	For low birth weight, premature or light for date babies when breast milk is not available.
	<ul style="list-style-type: none"> <li>• CHO-56.2%</li> <li>• PRO-12.5%</li> <li>• FAT-27.7%</li> </ul>	For infants of normal birth weight (mature, normal for date) when breast milk is not available.
	<ul style="list-style-type: none"> <li>• CHO-55.4%</li> <li>• PRO-11.4%</li> <li>• FAT-27.7% corn oil, soy oil, coconut oil.</li> </ul>	For infants and low birth weight, light for date babies when breast milk is not adequate or not available
Lactose free infant formulas	<ul style="list-style-type: none"> <li>• CHO-55.4% mainly maltodextrin</li> <li>• PRO-14.0%</li> <li>• Soy protein isolate.</li> <li>• FAT-25% palm, soya and coconut oil.</li> </ul>	For infants
	<ul style="list-style-type: none"> <li>• CHO-52%</li> <li>• Corn syrup solids</li> <li>• PRO-14%</li> <li>• Soy protein isolate</li> <li>• FAT-27%</li> <li>• Blend of vegetable oils.</li> </ul>	For infants and adults when lactose or cow's milk should be avoided.
	<ul style="list-style-type: none"> <li>• CHO-50% corn syrup, sucrose.</li> <li>• PRO-15.6% soy protein isolate.</li> <li>• FAT-28.1%</li> </ul>	For infants and adults when lactose or cow's milk should be avoided.
	<ul style="list-style-type: none"> <li>• CHO-40%</li> <li>• Glucose polymer and corn syrup solids.</li> <li>• PRO-12% Soy isolate.</li> <li>• FAT-48% soy oil, coconut oil.</li> </ul>	For infants and adults when lactose or cow's milk should be avoided.



Feed	Composition – 100g powder	Indications
High protein powder supplements <ul style="list-style-type: none"> <li>• Full cream powdered milk</li> <li>• Dried skimmed milk powder (DSM)</li> </ul>	<ul style="list-style-type: none"> <li>• CHO-37.4%</li> <li>• PRO-25%</li> <li>• FAT-28%</li> </ul>	A protein caloric supplement that can be incorporated in liquid or solid diets
	<ul style="list-style-type: none"> <li>• 2. CHO-54%</li> <li>• PRO-36.4%</li> <li>• FAT-1%</li> </ul>	A protein caloric supplement useful where low fat diet is required
	<ul style="list-style-type: none"> <li>• CHO-68%</li> <li>• Corn syrup solids, glucose, lactose.</li> <li>• PRO-24%</li> <li>• Non-fat milk,</li> <li>• Whole milk, caseinate</li> <li>• FAT-8% Milk, fat</li> </ul>	Controlled fat diets
	<ul style="list-style-type: none"> <li>• CHO-54% Glucose and tapioca starch</li> <li>• PRO-11% Hydrolyzed casein and amino acids</li> <li>• FAT-35% corn oil, MCT oil</li> </ul>	For oral or tube feedings. Useful in Malabsorption and low fat modified diets
	<ul style="list-style-type: none"> <li>• CHO-6.7%</li> <li>• Lactose, sucrose</li> <li>• PRO-17.1%</li> <li>• Calcium caseinate</li> <li>• FAT-0.6%</li> </ul>	Useful in high protein, low calorie low fat, fat residue diets
	<ul style="list-style-type: none"> <li>• CHO-30%</li> <li>• PRO-55%</li> <li>• FAT-1%</li> <li>• Calories per 100g – 366g</li> </ul>	A protein, vitamin and mineral supplement ideal for high protein diets, low fat diets and cases of malabsorption useful for patient allergic to lactalbumins
Nutritionally complete liquid diets	<ul style="list-style-type: none"> <li>• CHO-13.8g = 55% of total Cal.</li> <li>• PRO-3.8g = 15% total Kcal.</li> <li>• FAT – 3.4g = 30% of total Kcal l.</li> <li>• Energy = 100Kcal/100ml</li> </ul>	Nutritionally complete liquid diet for total or supplemental feeding, tube feeding or oral feeding Low in lactose
	<ul style="list-style-type: none"> <li>• CHO-17g = 54.6% of total Kcal.</li> <li>• PRO-7.5g = 15.1% of total Kcal.</li> <li>• FAT-68g = 30.3% of total Kcal.</li> <li>• ENERGY-1Kcal per ml.</li> </ul>	High caloric formula suitable for tube or oral feeding especially where energy intake is increased, where fluid is restricted and or fat malabsorption
	<ul style="list-style-type: none"> <li>• CHO-12g = 53% of total Kcal.</li> <li>• PRO-3.4g = 15% of total Kcal</li> <li>• FAT-3.2g = 32% of total Kcal</li> <li>• FIBER-1.5g per 100ml (90 Kcal).</li> </ul>	Nutritionally complete feed for oral or tube feeding in diabetics.
	<ul style="list-style-type: none"> <li>• CHO-58% of total Kcal.</li> <li>• PRO-15% of total Kcal.</li> <li>• FAT-30% of total Kcal.</li> </ul>	Nutritionally complete feed for oral or tube feeding as a total diet or supplemental diet. <u>Lactose free with fiber</u>
	<ul style="list-style-type: none"> <li>• CHO-61.5g = 54% of total Kcal.</li> <li>• PRO-15.8g = 14% of total Kcal.</li> <li>• FAT-15.8g = 32% of total Kcal.</li> <li>• ENERGY = 100 Kcal per 100ml.</li> </ul>	Nutritionally complete feed for oral or tube feeding as a total or supplemental diet. Lactose free feed, low in cholesterol and sodium

## **PARENTERAL NUTRITION**

This refers to nutrition directly into the systemic circulation, bypassing the gastrointestinal tract (GIT) and the first circulation through the liver. The primary objective of parenteral nutrition is to maintain or improve the nutritional and metabolic status of patients who have temporary or permanent intestinal failure.

### **Characteristics of parenteral nutrition**

- Patients on TPN (Total Parenteral Nutrition) have similar requirements as enterally fed patients
- The six major nutrients covered are: carbohydrates, proteins, fats, vitamins, minerals and water
- Feeds must provide adequate calories
- Nutrient form must be specialized for infusion into blood count prior to digestion
- Standardized concentration may be modified to suit individual requirements

### ***Indications for Parenteral Nutrition***

Patients who are candidates for parenteral nutrition cannot eat adequately to maintain their nutrient stores. These patients are already, or have the potential of becoming malnourished.

Peripheral Parenteral Nutrition (PPN) may be used in selected patients to provide partial or total nutrition support for up to 2 weeks in patients who cannot ingest or absorb oral or enteral tube delivered nutrients or when central-vein parenteral nutrition is not feasible.

Parenteral nutrition (PN) support is necessary when parenteral feeding is indicated for longer than 2 weeks, peripheral venous access is limited, nutrient needs are large, or fluid restriction is required, and the benefits of PN support outweigh the risks. Patient has failed Enteral Nutrition (EN) trial with appropriate tube placement (post-pyloric).

EN is contraindicated or the intestinal tract has severely diminished function due to underlying disease or treatment. Specific applicable conditions are as follows:

- Paralytic ileus
- Mesenteric ischemia
- Small bowel obstruction
- GI fistula except when Enteral access may be placed distal to the fistula or volume of output (<200 mL/d) supports a trial of EN
- Diseases of the small intestine
- Intractable vomiting/diarrhea
- Massive small bowel resection
- Trauma
- Inflammatory Bowel Disease
- Enterocolitis (AIDS, chemotherapy, radiotherapy)
- Pancreatitis
- Burns
- Cancer
- Immaturity (premature babies)

As occurs in postoperative nutrition support, the exact duration of starvation that can be tolerated without increased morbidity is unknown. It has been suggested that wound healing would be impaired if PN is not started 5–10 days. This is for postoperative patients unable to eat or tolerate enteral feeding.

The patient's clinical condition is considered in the decision to withhold or withdraw therapy. Conditions where nutrition support is poorly tolerated and should be withheld until the condition improves are severe hyperglycemia, azotemia, encephalopathy and hyperosmolarity and severe fluid and electrolyte disturbances.

#### ***Contraindications***

- Functional GIT
- Existence of an advanced terminal condition for which aggressive therapy is not provided

#### ***Parenteral nutrition in infants***

Very preterm infants, who often have relatively delayed gastric emptying and intestinal peristalsis, may be slow to tolerate the introduction of gastric tube feeds. These infants may need intravenous nutrition while enteral nutrition is being established or when enteral nutrition is not possible—for example, because of respiratory instability, feed intolerance, or serious gastrointestinal disease.

Examples of feeds for pediatrics

- Protein source: Amino venous
- CHO source: dextrose
- LIPIDS (Fat) source: Lipovenous 10%

Total parenteral nutrition consists of a glucose and amino acid solution with electrolytes, minerals, and vitamins, plus fat as the principal non-protein energy source. Bloodstream infection is the most common important complication of parenteral nutrition use. Delivery of the solution via a central venous catheter rather than a peripheral catheter is not associated with a higher risk of infection. Extravasation injury is a major concern when parenteral nutrition is given via a peripheral cannula. Subcutaneous infiltration of a hypertonic and irritant solution can cause local skin ulceration, secondary infection, and scarring. Extravasation injury may occur when a peripheral cannula is used to deliver the parenteral nutrition solution

#### ***Routes of administration of parenteral nutrition***

Intravenous solutions can be provided in different ways. The methods used depend on the person's immediate medical and nutrient needs, nutrition status and anticipated length of time on IV nutrition support. They include:

- Peripheral Parenteral Nutrition (PPN)
- Central Parenteral Nutrition (TPN)

The general decisions to use PPN instead of CPN are based on comparative energy demands and anticipated time of use.

#### ***Peripheral Parenteral Nutrition***

This refers to use of peripheral veins to provide a solution that meet nutrient needs for infusion. It has lower dextrose (5% to 10% final concentration) and amino acid (5% final concentration) concentration than CPN. It may provide full or partial nutritional requirements to patients.

PPN can be administered in to peripheral veins if solutions used have osmolarity below 800 - 900mosm/l for a brief period of less than 14 days. Short catheters (cannulas) and mid-way catheters are normally used. However, PPN administration is possible for several weeks with fine bore catheter.

PPN may be used in patients with mild or moderate malnutrition to provide partial or total nutrition support when they are not able to ingest adequate calories orally or enterally or when central vein PN is not feasible.

All in one admixture are highly recommended compared to the single bottle system during PPN.

### ***Central Parenteral Nutrition (CPN)***

CPN is often referred to as “Total Parenteral Nutrition” since the entire nutrient needs of the patient may be delivered by this route. It requires a central venous system for long term infusions.

The sites mainly used are the Vena jugularis external, Vena jugularis internal, Vena subclavia, Vena cephalica and Vena basilica for solutions with osmolarity above 800 - 900 mosm/l.

Peripherally Inserted Central Catheters (PICC) for short - and long term infusions are possible. Implantable system for central venous access (Ports) Lasts for years after implantation and patients may go on TPN for years with the catheters being changed every 5 - 10 years. Central Parenteral Nutrition is complete nutrition similar to physiological nutrition and can be provided for unlimited period (weeks to years). PN can be used in hospitalized patients and those who have returned home or are in assisted living, extended care facilities or nursing homes.

### ***Access routes for parenteral nutrition include:***

#### **Peripheral Access Routes**

One of the easiest and safest ways to access the vascular system is to place a cannula into a peripheral vessel. The adequacy of the vein limits the use of the peripheral system for infusion. Catheter tips that are located in a peripheral vessel are not appropriate for the infusion of PN formulas > 900 mosm/L.

The indications for peripheral infusion are short-term access needs. Specially formulated PN may be administered by peripheral access. These solutions are based on a decreased dextrose concentration and osmolarity and have been reported to be used for short-term therapies (<10–14 days) when fluid restriction is not necessary.

The leading complication associated with peripheral access is peripheral venous thrombophlebitis. The hallmark symptoms of infusion phlebitis (an inflammation of the cannulated vein) are pain, erythema, tenderness or a palpable cord. Peripheral devices have the lowest risk of catheter related infections.

### Central Venous Access

Central venous access is defined as a catheter whose distal tip lies in the distal vena cava or right atrium. The most common sites of venipuncture for central access include the subclavian, jugular, femoral, cephalic, and basilic veins.

Figure 8 below illustrates administration of PN through the sub-clavian vein.

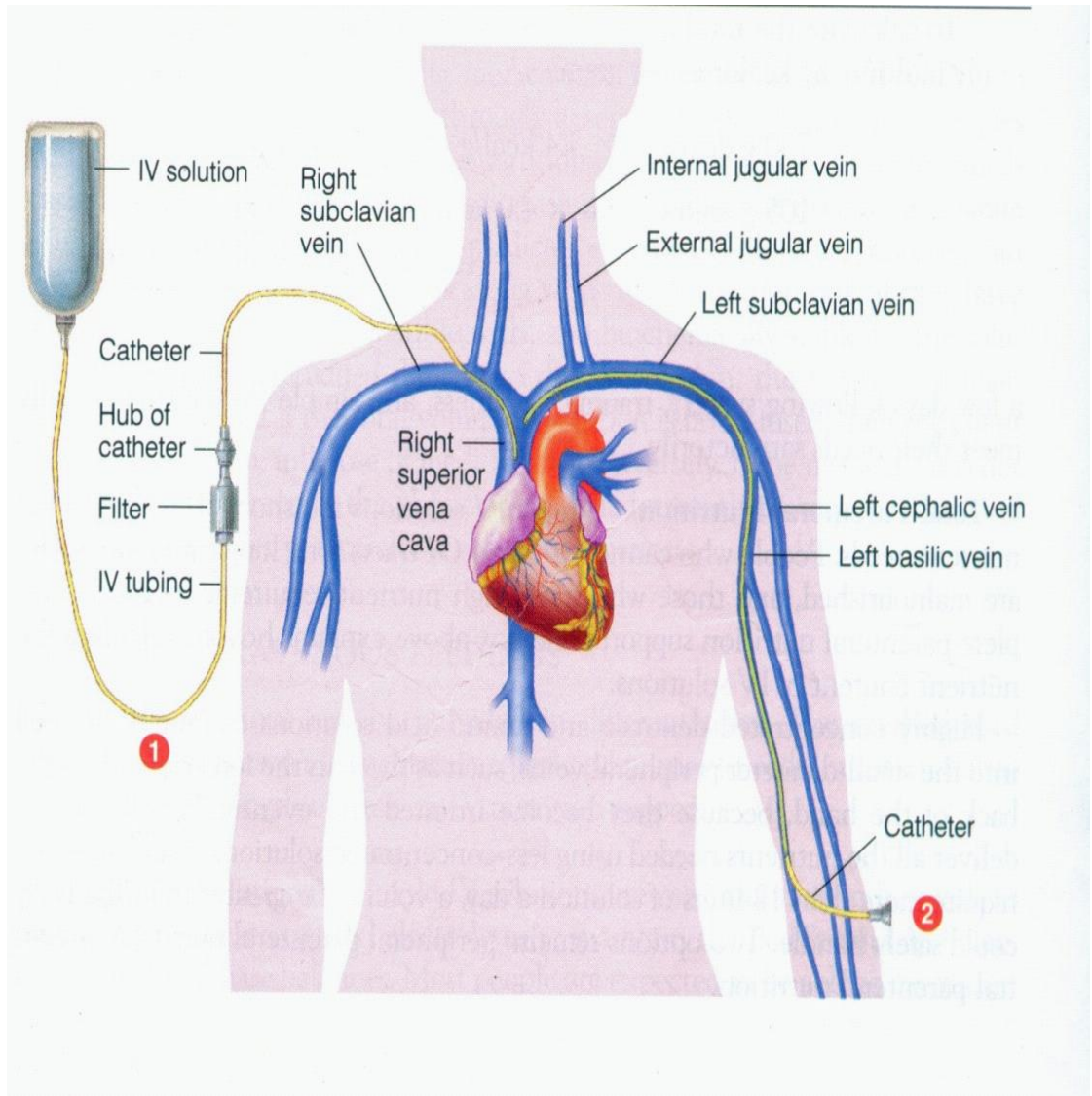


Figure 8: Administration of parenteral nutrition through sub clavian vein

### *Calculating the nutrient content of Intra Venous (IV) formulas*

The energy/nutrient requirements of patients on parenteral nutrition comprises of a complete nutrition similar to physiological nutrition. These requirements can be calculated using several different available formulas and no standard prescription provides an answer for all patients. Nutrient requirements are also adjusted at all times to suit the patient's current medical or surgical condition. One of the standard parenteral nutrition regime that is suited for 80% of patients and calculated as per the kilogram body weight is as shown in table 42 below:

**Table 42: Nutrient requirements for IV formulas**

<b>Nutrients</b>	<b>Requirements</b>
Amino acids	1 - 1.5g
Energy (as fat and glucose) 25 - 30 kcal (NPE - Non Protein Energy)of which glucose	3 - 5g (>2g/kg, <7g/kg)
Fat (LCT)	1- 2g (<0.3g/kg, <3g/kg)
Vitamins and trace elements	Basic needs
Water and electrolytes	Basic needs

#### **Note:**

Protein Energy (NPE): Stand for energy from carbohydrate and fat only, excluding the energy from protein. The protein requirements are then calculated separately as per the patient's body weight.

The proportion of carbohydrate to fat is then calculated at a proportion of 70: 30 or 50: 50 depending on the patient's condition. This means that 70% of the NPE will be the required energy from Carbohydrate and 30% of NPE will be the required energy from fat.

Total energy (TE) requirements can also be calculated from e.g. the Harris Benedict Equation (HBE) or any other equation or formulas available. The ratio of energy to nitrogen is then calculated as follows:

Calorie nitrogen ratio – An adequate energy provision is necessary to support the use of protein for anabolism. The recommended non-protein calorie nitrogen ratio (C: N) for the different conditions is calculated as shown in the table below.

**Table 43: Recommended non-protein calorie nitrogen ratio (C: N) for the different conditions**

Conditions	Calorie: Nitrogen Ratio (gN)
For normal body maintenance	300:1
Stressful conditions	150:1
Renal failure	250: 1
PPN	70:1
Children	300:1

The percentage of nutrient requirements can also be calculated from the TE as follows:

- 50 – 60% of the TE from Carbohydrate
- 15 – 20% of TE from Protein
- 25 - 30% of TE from FAT

### Precautions in Parenteral Nutrition

Osmolarity – ensure appropriate osmolarity is infused via the appropriate veins to avoid thrombosis and small blood vessel damage. E.g. osmolarity > 900 should be administered centrally.

Calculation of the osmolarity of parenteral nutrition solutions

- Multiply the grams of dextrose per liter by 5 mosm/g
  - i) Example: 50g of dextrose x 5 = 250mOsm/L
- Multiply the grams of protein per liter by 10 mosm/g
  - i) Example: 30g of protein x 10 = 300mOsm/L
- Fat is isotonic and does not contribute to osmolarity
- Electrolytes further add to osmolarity for example: 1 mosm/me of individual electrolyte additive
- Total osmolarity is then derived from the sum of the osmolarity of all nutrients infused
- Infusion rate – always check label and package inserts. The maximum infusion rate recommended for specific solutions should not be exceeded in order to avoid complications
- Vital signs should be monitored daily
- Discontinuation should also be gradual to avoid hypoglycemia
- Infuse parallel, it is best to infuse parallel. If parallel infusion is not possible then infuse directly



- First carbohydrates with electrolytes, second amino-acid with electrolytes, third fat

## **Administration of parenteral nutrition**

Parenteral Nutrition feeds can be administered in the following forms:

**Single bottle system:** These are single products/bottles providing either one of amino acid solution, dextrose solution or lipid emulsions or vitamins or trace elements or a combination of Amino acid and dextrose. The single bottle system may also contain electrolytes.

**All in One (AIO) admixtures:** These formulations may be prepared as a single product by the hospital pharmacist or industrial admixtures. The industrial admixtures are mixed up at the factory and delivered to the hospital. Refrigeration is required and they have a short shelf life.

**Chamber bags:** Two and three chamber bags. These AIO parenteral nutrition feeds have a much longer shelf life and are mixed prior to administration.

### **COMPLICATIONS OF PARENTERAL NUTRITION**

These complications are mainly divided into two main categories as follows:

#### **Catheter related complications which involve:**

- Occlusion of the catheter
- Catheter blockage (check the type, diameter, period of use)
- Catheter related infections - these infections may come from the skin or systemic circulation (gram negative organisms and fungi)
- Catheter related sepsis - there is need to use antiseptic techniques at all times

#### **Metabolic Complications**

##### **Hepatobiliary or Gastrointestinal complications**

Abnormal liver function (caused by underlying diseases, i.e. sepsis, malignancy, IBD, pre-existing liver disease) bacterial overgrowth in the intestines, biliary sludge and gallstones. Steatosis which may be caused by sole infusion of dextrose as an energy source without fat emulsions or excessive glucose load (above or equals to 7g of glucose/kg/day). Sole glucose infusion without fat may also cause essential fatty acid deficiency (EFAD).

##### **Macronutrient Complications**

These are risks associated with underfeeding or overfeeding. |:

- Hyperglycemia - several factors may cause hyperglycemia including overfeeding
- Hypoglycemia - this may occur mainly if weaning off parenteral nutrition is not done appropriately or if there is excess insulin administration

- Azotemia can result from dehydration, excessive and/or inadequate non protein calories. Omission of fat emulsions during PN may cause EFAD
- Too much infusion may cause hyperlipidemia

### ***Micronutrient Related Complications***

- Fluid imbalance (Dehydration from osmotic diuresis, fluid overload)
- Electrolyte imbalance
- Vitamin, mineral and trace elements deficiency may only occur

The above complications can greatly be reduced and avoided if there is a multi-disciplinary nutrition team with experienced clinicians available to insert the central feeding catheters, designated nurses to care for the catheters, and an experienced registered dietician to prescribe the right parenteral nutrition formulation and make the necessary follow ups, monitoring and necessary adjustments. The table below shows complications of total parenteral nutrition.

**Table 44: Complications of total parenteral nutrition**

<b>Catheter related complications</b>	<b>Metabolic complications</b>
<ul style="list-style-type: none"><li>• Bacteraemia (staphylococcal)</li><li>• Invasive fungal infection</li><li>• Thrombosis</li><li>• Extravasation injuries</li><li>• Cardiac tamponade</li></ul>	<ul style="list-style-type: none"><li>• Cholestatic jaundice</li><li>• Hyperglycaemia or glycosuria</li><li>• Vitamin deficiencies or excesses</li><li>• Hyperammonaemia</li></ul>

### ***Examples of parenteral nutritional formulations:***

You can have confidence in IV solutions if you know what they contain. The basic thing to remember is that the percentage of a substance in solution tells you how many grams of that substance are present in 100mL e.g. a 5% dextrose solution contains 5g of dextrose per 100 ml; a 3.5% amino acid solution contains 3.5g of amino acids per 100ml. A 0.9% normal saline solution contains 0.9g of NaCl per 100mL. Table 45 shows examples of parenteral formula feeds. Table 46 on the other hand, shows pediatric parenteral nutrition formulations.

**Table 45: Examples of parenteral formula feeds**

<b>Amino acid solutions</b>	<b>Features</b>	<b>Presentation</b>
<p>Standard Amino Acids</p> <ul style="list-style-type: none"> <li>• 5% (50g AA/L)</li> <li>• 10% (100g AA/L)</li> <li>• 15% (150g AA/L)</li> </ul>	<p>These are standard Amino acids for parenteral nutrition which contain WHO recommended ratio for essential and non essential amino acids and may contain electrolytes or may be electrolyte free</p> <p>Essential nitrogen balance</p>	<p>200ml,500ml and 1000ml bottles</p>
<p>Special Amino Acids</p>	<p>May be balanced AA solution containing Glutamine and tyrosine , Arginine</p>	<p>200ml, 500ml bottle</p>
<p>Special Amino Acids</p>	<p>Disease specific formulation containing AA glutamine</p>	<p>50ml, 100ml, 200ml bottles</p>
<p>Special AA for Hepatic insufficiency</p> <ul style="list-style-type: none"> <li>• 8% (80g AA/L)</li> </ul>	<p>These are disease specific formulations. Specially designed to compensate the AA disorders in hepatic insufficiency, rich in BCAA and quite low in AAA.</p>	<p>200ml, 500ml bottles</p>
<p>Special AA for renal insufficiency</p> <ul style="list-style-type: none"> <li>• 7% (70g AA/L)</li> <li>• 10% (100g AA/L)</li> </ul>	<p>Adapted to the metabolic AA disorder in renal failure and contains a balanced profile of EAA and NEAA and the dipeptide glycyl-tyrosine</p> <p>Well balanced AA pattern specifically designed for infants (preterm, new born, babies) and young children.</p> <p>Contains EAA and NEAA similar to human breast milk.</p> <p>Contains taurine an EAA for neonates</p>	<p>200ml, 250ml and 500ml bottles</p>
<b>Carbohydrates solutions</b>	<b>Features</b>	<b>Presentation</b>
<ul style="list-style-type: none"> <li>• 5% (50g /L)</li> <li>• 6% (60g/ L)</li> <li>• 10% (100g/L)</li> <li>• 20% (200g/L)</li> <li>• 25% (250g/L)</li> <li>• 50% (500g/L)</li> </ul>	<p>These carbohydrate feeds mainly contain glucose but some may contain xylitol and or sorbital</p>	<p>50ml, 100ml, 500ml, 1000mls bags or bottles</p>
<p>Solutions with both Carbohydrate and Amino acids.</p>	<p>These parenteral nutrition solutions contain both carbohydrate and amino acid including electrolytes and may be administered peripherally. e.g.</p> <ol style="list-style-type: none"> <li>1) 3% AA and 6% carbohydrate plus electrolytes.</li> <li>2) 5% AA and 5% sorbital.</li> </ol>	<p>200ml, 500ml, 1000ml bottle</p>

<b>Lipid Emulsions</b>	<b>Features</b>	<b>Presentation</b>
<ul style="list-style-type: none"> <li>• 10%</li> <li>• 20%</li> <li>• 30%</li> <li>• 20% MCT-LCT</li> </ul>	<p>These are lipid emulsions for parenteral nutrition with different special functions different lipid formulations may contain the following:</p> <ul style="list-style-type: none"> <li>• contains soybean oil (LCT) rich in EFA</li> <li>• contain EFA, MCFA &amp; LCFA</li> <li>• contain mixture of MCT and LCT</li> <li>• Rapid clearance and energy production preference fuel in conditions like carnitine</li> <li>• Isotonic</li> <li>• Mean globule size similar to chylomicrons</li> </ul>	200ml, 250ml and 500ml bottle or bag
Lipid Emulsion (fish oil)	<ul style="list-style-type: none"> <li>• Contain fish oil</li> <li>• Rich in EPA and DHA</li> <li>• Has anti-inflammatory and immunomodulatory effect</li> </ul>	50ml and 100ml bottles
<b>All in One</b>	<b>Features</b>	<b>Presentation</b>
<b>All in One Parenteral Nutrition formulations</b>	<p>Three (triple) chamber bags with separate compartments for amino acids, fat and a combination of glucose or sorbitol and electrolytes for central or peripheral parenteral Nutrition, depending on the osmolarity and specifications.</p> <p>Vitamins and minerals are added into the bag prior to infusion.</p>	1000ml, 1500ml, 2000ml, 2500ml. bags
Two chamber bags	<p>Two chamber bags with separate compartments for amino acid and glucose with or without electrolytes.</p> <p>Other nutrients may be added i.e. fat, vitamins, trace elements as per the specifications</p>	1000ml, 1500ml, 2000ml bags
<b>Vitamins</b> <ul style="list-style-type: none"> <li>• 9 water soluble vitamins</li> <li>• 4 fat soluble vitamins</li> </ul>	<p>Contains all the water soluble and or fat soluble vitamin based on international recommendations.</p> <p>These are added into the parenteral nutrition product prior to infusion, once daily.</p> <p>Water soluble vitamins to be added into water base products e.g. Dextrose, amino acids or the all in One PN bags but <b>NOT</b> to be added into the single bottle of fat emulsion.</p> <p>The fat soluble vitamins can only be added into the fat emulsion bottle or the All in One PN bags</p> <p>follow instructions as specified</p>	10ml vials 10ml ampules.
<b>Trace elements</b>	<p>Trace element in adults for parenteral nutrition based on international recommendations e.g. zinc, copper, chromium, manganese, selenium.</p>	10ml ampoule 1ml, 3ml, 10ml vials

**Table 46: Pediatric Parenteral Nutritional Formulations**

<b>Feed</b>	<b>Composition per 10 0mls</b>	<b>Presentation</b>
Special AA for pediatrics 6.5% (65g AA/l) 7% (70g AA/L) 10% (100g AA/L)	<ul style="list-style-type: none"> <li>Well balanced AA pattern specifically designed for infants (preterm, new born, babies) and young children</li> <li>Contains EAA and NEAA</li> <li>Similar to human breast milk</li> <li>Contains taurine an EAA for neonates</li> </ul>	100ml, 250ml and 500ml bottles.  Dosage: As per the child's age, weight and recommendations
Special Amino acids for hepatic and renal failure	<ul style="list-style-type: none"> <li>As above for children above 6 months of age</li> </ul>	As above Dosage: As per the child's age, weight and recommendations
Carbohydrate solutions (presentations as Above for adults)	<ul style="list-style-type: none"> <li>The carbohydrate solutions mainly contain glucose</li> </ul>	100ml, 500ml bottles Dosage: As per the child's age, weight and recommendations
Lipid emulsions	<ul style="list-style-type: none"> <li>As Adults</li> <li>Dosage: As per the child's age, weight and recommendations</li> </ul>	100ml bottles
Vitamins: Water soluble vitamins	<ul style="list-style-type: none"> <li>As Adults</li> <li>Dosage: As per the child's age, weight</li> <li>Requirements will be calculated as per the child's weight</li> </ul>	10ml vial
Fat soluble vitamins for infants	<ul style="list-style-type: none"> <li>A multivitamin preparation of lipid soluble vitamins for parenteral nutrition for infants</li> </ul>	10ml ampoule Dosage: As per the child's age, weight and recommendations
Trace elements for children	<ul style="list-style-type: none"> <li>Trace element additive for children in parenteral nutrition based on international recommendations, to meet the basal requirements of trace elements during intravenous nutrition in infants and children</li> </ul>	10ml vial Dosage: As per the child's age, weight and recommendations

Current formulations in the market have the three chamber bags for peripheral and central parenteral infusion.

### **Vitamin requirements in Parenteral Nutrition**

It is recommended that all adult/pediatrics PN patients, be supplemented daily with a standard multivitamin package. Table 47 below provides the standard vitamin package/requirement for parenteral nutrition.

**Table 47: Vitamin requirements in parenteral nutrition**

<b>Vitamins</b>	<b>Daily Requirements</b>
B1	3.0 mg
B2	3.6 mg
Niacin	40.0 mg
Pantothenic Acid	15.0 mg
B6	4.0 mg
Biotin	60,0 mg
Folacin Acid	400.0 mg
B12	5.0 mg
C	100.0 mg
A	3,300 IU
D	200 IU
E	10 IU
K	300-500 mg

\* *AMA Recommendation, JPEN 1979*

\*\* *Nutritional advisory group, JPEN 1998*

*Note: Vitamin supplementations for pediatrics are calculated as per the child's weight.*



## DETERMINING TRACE ELEMENT REQUIREMENTS

The trace elements zinc, copper, chromium, manganese, iodine, iron, and selenium must be provided in PN to prevent clinical deficiency. It is recommended that all adult PN patients be supplemented daily with a standard trace element package as shown in the table below.

Table 48: Recommendations for trace elements in parenteral nutrition

Adult patients	mg/day	μmol/day
Chromium (Cr)	0.010-0.015	0.19-0.29
Cobalt (Co)		
Copper (Cu)	0.5-1.5	8-24
Fluorine (F)	1-3	53-158
Iron (Fe)	1-2	18-36
Iodine (I)	0.1-0.2	0.79-1.6
Manganese (Mn)	0.15-0.8	2.7- 15
Molybdenum (Mo)	0.015-0.030	0.16-0.31
Selenium (Se)	0.03-0.06	0.38-0.76
Zinc (Zn)	2.5-4.0	38-61

### Monitoring of Parenteral Nutrition

This is necessary to assess whether the regimen is suitable for the patient and also to confirm and, if necessary correct the prescribed regime. To prevent possible complications, for example, catheter related complications and metabolic related complications

Be careful to check:

- The general condition of the patient
- Patient's daily body weight - bed weighing scales may be practical to check body weight daily at the same time.
- Nitrogen balance
- Fat elimination - check fat tolerance test and plasma triglycerides
- Blood electrolytes - including phosphate
- Blood glucose
- Micronutrients in the long-term parenteral nutrition patients

## Summary of Parenteral Nutrition Guidelines in the Critical Care Unit

Source: JPEN 1998

- All patients receiving less than target in 3 days enterally to receive PN within 24 to 48 hours of admission once haemodynamically stable
- NPE requirements to be calculated at 25 kcal/kg/d and increased to target over 2 – 3 days
- Carbohydrate to be given at a minimum of 2g/kg/d as glucose, monitor blood sugars (BS), BS >10mmol/l to be avoided
- Lipids to be given at a dose of 0.7 – 1.5g/kg/d, EFA, EPA and DHA, live oil based, fish oil added
- Protein to be given at 1.3 –1.5g ideal body weight (IBW)
- Amino acid solution should contain glutamine at a dose of 0.2 –0.4g /kg/Bodyweight/d (0.3 – 0.6g alanyl-glutamine dipeptide)
- Daily dose of multivitamin and trace element to be adhered to
- PN admixtures to be administered as a complete All in One bag. If there is evidence of PEM on admission and enteral nutrition is not feasible, it is appropriate to initiate parenteral nutrition as soon as possible following admission and adequate resuscitation
- If a patient is expected to undergo major upper GI surgery and EN is not feasible, PN should be provided under specific conditions: If the patient is malnourished PN to be given 5-7 days preoperatively and continued into the postoperative period
- Wean PN gradually
- Discontinue once the patient is able to adequately tolerate 60% of caloric requirements enterally

## CHAPTER FIVE: PROTEIN ENERGY AND MICRONUTRIENT DEFICIENCY DISORDERS

### OVERVIEW

Malnutrition refers to a deviation from normal nutrition due to inadequate or excess intake of nutrient(s) in the body resulting to macronutrient (protein and energy) malnutrition and micronutrient (vitamins and mineral) malnutrition. The deficiency or excess (imbalance) of nutrients can cause measurable adverse effects on tissue/body form (body shape size and composition), function and clinical outcome.

Under nutrition defines a state when the body does not have enough of the required nutrients. There are two categories of under nutrition namely, acute (wasting) and chronic (stunting). These forms are frequently accompanied by multiple or single micronutrients and /or mineral deficiencies although these may occur in the absence of macronutrient depletion and give rise to specific deficiency syndromes. This chapter focuses on wasting which is acute form of malnutrition.

Chronic malnutrition measured by patient's degree of stunting (height for age) occurs over long period usually over the first two years of life and is irreversible after this period. Nutrition intervention is therefore critical within the first two years of life to correct or prevent it. Underweight is a reflection of either acute or chronic malnutrition or both. In both cases of stunting and underweight, nutrition counseling is encouraged.

In adults, under nutrition normally occurs in form of wasting (weight loss) and is measured using body mass index (BMI) or Mid Upper Arm Circumference (MUAC) in pregnant and lactating women or patients to ill to stand (Bedridden). Table 49 below shows anthropometric criteria for acute malnutrition

Table 49 Anthropometric criterion for acute malnutrition

INDICATOR	Severe Acute Malnutrition (SAM)	Moderate Acute Malnutrition (MAM)	At Risk
<b>Infants less than 6 months</b>			
W/L	W/L < - 3 Z-score	Static weight or losing weight at home	Static weight or losing weight at home
Oedema	Oedema Present	Oedema Absent	Oedema Absent
Other signs	Too weak to suckle or feed	Poor feeding	Poor feeding
<b>Children 6 months to 10 years</b>			
W/H Z-Scores	< -3 Z-Score	Between -3 to < -2 Z-Score	Between -2 to -1 Z-Score
MUAC (6-59 months)	<11.5 cm	11.5 to 12.4cm	12.5-13.4cm
Oedema	Oedema Present	Oedema Absent	Oedema Absent
<b>Adolescent (10 years to 18 years)</b>			
MUAC	< 16cm	N/A	N/A
Oedema	Oedema Present	Oedema Absent	Oedema absent
<b>Adults (older than 18 years)</b>			
MUAC	<16cm irrespective of clinical signs	16-18.5cm with no relevant clinical signs. Few relevant social criteria e.g. critical household food insecurity	N/A
MUAC	16-18.5cm plus one of the following: 1) Oedema 2) Inability to stand 3) Apparent dehydration	N/A	N/A
BMI	<16	16-17	17-18.5



<b>Oedema</b>	<b>Oedema Present</b>	<b>Oedema Absent</b>	<b>Oedema Absent</b>
<b>Pregnant &amp; lactating women</b>			
<b>MUAC</b>	<b>No available criteria</b>	<b>&lt; 21cm</b>	

*Source: IMAM guideline, June 2009*

## ACUTE MALNUTRITION IN CHILDREN 6 - 59 MONTHS

Acute malnutrition is categorised into two namely; moderate and severe acute malnutrition and is determined by patients degree of wasting. All cases of bilateral pitting oedema are categorised as severe acute malnutrition(SAM). SAM is further categorized into two; Marasmus and Kwashiorkor. A patient may present with both forms. Table 50 below shows the characteristics of kwashiorkor and marasmus.

Table 50: Characteristics of Kwashiorkor and Marasmus

Kwashiorkor	Marasmus
 <ul style="list-style-type: none"> <li>● Bi-lateral pitting oedema (fluid accumulation)</li> <li>● Loss of appetite</li> <li>● Brittle thinnig hair and colour change</li> <li>● Aperthetic and irritable</li> <li>● Face may seem swollen</li> <li>● High risk of death</li> </ul>	 <ul style="list-style-type: none"> <li>● Severe weight loss and wasting</li> <li>● Ribs prominent</li> <li>● Limbs emaciated</li> <li>● Muscle wasting</li> <li>● May have good appetite</li> </ul>

Source: IMAM Guideline, June 2009

## **PATHOPHYSIOLOGY OF MALNUTRITION**

Malnutrition result in profound metabolic, physiological and anatomical changes. All physiological processes are altered due to acute malnutrition and all body organs slow down in order to survive on the limited macro and micronutrient intake a condition refered to as reductive adaptation. These include:

- Reduced metabolic rate
- Impaired protein synthesis and metabolism
- Impaired liver function
- Impaired kidney function
- Impaired immunity
- Impaired electrolyte balance

## **DIAGNOSIS AND TRIAGE**

Various categories of acute malnutrition will require different nutrition therapies (management). Figure 9 below provides an algorithm for diagnosis and triage of acute malnutrition.

## Algorithm for Diagnosis and Triage of Acute Malnutrition

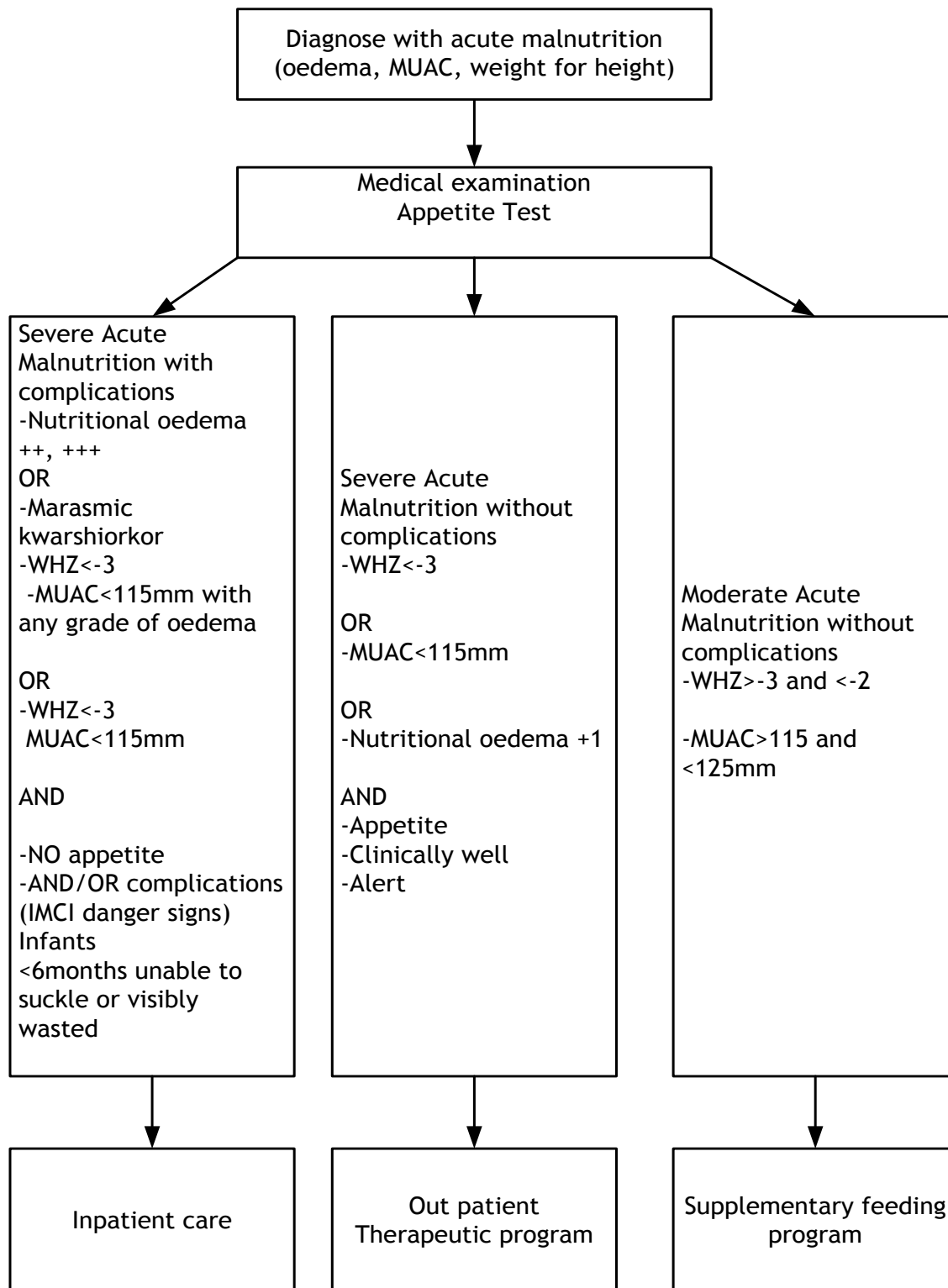


Figure 9: Algorithm for Diagnosis and Triage of Acute Malnutrition



## NUTRITIONAL MANAGEMENT

The aim of nutritional management is:

- To correct nutritional imbalances
- Restoration of patho-physiological function

### SAM WITH MEDICAL COMPLICATIONS

Severely malnourished patients with complications are usually rehabilitated in three phases namely: cautious feeding phase, transition phase and catch up (Rehabilitation) phase. The three phases encompass ten (10) step approaches as outlined below:

#### *Stabilization Phase (Cautious Feeding)*

1. Treatment/prevention of hypoglycaemia
2. Treatment/prevention of hypothermia
3. Treatment/prevention of dehydration
4. Correcting electrolyte imbalance
5. Treatment/prevention of infection
6. Correcting micronutrient deficiencies
7. Starting cautious feeding

#### *Transition and Catch up Phase*

8. Achieving catch-up growth
9. Providing sensory stimulation and emotional support
10. Preparing for follow-up after recovery

### STABILIZATION PHASE (CAUTIOUS FEEDING)

The aim of this phase is to stabilize the patient both medically and nutritionally. It usually takes 2 to 3 days. In this phase a cautious approach is required because of the child's fragile physiological state and reduced homeostatic capacity. Feeding should be started as soon as possible after admission and should be designed to provide just sufficient energy and protein to maintain basic physiological processes. The essential features of feeding in the stabilization phases are:

- Small, frequent feeds of low osmolarity and low lactose
- Oral or nasogastric (NG) feeds
- 100 Kcal/ kg/day
- 1-1.5 protein/kg/day
- 130 ml/kg/day of feed (100 ml/kg/day if the child has severe edema)
- If the child is breastfed, encourage to continue breastfeeding but give the prescribed amounts of starter formula to make sure the child's needs are met

The suggested starter formula and feeding schedules (see below) are designed to meet these targets. Milk-based formulas such as starter F-75 containing 75 Kcal/100 ml and 0.9 g protein/100 will be satisfactory for most children. Give from cup; dropper or syringe may be used to feed very weak children. All patients must be kept warm to prevent hypothermia (for infants, kangaroo method is encouraged).

- On admission, if the patient is alert give 5 ml/kg of 10% glucose to prevent hypoglycemia and feed with F-75 at 130 ml/kg/day every 3 hrs
- If patient has generalized edema (grade 3 or +++) give 100ml/kg/day of F-75 every 3 hours
- If the patient is losing consciousness, give 50ml (5 – 10ml/kg) of sugar-water by NG tube immediately. When consciousness is regained, give milk feed frequently
- On admission, if the patient is unconscious, give sugar water by NG tube. Give glucose as a single intravenous injection (5ml/kg of sterile 10% glucose solution)
- If the patient is dehydrated, rehydrate using Resomal at 5ml/kg every 30 minutes while monitoring for two hours. Start feeding after two hours of successful rehydration. Alternate feeds every hour with Resomal up to 10 hours
- If the patient has severe anemia, transfuse for 3 hours with close monitoring. Feeding using F-75 should start 2 hours after transfusion
- Feeding should be encouraged and monitored after every feed, If the patient is not taking sufficient amount (less than 75%), has pneumonia with rapid respiration rate, mouth lesions, cleft palate or other physical deformity or disturbance of consciousness a naso-gastric tube should be used to feed at 130 ml/kg/day
- Vitamin A should be provided as per IMAM guidelines

**NB:** When feeding on F-75, monitoring is important and especially for night feeds to ensure that the patient has adequate intake. Iron supplementation is contraindicated in this phase and should be delayed until the patient moves to Phase 2

## TRANSITION PHASE

The ONLY change in the diet when transferring from Phase 1 to Transition Phase is that F75 is replaced by either F100 or equivalent made-up milk. The number of feeds, the timing, and the volume of the diet remains exactly the same in Transition Phase as in Phase 1 (130ml/kg/day).

The purpose of transition phase is to move the patient to a more energy dense food (F-100) in preparation for rapid weight gain. During this phase minimal weight gain can be expected (6g/kg/day) and lasts for 2 days. Criteria for transition phase include: a patient regaining appetite (No NG tube/finishes all prescribed feed), medically stable and losing edema.

- Give 130ml/kg/day of F-100 five to six feeds a day
- Feed amounts should be strictly controlled and no more should be given
- If the child is breastfeeding, encourage and continue breastfeeding on demand
- Close monitoring on patients adaptation to the feed is important

***NB: In case there is increase/development of oedema, loss of appetite, development of medical complication, re-feeding diarrhoea, tense abdominal distension, and signs of fluid overload or rapid increase in liver size transfer immediately to Phase 1.***

## REHABILITATION PHASE (ACHIEVING CATCH-UP GROWTH)

In Phase 2, the main objective is to achieve catch-up growth and resolve micronutrient deficiencies. As the patients are recovering, the frequency of meals and some of the routine surveillance is less frequent as in Phase 1 and Transition Phase. A vigorous approach to feeding is required to achieve very high intakes and rapid weight gain of >10g/kg/day. F-100 is used at 130ml/kg/day and 2.9 g protein/100mls. Modified porridges or modified family foods can also be used provided they have comparable energy and protein concentrations.

Readiness to enter the rehabilitation phase is signaled by a return of appetite i.e. a patient is able to finish all prescribed feed in transition phase usually about one week after admission.

- The volume of milk is increased from 130ml/kg/day to 200ml/kg/day (equivalent to 200kcal/kg/day).
- The frequency is reduced to 5 feeds a day
- If the child remains hungry after completing a feed, more milk can be offered
- Either F100 or RUTF can be given, or a combination of both

## *Iron*

Iron is given in this phase usually by adding an iron tablet into the milk. Crush an iron tablet and add to 4mls of water and mix well (Iron Solution).

For one sachet of F100 (makes 2.4 litres of F100), add one (1) crushed tablet of ferrous sulphate (200mg) in the 4mls of water (Iron Solution).

- If using locally made-up formulas add iron solution as above to the milk
- If the patient is on RUTF, do not give additional iron as it already contains the necessary iron

### **PREPARING PATIENT FOR DISCHARGE**

During this phase the patient should be prepared for eventual discharge. After a clinical team has ascertained that the patient is ready for discharge, specific criteria for discharging clients with appropriate follow up action should be followed as outlined in IMAM guideline.

***NB: severely and moderately malnourished patients without medical complications can be managed as outpatient by following specified guidelines outlined in the National guideline on Integrated Management of Acute Malnutrition(IMAM)***

## OBESITY IN ADULTS

Defined as a state of adiposity in which the body fat is above the ideal i.e. when the individual's body weight is 20% more than the normal body weight or when the BMI is more than 30kg/m<sup>2</sup>. The normal body weight of a person depends on age, sex, height and body frame. Obesity is a chronic disorder of excessive accumulation of fat in the body, whereas overweight refer to the excess amount of body weight in all tissues.

### RISK FACTORS

- Genetics
- Sedentary Lifestyle
- Dietary

### CAUSES

- Energy imbalance between calories consumed and those that are expended
- A shift in diet towards increased intake of energy-dense foods high in fat and sugar but low in vitamins, minerals and other micronutrients
- A trend towards decreased physical activity due the increasingly sedentary nature of many forms of work, changing modes of transport and increasing urbanization

### MANAGEMENT OF OBESITY

*Aim of nutritional management is to:*

- Achieve and maintain ideal body weight by bringing about gradual weight loss
- Correct fault food habits

### Management

- Control total energy intake based on individual assessment by limiting energy intake from total fat and simple sugars.

*NB: A maximum reduction of 1000kcal daily is required to lose about 1kg a week and a reduction of 500kcal daily brings about a weight loss of about half a kg a week. Drastic reduction of calorie intake is however not advisable. Put the client on a weight reduction diet regime of 30-25kcal/kg /day.*

- High fiber, restricted fat diets based on individual assessment is recommended
- Offer nutrition education and counseling to the clients with emphasis on weight management, fad diets and other unhealthy practices in weight control
- Recommend suitable exercise program and encourage physical activity for gradual weight loss
- Recommend support systems for the clients who need behavior modification.

*NB: Refer to Chapter 4: the calorie restricted diet*

## DIETARY CONSIDERATIONS IN THE MANAGEMENT OF OBESITY

### Proteins

- Give slightly higher than normal as it gives a feeling of satiety and helps to maintain a good nutritional status yet excess is deaminated. Provide approximately 20% of total energy from proteins. This should include good quality proteins, lean and whole pulses.

### Fats

- Provide 20% or less of total energy from fats. Emphasize on the use of unsaturated fats to reduce the risk of heart problems. Restrict or avoid fried foods

### Carbohydrates

- Provide the rest of energy 60% from carbohydrates which should be mainly in complex form; starches and dietary fiber. Limit simple forms like sugars

### Minerals and vitamins

- Diet should provide adequate amount of essential nutrients like minerals and vitamins to maintain a good nutrition status

### Alcohol

- Alcohol should be restricted as it provides a lot of kilocalorie per kg. If desired alcohol may be provided in limited amounts

*N.B. diet adjustments should be gradual as such people experience excessive appetite.*

*Use of appetite suppressants is not recommended.*

### Generally increase intake of the following food:

- Vegetables such as broccoli, mushroom, zucchini, cabbage, lettuce, cucumber
- Fruits such as pineapple, cherimoya, peach, grapefruit
- Tubers such as sweet potatoes
- Low fat milk
- Diuretic foods such as celery, apples, watermelon (diuretic drugs are not recommended)

### Avoid

- Saturated fats
- Fried foods
- Refined baked foods

## SPECIAL GROUPS

### OBESE CHILDREN

It is better not to try to get children to lose weight, since weight loss is usually associated with a decrease in height growth. Ideally the child who is overweight at age 7 years should be managed so that weight gain is slowed while height continues to increase, with an objective of achieving a normal weight-for-height at age 12 years. This does not involve weight loss at any stage, and only a very modest restriction of energy such as may be achieved by substituting fruit for sweets, and low energy drinks for sugary drinks, and encouraging physical activity as much as possible. If the childhood obesity is not tackled until the teens are reached, the opportunity for this gentle approach will have been lost.

### PREGNANCY AND LACTATION

For similar reasons, obese expectant and lactating mothers should not be asked to lose weight: the time for weight loss is between pregnancies. However, it is probably, reasonable to aim for a constant weight during pregnancy of a mother who starts obese, so, after childbirth she will weigh less than at the beginning of the pregnancy.

- 

## IRON DEFICIENCY ANAEMIA

Iron deficiency anaemia also called (IDA) is a condition where a person has inadequate amounts of iron in the body to meet body demands. Iron is an essential component of haemoglobin, the oxygen carrying pigment in the blood. Iron-deficient people tire easily because their bodies are starved of oxygen. Iron is also part of myoglobin, which helps muscle cells to store oxygen. Without enough iron, the body's fuel cannot be properly synthesized. Iron is normally obtained through food in the diet or supplementation.

### RISK FACTORS TO IRON DEFICIENCY ANAEMIA INCLUDE;

- Inadequate consumption, or low intake of *heme* iron
- High consumption of staples with low bio available iron
- Inadequate intake of foods that enhance iron absorption from diet, such as Vitamin C
- Consumption of foods high in phytate or phenolic compounds that inhibit iron absorption (legumes, cereals, coffee, tea, sorghum and millet)
- Parasitic infestation such as hookworms, ascaris and schistosomiasis
- Malaria
- Chronic infections such as TB and HIV
- Heavy blood loss

### COMMON CAUSES OF ANAEMIA

- **Insufficient blood production:** erythrocytes (red blood cells) live approximately 100 days and the bone marrow is constantly producing new blood cells. To do this the bone marrow requires iron, proteins, folic acids and a variety of vitamins
- **Blood loss:** whether from acute haemorrhage or chronic haemorrhage
- **Destruction of blood cells:** these produces haemolytic anaemia in which the red blood cells are destroyed for various causes and diseases

### SYMPTOMS OF IRON DEFICIENCY ANAEMIA

- Abnormal paleness or lack of skin color
- Lack of energy or tiring easily (fatigue)
- Increased heart rate (tachycardia)
- Sore or swollen tongue
- Enlarged spleen
- Irritability
- Dizziness
- Shortness of breath
- Brittle nails
- Decreased appetite (especially in children), headache - frontal



#### DIETARY PREVENTION OF ANAEMIA

- Encourage consumption of foods rich in iron and those that enhance iron absorption such as vitamin C
- Encourage consumption of vitamin rich foods especially the B group vitamins, folate, vitamin C, vitamin E
- Avoid consumption of food that inhibits absorption of iron i.e. those high in phytates, tannins and oxalates. Where possible avoid eating them with the iron-rich foods to maximize iron absorption

#### DIETARY MANAGEMENT

- Encourage consumption of foods rich in iron, folate, proteins and other nutrients needed for blood production. This include: soy, fruits, green leafy vegetables such as beetroots, spinach, avocado, sunflower seeds, passion fruits, lemon and spirulina
- Encourage consumption of meat and meat products especially liver
- Provide foods rich in Vitamin B<sub>12</sub>, folate, Vitamin E and C
- Reduce intake of beverages that contain phenolic compounds and tannin such as tea leaves, wheat brans

**NB:** *The absorption of Non-heme iron can be improved by provision of both non-heme and heme iron in the same meal.*

*Sources of heme iron include: meat and meat products such as liver, oyster, chicken and fish*

*Sources of non-heme iron include: enriched breakfast cereals, cooked beans and lentils, pumpkin seeds, potato with skin and enriched pasta*

## VITAMIN A DEFICIENCY

Vitamin A deficiency occurs when the body stores are depleted to the extent that physiological functions are impaired. It leads to depressed immune response, impaired movement of iron, poor growth and night blindness. In its most severe form it leads to xerophthalmia. Vitamin A deficiency is most common among children, especially those with measles, diarrhea and undernutrition.

### RISK FACTORS FOR VAD

- Consumption of diets low in vitamin A or of low bioavailability
- Poor nutritional status of an individual
- Consumption of diets low in fats
- Infections such as measles, diarrhea, respiratory diseases, HIV/AIDS and helminthes
- Pregnancy increases vitamin A needs

### MANAGEMENT OF VITAMIN A DEFICIENCY

- In order to prevent vitamin A deficiency, routine supplementation is recommended
  - For lactating mothers provide 200,000 IU as a single dose at delivery or during BCG vaccination (within 4 weeks of delivery)
  - For infants 6-11 months give 100,000 IU as a single dose during MCH contacts
  - Children 12-59 months give 200,000 IU as a single dose every 6 months during MCH contacts
- For disease targeted supplementation ( diseases targeted for vitamin A supplementation include measles, chicken pox, severe protein energy malnutrition, acute or persistent diarrhea lasting more than 14 days, tuberculosis, HIV/AIDS, acute lower respiratory tract infection, malaria, anemia, schistosomiasis, heavy worm infestation)
  - For children 6-11 months and children of any age weighing less than 8 kgs give 100,000 IU at the first time of contact with the health facility with each episode of illness
  - For children 12-59 months give 200,000 IU at the first time of contact with the health facility with each episode of illness
  - For adults (except women of reproductive age) give 200,000 IU at the first time of contact with the health facility with each episode of illness.

*All children admitted to wards should also be targeted for supplementation.*

In case of xerophthalmia and measles:

- For infants < 6 months give 50,000 IU immediately on diagnosis repeat next day and on day 14
- For infants 6-11months give 100,000 IU immediately on diagnosis repeat next day and on day 14
- For children 12-59 months, give 200,000 IU immediately on diagnosis repeat next day and on day 14
- For all adults except women of reproductive age give 200,000 IU immediately on diagnosis repeat next day and on day 14

*NB: Treatment for xerophthalmia or Bitot's spot for women of reproductive age whether pregnant or not should be daily dose of 10,000 IU for 4 weeks*

- *Every dose given to a patient should be recorded on individual card to avoid over dosage*

## PELLAGRA

Pellagra is a systemic disturbance caused by a cellular deficiency of niacin, resulting from inadequate dietary nicotinic acid and/or its precursors, the essential amino-acid tryptophan. Table below shows a summary of causes, symptoms and treatment/prevention strategies for pellagra

Table 51 : Causes, symptoms and treatment of pellagra

Causes	Symptoms	Treatment and prevention
<ul style="list-style-type: none"> <li>• Nutritional niacin deficiency</li> <li>• Chronic alcoholism</li> <li>• Gastro-intestinal malabsorption</li> <li>• Some medications (5-fluoro-uracil, isoniazid, pyrazinamide, ethionamide, 6-mercaptopurine, hydantoins, phenobarbital and chloramphenicol).</li> </ul>	<ul style="list-style-type: none"> <li>• Dermatitis (bilaterally symmetrical erythema at the sites of solar exposure)</li> <li>• Dermatitis begins in the form of an erythema with acute or intermittent onset gradually changing to an exudative eruption on the dorsa of the hand, face, neck, and chest with pruritus and burning.</li> <li>• Acute dermatitis of pellagra resembles sunburn in the first stages, sometimes with vesicles and bullae</li> <li>• Gastro-intestinal disturbances such as anorexia, nausea, epigastric discomfort and chronic or recurrent diarrhea.</li> <li>• Anorexia and malabsorptive diarrhea lead to a state of malnutrition and cachexia</li> <li>• Watery stools but occasionally can be bloody and mucoid.</li> <li>• Neuropsychological manifestation including photophobia, asthenia, depression, hallucinations, confusions, memory loss and psychosis.</li> <li>• As pellagra advances, patient become disoriented, confused and delirious; then stuporous and finally die.</li> <li>• Pathological changes in the skin is non-specific, there are no chemical tests available to definitively diagnose pellagra. However low levels of urinary excretion of N-methylnicotinamide and pyridone indicates niacin deficiency.</li> </ul>	<ul style="list-style-type: none"> <li>• Treatment of pellagra consists of exogenous administration of niacin or nicotinamide cures</li> <li>• Topical management of skin lesions with emollients may reduce discomfort.</li> <li>• Provide B vitamins, zinc and magnesium as well as a diet rich in calories.</li> <li>• Prevention is based on nutritional education (food sources of niacin: eggs, bran, peanuts, meat, poultry, fish, red meat, legumes and seeds), and eliminating consumption of alcohol</li> </ul>

## RICKETS

This is an abnormal bone formation resulting from inadequate calcium in the bones. Normally common in children and can result in fractures. It is manifested in softening and deformation of the bones. It is mainly caused by lack of calcium and vitamin D.

### SYMPTOMS

- Soft and deformed bones

### AIM OF MANAGEMENT

- To achieve and maintain healthy bones through provision of adequate calcium, phosphorus, magnesium, boron, fluorine and vitamin D

### MANAGEMENT

- Recommend foods rich in calcium and vitamin D e.g. dairy products
- Exposure of babies/children and even adults to sun
- Exercise as this promotes calcium metabolism
- Limit meat intake in adults as this fosters urinary calcium loss

## CHAPTER SIX: NUTRITION INTERVENTION FOR INFECTIOUS DISEASES

### HIV AND AIDS

Human Immunodeficiency Virus (HIV) is a virus that causes AIDS. Acquired Immuno-Deficiency syndrome (AIDS) is caused by HIV virus which invades the genetic core of the CD4+ or T helper lymphocyte cells. These cells are the principal agent involved in the protection against infection. The HIV infection causes a progressive depletion of the CD4+ cells, which eventually leads to immunodeficiency, secondary infection and neoplasm.

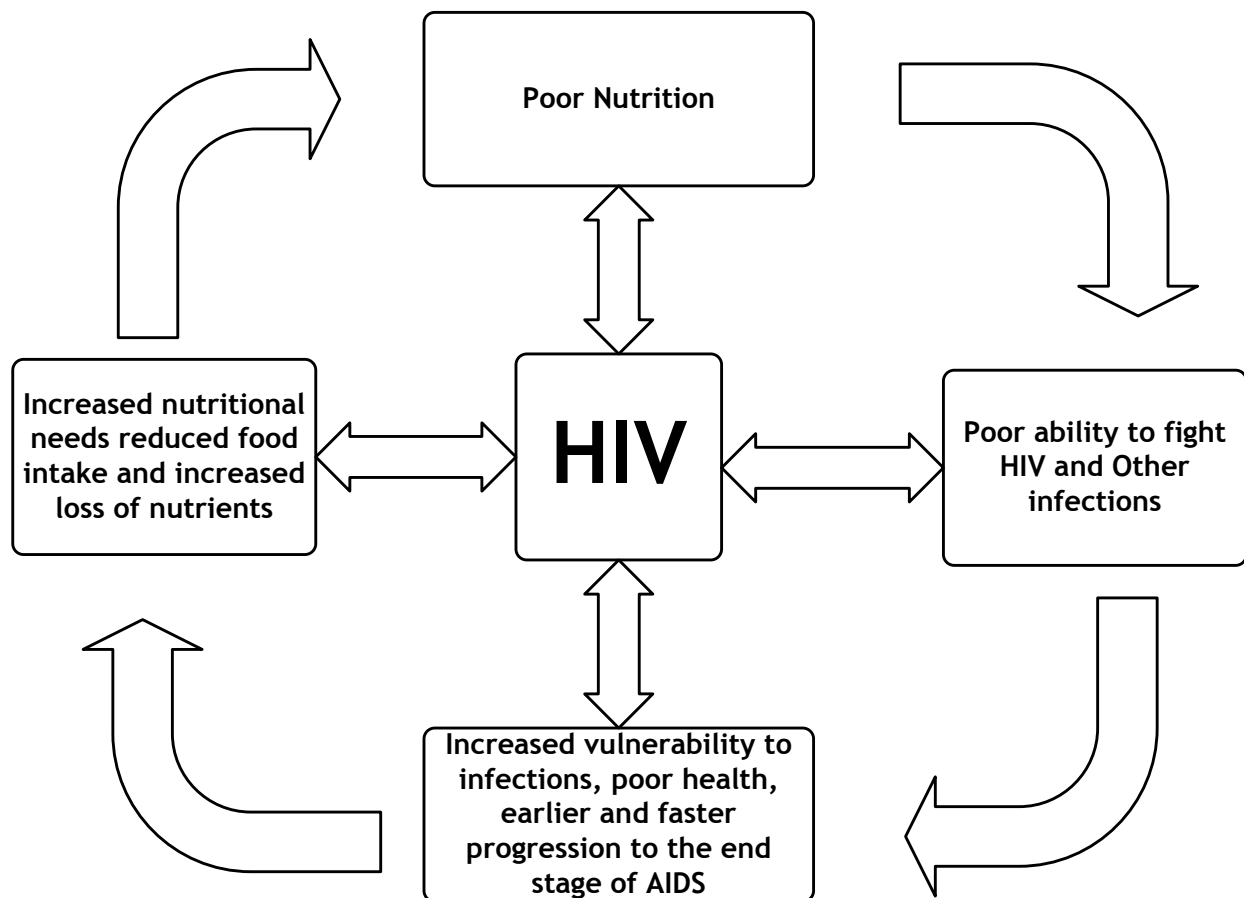
It is important to control symptoms, support the immune system, and lower the levels of HIV circulating in the blood. To lower the level of HIV in the blood, patients take a prescribed combination of antiviral drugs. Nutrition supports the immune system thus preventing onset of opportunistic infections. The role nutrition plays will vary along the disease continuum (disease progression over many years), with consideration given to the patient's age, gender, behaviours, current medication, drug history, socioeconomic status, and associated health concerns. Poor nutrition among PLHIV may result from a number of causes such as:

1. Increased nutrient needs
2. Diarrhea which causes poor absorption resulting in poor utilization of ingested foods and nutrients
3. Reduced food intake due to:
  - Reduced appetite as a result of infection
  - Mouth infection including Candida which makes it painful to eat or suckle
  - Depression
  - Side effects of drugs
  - Nausea
  - Vomiting

## THE LINK BETWEEN FOOD, NUTRITION AND HIV/AIDS

Nutrition and HIV/AIDS are strongly interrelated. Malnutrition can both contribute to and result from the progression of HIV. This relationship between malnutrition and HIV/AIDS creates a vicious cycle: HIV weakens the immune system, which in turn leads to more infections (See Figure 10 below). Infections increase energy needs and at the same time cause anorexia, as indicated in Table 2. Heightened infections (in number and severity) lead to loss of appetite, resulting in inadequate food intake, and eventually malnutrition. Malnourished persons are at greater risk of infections, creating more vulnerability to HIV, and so the cycle continues.

### THE CYCLE OF POOR NUTRITION AND INFECTION IN THE CONTEXT OF HIV/AIDS



Source: Kenya National Guidelines on Nutrition and HIV 2007

Figure 10: The Cycle of Nutrition and Infection in the context of HIV/AIDS

In light of the HIV and nutrition vicious cycle, it is imperative that nutrition interventions are put in place to slow disease progression and improve the individual's immunity. Figure 11 below shows various entry points where nutrition care and management can be provided for people living with HIV and AIDS and where this manual can be used to support and promote nutrition for PLWHA.

**Entry points for raising Nutrition issues and providing Nutrition care**

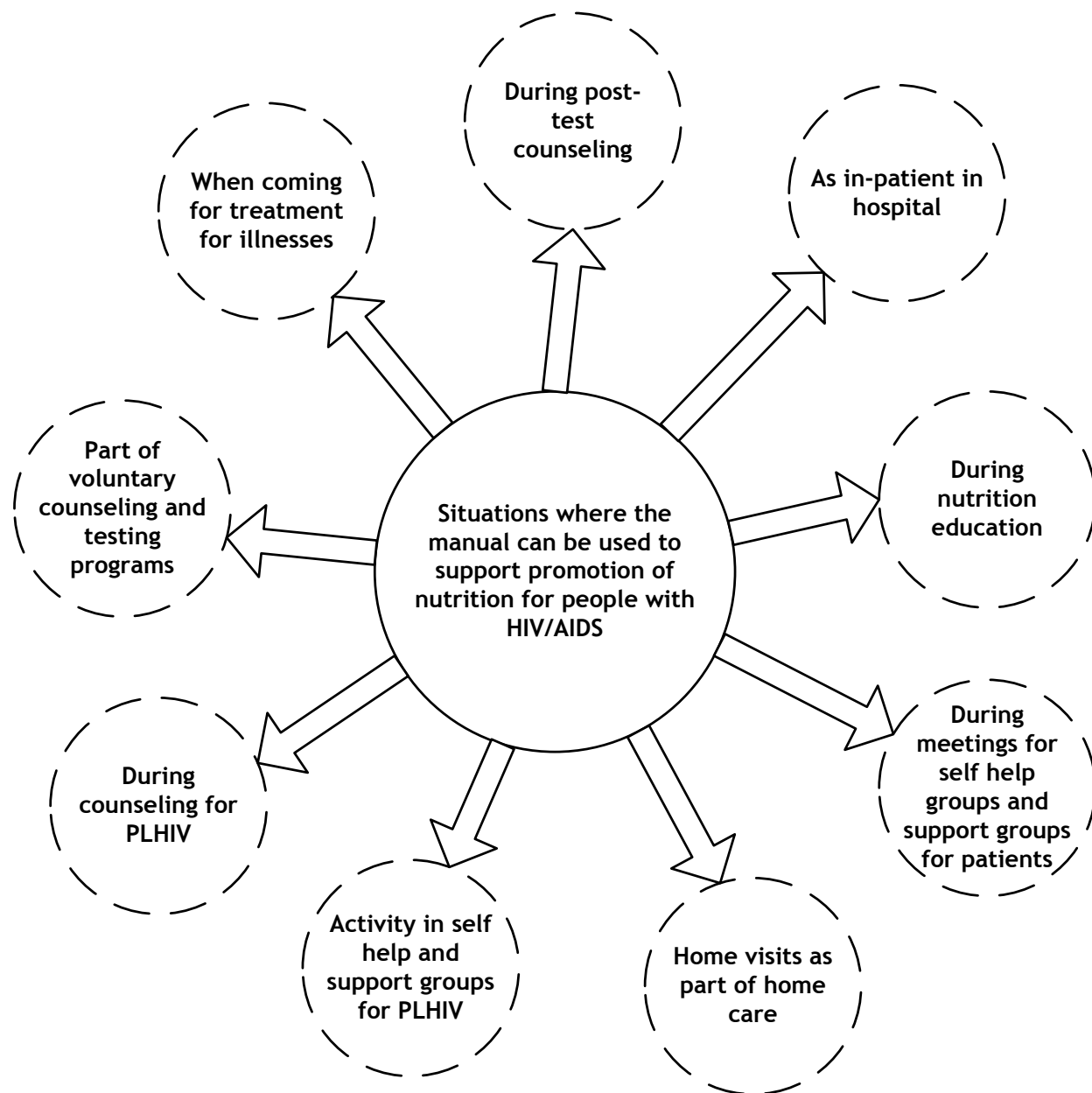


Figure 11: Entry points for Raising Nutrition Issues





### MODES OF TRANSMISSION

HIV can be transmitted through various ways such as:

- Transfusion of blood infected with the virus
- Having unprotected sexual intercourse with an infected person
- Use of contaminated needles and injections/skin pricking instruments
- Vertical transmission from infected mothers to child during pregnancy, delivery or through breastfeeding

### IMPLICATIONS

- Suppressed body immunity
- Increased susceptibility to infections
- Altered metabolism-high catabolic rate
- Decreased body cell mass
- Malnutrition
- Altered body weight (overweight or underweight)

### AIMS OF NUTRITIONAL MANAGEMENT

- Maintain and improve nutrition status of a person living with HIV/ AIDS thus delay the progression from HIV to AIDS related diseases
- Ensure adequate intake of all nutrients thus preventing development of nutritional deficiencies
- Preservation of lean body mass
- Maintain body weight and fitness
- Improve performance of immune system
- Replenishment of nutrient losses incurred during infection
- Minimizing symptoms of malabsorption
- Regeneration of glycogen stores
- Maintain laboratory values within normal limits
- Control side effects due to medication—refer to the section on drug-nutrient interaction

An effective nutritional care and support program will improve the quality of life of people living with HIV/AIDS by:

- Maintaining body weight and strength
- Replenishing lost vitamins and minerals
- Improving the function of the immune system and the body's ability to fight infections
- Prolong the period from infection to the development of the AIDS disease
- Improving response to treatment; reducing time and money spent on health care
- Keeping HIV-infected people active, allowing them to take care of themselves, their family and children; and
- Keeping HIV-infected people productive, able to work, grow food and contribute to the income of their families

### Nutrient requirements for PLHIV

In PLHIV there is increased nutrient needs due to:

- Increased resting energy equilibrium (REE)
- Viral load (body trying to cope with illness/inflammation)
- Opportunistic infections (OIs) that increase energy demand
- Nutrient malabsorption

The WHO has given recommendations on the amount of energy increments in PLHIV according to disease stage as shown in table 52 below

**Table 52: Energy needs by Disease Stage**

Population group	HIV phase	Energy requirements
Adult	Asymptomatic	10% increase
	Symptomatic	20-30% increase
Pregnant/lactating women	Asymptomatic	10% increase
	Symptomatic	20-30% increase
Children	Asymptomatic	10% increase
	Symptomatic (with no weight loss)	20-30% increase
	Symptomatic (with weight loss)	50-100% increase

Source: WHO 2003

### PROTEIN NEEDS

World Health Organization does not recommend increased protein intake by HIV-infected persons. The protein needs for the HIV infected adult are the same as those recommended for a healthy non-HIV infected adult. The recommended protein intake for a healthy non-HIV infected adult is 12-15% of the total energy needs or 0.8g/kg for females and 0.85g/kg for males.

However, other factors increase protein needs. These include illness, surgery, infection, trauma, and pressure ulcers. It is, therefore, important to consider pre-existing or concurrent protein deficiencies.

If energy intake is insufficient, protein will be used to provide the body with energy. This means that there will be less protein available for maintaining muscle tissue and strengthening the immune system and in children less protein for growth and development. It is, therefore, important to have adequate energy intake at all times, especially during infections. In this way, protein may be used for building or maintaining lean muscle and strengthening the immune system.

### FAT NEEDS

WHO does not recommend increased fat intake over what is recommended for a healthy non-HIV infected individual. Dietary fat is a good source of essential fatty acids, vitamins and concentrated energy. Fat can be used to help meet increased energy needs if the patient does not have fat malabsorption or diarrhea. However, the WHO Technical Advisory Group on nutrition and HIV/AIDS recognized that individualized advice regarding fat intake might be required in individuals on anti-retroviral therapy and among those with persistent diarrhea. The recommended intake for fat for a healthy adult is <30% of the total energy needs.

### MICRONUTRIENTS

Micronutrient deficiencies of vitamin A, C, E, B6, B12, Folate and minerals such as zinc, iron and selenium are common among HIV infected individuals due to excessive losses in urine. Correcting these deficiencies when they exist may help to slow down disease progression. Table 53 below provides guideline for management of common problems on food intake for PLHIV

Table 53: Management of Common problems on Food intake in HIV/AIDS

Condition	Management
Loss of appetite	<ul style="list-style-type: none"> <li>• Minimize foods with strong odors.</li> <li>• Try different foods until you find those that you like and try to have a mixed diet</li> <li>• Encourage intake of small frequent meals more often</li> <li>• Use spices and seasonings to improve food aroma and taste. Squeeze some lemon juice over it or add spices such as cardamom, fennel, coriander and cinnamon</li> <li>• Encourage patients to eat food in relaxed atmosphere</li> <li>• Use calorie dense supplements/foods</li> <li>• Take light exercise such as walking outdoors</li> <li>• Eat in a well ventilated room away from cooking or unpleasant smells</li> <li>• Avoid alcohol, it reduces appetite, weakens the body and interferes with medicines Avoid fizzy drinks, beer and foods such as cabbage, broccoli and beans that create gas</li> </ul>
Nausea and Vomiting	<p><b>General</b></p> <ul style="list-style-type: none"> <li>• Sit up when eating, try not to lie down until 1hr or 2hrs after eating</li> <li>• Try not to prepare food yourself to avoid smell which may worsen nausea</li> <li>• Encourage small frequent meals. Alternating dry and fluid feeds</li> <li>• Drink plenty of fluids after meals</li> <li>• Chew food thoroughly and slowly</li> </ul> <p><b>Recommended</b></p> <ul style="list-style-type: none"> <li>• Keep drinking small amounts of water, soups and spice teas, eat soft foods and go back to solid foods when the vomiting stops</li> <li>• You may relieve the feeling by smelling fresh orange or lemon peel or drinking lemon juice in hot water or a herbal or ginger tea</li> <li>• Eat dry and salty foods such as toast, crackers and cereals</li> <li>• Eat promptly when hunger is first felt</li> <li>• Drink fluids 30 minutes after meals instead of with meals</li> </ul> <p><b>Foods to avoid</b></p> <ul style="list-style-type: none"> <li>• Fats, fatty foods and greasy foods</li> <li>• Highly seasoned foods</li> <li>• Very sweet foods</li> <li>• Eliminate one food at a time from the diet to see if it makes a difference</li> </ul>

Condition	Management
Change in taste	<ul style="list-style-type: none"> <li>• Use the trial and error approach to find out which foods taste good and which are not acceptable. Remember taste change is often temporary and your list of acceptable and unacceptable foods may change.</li> <li>• Keep your mouth clean by rinsing often and brushing with a soft toothbrush. Rinse your mouth before eating</li> <li>• Improve taste perception with the use of sour candy or peppermint</li> <li>• Avoid greasy or fried foods, red meats, chocolate and coffee</li> <li>• Find ways to increase the flavour and appeal of foods by using different spices, including sugar, lemon, vinegar, salt, herbs and/or wine (cooked into the recipe).</li> <li>• Serve food elegantly with different colours and textures to enhance its appearance.</li> <li>• Drinking fluids with solid foods may help with taste unless it reduces caloric intake.</li> </ul>
Malabsorption	<ul style="list-style-type: none"> <li>• In severe malabsorption parenteral nutrition is recommended</li> <li>• Treat underlying cause</li> <li>• Based on patient's tolerance provide low fat, lactose free or low lactose caffeine free diet</li> </ul>
Heartburn and indigestion	<ul style="list-style-type: none"> <li>• Avoid spicy, fatty or fried foods and caffeinated foods and beverages</li> <li>• Walk after eating and do not lie down after meals</li> <li>• Wear loose clothing around your waist</li> <li>• Eat five to six small meals in a day</li> </ul>

Condition	Management
Anorexia	<ul style="list-style-type: none"> <li>• If related to depression or any other psychological conditions refer to a counselor or psychiatrist</li> <li>• Use calorie dense supplements/foods</li> </ul>
Early satiety	<ul style="list-style-type: none"> <li>• Avoid serving liquids during meals. Can be taken one hour before or after meals</li> </ul>
Diarrhea	<ul style="list-style-type: none"> <li>• Encourage fluids to replace losses</li> <li>• Minimize insoluble fiber intake and increase soluble fiber</li> <li>• Avoid citrus fruits and juices, caffeinated drinks and alcoholic beverages</li> <li>• ORS may be considered to cater for electrolyte imbalance.</li> <li>• If severe parenteral nutrition is recommend</li> <li>• Treat underlying cause</li> </ul>
Oral sores	<ul style="list-style-type: none"> <li>• Use bland, cold, soft/liquid diets</li> <li>• Avoid acidic foods and fizzy drinks</li> </ul>
Lactose intolerance	<ul style="list-style-type: none"> <li>• Avoid milk and milk products</li> </ul>
Fat malabsorption	<ul style="list-style-type: none"> <li>• Avoid fats and fatty foods. Encourage low fat diets</li> <li>• Use preparations with medium chain triglycerides</li> </ul>
Anemia	<ul style="list-style-type: none"> <li>• Treat for malaria in case it is the underlying cause</li> <li>• If on Zidovudine hemoglobin assessment at least every 3 months is recommend</li> <li>• Consumption of tea &amp; coffee should be 1 hour after or before meals</li> <li>• Recommend foods rich in both Iron and vitamin C</li> </ul>
Fever	<ul style="list-style-type: none"> <li>• Treat underlying cause</li> <li>• Encourage intake of plenty of fluids and safe water</li> <li>• Encourage intake of energy dense food</li> <li>• Rest in an area that is well ventilated with cool fresh air</li> </ul>
Muscle wasting	<ul style="list-style-type: none"> <li>• In case of &gt; 10% weight loss refer the client for assessment for ARVs</li> <li>• Treat underlying cause</li> <li>• Monitor weight monthly</li> </ul>

*NB: In case of fever and multiple infections, consider addition of 10% on the calorie requirement*

HIV infections can have significant nutrition related ramifications for multiple body systems as well as for immune functions. A comprehensive nutrition assessment should therefore be performed. The diet should be evaluated for nutrient adequacy especially those involved in immune functions. Psychosocial conditions should also be assessed. Fear, anxiety, depression and social isolation all affect appetite and nutrient intake. Illness may lead to lack of employment and subsequent loss of social contact. Evaluating weight in terms of percentage weight rather than the published height and weight tables is more accurate. Monitoring changes in anthropometric measurement is therefore recommended because patients will have multiple clinic visits. The calculations should be compared to each other rather than published reference data. Table 54 provides guidelines and rationale for nutrition status assessment for PLHIV.

**Table 54: Guidelines and Rationale of Nutrition Care for PLHIV**

<b>Nutrition Care</b>	<b>Rationale</b>
Determine usual weight before patient was diagnosed and periodically (monthly)	Recent unexplained involuntary weight loss may be a factor in seeking initial medical evaluation
Weigh regularly and establish current anthropometric measurements(BMI, MUAC, % of usual weight)	Helps assess/monitor wasting and determine nutritional needs (use of cut of points)
Assess presence and degree of nausea and vomiting	Protracted nausea and vomiting can debilitate a patient, leading to loss of lean body mass, electrolyte imbalances and further deterioration of immune function
Ascertain current financial status, recent and/ or anticipated changes in economic status. Explore related costs of varieties of foods	Helps in planning for meeting nutritional needs, such as purchasing low cost foods that are nutritionally packed or patient may need referral to financial aid to help with food stamps or obtaining meals
Determine the patient's current dietary patterns/intake and knowledge of nutrition. Use an in-depth dietary assessment tool (24hr recall, food frequency in take for 7 days)	Identification of these factors helps plan for an individual's needs. Patients with HIV infections have documented vitamin and mineral (zinc, magnesium, selenium) deficits. Alcohol and drug abuse interfere with adequate intake
Discuss /document nutritional side effects of medications	Commonly used medications cause anorexia, altered taste, nausea and ,or vomiting: some interfere with bone marrow production of red blood cells (RBCs), causing anemia
Help patient plan ways to maintain/improve intake. Provide information about nutritionally dense high calorie, high protein, high vitamins and high mineral foods	Having information help patient understand the importance of well balanced diet
Stress importance of maintaining balanced adequate nutritional intake and fluid rich with electrolytes	Patients may be depressed and discouraged with changed health and social status and find it difficult to eat for many reasons. Knowing how important nutritionally balanced intake is to supporting the immune system and remaining healthy can motivate patient to eat



Nutrition Care	Rationale
Assist patients to formulate dietary plan, taking into consideration increased metabolic demands/energy needs and hyperlipidemia	Provides guidance and feedback while promoting sense of control, enhancing self esteem and possibly improving intake. HIV infection is continuously stimulating the immune system, increasing metabolic rate and nutritional needs. Use of protease inhibitors is known to elevate levels of glucose and lipids especially triglycerides and cholesterol
Recommend environment conducive to eating, e.g. eating frequent small meals, avoiding cooking odors if bothersome; keeping room well ventilated, removing noxious stimuli. Suggest use of spices, marinating red meat before cooking and or substituting other proteins sources for red meat	Improves nutritional intakes, which is needed to help patients restore/ maintain nutritional deficiencies
Emphasize the importance of sharing meals with others. Identify someone who can join patient for meals	Socialization can enhance appetite/food intake especially when depression, neglect of self care and diminished appetite are present
Explore complementary therapies and non pharmacological interventions such as progressive relaxation and guided imagery to manage anorexia	The goal of these interventions is to manage distressing symptoms that interfere with optimal nutrition intake
Discuss use of lactobacillus acidophilus replacements e.g. yoghurt dairy products and or tablets/ capsules.	HIV infection changes the structure of the gut wall, resulting in a decreased lactose level. Intolerance causes abdominal cramping, malabsorption, a bloated feeling and diarrhea. Also antibiotics taken for prevention of opportunistic infections cause changes in normal bowel flora, contributing to diarrhea
Monitor laboratory values e.g. hemoglobin (Hb) RBCs, albumin/prealbumin, potassium, total iron binding capacity	These laboratory values are important for monitoring the patient's nutritional immune status and in identifying nutritional therapy needs. For example decreased RBCs (anaemia) may require additional intervention such as supplementation

## FOOD/NUTRIENT BASED INTERVENTIONS FOR PLHIV PATIENTS

### IMPORTANCE

For the individual with HIV, nutritional status can be compromised by decreased oral intake due to anorexia, vomiting, dyspnea, fatigue, neurologic disease, and disorders of the mouth and esophagus. When the gastrointestinal tract is affected, nutrient absorption may be decreased due to malabsorption. At the same time, energy and protein needs may be increased by fevers and infection. Lipid metabolism and transport may also be affected by infection, causing lean body wasting. Weight loss, body cell mass depletion, decreased skin fold thickness and mid upper arm circumference, decreased iron binding capacity, and hypoalbuminemia are frequently reported. Immune changes seen in severe under nutrition are similar to those seen in full blown AIDS. Both conditions are marked by multiple opportunistic infections of viral, bacterial, parasitic, and fungal origin. Deficiencies of protein, calories, copper, zinc, selenium, iron, essential fatty acids, pyridoxine, folate, and vitamins A, C, and E all interfere with immune function. Severe weight loss can also result in organ damage, which may increase the risk for fatal outcome of infections. Therefore, the general goals of food based products e.g. food by prescription (FBP) as a nutritional intervention are to preserve optimal somatic and visceral protein status, prevent nutritional deficiencies or excesses known to compromise immune function, minimize nutrition related complications that interfere with either intake or absorption of nutrients, and enhance the quality of life. Figure 12 below illustrate the benefits of nutrition intervention for PLHIV and AIDS.

THE CYCLE OF BENEFITS OF NUTRITION INTERVENTION IN THE CONTEXT OF HIV/AIDS

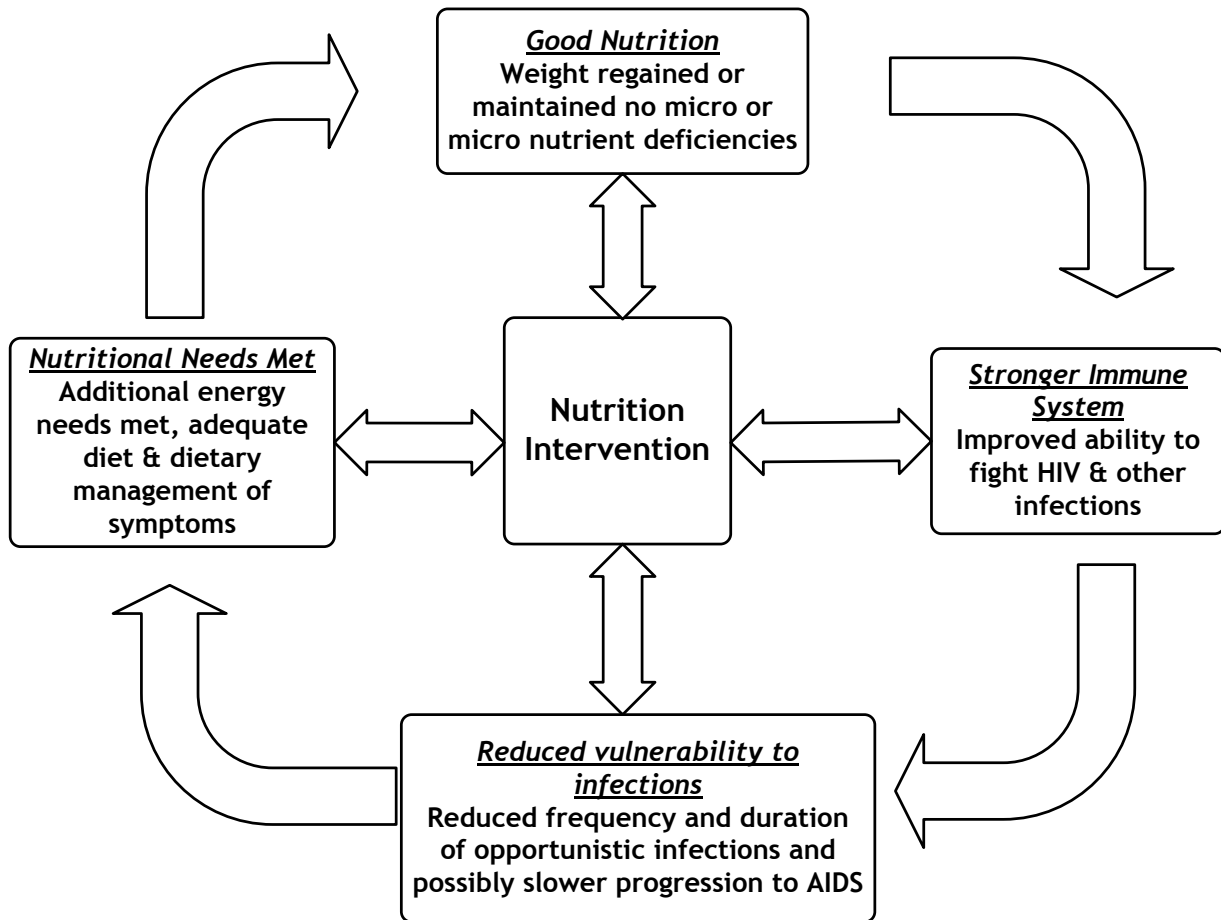


Figure 12: Cycle of the benefits of nutrition intervention in the context of HIV/AIDS

Source: Kenya National guidelines on Nutrition and HIV 2007

## EXAMPLES OF FOOD BASED INTERVENTIONS

### FOOD BY PRESCRIPTION

Food By Prescription is a nutrient-based intervention that enables health service providers to assess the nutrition risk of patients through individualized therapy and follow up. A problem based intervention provides a model for caring for an individual as a whole and not as an example of a disease or medical diagnosis. A thorough assessment of the nutritional status is made to identify nutritional deficiencies, which then determines the type of nutrition therapy to be prescribed. Nutrition therapy is the administration of food and fluids to support metabolic processes of a patient who is malnourished or at risk of becoming malnourished.

The services provided to clients under this program are guide by a standardized protocol of nutrition care through the four steps: assessment, diagnosis, intervention and monitoring and evaluation. The protocols are as shown in the table 55-60 below.

Table 55: Food by prescription protocol for OVC 6 – 23 months

Nutrition care process step	Classification of under nutrition	
	Severe	Moderate / mild
Nutrition Assessment	<ol style="list-style-type: none"> <li>1. Signs of severe wasting <ul style="list-style-type: none"> <li>- loss of muscle bulk</li> <li>- sagging buttocks</li> </ul> </li> <li>2. Check for presence of edema on both feet</li> <li>3. No severe edema</li> <li>4. Check height or weight</li> <li>5. Check for medical complications</li> <li>6. Conduct appetite test</li> </ol>	<ol style="list-style-type: none"> <li>1. Check height or weight</li> <li>2. No medical complications</li> <li>3. Conduct appetite test</li> </ol>
Nutrition Diagnosis	<ul style="list-style-type: none"> <li>- Signs of severe visible wasting</li> <li>- Bilateral pitting Oedema (+)</li> <li>- Weight-for-height less than -3 z-scores or,</li> <li>- Less than 70% W/H or,</li> <li>- MUAC less than 11 cm and</li> <li>- Passed appetite test</li> </ul>	<ul style="list-style-type: none"> <li>- Weight-for-height less than - 2 z scores</li> <li>- MUAC between 11 – 12 cm</li> <li>- Eligibility for FBP is less than - 2 Weight for Height</li> </ul>
Nutrition intervention	<p><i>(transition and Phase II)</i></p> <ul style="list-style-type: none"> <li>- Nutrition counseling</li> <li>- Provide 200 Kcal/ Kg /day RUTF</li> <li>- 37g/kg /day of RUTF i.e., (21 – 28 sachets per wk)</li> <li>- One bottle (150 ml) of SWS*per month</li> </ul>	<ul style="list-style-type: none"> <li>- Nutrition counseling</li> <li>- Provide 100 grams First food per day i.e. 1 bag (3kg) per month</li> <li>- One bottle (150 ml) SWS* per month</li> </ul>
Nutrition monitoring and evaluation	<ul style="list-style-type: none"> <li>- Check weight weekly,</li> <li>- weight for height equal to or above -1 Z scores,</li> <li>- or MUAC &gt; 11 cm,</li> <li>- or no edema for 10 days</li> <li>- and passed appetite test</li> <li>- <i>Discontinue RUTF if weight for height equal to or above -2 Z scores and start on FBF (First food)</i></li> </ul>	<ul style="list-style-type: none"> <li>- Check weight monthly and height every three months</li> <li>- Discharge from program if weight for height is to equal or greater than - 1.0 Z score</li> </ul>
Summary Prescriptions	<p><u>Single Food dose</u></p> <ul style="list-style-type: none"> <li>- Between 21 – 28 sachets RUTF per week <i>plus</i></li> <li>- One bottle (150 ml)per month SWS</li> </ul>	<p><u>Single food dose</u></p> <ul style="list-style-type: none"> <li>- 1 bag (3kg) of FBF (First food) per month</li> <li>- One bottle (150 ml) SWS* per month</li> </ul>

\* SWS = Safe water solution

Table 56: Food by prescription protocol for OVC 24 – 59 months

Nutrition care process step	Classification of under nutrition	
	Severe	Moderate / mild
Nutrition Assessment	<ol style="list-style-type: none"> <li>1. Signs of severe wasting <ul style="list-style-type: none"> <li>- loss of muscle bulk</li> <li>- sagging buttocks</li> </ul> </li> <li>2. Check for presence of edema on both feet</li> <li>3. No severe edema</li> <li>4. Check height or weight</li> <li>5. Check for medical complications</li> <li>6. Conduct appetite test</li> </ol>	<ul style="list-style-type: none"> <li>- Check height or weight</li> <li>- No medical complications</li> <li>- Conduct appetite test</li> </ul>
Nutrition Diagnosis	<ul style="list-style-type: none"> <li>- Signs of severe visible wasting</li> <li>- Bilateral pitting Oedema (+)</li> <li>- Weight-for-height less than -3 z-scores or,</li> <li>- Less than 70% W/H or,</li> <li>- MUAC less than 11.5 cm, and</li> <li>- Passed appetite test</li> </ul>	<ul style="list-style-type: none"> <li>- Weight-for-height less than - 2 z scores or,</li> <li>- MUAC between 11 – 12 cm</li> <li>- Eligibility for FBP is less than - 2 Weight for Height</li> </ul>
Nutrition intervention	<p><i>(transition and Phase II)</i></p> <ul style="list-style-type: none"> <li>- Nutrition counseling</li> <li>- Provide 200 Kcal/ Kg/day RUTF</li> <li>- 37g/kg /day of RUTF i.e., (35 – 42 sachets per wk)</li> <li>- One bottle (150 ml) of SWS*per month</li> </ul>	<ul style="list-style-type: none"> <li>- Nutrition counseling</li> <li>- Provide 200 grams First food per day i.e. 2 bags (6kg) per month</li> <li>- One bottle (150 ml) SWS* per month</li> </ul>
Nutrition monitoring and evaluation	<ul style="list-style-type: none"> <li>- Check weight weekly,</li> <li>- weight for height equal to or above -1 Z scores, or,</li> <li>- or MUAC &gt; 11cms,</li> <li>- or no edema for 10 days</li> <li>- and passed appetite test</li> <li>- <b>Discontinue RUTF if weight for height equal to or above -2 Z scores and start on FBF (First food)</b></li> </ul>	<ul style="list-style-type: none"> <li>- Check weight monthly and height every three months</li> <li>- Discharge from program if weight for height is to equal or greater than - 1.0 Z score</li> </ul>
Summary Prescriptions	<p><b>Single food dose</b></p> <ul style="list-style-type: none"> <li>- Between 35 – 42 sachets RUTF per week <i>plus</i></li> <li>- 1bag of FBF (First food) per month</li> <li>- One bottle (150 ml)per month SWS</li> </ul>	<p><b>Single food dose</b></p> <ul style="list-style-type: none"> <li>- 2 bags (6kg) of FBF (First food) per month</li> <li>- One bottle (150 ml) SWS* per month</li> </ul>

\* SWS = Safe water solution

Table 57: Food by prescription protocol for OVC 5 – 9 years

Nutrition care process step	Classification of under nutrition	
	Severe	Moderate / mild
Nutrition Assessment	<ol style="list-style-type: none"> <li>1. Signs of severe wasting <ul style="list-style-type: none"> <li>- loss of muscle bulk</li> <li>- sagging buttocks</li> </ul> </li> <li>2. Check for presence of edema on both feet</li> <li>3. No severe edema</li> <li>4. Check height or weight</li> <li>5. Check for medical complications</li> <li>6. Conduct appetite test</li> </ol>	<ul style="list-style-type: none"> <li>- Check height and weight</li> <li>- No medical complications</li> <li>- Conduct appetite test</li> </ul>
Nutrition Diagnosis	<ul style="list-style-type: none"> <li>- Signs of severe visible wasting</li> <li>- Bilateral pitting Oedema (+)</li> <li>- BMI for Age less than -3 z-scores or,</li> <li>- MUAC less than 13.5 cm and,</li> <li>- Passed appetite test</li> </ul>	<ul style="list-style-type: none"> <li>- BMI for Age greater than -3 and less than -2 z scores</li> <li>- MUAC between 11 – 12 cm</li> <li>- Eligibility for FBP is BMI for Age less than -2 Z score</li> </ul>
Nutrition intervention	<p><i>(transition and Phase II)</i></p> <ul style="list-style-type: none"> <li>- Nutrition counseling</li> <li>- Provide 200 Kcal/ Kg/day RUTF</li> <li>- 279gms per day of RUTF i.e., (21 sachets per wk)</li> <li>- 100 grams per day FBF (First food) i.e., 1 bag per month</li> <li>- One bottle (150 ml) of SWS*per month</li> </ul>	<ul style="list-style-type: none"> <li>- Nutrition counseling</li> <li>- Provide 200 grams First food per day i.e. 2 bags (6kg) per month</li> <li>- One bottle (150 ml) SWS* per month</li> </ul>
Nutrition monitoring and evaluation	<ul style="list-style-type: none"> <li>- Check weight weekly,</li> <li>- BMI for Age equal to or above -2 Z scores,</li> <li>- or MUAC &gt; 13.5 cm,</li> <li>- or no edema for 10 days</li> <li>- and passed appetite test</li> <li>- <i>Discontinue RUTF if BMI for age is equal to or above -3 Z scores and continue on FBF (First food)</i></li> </ul>	<ul style="list-style-type: none"> <li>- Check weight monthly and height every three months</li> <li>- Discharge from program if BMI for Age is to equal or greater than -1.0 Z score</li> </ul>
Summary Prescriptions	<p><b>Combination food dose</b></p> <ul style="list-style-type: none"> <li>- 21 sachets RUTF per week <i>plus</i></li> <li>- 1bag of FBF (First food) per month</li> <li>- One bottle (150 ml)per month SWS</li> </ul>	<p><b>Single food dose</b></p> <ul style="list-style-type: none"> <li>- 2 bags (6kg) of FBF (First food) per month</li> <li>- One bottle (150 ml) SWS* per month</li> </ul>

Table 58: Food by prescription protocol for OVC 10 – 17 years

Nutrition care process step	Classification of under nutrition	
	Severe	Moderate / mild
Nutrition Assessment	<ol style="list-style-type: none"> <li>1. Signs of severe wasting <ul style="list-style-type: none"> <li>- loss of muscle bulk</li> <li>- sagging buttocks</li> </ul> </li> <li>2. Check for presence of edema on both feet</li> <li>3. No severe edema</li> <li>4. Check height or weight</li> <li>5. Check for medical complications</li> <li>6. Conduct appetite test</li> </ol>	<ol style="list-style-type: none"> <li>1. Check height and weight</li> <li>2. No medical complications</li> <li>3. Conduct appetite test</li> </ol>
Nutrition Diagnosis	<ul style="list-style-type: none"> <li>- Signs of severe visible wasting</li> <li>- Bilateral pitting Oedema (+)</li> <li>- BMI for Age less than -3 z-scores or,</li> <li>- MUAC less than 16 cm and</li> <li>- Passed appetite test</li> </ul>	<ul style="list-style-type: none"> <li>- BMI for Age greater than -3 and less than -2 z scores or,</li> <li>- MUAC between 16 – 18.5 cm</li> <li>- Eligibility for FBP is BMI for Age less than -2 Z score</li> </ul>
Nutrition intervention	<p><i>(transition and Phase II)</i></p> <ul style="list-style-type: none"> <li>- Nutrition counseling</li> <li>- Provide 200 Kcal/ Kg/day RUTF</li> <li>- 279gms per day of RUTF i.e., (21 sachets per wk)</li> <li>- 300 grams per day FBF (Foundation plus) i.e., 2 bag (9kg) per month</li> <li>- One bottle (150 ml) of SWS*per month</li> </ul>	<ul style="list-style-type: none"> <li>- Nutrition counseling</li> <li>- Provide 300 grams Foundation plus per day i.e. 2 bags (9kg) per month</li> <li>- One bottle (150 ml) SWS* per month</li> </ul>
Nutrition monitoring and evaluation	<ul style="list-style-type: none"> <li>- Check weight weekly,</li> <li>- BMI for Age equal to or above -2 Z scores,</li> <li>- or MUAC &gt; 16 cm,</li> <li>- or no edema for 10 days</li> <li>- and passed appetite test</li> <li>- <i>Discontinue RUTF if BMI for age is equal to or above -3 Z scores and continue on FBF (Foundation plus)</i></li> </ul>	<ul style="list-style-type: none"> <li>- Check weight monthly and height every three months</li> <li>- Discharge from program if BMI for Age is to equal or greater than -1.0 Z score</li> </ul>
Summary Prescriptions	<p><b>Combination food dose</b></p> <ul style="list-style-type: none"> <li>- 21 sachets RUTF per week <i>plus</i></li> <li>- 2 bags of FBF (Foundation plus) per month</li> <li>- One bottle (150 ml)per month SWS</li> </ul>	<p><b>Single food dose</b></p> <ul style="list-style-type: none"> <li>- 2 bags (9kg) of FBF (Foundation plus) per month</li> <li>- One bottle (150 ml) SWS* per month</li> </ul>

\* SWS = Safe water solution



Table 59: Food by prescription protocol for adults 18 years and above

Nutrition care process step	Classification of under nutrition	
	Severe	Moderate / mild
Nutrition Assessment	<ol style="list-style-type: none"> <li>1. Signs of severe wasting <ul style="list-style-type: none"> <li>- loss of muscle bulk</li> <li>- sagging buttocks</li> </ul> </li> <li>2. Check for presence of edema on both feet</li> <li>3. No severe edema</li> <li>4. Check height or weight</li> <li>5. Check for medical complications</li> <li>6. Conduct appetite test</li> </ol>	<ul style="list-style-type: none"> <li>- Check height and weight</li> <li>- No medical complications</li> <li>- Conduct appetite test</li> </ul>
Nutrition Diagnosis	<ul style="list-style-type: none"> <li>- HIV positive</li> <li>- Signs of severe visible wasting</li> <li>- Bilateral pitting Oedema (+)</li> <li>- BMI less than 16 kg/m<sup>2</sup></li> <li>- MUAC less than 16 cm</li> <li>- MUAC 16 -18.5 cm with WHO stages 2 or 3 criteria</li> <li>- Passed appetite test</li> </ul>	<ul style="list-style-type: none"> <li>- HIV positive</li> <li>- BMI greater than 16 and less than 18.5 kg/m<sup>2</sup></li> <li>- MUAC between 16 – 18.5 cm</li> <li>- Eligibility for FBP is BMI less than 18.5</li> </ul>
Nutrition intervention	<p><i>(transition and Phase II)</i></p> <ul style="list-style-type: none"> <li>- Nutrition counseling</li> <li>- Provide 200 Kcal/ Kg/day RUTF</li> <li>- 279gms per day of RUTF i.e., (21 sachets per wk)</li> <li>- 300 grams per day FBF (Foundation plus) i.e., 2 bag per month</li> <li>- One bottle (150 ml) of SWS*per month</li> </ul>	<ul style="list-style-type: none"> <li>- Nutrition counseling</li> <li>- Provide 300 grams Foundation plus per day i.e. 2 bags (9kg) per month</li> <li>- One bottle (150 ml) SWS* per month</li> </ul>
Nutrition monitoring and evaluation	<ul style="list-style-type: none"> <li>- Check weight weekly,</li> <li>- BMI equal to or above 16 kg/m<sup>2</sup>,</li> <li>- or MUAC &gt; 16 cm,</li> <li>- or no edema for 10 days or 2 consecutive visits</li> <li>- and passed appetite test</li> <li>- <b>Discontinue RUTF if BMI is equal to or above 16 kg/m<sup>2</sup> and continue on FBF (Foundation plus)</b></li> </ul>	<ul style="list-style-type: none"> <li>- Check weight monthly and height every three months</li> <li>o <b>Discharge from program if :</b> <ul style="list-style-type: none"> <li>▪ BMI is equal to or greater than 18.5 kg/m<sup>2</sup> observe and prescribe FBF for 2 consecutive visits OR</li> <li>▪ BMI is to equal or greater than 20 kg/m<sup>2</sup></li> </ul> </li> </ul>
Summary Prescriptions	<p><u>Combination food dose</u></p> <ul style="list-style-type: none"> <li>- 21 sachets RUTF per week plus</li> <li>- 2 bags of FBF (Foundation plus) per month</li> <li>- One bottle (150 ml)per month SWS</li> </ul>	<p><u>Single food dose</u></p> <ul style="list-style-type: none"> <li>- 2 bags (9kg) of FBF per month</li> <li>- One bottle (150 ml) SWS* per month</li> </ul>

**NB:** All adults should be discharged when: a BMI= or > 18.5 kg/m<sup>2</sup> is attained, they should receive FBF for ONLY two consecutive visits after which no more FBF should be prescribed. OR when a BMI = or > 20 kg/m<sup>2</sup> is attained, at this point no FBF should be prescribed. The two discharge criteria are exclusive and whichever comes first dictates the next course of action i.e. you can only use one criterion on a case to case basis

Table 60: Food by prescription protocol for pregnant or post partum mothers

Nutrition care process step	Classification of under nutrition	
	Severe	Moderate / mild
Nutrition Assessment	<ol style="list-style-type: none"> <li>1. Signs of severe wasting <ul style="list-style-type: none"> <li>- loss of muscle bulk</li> <li>- sagging buttocks</li> </ul> </li> <li>2. Check for presence of edema on both feet</li> <li>3. No severe edema</li> <li>4. Check height or weight</li> <li>5. Check for medical complications</li> <li>6. Conduct appetite test</li> </ol>	<ol style="list-style-type: none"> <li>1. Check height and weight</li> <li>2. No medical complications</li> <li>3. Conduct appetite test</li> </ol>
Nutrition Diagnosis	<ul style="list-style-type: none"> <li>- HIV positive</li> <li>- Signs of severe visible wasting</li> <li>- Bilateral pitting Oedema (+)</li> <li>- MUAC less than 22 cm</li> <li>- BMI &lt; 20</li> <li>- Passed appetite test</li> </ul>	<ul style="list-style-type: none"> <li>- HIV positive</li> <li>- MUAC between 22 – 24 cm</li> <li>- <u>If pregnant:</u> <ol style="list-style-type: none"> <li>a. With low weight gain of &lt; 1.3 kg/month</li> </ol> </li> <li>- <u>If post partum:</u> <ol style="list-style-type: none"> <li>a. With non intentional weight loss of &gt; 0.7 kg/ month</li> <li>b. With weight loss and low BMI i.e. &lt; 20</li> </ol> </li> </ul>
Nutrition intervention	<p>(transition and Phase II)</p> <ul style="list-style-type: none"> <li>- Nutrition and infant feeding counseling</li> <li>- Provide 200 Kcal/Kg/day RUTF</li> <li>- 279gms per day of RUTF i.e., (21 sachets per wk)</li> <li>- 300 grams per day FBF (Advantage ) i.e., 2 bags (9kg) per month</li> <li>- One bottle (150 ml) of SWS*per month</li> </ul>	<ul style="list-style-type: none"> <li>- Nutrition and infant feeding counseling</li> <li>- Provide 300 grams Advantage per day i.e. 2 bags (9kg) per month</li> <li>- One bottle (150 ml) SWS* per month</li> </ul>
Nutrition monitoring and evaluation	<ul style="list-style-type: none"> <li>- Check weight weekly,</li> <li>- MUAC greater than or equal to 22 cm</li> <li>- or no edema for 10 days</li> <li>- and passed appetite test</li> <li>- <i>Discontinue RUTF for:</i> <ol style="list-style-type: none"> <li>a. <i>Pregnant mothers when there is an observed weight gain of greater than 1 kg per month.</i></li> <li>b. <i>For post partum mothers an observed steady weight gain after 6 weeks and BMI &gt; or = 20 and continue on FBF (Advantage)</i></li> </ol> </li> </ul>	<ul style="list-style-type: none"> <li>- Check weight monthly and height every three months</li> <li>- Discharge from program if MUAC is to equal or greater than 24 cm</li> </ul>
Summary Prescriptions	<p><b>Combination food dose</b></p> <ul style="list-style-type: none"> <li>- 21 sachets RUTF per week plus</li> <li>- 2 bags of FBF (advantage) per month</li> <li>- One bottle per month SWS</li> </ul>	<p><b>Single food dose</b></p> <ul style="list-style-type: none"> <li>- 2 bags (9kg) of FBF (advantage) per month</li> <li>- One bottle (150 ml) SWS* per month</li> </ul>

\* SWS = Safe water solution



## CRITICAL NUTRITION INTERVENTIONS FOR PLWHA

Timely and appropriate nutrition intervention is extremely crucial in management of PLHIV. Below are therefore critical nutrition practices for management of PLHIV.

1. Advise the client to have **periodic nutritional status assessments**, especially of their weight, every 2nd month for symptomatic clients and every 4th month for asymptomatic clients
2. Educate and counsel PLWHA of the **increased energy needs** for their disease stage, and the need to consume a balanced diet. Clients with severe malnutrition should be supported with therapeutic supplementary foods
3. Educate and support clients to **maintain high levels of sanitation**, food hygiene, and water safety at all times. They should be de-wormed bi-annually with an appropriate broad-spectrum anti-helminthes drug, like Albendazole or Mebendazole
4. They must **practice positive living behaviors** including practicing safer sex, avoiding or moderating use of alcohol, cigarettes and non-prescription drugs
5. Educate and support clients to **carry out physical activity or exercise** in order to build muscles, increase appetite and improve health
6. **Drink plenty of clean safe water** (filtered and boiled or treated) and use clean safe water to swallow medicines and prepare food
7. Counsel PLWHA to seek **prompt treatment for all opportunistic infections** and symptoms, and especially those that may interfere with food intake
8. Those on medicine, including ARVs, should be informed about managing the **drug food interactions and side-effects** that can be managed by food and nutrition interventions

## TUBERCULOSIS (TB)

Tuberculosis (TB) is caused by bacteria known as *Mycobacterium typhi*. TB can affect several body parts including lungs, spine, and bones among others. Nutrition is a principal

determinant of morbidity and mortality from tuberculosis. TB increases as one passes from well-to-do to poor populations. There is good epidemiological and clinical evidence that malnutrition contributes up to 60% of both the incidence and severity of tuberculosis. Together with poverty, overcrowding and HIV, poor nutrition has contributed to a global problem of TB “TRIPPLE TROUBLE”, i.e. Malnutrition, TB and HIV.

#### SYMPTOMS ASSOCIATED WITH TB

- Cough lasting 2 weeks or more
  - Fever/night sweat-which increase calorie requirement (10% extra calorie per every 1°C rise in body temperature)
  - Loss of appetite-compromises nutrient intake leading to poor nutritional status
  - Weight loss-compromise health and nutritional status predisposing the clients to frequent, prolonged and severe infections due to impaired immunity
  - Blood in the sputum-increase energy demand and loss of blood/iron predisposing the clients to anaemia and other infections
  - Oozing matted lymph nodes or enlarged lymph nodes-increase protein/micronutrients requirement for tissue repair
  - Breathlessness and fatigue – pulmonary effusion, pericarditis-increases energy need

#### NUTRITION IMPLICATIONS OF TB

- Reduced protein synthesis and metabolism
- Nutrient deficiency
- Reduced immunity
- Reduced food and nutrient intake
- Increased nutrient requirements

*Note: Nutrition status is a principal determinant of morbidity and mortality from tuberculosis*

#### OBJECTIVES OF NUTRITION CARE AND MANAGEMENT OF TB PATIENTS

The general objectives in nutritional care and management of TB patients are;

- Maintain good nutrition status
- Prevent and control body wasting and weakness
- Correct nutritional deficiencies which may have occurred during the disease
- Modify diets to the body's ability to metabolize nutrients during TB disease
- Accelerate healing process

## NUTRIENT REQUIREMENTS AND DIETARY MANAGEMENT

### *Energy*

Most patients with chronic tuberculosis are malnourished, energy needs are increased in order to minimize weight loss and achieve a desirable weight. An additional 300- 500 kcal (35 -40 kcal per ideal body weight) is recommended. This will help in protein sparing.

### *Protein*

An intake of 1.2- 1.5 g of protein per kg body weight is required to generate serum albumin levels per day, due to tissue wasting and repair of worn out tissues.

### *Fats/ oils*

These should provide 25-30% or less of the total energy requirements of an individual.

### *Vitamins and minerals*

The body should be provided with liberal amounts of vitamins and minerals. In TB conversion of beta carotene to retinol is affected in the intestinal mucosa. The client should be supplemented with vitamin A (as per the National Vitamin A supplementation schedule) and encouraged to eat vitamin A rich foods.

Patients on isoniazid should ideally be supplemented with 10mg of pyridoxine B6 daily since the drug inhibits its absorption. Additional amounts of vitamin C is recommended in the diet to facilitate healing of lesions. Other antioxidants (Vit A, C, and E, folic acid, zinc and selenium) neutralize free radicals and prevent the production of peroxides from lipids.

### *Water*

At least 8 glasses (250ml) or more of safe drinking water per day

## FOOD/NUTRIENT BASED INTERVENTIONS FOR TB PATIENTS

**Without malnutrition or with mild malnutrition;** provide nutrition education and counseling on good nutrition practices (CNP), follow-up and closely monitor

**Moderate malnutrition;** provide nutrition education and counseling, food and multiple micronutrients and conduct regular monitoring and follow-up

**Severe acute malnutrition without complications;** provide therapeutic feeds, nutrition education and counseling and close monitoring and follow-up (weekly)

**Severe acute malnutrition with complications;** admit for in-patient stabilization and management of severe malnutrition and close monitoring and follow-up (Daily)

**Other interventions in nutrition management of TB include;** regular de-worming, vitamin A supplementation as per national schedule, targeted multiple micro nutrient supplementations, health and nutrition education and counseling along CB-DOTS

*It is worth noting that some TB drugs may interact with some nutrients and therefore issues of drug food interaction should be given appropriate attention. Table 61 shows some of the possible side effects related to TB drugs and food intake recommendations that can minimize the side effects.*

**Table 61: Side Effects related to TB drugs and food intake recommendations to minimize them**

<b>Drug name</b>	<b>Food recommendation</b>	<b>avoid</b>	<b>Possible side effects</b>
Rifampicin	To be taken 1 hr before or 2 after food. 1 hr before antacids	alcohol	Nausea, vomiting, appetite loss
Isoniazid	Taken 1 hr before or 2 hrs after food. Give 10mg B <sub>6</sub> daily	Alcohol	Interferes with
Ethambutol	May be taken with food	Avoid alcohol	
Streptomycin	Increase fluid intake		Taste changes, taste of food, nausea
Pyrazinamide	May be taken with food		
Ethionamide	Take with or after meals(Supplement with Vit B <sub>6</sub> )	Alcohol	Abdominal discomforts, nausea
Ofloxacin	Take 2hrs before or after food	Antacids, milk products	
Kanamycin	Can be taken without regard to food		
Capreomycin	Increase fluid intake, take with foods high in potassium(bananas, avocados)		
Para-aminosalicylic acid(PAS)	Take with or immediately after food. Increase fluid intake	Alcohol	
Cycloserine	Supplement with vitamin B <sub>6</sub>	alcohol	

## OTHER INFECTIOUS DISEASES

### TYPHOID

Typhoid is an infectious disease caused by salmonella typhi. The infection is transmitted through fecal-oral routes i.e. by consuming water, food or milk contaminated with intestinal contents. It may affect all age groups but commonly occur in children.

#### *Symptoms*

- Nausea, vomiting, anorexia, diarrhea, sweating, headache, weight loss, vomiting body changes in typhoid fever
- There is loss of tissue proteins which may amount to as much as 250mg to 500g of muscle tissue a day
- Body stores of glycogen are quickly depleted and the water electrolyte balance is disturbed
- The intestinal tract is highly inflamed and irritable and diarrhea is therefore a frequent complication which interferes with absorption of nutrients
- Ulceration in the intestine may be so severe that even hemorrhage and perforation of the intestine may occur

#### *Objectives of nutrition management are to:*

- Maintain adequate nutrition
- Restore positive nitrogen balance
- Provide relief from symptoms
- Correct and maintain water and electrolyte balance
- Avoid irritation of the intestinal tract

#### *Nutrient Requirement and Nutrition Management of Typhoid*

- Keep the patient warm, encourage bed rest, give antibiotic medicine therapy, and modified diet
- During high fever there is an aversion towards food in the form of anorexia, nausea and vomiting
- To attain the above objectives the following are the nutrient requirements;

#### *Energy*

- The BMR may increase as much as 50% due to increase in temperature, restlessness also increase the energy expenditure
- Increase energy by 10-20%
- Initially during the acute stage only 600-1200kcal may be consumed per day, this energy intake should be increased gradually with recovery and improved tolerance



### *Proteins*

- Requirements of proteins related to severity and duration of infection rather than to the height of the fevers
- There is excessive destruction of tissue-protein intake should be increased to 1 ½ to 2g of protein/kg/day
- Proteins of high biological value should be used such as soya beans, milk, fish, meat and chicken
- Meals should be supplemented with high protein beverage e.g. milk shakes

### *Carbohydrates*

- Provide liberal carbohydrates to replenish glycogen stores; well cooked and easily digestible starches should be given such as simple starches, glucose, honey and sugarcane

### *Dietary fiber*

- As the symptoms of fever include diarrhea and lesion in the intestinal tract all forms of irritants have to be eliminated from the diet. All harsh irritating fibers should therefore be avoided in the diet as it has a mechanical irritant

### *Fats*

- Fats are required mainly to increase the energy intake. However, due to presence of diarrhea fats only in the emulsified form like cream, butter, whole milk, egg yolk, should be included in the diet as they are easily digested and well tolerated by patients
- Limit fats as they may aggravate nausea and avoid fried foods

### *Minerals*

- There is excessive loss of electrolytes like sodium, potassium and chloride due to increased perspiration. Salty soups, broths, fruit juices, milk etc... should be included to compensate for loss of electrolytes

### *Vitamins*

- There is need to increase vitamin A and C as fever increases their requirement. The need for B vitamins is also increased
- The use of antibiotics and drugs interfere with intestinal bacterial synthesis of some B group vitamins so vitamin B supplementation may have to be given for sometimes

### *Fluid*

- A liberal fluid intake is very essential
- A daily intake of 2.5-5litres of fluid is essential

## RESPIRATORY CONDITIONS

### *Cough*

Cough is caused by foreign or irritating substances in the bronchial tubes. It is the body's defense mechanism to expel foreign or irritating substances from the bronchial tubes. It is the most common symptom of a respiratory disease.

### *Aim of nutrition management*

- To boost the body's immune system
- relieve the cough

### *Nutrition Management of Coughs*

- Intake of lemon juice with honey which is a traditional remedy for coughs is recommended
- Provide foods rich in Vitamin A as it is vital for healthy bronchial mucosa and helps relieve cough
- Provide foods rich in vitamin C as it boosts body's immunity to effectively fight infections
- Reduce intake of salt as it may cause fluid retention in the respiratory system hence aggravate cough
- Reduce intake of dairy products as they may increase mucous production in the respiratory tract which can trigger or aggravate cough

## BRONCHITIS

This is the inflammation of the mucosa lining the bronchial passages. Bronchitis is caused by infections and is exacerbated by inhalation of irritant fumes such as tobacco smoke.

### *Symptom*

- Cough and expulsion of mucus

### *Aim of Nutritional management*

- To aid expulsion of mucous
- To relieve the cough

### *Nutritional Management*

- Use of mucolytics such as onions, leek and radishes is recommended
- Provide emollients such as okra, dates and figs as they soften and reduce inflammation in the respiratory mucosa
- Use of foods with antibiotic and antiseptic properties such as garlic and propolis is recommended as they combat bacteria and viruses that cause or aggravate bronchitis
- Encourage intake of lemon juice with honey which is a traditional remedy for coughs
- Provide foods which are rich in vitamin A as it is vital for healthy bronchial mucosa and helps relieve cough

## **ASTHMA**

This is a condition which manifest with attacks of dyspnea (difficult breathing) accompanied by wheezing, cough, expectoration and chest pressure. Asthma is caused by allergic reactions.

### ***Symptoms/implications***

- Cough
- Wheezing
- Expectoration
- Chest pressure

### ***Aim of nutrition management***

- To relieve and prevent asthma attack

### ***Nutrition Management***

- Provide antioxidants such as vitamins A, C and E as they enhance bronchial tubes' ability to withstand free radicals coming from environmental pollution
- Provide honey as it contains some pollen which can desensitize the body against environmental pollen
- Encourage consumption of onions. Onion is a bronchial dilator and antispasmodic which can relieve and prevent asthma attacks
- Reduce intake of food additives, salt, wine, beer and fish. Fish contains histamine which provokes all allergic reactions

## CHAPTER SEVEN: CLINICAL CONDITIONS, DISORDERS AND THEIR NUTRITIONAL MANAGEMENT

### GASTROINTESTINAL DISORDERS

#### PEPTIC ULCERS

Peptic ulcer is the general term given to an eroded mucosal lesion in the central position of the gastro intestinal tract. The areas affected include the lower portion of the oesophagus, the stomach and the first part of the duodenum. A bacteria *helicobacter pylori* is the biggest cause of peptic ulcers; the second leading cause is the use of non-steroidal anti inflammatory drugs (NSAIDS) that may damage the stomach lining. Eating spicy food does not cause ulcers. Gastric normally occur in adults 45-60 and duodenal occur at age 20-30.

#### *Causes*

- Factors that disrupt the mucosal barrier, permitting hydrogen ions to diffuse into the mucosal tissue where they cause damage that leads eventually to cell distraction and subsequent ulceration
- Enteral gastritis from *Helicobacter pylori*
- Defect in the pyloric sphincter resulting in reflux of the duodenal content in to the antrum of the stomach where the detergent effect of bile salts reduces mucosal resistance
- NSAID's (non steroid anti inflammatory drugs) e.g. aspirin, brufen, diclofenac, paracetamol, dramatically increase the risk of ulcers
- Increased acid secretion
- Increased gastric acid emptying rate
- Reduced ability of the duodenum to handle an acid load
- Stress or nervous tension which causes vasoconstriction or reduce blood supply to the gastric mucosa leaving it unprotected

#### *Symptoms of peptic ulcers*

- Pain
- Vomiting
- Haemorrhage

#### *Relationship of food to gastric irritation*

- Hydrochloric acid and pepsin breaks down food proteins
- Mucus protects lining of stomach from being digested by HCL and pepsin
- Ulcer develops when acid pepsin reaction overpowers mucus protection action
- Food causes stomach to expand
- Expansion signals release of hormone that stimulates acid secretions

- Proteins stimulate and neutralize gastric acidity
- Products that result from breakdown stimulate gastric secretions that are responsible for pain experienced 1 to 3hrs after a meal
- Chemical irritants e.g. caffeine and theobromine irritate gastric mucosa
- Stimulants are found in spices, alcoholic beverages, aspirin, tobacco and some other drugs should be restricted

### *Nutritional implications of peptic ulcers*

It could lead to:

- Anaemia
- Altered food and nutrient intake

### *Aims of nutrition management*

- Reducing and neutralizing stomach acid secretion
- Maintaining acid resistance of gastro-intestinal epithelial tissue
- Limiting patient's discomfort and relieving their pain
- To provide continuous neutralization of gastric acid
- To promote healing and reduce irritation of GIT
- Restoring good nutrition status
- To reduce mechanical, thermal and chemical irritation to the gastric mucosa

### *Dietary management*

The patient with peptic ulcer disease should:

- Eat three regular meals daily
- Eat small meals to avoid stomach distension
- Eat slowly
- Use in moderation easily digested fats like fat of whole milk, egg yolk, cream and butter
- Avoid drinking excess coffee and alcohol
- Cut down on or quit smoking
- Avoid using large amounts of aspirin, other NSAID's or other drugs known to damage the stomach lining
- Avoid foods or drinks that cause discomfort
- Eat meals in a relaxed atmosphere as possible
- Take antacids one and three hours after meals and before bedtime

### *Bland diet*

- Moderate in fibre and connective tissues
- Little or no condiments or spices except salt in small amounts
- Avoid or eliminate highly acid foods
- Foods simply prepared

### *Foods to avoid*

- Fatty and tough meat

- Fried foods
- Sour foods
- Unripe citrus fruits like oranges and sweet lime
- Garlic
- Ginger strongly flavoured vegetables
- Strong spices and condiments
- Chillies, pickles
- Strong tea and coffee
- Alcoholic beverages

*Foods recommended for use*

- Cabbage: fresh juice, fermented or raw has anti inflammatory effects
- Potatoes: nutritious, anti acid, soothing and sedating
- Other vegetables: carrots, peas, okra, other leafy vegetables that are tolerated (pilipili hoho)
- Fruits: orange juice, apples, ripe bananas, avocados, pears, pawpaw, apricots, cherimoya and guava
- Okra: contain mucilage capable of protecting gastric mucosa
- Cereals: porridge, oatmeal, semolina, macaroni products, spaghetti, rice, chapatti and matoke
- Desserts: custards, ice creams, cakes
- Oils: use polyunsaturated fatty acids
- Beverages: buttermilk, malted milk
- Eggs: boiled, poached, scrambled
- Roast beef and lamb, stewed or baked should be used in moderations because they contain purines (non protein substances that stimulate gastric mucosa)

## GASTRIC DISEASES

Gastric diseases include: indigestion, acute gastritis, chronic gastritis, dumping syndrome, duodenal and gastric ulcers.

### *Indigestion*

You get indigestion when the acid in the stomach flows back up the oesophagus (the pipe that goes from the mouth to the stomach) or when the stomach is irritated or inflamed. Most people have suffered from indigestion after a large meal at some time, and up to four in 10 adults suffer from heartburn each year. Although it's most common after meals, you can get indigestion at any time.

It refers to any discomfort in the digestive tract. Indigestion is mainly caused by gall bladder disease, chronic appendicitis, ulcer disease, stress, rapid eating, poor mastication, over indulgence and food allergies.

### *Symptom*

- Discomfort in the digestive tract

### *Nutritional implication*

- Inadequate food and nutrient intake

### *Dietary management*

- Provide a well balanced diet
- Avoid rapid eating, poor mastication and over-indulgence
- Take plenty of potable drinking water

## ACUTE GASTRITIS

This is a temporary inflammation of the gastric mucosa, usually self-limiting caused by the indigestion of infectious or corrosive substances e.g. aspirin, food poisoning, radiation therapy, metabolic alcoholism, acute alcoholism and uraemia.

### *Causes*

Acute gastritis is mainly caused by over eating, over use of alcohol and tobacco, chronic or excessive doses of aspirin or non-steroidal anti-inflammatory agents (NSIA), trauma, surgery, shock, jaundice, fever, renal failure, burns and radiation therapy.

### *Symptoms*

- Nausea
- Vomiting
- Malaise
- Anorexia
- Headache
- Haemorrhage

- Pain

#### *Nutrition implications*

- Anaemia
- Loss of nutrients
- Increased metabolism

#### *Aims of nutrition management*

- Relieve pain
- Manage dietary deficiencies

#### *Dietary management*

- To allow the stomach time to rest and heal, withhold food for 24 to 48hrs or longer, depending on whether there is bleeding or pain
- Give fluids intravenously during this period
- Add fluids as tolerated following the resting period
- Increase number of feeds according to the patient's tolerance, until a full regular diet is achieved
- Avoid seasoned foods

## **CHRONIC GASTRITIS**

This condition is marked by progressive and irreversible atrophy of the gastric mucosa related to chronic inflammation. The loss of mucosal cell function may lead to achlorhydria (lack of HCl in the stomach), pernicious anaemia and malnutrition. Additional complications may include perforation, haemorrhage, and pyloric obstruction related to the scar tissue.

Crohn disease is a chronic (slowly developing, long-term) inflammation of the digestive tract. It can affect any part of the digestive tract from the mouth to the anus but usually involves the terminal part of the small intestine, the beginning of the large intestine (cecum), and the area around the anus. The inflammation causes uncomfortable and bothersome symptoms and may produce serious damage to the digestive tract. Crohn disease is sometimes called regional enteritis or ileitis. It and a similar condition called ulcerative colitis are referred to together as inflammatory bowel diseases. These illnesses are known for their unpredictable flares and remissions.

The inflammation usually starts in one or more areas of the mucosa that lines the inside of the intestines.

- The disease may invade deeper tissues of the intestinal wall and spread to involve more areas of the bowel
- Ulcers may form at the sites of the most intense inflammation
- The ulcers may spread and become very large but are usually separated by areas of relatively healthy tissue with little or no inflammation



- The mucosal lining of the intestines in Crohn disease is often described as looking like a cobblestone street, with areas of ulceration separated by narrow areas of healthy tissue

The inflammation damages the lining of the intestine so that it cannot absorb nutrients, water, and fats from the food you eat. This is called malabsorption, and it can result in malnutrition, dehydration, vitamin and mineral deficiencies, gallstones, and kidney stones.

As the inflammation invades deeper into the intestinal tissues, the intestinal wall becomes thicker, narrowing the bowel lumen (the space through which food passes). The intestinal lumen may become so narrow that it becomes obstructed, so that food cannot pass through at all. This obstruction is usually intermittent, meaning that it comes and goes, and gets better with medical treatment. Eventually, however, the obstruction can become permanent.

If the inflammation in one area spreads all the way through the intestinal wall, the inflamed area can stick to other organs and structures in the abdomen.

Crohn disease can also cause problems around the anus. These may include tiny but painful cracks in the skin known as anal fissures; tunneling sores called fistulas that cause abnormal connections between the bowel and the skin; or an abscess, a pocket of inflamed or dead tissue that is usually very painful.

### **Cause**

- Cause is unknown, but usually precedes the development of gastric lesions such as cancer or ulcer
- It may be caused by an enteral infection with *Helicobacter pylori*
- It may also be indirectly due to diseases such TB, myocardial failure and nephritis

### **Symptoms**

- Maybe vague or absent
- Loss of appetite, feeling of fullness, belching, vague epigastric pain, nausea and vomiting

### **Nutrition implication**

- Altered food intake
- Loss of nutrients

### **Aims of nutritional management**

- Restore nutrient loss
- Maintain adequate food and nutrient intake

### **Dietary management**

- Nutrition care must follow general guidelines because the symptoms are vague
- The prescription of individualised treatment based on foods and situations determined to cause discomfort is most important
- Diet should be adequate in calories and soft in consistency

- Encourage patient to eat at regular intervals, chew food thoroughly and avoid foods known to cause discomfort
- Bland diet is recommended
- Minimize drinking fluids with food; drinking lots of fluids with food tends to cause discomfort because of stomach distension
- In atrophic gastritis there is loss of secretion of HCL and B<sub>12</sub> intrinsic factor, therefore Vitamin B<sub>12</sub> status should be assessed

## **DUMPING SYNDROME**

This is a complication of gastric surgeries in which the pyloric sphincter is removed, bypassed or disrupted. This causes partially digested food to rapidly enter the jejunum, it is quickly digested and creates a hyperosmolar load. Fluid from the intestinal capillaries enters the jejunum, diminishing blood volume and stimulating peristalsis, resulting into low blood pressure and diarrhoea.

### ***Causes***

Gastric surgery (post-gastrotomy, hypoglycaemia caused by: pyloroplasties, vagotomies, total gastrotomy, and gastric by-pass surgery)

### ***Symptoms***

- Sweating
- Weakness
- Diarrhoea
- Rapid pulse rate
- Dizziness
- Paleness
- Crampy abdominal pain

### ***Nutritional implications***

- Loss of nutrients
- Weight loss

### ***Aims of nutrition management***

- Provide adequate calories and nutrients to support tissue healing
- Prevent weight loss
- Correct hypoglycaemia in the short term

### ***Dietary Management***

After surgery the following should be done:

- All fluids and foods by mouth should be withheld for 3 to 5 days and the patient fed by nasogastric tube
- Ice chips should be held in mouth or small, infrequent sips of water should be given. Some people tolerate warm water better than ice chips or cold water

- Low carbohydrates, clear liquids such as soups, or diluted unsweetened fruit juices should be given and limited to ½ to 1 cup servings, however, at least 6 cups of fluids should be consumed daily to replace losses resulting from diarrhoea. Carbonated beverages and milk are not recommended in the initial stages of the diet
- The post-gastrotomy diet then begins with gradual progression to a general diet as tolerated. Bland foods should be started first, but a more important priority is offering the patient foods he/she likes and can tolerate. By the 5<sup>th</sup> to 7<sup>th</sup> day most patients can tolerate solid foods
- For persons near desirable body weight about 1.5g to 2g protein should be given (35Kcal to 45Kcal/kg)
- Pectin, a dietary fibre found in fruits and vegetables maybe helpful in treating dumping syndrome. Pectin delays gastric emptying, slow carbohydrate absorption and reduces glycemic response, though small dry meals are of more benefit
- Vitamin and mineral supplementation maybe necessary depending on the extent of surgery and whether the symptoms of dumping syndrome persist
- Generally, liquids are served between meals rather than with meals to slow the passage of the food mass. Limit simple carbohydrates
- Lie down immediately after eating to help slow the transit of food to the intestines. Clients who experience reflux should not lie down after eating. Beware that lactose intolerance may develop and produce discomfort in relation to milk and milk products

## INFLAMMATORY BOWEL DISEASE (IBD)

This refers to inflammation of the bowel. There are two conditions under IBD namely: Crohn's disease and ulcerative colitis.

### *Crohn's disease*

This refers to a chronic inflammatory bowel disease.

### *Causes*

- Inadequate food intake
- Loss of protein in to the gut lumen
- Fever
- Low grade but chronic intestinal obstruction
- Malabsorption or mal-digestion of fat and protein
- Possibly zinc deficiency

### *Symptoms*

Fatigue, anorexia, variable weight loss, right lower quadrant pain or cramping, diarrhoea, fever and stricture formation may precipitate bowel obstruction.

### *Nutrition implications*

- Inadequate food and nutrient intake
- Malabsorption and mal-digestion
- Increased nutrient needs

### *Aims of nutrition management*

- Restoration of good nutritional status
- Relief of discomfort

### *Dietary management*

- During acute flare-ups bowel rest and parenteral nutrition is recommended
- Later in patients who cannot tolerate whole foods elemental oral formula maybe useful
- Energy and protein content of the diet should be high to promote healing and restore weight. Provide 40 – 50Kcal/Kg, and for protein 1 – 1.5g/Kg
- Give a low fiber diet to minimize bowel stimulation
- Give small frequent meals that are better tolerated than three large meals, this may help maximize intake
- Assess status of calcium, magnesium and zinc since steatorrhea promotes their loss

## **ULCERATIVE COLITIS**

The disease is characterised by inflammation and ulceration of the large intestines that always begins in the rectum.

### *Cause*

It is likely that intestinal allergy caused by some foods like milk maybe responsible for the disease in some cases.

### *Symptoms*

- Passage of loose stool with mucus and blood accompanied by pain and spasms
- Loss of appetite
- Rectal bleeding
- Fever
- Ulcerative lesions in the mucosa of the large intestines
- Dehydration
- Electrolyte imbalance
- Anorexia
- Malnutrition

### *Nutrition implications*

- Anaemia
- Increased nutrient needs
- Fluid imbalance
- Food mal-digestion and nutrient malabsorption

### *Aims of nutrition management*

- To relieve pain and inflammation
- To restore and maintain optimal nutritional status

### *Dietary management*

- Same as in Crohn' disease. However, no dietary interventions seem to lessen disease activity. And unlike Crohn's disease where intestinal surgery fails to cure the disorder, removal of the colon and the rectum does cure ulcerative colitis

## **DIVERTICULAR DISEASE**

Diverticular refers to the small out pouching in the gastrointestinal tract. These pouching may occur in the oesophagus as well as in the lower intestine. It is caused by increased pressure within the intestinal lumen, which may be related to chronic constipation and long term low fibre diets. Diverticular usually occur in the weakened areas of the tissue resulting from such factors as tissue irritation, secretory or muscular malfunctioning. Diverticulitis refers to inflammation of the Diverticular.

### *Causes*

- Aging
- Low fibre diets

### *Symptoms*

- Gross bleeding
- Low Hb and albumin levels
- Ulceration or even perforations of the lower intestine
- Dysphagia
- Cramping
- Alternating periods of diarrhoea and constipation
- Regurgitation
- Bad breath and foul taste in the mouth
- Low grade fever

### *Nutritional implications*

- Anaemia
- Increased nutrient needs

### *Aims of nutrition management*

- To restore nutritional status
- To relieve pain and enhance healing

### *Dietary management*

- In chronic cases, provide a moderately fiber restricted diet
- In acute cases, provide clear liquid diet with progression to a very low-residue diet
- Ensure high calories diet to cater for the increased calories needs, except in overweight cases where normal calories requirement may be provided to check on the weight
- High protein is needed for repair of worn out tissues
- Ensure that the diet is of low fats

## GASTROESOPHAGEAL REFLUX DISEASE (GERD)/OESOPHAGITIS

This is a condition that produces indigestion and heartburn from the backflow of acidic gastric juices onto the lower oesophageal mucosa.

### *Causes*

- Irritating effect of acidic gastric reflux on the oesophageal mucosa
- Stress
- Ingestion of an irritating agent
- Viral inflammation
- Fungal infection
- Intubation
- Aging
- Radiation such as for lung cancer treatment
- Medication that gets stuck in oesophagus e.g. tetracycline
- Chronic or reflux esophagitis is a result of recurrent gastroesophageal reflux owing to a hiatal hernia, reduced Lower Oesophageal Sphincter (LES) pressure, increased abdominal pressure and recurrent vomiting.

### *Symptoms*

- Heartburn
- Regurgitation
- Dysphagia
- Bleeding

### *Nutrition implication*

- Indigestion
- Anaemia

### *Aims of nutritional management*

- Prevent irritation of the oesophageal mucosa in the acute phase
- Prevent oesophageal reflux
- Decrease the irritating capacity or acidity of gastric juice

### *Dietary Management*

- In acute phase give liquid diet that is less abrasive to the oesophagus
- Avoid acidic foods e.g. citrus fruits, tomato products, coffee, carbonated beverages, alcohol and spices (all of which lower LES) according to individual tolerance.
- Provide low fat foods and small frequent meals
- Timing of the evening meal is important. The patient should consume nothing except water for 3 hours before lying down
- Avoid or quit smoking as it also triggers acid production
- Elevate the head of the bed when sleeping
- Avoid clothing that is tight on the abdominal area and maintain upright posture during and after eating.
- Reduce weight if overweight

## HIATAL HERNIA

Refers to anatomical abnormality in which part of the stomach protrudes through the diaphragm into the chest; that is an out pouching of a portion of the stomach in to the chest through the oesophageal hiatus of the diaphragm.

Usually the stomach is completely below the diaphragm (the sheet of muscle that separates the lungs and chest from the abdomen). But in some people, part of the stomach or the sphincter can slide up into the chest cavity. This is called a hiatus hernia. It's quite common, but in some people it may cause heartburn due to reflux of stomach acid.

### *Causes*

Larger than normal oesophagi hiatus (opening in the diaphragm through oesophagus passes from the chest into the abdomen)

### *Symptoms*

- Discomfort after heavy meals
- Stomach distension
- Difficulty in breathing, lying down and bending

### *Dietary management*

- In acute phase provide liquid diet that is less abrasive to the oesophagus
- Avoid acidic foods e.g. citrus fruits, tomato products, coffee, carbonated beverages, alcohol, spices (all of which lower LES) according to individual tolerance
- Provide low fat foods and small frequent meals
- Timing of the evening meal is important. The patient should consume nothing except water for 3 hours before lying down
- Avoid or quit smoking as it also triggers acid production
- Elevate the head of the bed when sleeping
- Avoid clothing that is tight on the abdominal area and maintain upright posture during and after eating
- Reduce weight if overweight

## METABOLIC DISORDERS

These physiological disorders either result from altered metabolism or affect metabolism. These includes; diabetes mellitus, gout, hyper/hypothyroidism.

### DIABETES MELLITUS

Diabetes mellitus is a chronic metabolic disorder that occurs when the pancreas does not produce enough insulin or when the body cannot effectively utilize the insulin it produces. It is characterized by decreased ability or complete inability of the tissue to utilize carbohydrates accompanied by a change in metabolism of fats, protein, water and electrolytes. This results in elevated blood sugar (hyperglycemia) which over time leads to multiple organ damage. It is associated with acute complications such as ketoacidosis and hypoglycemia, as well as long-term complications affecting the eyes, kidneys, feet, nerves, brain, heart and blood vessels.

There are three types of Diabetes mellitus.

- Type I: Results from the body's failure to produce insulin
- Type II: Results from Insulin resistance, a condition in which cells fail to use insulin properly, sometimes combined with relative insulin deficiency
- Gestational Diabetes: Pregnant women who have never had diabetes before but who have high blood sugar (glucose) levels during pregnancy are said to have gestational diabetes. Gestational diabetes affects about 4% of all pregnant women worldwide. It may precede development of type 2 (or rarely type 1)

### *Risk factors for diabetes mellitus*

These include: heredity, age, sex, obesity, dietary factors, physical inactivity and infections

### *Common symptoms include:*

- Increased thirst (polydipsia)
- Increased urination (polyuria)
- Increased hunger (polyphagia)
- Weight loss in Type 1 diabetes
- Over weight/Obesity in type 2 diabetes
- Sugar in the urine (glycosuria)
- Elevated blood sugar or glucose (hyperglycemia)
- Skin irritation or infection
- Weakness/general loss of strength

Figure 13 below illustrates how diabetes symptoms are manifested in various body organs.



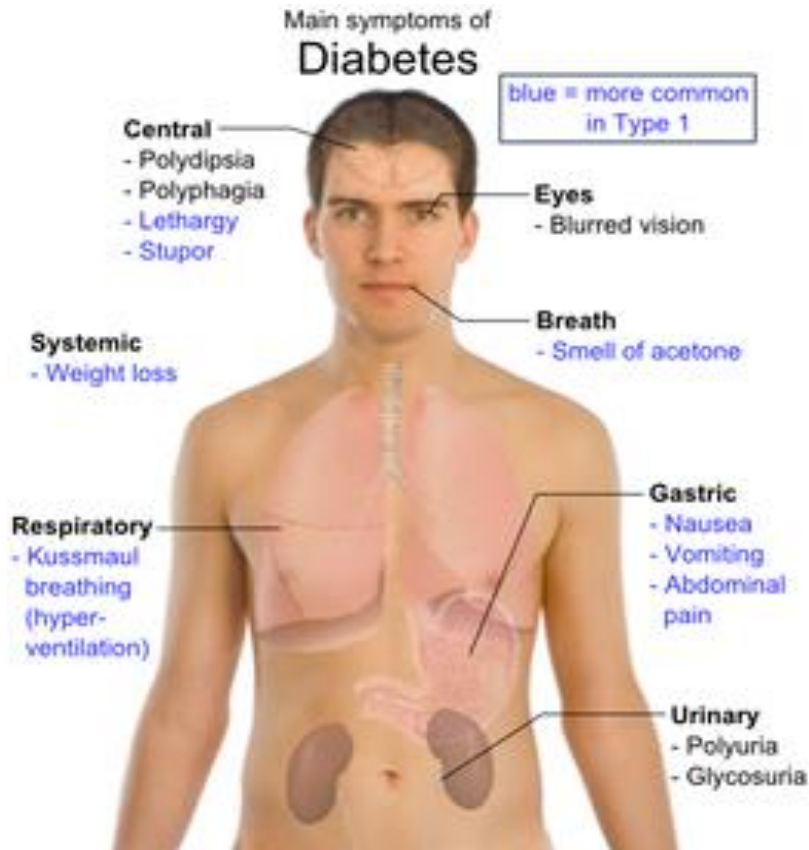


Figure 13: Manifestation of Diabetes symptoms in the body

### **Management Plan**

The aim of management in diabetes is to control blood sugar and prevent development of disease complications.

### **Objectives**

- Attain and maintain blood glucose levels as close to normal as possible
- Prevent hypo- and hyperglycaemia
- Attain optimum blood lipids and blood pressure control and so reduce the risk of macro vascular disease
- To promote physical, social and psychological well being
- To prevent, delay or minimize the onset of chronic degenerative complications e.g. hypertension and renal diseases
- To achieve and maintain optimal metabolic and physiologic outcomes
- To provide relief from symptoms

### **Components of management plan**

- Medical therapy
- Medical nutrition therapy
- Exercise and physical activity

### Medical Therapy

Medical therapy includes clinical diagnosis, drug prescription and administration. Insulin administration is important in the nutrition therapy. Insulin doses need to be adjusted to balance with nutritionally adequate food and physical activity. The quantity of food at each meal should be consistent and at regular times every day and harmonized with drug intake. Table 62 shows types of insulin, onset peak and duration of action and the consequences resulting when the drugs administration and diet intake is not harmonized in reference to drug action.

**Table 62: Approximate Pharmacokinetic Parameters of Currently Available Insulin Preparations Following Subcutaneous Injection of an Average Patient Dose**

Type of insulin	Onset of action	Peak of action	Duration of action	Common pitfalls
Insulin lispro (Humalog)	5 to 15 minutes	1 to 2 hours	4 to 5 hours	Hypoglycemia occurs if the lag time is too long or the patient exercises within one hour of administration; with high-fat meals, the dose should be adjusted downward.
Regular insulin (Humulin R)	30 to 60 minutes	2 to 4 hours	6 to 8 hours	Lag time is not used appropriately; the insulin should be given 20 to 30 minutes before the patient eats.
NPH insulin (Humulin N)	1 to 3 hours	5 to 7 hours	13 to 18 hours	In many patients, breakfast injection does not last until the evening meal; administration with the evening meal does not meet insulin needs on awakening.
Lente insulin (Humulin L)	1 to 3 hours	4 to 8 hours	13 to 20 hours	Zinc suspension binds with regular insulin, which loses its effect if it is left in the syringe for more than a few minutes.
Ultralente insulin (Humulin U)	2 to 4 hours	8 to 14 hours	20 to 24 hours	Same as for lente insulin; in addition, peak of action is erratic in some patients.

## **MEDICAL NUTRITION THERAPY**

Medical nutrition therapy is an integral component of diabetes management. It has both short and long term benefits for diabetes outcomes. Dietary modification is one of the cornerstones of diabetes management, and is based on the principle of healthy eating in the context of social, cultural and psychological influences of food choices. Dietary modification and increasing levels of physical activity should be the first step in the management of diabetes mellitus that have to be maintained. The nutrition care process should be followed when managing diabetic patients.

Diabetes nutrition therapy aims to enable people with diabetes to make appropriate changes to their lifestyle in order to reduce the risks of both micro- and macro vascular complications and control blood sugar. Nutritional therapy should be individualized to accommodate age, nutritional needs, religion, culture, preferences and lifestyle. Nutrition therapy involves modifying both diet and patterns of physical activity. Positive outcomes of the therapy include:

- Improved metabolic control
- Decreased risk of micro- and macro vascular complications
- Quality of life and life expectancy similar to that of the general population

### ***Aims of the Nutrition Therapy***

Diet therapy aims at tailoring the diet care plan in accordance with the prevailing clinical situation. Diet therapy is not only concerned with the prevention and management of micro and macro vascular complications but also chronic complications of diabetes.

### ***The objectives of nutrition therapy are to:***

- Attain and maintain blood glucose levels as close to normal as possible
- Prevent hypo- and hyperglycaemia
- Attain optimum blood lipids and blood pressure control and reduce the risk of macro vascular disease
- Assess energy intake to achieve optimum body weight (this can mean taking action to either increase or decrease body weight).
- Promote physical, social and psychological well being
- Prevent, delay or minimize the onset of chronic degenerative complications e.g. hypertension and renal diseases
- Achieve and maintain optimal metabolic and physiologic outcomes
- Provide relief from symptoms
- Individualize meal plan according to a person's lifestyle and based on usual dietary intake

### *Essential considerations in planning the diet*

#### **1. Determine energy requirements**

- a. Calculate the energy requirement for each diabetic patient individually
- b. Type 1: base the energy requirement on needs for normal growth and development, physical activity and maintenance of desirable body weight
- c. Type 2: majority are overweight and obese therefore energy requirement is meant for weight loss

#### **2. Distribute energy in terms of carbohydrates, proteins and fats**

- a. Protein allowance is essentially as that for normal individuals and should not exceed 1gm/kg. Protein should provide 15-20% of total energy in the diet.
- b. Energy from carbohydrates should contribute 45% to 60% of total calories. An amount of less than 100gms carbohydrates per day is not advisable as it leads to ketosis, on the other hand more than 300g per day may overburden the metabolic capacity. The distribution and amount of carbohydrates between meals is extremely important to synchronize with the action of insulin and drugs.
- c. Fats should provide < 30% of energy
- d. A lower fat intake of up to 20% or less of the daily energy in case of obese adult diabetics

#### **3. Determine the type of carbohydrates and type of preparations**

- a. Give more of carbohydrate as complex starches e.g. whole grain cereals, roots and stem tubers, whole grain bread, rather than simple sugars because they breakdown more slowly to release glucose.
- b. In case of hypoglycaemia provide some glucose
- c. Refer to, calorie restricted, high fiber and fat modified diet section

*NOTE: The principles of a healthy diet discussed in chapter two applies when planning meals for diabetes patient's i.e.*

- Adequacy in all nutrients
- Balance of foods and nutrients in the diet
- Variety in food choice
- Moderation in the diet

### ***Nutritional Education and Counseling***

It is important to educate all diabetic patients on the disease and its' management i.e.

- Causes, signs and symptoms
- Basic information about nutrition
- Nutrient requirements
- Healthy eating guidelines
- How to make healthy food choices
- Relationship between diabetes and diet
- Drug-nutrient interactions
- Acute and chronic complications and their management
- Encouraging self monitoring of blood glucose at home (SMBG) or at the nearest facility
- Self management training using food pyramid, plate model, signal system
- Administration of insulin
- Healthy lifestyle- i.e. importance of exercise and maintenance of ideal body weight
- Preparing structured meal plan using menus, food exchange lists, counting calories, counting carbohydrates, glycemic index
- How to deal with special situations-eating out, travelling, exercise, sickness, lifestyle

### ***Individual counselling***

- Discuss the outcome of assessment with the diabetic client/patient
- Explain how the diagnosis has been arrived at
- Involve the patient in the formulation of the diet
- Discuss other factors that may affect the disease e.g. stress
- Fill in knowledge gap identified in the assessment

***The focus of nutritional counselling should be to aim at modifying an individual existing habit.***

- Food choice
- Meal composition
- Meal timing
- DO NOT set rigid targets

### ***Methods for planning diets***

- Food Pyramid
- Signal System (Healthy food choices)
- Hand Jive
- Plate Model
- Food Exchange System
- Glycemic Index

### **Food pyramid**

This provides a conceptual framework for selecting the kinds and amounts of various foods, which together provide a nutritious diet. Food pyramid focuses on variety and on reducing the amount of added fat and sugar in the diet. The bread/cereal, starches, vegetable and fruit groups make up the base of the diet. The food pyramid will help in diet planning in the area of food choice, amount of serving and as a teaching tool. Refer to figure 5, chapter 4.

### **Signal System: Principle of Healthy Food Choices and Cooking Methods**

This system is based on traffic light concept of red for 'stop' which also denotes danger, yellow for 'go slow' or cautious, and green for 'go' or safer road (see table 63 below). It uses universally understood symbols which makes it simple and highly useful way for a person to make an informed choice. Importantly it focuses attention on processing and cooking, lays stress on the Glycemic Index (GI), fiber content of food, the amount and type of fat used and the mode of cooking. It removes negative feelings about being on a diet and avoiding certain foods. It empowers the person to make a behavior change towards healthy eating.

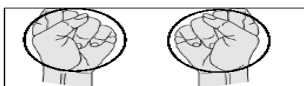
**Table 63: Principles of Healthy Food Choices, Signal system**

<b>Principles</b>	<b>Green</b>	<b>Yellow</b>	<b>Red</b>
Refined cereals and sugars	Low	Moderate to high	High
Saturated fat	Low	Low	High
Total fat	Low	Moderate	High
Glycemic index	low	Moderate high	High GI
Fiber	High	Low	Negligible
Cooking method	Steaming, boiling, roasting, grilling, tandoor, dry heat, less fat in cooking	Pan fried, sautéed, stir fry; moderate amount of fat in cooking	Deep fried, extra butter, ghee added, rich sauce/dressing, rich in added sugar
Processing	Rich fiber, parboiled, hand pounded.	Low fiber, refined, milled	Low fiber processed, ready to eat
How much to eat	Eat as permitted	Moderation	Restrict

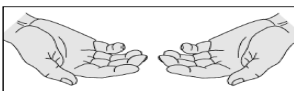
### **Hand Jive**

The Zimbabwe hand jive shown in figure 14 below, suggested by Dr K Mawji, illustrates how to measure the amount of food 'imaginatively', in a reasonably accurate manner, without scales etc.

## Hand Jive



**Carbohydrates (starch and fruit):** Choose an amount the size of your 2 fists.



**Vegetables:** Choose as much as you can hold in both hands. Choose low carbohydrate vegetables (e.g. green or yellow beans, cabbage, lettuce).



**Protein:** Choose an amount the size of the palm of your hand and the thickness of your little finger.



**Fat:** Limit fat to an amount the size of the tip of your thumb.

Drink no more than 250 mL of low-fat milk with a meal.

Figure 14: The Zimbabwe Hand Jive

### Plate model method

The Plate Method is a simple method for teaching meal planning. A 9-inch dinner plate serves as a pie chart to show proportions of the plate that should be covered by various food groups. This meal planning approach is simple and versatile. Vegetables should cover 50 percent of the plate for lunch and dinner. The remainder of the plate should be divided between starchy foods, such as bread, grains, or potatoes, and a choice from the meat group. A serving of fruit and milk are represented outside the plate. Figure 15 below shows how a sample basic meal should appear in the plate for a normal healthy individual.

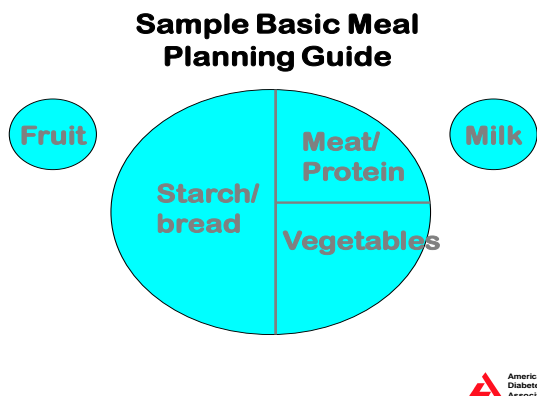


Figure 15: Simple Basic Meal Planning Guide for Healthy individual

Figure 16 shows a sample plate for a diabetic patient. Note the difference in the portion sizes of vegetables.

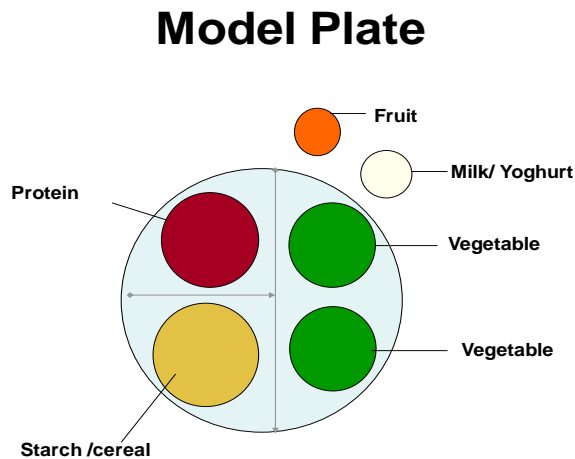


Figure 16: Model Plate for a Diabetic Patient

Combined with the plate model the signal system is a practical and easy way to implement diet advice for a newly diagnosed person with type 2 diabetes

Figure 17 shows plates usually seen for many people which are not in line with the principles of meal planning

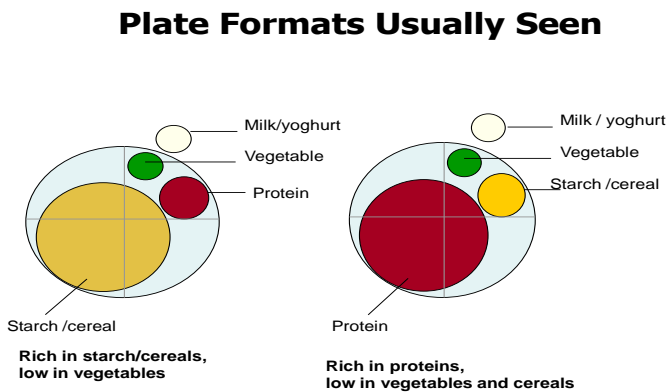


Figure 17: Plate Formats usually seen not in Line with Meal Planning



### **Food Exchanges**

In this system, food is separated into six categories based on macro nutrient content (i.e., starch [cereals, grains, pasta, bread, beans, and starchy vegetables], meat and meat-substitutes, non-starchy vegetables, fruits, milk and fats). Individuals with the help of a physician or dietitian, design a daily meal plan based on a set amount of servings from each category. The food exchange method allows a person to measure rather than weigh food. This saves time and encourages compliance. Any food may be substituted for another within the same food exchange list as it has the same caloric value. This facilitates easy variation in diet. As with other methods, all meals and snacks should be eaten at about the same time each day and be consistent in the amount of food consumed. One unit of a cereal exchange - one slice of bread can be exchanged for ½ cup rice. Foods from different groups cannot be interchanged for example 1 slice of bread cannot be exchanged for 1 ½ tsp of butter although calories from both are the same. Table 64 below shows an example of a diabetic diet pattern with a total food exchange.

**Table 64: Example of a Diabetic diet pattern with a total food exchange**

<b>Food group</b>	<b>Kcal 800</b>	<b>Kcal 1000</b>	<b>Kcal 1200</b>	<b>Kcal 1500</b>	<b>Kcal 1800</b>	<b>Kcal 2000</b>	<b>Kcal 2200</b>	<b>Kcal 2500</b>	<b>Kcal 3000</b>
Milk	1	2	2	2	2	2	2	3	4
Vegetables	2	2	2	2	2	3	3	3	5
Fruit	2	2	3	3	3	4	4	4	6
Starch	3	4	5	7	9	10	12	13	14
Meat	4	4	4	6	7	7	7	8	9
Fat	0	1	2	2	3	4	5	6	8

Food exchange list can be used to arrive to individual kilocalorie needs for diabetic patient. This will involve 3 steps, food plan/ meal pattern and coming up with a menu.

### **Food plan**

Food plan consists of the total number of exchanges of the food groups constituting the food exchange system e.g. supposing a diet providing 1400 kilocalorie and 30g protein is to be formulated. Step one involves making a food plan. Table below shows an example of a meal plan for a diabetic patient using exchange list

### Making a Food Plan

Table 65: An example of Food Plan for Diabetic using Exchange list

Food group	No of Exchange required	Size equivalent to an Exchange Serving	Amount in ml/ g	Total amount required	Kcal/ Serving	Protein	CHO	FATS	Total
Milk (non fat)	2	1 cup	250ml	500ml	90	16	24	trace	180
<ul style="list-style-type: none"> <li>• Meat (lean)</li> <li>• Egg/</li> <li>• chicken</li> </ul>	5	<ul style="list-style-type: none"> <li>• 6small cubes,</li> <li>• 1matchbox</li> <li>• Leg or thigh of a chicken</li> <li>• ½ cup cooked fresh beans, peas</li> </ul>	30	150	55	7		3	275
<ul style="list-style-type: none"> <li>• Starch</li> <li>• Bread</li> <li>• cereals</li> </ul>	7	<ul style="list-style-type: none"> <li>• ½ cup arrowroots,</li> <li>• ½ chapatti, ½ cup sweet potatoes,</li> <li>• ½ cup cereals, a slice of bread</li> </ul>	<ul style="list-style-type: none"> <li>• Cereal=30</li> <li>• bread=20</li> </ul>		80	3	15	trace	560
Vegetables	4	½ cup	100-150		25	2	5	25-28	100
Fruits	3	<ul style="list-style-type: none"> <li>• ½ cup juice</li> <li>• 1 cup cut fruit</li> </ul>	Varies		60	-	15	-	180
Fats	2	1tsp	5	10	45			5	90
									<b>1385</b>

### *Preparing a the meal pattern*

The next step involves preparation of meal patterns. This involves distributing the food exchanges from the total food plan as evenly as possible between the various meal times. Table 66 below shows the distribution of meals of the above food plan throughout the day in order to meet the nutritional needs of the client.

**Table 66: Distribution of Meal Exchanges throughout the day**

	<b>B/Fast</b>	<b>Snack</b>	<b>Lunch</b>	<b>Snack</b>	<b>Supper</b>	<b>Total</b>
Milk	1	½	-	-	½	2
Meat	1	-	2	-	2	5
Starch/bread/cereals	2	-	2	1	2	7
Vegetables	-	-	2	-	2	4
Fruits	1	1	1	-	1	-
Fats	½	-	½	½	½	2
Sugar	1	-	-	-	-	1

### *Preparation of a menu*

The third step is the translation of the food allowances in the meal pattern into a menu plan suitable for an individual. Diet education should be an ongoing interactive process and NOT a standard package delivered in one session

### *Components of a healthy diet for the diabetic person*

A 'diabetic diet' is not a special 'diet'. It is rather a healthy eating plan. It is important that the plan is practical, realistic, and avoids setting perfection as a goal. Periodic review of the plan is essential because it will need to evolve as the person goes through different life stages and their circumstances change.

When planning a meal for the diabetic person there is need to consider the following basic principles of a healthy eating plan which are;

- To balance energy intake to energy expenditure
- To provide adequate quality and quantity of macro and micronutrients to meet nutritional requirements
- To integrate a healthy meal plan in accordance with culture, beliefs, taboos, values and socio economic status (It is important to eat a variety of all foods.)
- To make starchy foods the basis of all meals
- Limit intake of fatty foods and simple sugars
- Include 2 to 4 fresh fruit for the day. When drinking fruit juice, choose the juice that says 'no sugar added' but dilute the juice (half glass of water and half glass of juice) before drinking it

The overall effect of a meal on blood glucose levels will depend on the different types of foods comprising the meal. High carbohydrate foods have the greatest effect on blood glucose levels because, after digestion, they are mostly converted to glucose, which is absorbed from the intestine straight into the bloodstream. However, proteins and fats in the diet do affect blood glucose levels too.

The following food groups need to be included in the diet;

### *Starchy foods*

Starchy foods provide energy and are required by the body for daily functioning. They are a key component of a healthy diet and should be included in the meal plan. It is recommended that 55-60% of energy should come from carbohydrates. Common sources are; cereals, grains e.g. maize, rice, ugali, arrow roots (Nduma), sweet potatoes, wheat, and wheat products, cassava etc.

The amount of carbohydrate a person eats can make a big difference in their blood glucose levels. When a diabetic person eats more carbohydrate than usual at a meal, their blood glucose level is likely to be higher than usual several hours afterward.

Whole grain starches are recommended because they are digested at a slower rate than simple sugars, they in turn, either reduce the demand on beta cells in the pancreas to produce insulin or reduce the need to inject large amounts of insulin. Complex carbohydrates also have more vitamins, minerals, and fibre. Examples of complex carbohydrates include brown bread, rice, cereals, sweet potatoes, arrowroots, pasta etc....

### *Proteins*

Proteins are body building foods and are for the maintenance and repair of the body tissues. Protein in the diet can help to stabilize blood sugar as it is not broken down as quickly to glucose like carbohydrates and it therefore decreases the demand for insulin on your pancreas. However, it's still important not to consume protein in excess, because it can be converted to glucose by the liver. Sources of protein can be classified into two categories; animal and plant sources. It is recommended that 12-15% calories/energy should come from protein (approximately 0.8g protein/kg body weight)

#### *Animal sources*

These include: Meat and meat products, milk and milk products, fish, poultry (chicken, turkey, and ducks) and eggs.

#### *Plant sources*

Dry legumes e.g. beans, peas, soya, tofu, lentils nuts etc. Plant-based protein sources provide quality protein. Most of the fat in these products are unsaturated and their foods contain fiber so they are good for your heart as well, especially if you substitute them for other meats or poultry in your diet.

Foods in this group include: dried beans such as black, kidney, pinto and bean products, lentils such as brown, green or yellow, dried peas such as black-eyed or split peas, soya soya-based "meat" products, soy nuts, nuts and spreads such as almond butter, cashew, butter, peanut butter, and soy nut butter. Diet high in protein and low in carbohydrates is not advised because it is generally high in saturated fats.

### *Fruits*

Fruits provide carbohydrate, vitamins, minerals, and fiber. It is recommended that one uses the fruits in season. Examples of fruits include; apples, strawberries, grapefruit, bananas, raisins, oranges, watermelon, peaches, mango, guava, papaya, berries, tangerine and canned fruits.

## **Vegetables**

Vegetables provide vitamins, minerals, and fiber. They are low in carbohydrate. Include both the green leafy and yellow or orange vegetables in your diet. Examples of vegetables are; lettuce, broccoli, spinach, peppers, carrots, green beans, tomatoes, celery, chilies, kales, cabbage, traditional vegetables such as terere, managu, mrenda, saget, etc..

## **Dietary Fat/Oils**

These are high energy giving foods. It is recommended that fat intake should not exceed 30% of total calorie intake per day. The total fats depend on many factors. However the type of fat an individual eats is more important than total fat. All fats provide more energy per gram than other foods (9kcal/gm) but only differ in their action on the cholesterol metabolism. Therefore it is important to watch portion sizes as well.

**Sources of fats include;** salad dressing oil, cream, cheese, butter, margarine, avocado, mayonnaise, olives, bacon.

## **Fats are classified as follows;**

### **Saturated Fat**

This are found mainly in food of animal origin, however, coconut and palm oils belong to this category. They are solid at room temperature with the exception of coconut and palm oils. They adversely affect serum cholesterol levels. One of the important diabetes nutrition guidelines is to eat less than 7% of calories from saturated fat. Foods containing saturated fat include:

- High-fat dairy products such as full-fat cheese, cream, ice cream, whole milk, 2% milk and sour cream
- High-fat meats like regular ground beef, bologna, hot dogs, sausage, bacon and spareribs
- Lard, Butter, Fatback and salt pork, Cream sauces, Gravy made with meat drippings, chocolate, Palm oil and palm kernel oil, Coconut and coconut oil, Poultry (chicken and turkey) skin

### **Unsaturated Fats**

This are divided into;

#### **1. Trans-unsaturated Fats**

Like saturated fat, *Trans* fat tends to increase blood cholesterol levels. *Trans* fats are produced when liquid oil is made into a solid fat through the process called hydrogenation. Sources are; processed foods like snacks (crackers and chips) and baked goods (muffins, cookies and cakes) with hydrogenated oil or partially hydrogenated oil, stick margarines, shortening and some fast food items such as French fries.

#### **2. Monounsaturated Fats**

Monounsaturated fats are called “good or healthy” fats because they can lower the Low Density Lipoproteins (LDL). To include more monounsaturated fats, try to substitute peanut butter instead of butter, margarine or shortening when cooking. Sprinkling a few nuts or sesame seeds on a salad is an easy way to eat more monounsaturated fats. Nuts and oils are

high in calories, like all fats. If trying to lose or maintain your weight, eat small portions of these foods. Sources of monounsaturated fat include: avocado, canola oil, nuts like almonds, cashews, pecans, and peanuts, olive oil and olives, peanut butter and peanut oil, sesame seeds.

### 3. Polyunsaturated Fats (PUFA)

Polyunsaturated fats are also “healthy” fats. It is recommended that you include these in your diet as well as monounsaturated fats. Sources of polyunsaturated fats are: corn oil, cottonseed oil, safflower oil, soybean oil, sunflower oil, walnuts, pumpkin or sunflower seeds, soft (tub) margarine, mayonnaise salad dressings.

#### *Fibre (Both soluble and insoluble)*

Dietary fibre (fibre), sometimes called roughage, is the indigestible portion of plant foods that pushes food through the digestive system, absorbing water and easing defecation. Dietary fiber comes from the thick cell wall of plants.

Dietary fiber can be soluble (able to dissolve in water) or insoluble (not able to dissolve in water). Soluble fiber, like all fiber, cannot be digested. But it does change as it passes through the digestive tract, being transformed (fermented) by bacteria. Soluble fiber also absorbs water to become a gelatinous substance that passes through the body. Insoluble fiber, however, passes through the body largely unchanged.

Potential advantages of consuming fiber are the production of health-promoting compounds during the fermentation of soluble fiber, and insoluble fiber's ability (via its passive water-attracting properties) to increase bulk, soften stool and shorten transit time through the intestinal tract.

#### **Sources**

Food sources of dietary fiber are often divided according to whether they provide (predominantly) soluble or insoluble fiber. To be precise, both types of fiber are present in all plant foods, with varying degrees of each according to a plant's characteristics. Whole grains are the best source of insoluble fiber. Oats, barley, beans, fruit (but not fruit juice) and some vegetables

#### **EXERCISE AND PHYSICAL ACTIVITY**

Exercise and physical activity is an important component in diabetes management. All patients should have individualized exercise and physical activity plan. This helps to:

- Improve insulin resistance and lipid profile
- Lower blood pressure
- Reduce mortality in Type I diabetes and can reduce HbA1c by 0.7% in Type II diabetes
- Protect against the development of Type II diabetes
- Maintain appropriate body weight

*NB: It is recommended that every patient should have at least 30 minutes of exercise per day.*

## DIABETES COMPLICATIONS

### *Hypoglycemia*

This is a metabolic disorder caused by a drop in the blood glucose level to below the normal minimum essential for normal (80mg/100ml) brain functioning.

#### **Causes**

- Uncontrolled diabetes
- Excessive insulin administration
- Strainers physical activity
- Skipped meals and delayed meals
- Inadequate food intake
- Severe vomiting or diarrhea

#### **Symptoms**

- Weakness, hunger, nervousness, dizziness, sweating, palpitation, disorientation, slurred speech, headache, shakiness
- Advanced hypoglycemia symptoms are related to neuroglycopenia and include headaches, confusion and lack of coordination, blurred vision, anger, seizures and coma

#### **Aim of management**

- Increase the glucose level to normal

#### **Management**

- In acute state administer one sweet or one tea spoon of sugar to raise the blood glucose followed by a meal
- For long term management advise the client to adhere to the diet recommendations as stipulated

## HYPERGLYCEMIA

- This is a condition that is characterized by elevated blood glucose

#### **Causes**

Include insufficient insulin, ineffective insulin and untreated diabetes

#### **Symptoms and implications**

- Drawing of water from tissues into the blood leading to severe dehydration
- Glycosuria ( when blood glucose exceeds 180mg/100ml), polydipsia, polyuria, blurred vision, weight loss, fatigue, acetone breath, labored breathing

#### **Management**

- Adjust dosage of regular insulin
- Enhance physical activity
- Reduce amount of CHO
- Space meals based on insulin activity time span

## METABOLIC ACIDOSIS

This disorder results from a lowered blood and extracellular fluid PH of < 7.4

**Risk factors/causes**

- Heavily meat based diet; uncontrolled diabetes; renal failure and prolonged fasting

**Implications**

- Acetone breath; dehydration; severe acidosis can result to fatal coma

**Aim of management**

- To control acidosis by increasing the blood P<sub>H</sub>

**Management**

- Treat underlying cause
- Withhold acidic foods especially meat
- Use of plant based foods that are alkaline in nature .e.g. potatoes is recommend
- Take safe drinking water based on tolerance



## GOUT

A disorder of purine metabolism in which abnormal levels of uric acid accumulate in the blood and result to deposition of uric acid at the joints. It is a manifestation of inflammation and sharp joint pain because of crystallized deposits of uric acid.

### *Main Risk factors/causes*

- Excessive intake of red meat and fish which result to elevated uric acid in the blood
- Excessive intake of alcohol, as it blocks the elimination of uric acid from the body
- Excessive consumption of stimulant beverages as caffeine if part of the chemical family of purine. It transforms into uric acid in the body
- Hormonal factor
- obesity

### *Symptoms/ implications*

- Inflammation and pain of the joints especially the meta tarsal pharyngeal ( the base of big toe)
- A risk factor to chronic arthritis

### *Aim of nutritional management*

- Prevent excessive accumulation of uric acid

### *Management*

- Use of low purine diet by restricting consumption red meat, fish, alcohol, stimulants, and high protein foods to avoid exogenous addition of purines to the existing high uric acid load is recommended
- Encourage consumption of alkalizing foods e.g. lemons, tomatoes, green beans, fruits milk and milk products
- Intake of fluids about 3lts/day to enhance excretion of uric acid based on assessment is recommended
- Moderate protein intake ( 0.8g/kg/day)
- Maintain adequate CHO intake to prevent ketosis
- Limit fat intake
- Avoid large and heavy meals late in the evening
- Encourage consumption of whole grains

## **HYPERTHYROIDISM**

This is condition due to overactive thyroid gland. This may be initiated by hormonal imbalances or tumors.

### *Causes*

- Hormonal imbalances
- Tumors

### *Symptoms and implications*

- Increased metabolic rate
- Excessive production of the thyroid hormones
- Increased energy expenditure and weight loss
- Nervous excitation due to excessive hormone product
- Tachycardia ( high heart rate)
- Increased perspiration and heat sensitivity

### *Aims of management*

- To prevent/control weight loss-through provision of high calorie diet.
- Reduce workload

### *Management*

- Treat the underlying cause
- Use of high calorie diet to meet the extra energy needs is recommended
- Refer to high calorie diet

## **HYPOTHYROIDISM**

This is state resulting from reduced activity of the thyroid gland. The gland does not produce sufficient levels of thyroxine hormone.

### *Causes*

- Inadequate iodine intake and selenium deficiency

### *Symptoms/implications*

- Enlargement of thyroid gland as the cells enlarge to trap as much iodine as possible
- Sluggishness and weight gain
- In pregnancy it can result to impaired fetal development

### *Aim of management*

- To control iodine deficiency

### *Management*

- Recommend iodine rich foods e.g. sea foods or iodine fortified foods
- Recommend suitable exercise program

## CARDIOVASCULAR DISEASES

### *Overview*

Cardiovascular disease is a class of diseases that affect the heart and blood vessels (arteries and veins). In the majority of cases, this is due to the progressive effects of atherosclerosis in the arteries.

Coronary heart disease (CHD) occurs when plaques containing lipoproteins, cholesterol, tissues debris, and calcium form on the intima, or interior surface of blood vessels. The plaques roughen the intima, and platelets are attracted to the roughened areas, forming clots. When the plaques enlarge sufficiently to occlude the blood flow, tissues are deprived of oxygen and nutrients, creating an area of infarct. CHD is manifested when a myocardial ischemia such as angina pectoris.

Common examples of cardiovascular disease include coronary artery disease, stroke, and peripheral vascular disease some of the risk factors include; diet, age, diabetes, obesity, smoking and heredity among others.

### *General risk factors for cardiovascular diseases*

Non modifiable factors are age, gender, genetic factors and race. A family history of high blood pressure (HBP) and a “pre-hypertension” 120-139/80-89mmHg may be a risk of HBP, diabetes and kidney diseases.

**High salt (sodium chloride) intake:** when sodium is taken in excess more water is drawn into the circulation, increasing the volume of blood to be pumped. In addition, excess salt makes the arterial walls to be more rigid leading to arteriosclerosis. Much of the salt we eat is added to the table during eating (20%), fifteen percent comes from salt naturally found in foods and 60% comes from salt added to processed foods (hidden salt).

**High blood cholesterol:** There are two types of cholesterol that is dietary cholesterol contained in food and blood or plasma cholesterol that is essential from body metabolism. Excess cholesterol causes arteriosclerosis (narrowing and hardening of arteries due to deposits of cholesterol) and increased risk of heart attack (myocardial infarction) and stroke (thrombosis). The amount of cholesterol in the diet is not reflected by the amount in the blood; this is mostly determined by the amount of saturated fatty acids in the diet. Animal based foods and products (milk and its derivatives, eggs, fish, shellfish and all types of meat), variety of meats especially offal (particularly liver and brain), shrimps and eggs have the highest cholesterol content. Plant based foods do not contain cholesterol. However, there are minute amounts of cholesterol in vegetable oils that are considered incidental.

**Too much fat, saturated fatty acid, *Trans* -unsaturated fatty acids:** These increases harmful cholesterol (LDL) levels in the blood and reduces the good cholesterol. The major dietary sources of saturated fatty acids include animal based foods and products such as butter, cured cheeses, margarine, bacon, sausages and pork, fresh eggs, cream, hydrogenated vegetable fats, lard, palm oil and whole cow's milk. Plant based foods are low in saturated fatty acids with some exception such as coconut and palm oil.

**High levels of low density lipoprotein (LDL) cholesterol:** Cholesterol is transported around the body attached to specific proteins called lipoproteins. There are two types of lipoproteins; low density lipoproteins (LDL) and high density lipoproteins (HDL). LDL carry about three-quarters of the cholesterol in the blood and high LDL level usually reflect high cholesterol level and imply a high risk of heart disease. HDL, which carry much less fat signals a lower than average risk of heart disease.

**Smoking cigarettes:** produces nicotine which stimulates the production of certain body chemicals. These chemicals raise pulse rate, BP and the force of heart contraction. Smoking also makes the heart need more oxygen at the same time reduce the amount of oxygen available. In addition, it helps to increase the substance that clogs the arteries.

**Alcohol:** has got a higher caloric density than protein or carbohydrates and is a source of additional empty calories.

**Obesity:** although obesity is a disease on its own right, it is also one of the key risk factors for CVD.

**Reduced physical activity:** makes the energy from food not to be expended thus leading to increased body fats.

**Stress:** While stress can affect all the body organs and functions of the body, its effect tends to be concentrated on the heart and the cardiovascular system which is obliged to work hard.

#### ***Prevention and nutrition management of CVD***

**Reduced sodium intake** can prevent CVD in persons at risk and can facilitate CVD control in older age persons on medication. Sodium should be limited to 6g per day, an equivalent of 100mmols of sodium (2400mg) per day. To achieve this, choose food low in sodium and limit the amount of salt added to food.

**Consumption of diets that include a wide variety of fruits and vegetables:** These are high in nutrients and fibre and relatively low in calories and hence are nutrient dense. In addition, consuming a variety of fruits and vegetables (especially those that are dark green, deep orange or yellow) helps ensure adequate intake of micronutrients normally present in these foods. Micronutrients that play a role in controlling HBP include, potassium, magnesium, calcium and vitamin especially vitamin C.

**Dietary patterns high in grain products especially whole grains:** Grain products provide complex carbohydrates, vitamins, minerals and fibre. Foods high in starches (polysaccharides e.g. bread, pasta, cereals and potatoes) are recommended over sugars. Sugars supply only energy without the other nutritive benefits. A high complex carbohydrate diet is rich in fiber, minerals, vitamins, saponin (a phytochemical) and essential fatty acids. It is rich in antioxidants E, ascorbic acids and carotenoid especially lutein and zeaxanthin, which are important in preventing heart disease and delaying aging. A high carbohydrate diet especially complex carbohydrate is also rich in folic acid that helps to control an abnormal homocysteine level, an emerging cardiovascular disease risk.

### **Diet high in fiber (Fibre)**

Fiber is found exclusively in plant based foods. Animal foods such as milk, eggs, fish, meat and their derivatives contain no fiber. Insoluble fibres are found in higher concentration in vegetables such as carrots, green leafy vegetables, wheat and cereals. The insoluble fiber is found primarily in grain bran. Other sources of insoluble fiber include brown rice, rice bran, wheat bran, corn bran, whole grain bread and cereals, cabbage family, cauliflower, green beans, green peas, legumes, mature vegetables, root vegetables, tomatoes, nuts, fruits such as pears, peaches, plums, seeds, strawberries, apples and bananas. High concentration of soluble fiber occurs in fruits, oats, barley and legumes such as peas, beans and lentils. High carbohydrates based on whole plant foods prevent obesity.

**Consumption of diet that lower LDL (harmful) cholesterol:** polyunsaturated fatty acids which include fish and fish oils, soybeans, wheat germ, canola oil, sunflower oil, corn oil, cotton seed oil, walnut, some vegetables for example spinach, lettuce and broccoli, monounsaturated fatty acids such as avocado, cashews, canola oil, peanuts and poultry. The polyunsaturated and monounsaturated fatty acids lower BP, the level of triglycerides and LDL cholesterol and consequently lead to increase in HDL cholesterol that carries cholesterol in the blood back to the liver for recycling or disposal.

Fish and fish oils help prevent the development of atherosclerosis and heart disease. It is believed that fish oil exert their protective effect by lowering BP levels, blood triglycerides and LDL. Fish oils are also believed to reduce platelets and suppress the growth of smooth muscle cells in the arterial walls.

Soy protein is well known to produce less hypercholesterolemia and less atherosclerosis than animal proteins.

### *Micronutrients and cardiovascular*

**Magnesium:** High consumption of magnesium reduces the production of prostacyclin which is vasodilating and increases the release of thromboxane which is vasoconstricting (Prostacyclins and thromboxanes are hormone like the one compounds referred to as eicosanoids that regulate BP, clotting and other body functions). Magnesium also stabilizes calcium channels. Low blood magnesium lowers potassium level and leads to hypokalemia.

The food sources of magnesium ranked by milligram of magnesium per standard amount include bran, pumpkin and squash seeds kernel roasted, sesame, nuts, wheat germ, whole wheat flour, soybeans, molasses, spinach, white bean, green leafy vegetables, potatoes and oranges.

**Potassium:** Potassium causes increased excretion of sodium by the kidney. It may also result in a decrease in BP via its response in neither circulating nor epinephrine (a hormone produced by the adrenal gland and is a vasoconstrictor). In addition, it modifies the excitability of vascular tissue and relaxes arteriolar muscle. Potassium also reduces secretion of rennin which operates to conserve sodium and blood fluids.

Dietary sources of potassium include foods such as blackstrap molasses, soybeans, wheat germ, pumpkins, bananas, almond, avocado, spinach, potatoes, sweet potatoes, carrot juice, tomatoes, whole grain bread, melon, cucumber, prune juice, beans, oranges, mangoes. Others from animal sources include salmon, cod, beef steak, cheese, cow's milk and fresh eggs.

**Vitamin C:** Vitamin C is an electronic donor and this property accounts for its known functions. It acts as a potent water soluble antioxidant in humans thus preventing oxidative damage to tissues and the genesis of atherosclerosis. Vitamin C is found majorly in plant sources such as sweet red pepper, guava, black currant, broccoli, orange, lemon, cassava, peas, tangerine, tomatoes, potatoes and water melon. It may also be found in small amounts in animal sources such as beef, liver, oyster, trout and chicken. Human beings can neither synthesize this vitamin nor store it in significant amounts; therefore it must be taken in daily.

**Calcium:** It increases sodium excretion. It also alters the vascular smooth muscle reactivity. Milk and dairy products are well known as the best sources of calcium. However, there are a variety of plant based foods providing as much or more calcium as milk: sesame, blackstrap molasses, almonds, beans, corn, cabbage, broccoli and oranges are also good sources of calcium.

**Physical activity:** Physical activity has measurable biological effects affecting cholesterol levels, insulin sensitivity and vascular reactivity. Moreover these effects are dose dependant such that the more the exercise, the greater the health benefits. The WHO (2002) describes the opportunities for people to be physically active in terms of 4 domains: at work; for transport; in domestic duties and leisure time.

Engaging in moderate level of physical activities such as intermittent walking for 30 to 45 minutes is recommended for prevention of CVD. Moderate exercise such as walking may both lower LDL and raise HDL levels if the activity is constantly pursued for a long time. Moderate means 30 minutes brisk walking (3-4 miles) per hour, walking upstairs, dancing, bicycling and any exercise that will expend 200 calories per day.

It is important to balance time of stress with moments of relaxation. Do something that takes the mind off problems such as gardening, walking, playing as sport, meditating or listening to soothing music.

**Prevent and control obesity:** Limitation of dietary fats and alcohol (7kcal/g) is effective means to reduce both energy density and total energy. The diet should be within  $\leq 30\%$  of total kilocalories as fat to predict a weight loss of  $\frac{1}{2}$  kg per week (minus 500 to 1000kcal/day).

## **ATHEROSCLEROSIS**

This is a generative process that begins with the accumulation of soft fatty streaks along the inner arterial walls especially at the branch points. These streaks gradually enlarge and become hardened with minerals forming plaques.

### ***Risk factors***

High calorie intake; high saturated fat and cholesterol intake; increased serum LDL (harmful cholesterol) levels above 5mmol/liter; sedentary lifestyles; stress; hypertension; obesity and diabetes.

### ***Implications***

Obstruction of normal blood flow; tissue damage; increased blood pressure

### ***Aims of management***

- To normalize blood lipids, control the modifiable risk factors and prevent complications.

### ***Management***

- Reduce total fat intake(15-20%) -LDL-(saturated fat to 7% and dietary cholesterol 200mg/day)
- Reduce body weight for the overweight clients to the ideal body weight
- Avoid smoking and alcohol
- Physical activity is recommended

## **MYOCARDIAL INFARCTION**

This is sudden tissue death caused by blockages of vessels that feed the heart muscle, also called heart attack/cardiac arrest. Risk factors include hypertension and arteriosclerosis. Other contributors include abnormal blood clotting, spasms of the coronary artery, rheumatic heart disease, infections of the membranes covering the heart and electrical disturbances that alter the heart rate.

### ***Implications***

- Strained cardiac function

### ***Aims of nutritional management***

- To reduce the work load of the heart
- To relieve pain and stabilize the heart rhythm
- To treat infections and the underlying causes
- To regulate electrolyte balance

### ***Nutritional Management***

- When the patient is in shock, withhold food intake-nil per oral until shock resolves
- When shock resolves provide between 1000-1200 kcal that progresses from low sodium soft foods of moderate temperature in frequent and small feeding.
- After recovery adjust the diet to meet the individual needs and to deal with the underlying conditions such as hyper lipidemia, hypertension, and obesity
- Avoid caffeine as it stimulates metabolic rate and increase the workload of the heart

A healthy heart requires minimal consumption of saturated fats and cholesterol, reduced use of salt and sugar, avoiding use of tobacco and too much coffee and regular exercise.



## CONGESTIVE HEART FAILURE

This is a syndrome in which the heart can no longer adequately pump blood through the circulatory system. Risk factors include; uncontrolled atherosclerosis and hypertension.

### *Implications*

- Pulmonary oedema
- Reduced blood flow to all organs
- Fluid retention hence stagnation of fluids in all organs
- Enlarged heart and rapid heart beat
- Malnutrition due to high energy needs

### *Aim of Management*

- To reduce the workload of the heart
- To provide adequate nutrients
- To reduce weight for the overweight

### *Nutritional Management*

- Restrict sodium, caffeine and fat intake
- Encourage gradual weight loss where necessary
- Use of liquid formula of high nutrient density as oral supplement or enteral or tube feeding to prevent or reverse malnutrition is recommended. In some cases total parenteral nutrition may be required
- Selection of enteral or parenteral formulas should be done carefully to ensure that energy ,fluid, sodium intake will not overload the body
- Adjust dietary fiber to avoid constipation but avoid amounts and types that produce gas and abdominal distention
- For overweight patient counsel on weight reduction
- Restrict cholesterol intake to 300 mg /day
- Reduce intake of saturated fats
- Encourage intake of unsaturated fats (oils)
- Increase intake of dietary fiber to control glucose/fat absorption
- Reduce alcohol intake and encourage the patient to avoid smoking to prevent development of atherosclerosis

## **HYPERTENSION**

Hypertension is a cardiovascular disorder characterised by persistently elevated diastolic blood pressure (BP) of above 95mmHg. Uncontrolled hypertension can affect various body organs and can lead to impaired vision, kidney failure, stroke, paralysis, heart attack and brain damage. Risk factors include; diet, race, stress, age, diabetes, obesity, smoking, atherosclerosis and heredity among others.

### ***Implications***

- Strained cardiac and vascular function
- Cellular electrolyte imbalance
- Aneurysms (balloon out and busting of the arteries)
- Arterial lining injuries which accelerates the plaque formation

### ***Aims of nutritional management***

- To control blood pressure within the normal ranges
- To achieve a gradual weight loss in overweight and obese individuals and maintain their weight slightly below the normal
- To reduce sodium intake based on severity
- To maintain adequate nutrition
- Regulate fat intake

### ***Nutritional management***

- Provide low calorie diet if the patient is overweight until ideal body weight is achieved
- Regulate fat intake. Encourage intake of unsaturated fats (oils). The poly unsaturated and monounsaturated fatty acids lower BP, the level of triglycerides and LDL cholesterol and consequently lead to increase in HDL cholesterol that carries cholesterol in the blood back to the liver for recycling or disposal. Fats should be 20% of total kilo calorie
- Restrict alcohol intake
- Restrict sodium intake. To achieve this, encourage choice of food low in sodium and limit the amount of salt added to food, restrict processed foods and use of sodium containing spices
- Avoid stimulants e.g. caffeine and spirits
- Avoid cigarette smoking, which may lead to atherosclerosis
- In some cases it may be necessary to restrict fluid intake
- Encourage physical activity for those leading a sedentary lifestyle. Physical activity has measurable biological effects affecting cholesterol levels, insulin sensitivity and vascular reactivity. These effects are dose dependant such that the more the exercise, the greater the health benefits

## **STROKE/TRANSIENT ISCHEMIC ATTACK**

This is a temporal reduction in blood flow to the brain that causes temporal symptoms which depend on which part of the brain is affected.

### ***Risk factors***

- Atherosclerosis
- Hypertension or a combination of the two

### ***Implications***

- Light headedness
- Visual disturbances
- Paralysis
- Staggering
- Numbness
- Dysphasia ( inability to coordinate swallowing appropriately)

### ***Aim of management***

- To treat the underlying risk factors

### ***Management***

- Restricted energy intake, total fat and sodium
- Tube feeding may be indicated initially till the client is safely able to chew and swallow
- Some patients may need assisted feeding

## CHAPTER EIGHT: NUTRITION INTERVENTIONS IN TRAUMA (BURNS, SURGERY, ICU AND NEW BORN UNIT)

### BURNS

Major burns result in severe trauma. When a patient suffer from burn injuries the energy requirements can sometimes increase to as much as 100% above resting energy expenditure, depending on the extent of the burn (Total Burnt Surface Area - TBSA) and depth of the injury (degree of burns).

#### *Causes*

Burns can result from several causes. They include; fire, chemicals, contact with hot liquids, sunburn, electricity or lightning, prolonged exposure to hot liquids

#### *Implications*

- Catabolism of trauma
- Wasting and weight loss
- Anorexia
- Failure to feed
- Generalized discomfort and depression
- Loss of fluids and electrolytes
- Heat lost
- Infections
- Demand of tissue regeneration
- Anemia
- Malnutrition

#### *Special concerns for burn patients*

- Burn patients have all typical characteristics of hypermetabolic state and nitrogen losses exceed any other type of stress or trauma
- Hyper metabolism increase with size of the burnt area peaking up to 2 to 2.5 times above the normal metabolic rate for burns involving as much as 40% of the body surface
- When the skin surface is destroyed, the body's first line of defense against infection is lost
- Loss of skin also results in increased water and heat loss. The larger the burnt area the greater the loss of water vapor and heat
- Approximately 2.5-4l/day of water vapor may be lost from a major burnt wound
- The burnt surface allows leakage of a protein rich fluid containing approximately two thirds as much proteins as plasma

- Burn patients do not feed well because of pain, generalized discomfort and depression
- Many are anorexic and unable to consume a sufficient amount of kilocalories to satisfy energy requirements
- Large amounts of waste products (such as nitrogen and potassium) must be excreted by the kidney- fluids are required to keep these in solutions
- Curling ulcer or acute ulceration of the stomach or duodenum is frequently observed in burn patients-large amount of vitamin A can reduce incidence of stress ulcer

### ***Aims of Nutritional Management***

- Achieving and maintaining optimum body weight
- Replacement of fluids and electrolytes to maintain circulatory volume and prevent renal failure
- Promote wound healing
- Prevent infection and rapid or severe weight loss
- Attain normal hydration status and electrolyte balance

### ***Dietary Management***

For burn patients a high protein high calorie diet is vital for faster recovery. In adults and children TBSA of more than 10%, protein should comprise 20% of the total caloric requirement. TBSA 1% to 10%, protein should provide 15% of the total caloric requirements. For children younger than 1 year of age, a conservative recommendation of 3g to 4g protein /kg can be given because of infant's inability to tolerate high renal solute loads. Excessive high protein intake could result in azotemia, Hyperammonaemia, or acidosis. The energy and protein needs of both adult and children burn patients is determined using the Curreri formula (1979)

#### **Adults**

**Energy Needs:** Daily calorie requirements = [24kcal x kg usual body weight] + [40 kcal x TBSA {% burn}]

Where: TBSA stands for the total % burn

**Protein Needs:** Daily protein requirement = [1g x body weight] + [3g x TBSA]

#### **Children**

Daily calorie requirement

= [60kcal x kg usual body weight] + [35kcal x TBSA]

Daily protein requirement

= [3g x Kg. Usual Body weight] + [1g x TBSA]

### ***Nutrient Delivery***

Nutrient could be delivered either through oral, enteral, or parenteral routes

### **Enteral**

Continuous enteral feeding with or without oral intake is indicated for patients who are unable to meet a minimum of 75% Kcal and protein requirements via oral diets; for nocturnal tube feeding; for patients on ventilation and those with adequate bowel function.

**Pediatric patients;** For pediatric patients starting hourly feed should be 1ml to 2ml/kg/day and the volume should be increased gradually to 5ml to 15ml every 8, 12, or 24 hrs depending on the patient's tolerance.

**Adult patients;** For adult patients start with 10ml to 40ml per hour depending on patient tolerance. Then increase volume gradually with 20ml to 25ml every 8, 12 or 24 hours depending on patient tolerance. Free water requirements can be met by intermittent prescribed water flushes.

*NB: Check residual gastric volume every 4 hours when gastric feedings are given. If the residual is more than 1.5 times the hourly rate, the enteral feeding should be stopped and parenteral feeding initiated.*

### **Parenteral**

Parenteral nutrition should be administered when the gastrointestinal function is not functional. It should be tailored to the nutrient recommendations.

**Adult patients;** For adult patients administer hypertonic solutions by infusion pump at 40ml/hr at the beginning. Then increase the rate by 20ml to 40ml every 8 to 12hrs as tolerated until energy, protein and fluid requirements are attained

**Pediatric Patients;** For pediatric patients, initiate infusion of dextrose at a concentration of 10% and advance this as tolerated to a maximum of 20% dextrose concentration. Alternatively infuse 20% dextrose at a rate of one half of maintenance fluid for 12 hours and then advance to full maintenance fluids as tolerated

*Note: For patients on tube feeding and/or parenteral nutrition in non intensive care carefully monitor the following parameters daily: intake and output, urine sugar/acetone, blood glucose and consistency of bowel movements. For those patients in intensive care receiving parenteral feeds, tube feeding or both, the following parameters should be monitored closely on daily basis: sodium, potassium, BUN, creatinine, blood glucose, Hb, hematocrit, intake and output, urine sugar/acetone and consistency of bowel movement.*

## **SURGERY**

Surgery like any other injury to the body elicits a series of reactions including release of stress hormones and inflammatory mediators i.e. cytokines. This release of mediators to the circulation has a major impact on body metabolism. They cause catabolism of glycogen, fat and proteins with release of glucose free fatty acids and amino acids into the circulation so that substrate are diverted from their normal purposes e.g. physical activities to the task of healing and immune response. For optimal rehabilitation and wound healing the body needs to be in anabolic state. Measures to reduce stress of surgery can minimize catabolism and support anabolism throughout surgical treatment and allow patients to recover substantially better and faster even after major surgical operation.

### ***Goal of nutritional management***

To enhance recovery of patients after surgery

### ***Objectives***

- To avoid long periods of pre operative fasting
- To re establish oral feeding as early as possible after surgery
- To integrate nutrition into overall managements of patients
- To control metabolic processes

### ***Preoperative nutrition care***

- Encourage patients who do not meet their energy needs from normal foods to take oral nutrition supplements during the preoperative periods
- Administer preoperative enteral nutrition preferably before admission to the hospital
- Ensure the stomach is empty. It is important to empty the stomach at the time of operation to avoid the danger of aspiration during the induction of anesthesia or upon awakening
- Use a chemically defined or elemental liquid diet with minimal residue pre-operatively for patients with nutritional risks
- Patients who are scheduled to undergo surgery and who are considered to have no specific risk for aspiration may drink clear fluids until 2 hrs before anesthesia. Solids foods are allowed until 6 hrs before anesthesia
- For elective cases, no food is allowed by mouth (nil by mouth) for at least six hours before surgery
- Low fiber foods should be administered orally, a liquid diet for 2 – 3 days preceding surgery

### ***Postoperative nutrition care***

The aim of postoperative nutrition care is to reduce nutritional deficiencies that ordinarily develop in untreated patients during the period of post operation. Note;

- Length of nil by mouth after surgery may be influenced by the patients pre-existing nutritional status, severity of operative stress and the nature and severity of the illness

- If the period of post operative starvation is expected to be longer than one week, parenteral nutrition support maybe beneficial even for a mildly malnourished individual
- Introduction of solid foods depends on condition of the GI tract, oral feeding is often delayed for the first 24 – 48hrs following surgery to await the return of the bowel sounds or passage of flatus
- Initiate normal food intake or enteral feeding earlier after gastro intestinal surgery
- Oral intake including clear liquids can be initiated within hours after surgery to most patients undergoing colon resections
- Oral intake should be adopted to individual tolerance and to the type of surgery carried out
- Apply tube feeding in patients whom early oral nutrition cannot be initiated with special regard to those undergoing major head and neck or gastrointestinal surgery for cancer

### *Severe trauma*

For patients with obvious under-nutrition at the time of surgery and for whom oral intake will be inadequate (<60%) for more than 10 days;

- Initiate tube feeding for patients in need within 24 hours after surgery
- Start tube feeding with a low flow rate ( e.g. 10ml/hr to maximum of 20ml/hr) due to limited intestinal tolerance
- It may take 5-7 days to reach the target intake and this is not considered harmful
- Reassess nutritional status regularly during the stay in the hospital and if necessary continue nutritional support after discharge in patients who have received nutritional support preoperatively
- Progress over a period of several meals from clear liquids, and finally to solid foods



## **NUTRITION CARE AND SUPPORT IN THE INTENSIVE CARE**

Intensive care is a therapy unit concerned with the management of patients with acute life threatening disorders. The severe or critical disease relates to a wide variety of clinical or surgical conditions. Although the setting includes patients with many diseases with often quite different metabolic responses, jeopardizing overall recommendations for all patients, frequently at least one severe systemic dysfunction is described, requiring active therapeutic support.

Changes in most patients in the ICU include hyper metabolism, hyperglycemia with insulin resistance, accentuated lipolysis and increased protein catabolism. The impact of the combination of these metabolic changes and absence of nutritional support may lead to rapid and severe depletion of lean body mass. The implications are;

- Multiple organ failure
- Increased risk of infection
- Hyper metabolism
- Decreased immunity
- Increased nutritional requirements

*NB: The goal of nutrition management is to preserve lean body mass*

### ***Nutrition care and feeding***

Enteral nutrition (EN) via tube feeding is the preferred way of feeding the critically ill patients and an important means of counteracting for the catabolic state induced by severe diseases.

### ***Indications for and implementation of enteral nutrition (EN) in the ICU***

- All patients who are not expected to be on full oral diet within 3 days should receive enteral nutrition (EN)
- Haemodynamically stable critically ill patients who have a functioning GI tract should be fed early (<24hours) using an appropriate amount of feed
- With an inadequate oral intake, undernutrition is likely to develop within 8-12 days following surgery
- No general amount can be recommended as EN therapy has to be adjusted to the progression/ course of the disease and gut tolerance
- During the acute and initial phase of critical illness: an exogenous energy supply in excess of 20-25kcal/kg/day may be associated with a less favorable outcome and thus should be avoided whereas during the recovery (anabolic flow phase) the aim should be to provide 25-35kcal/kg/day to support the anabolic reconstitution
- Patients with severe under nutrition should receive EN up to 25-35 total kcal/kg/day. If these target values are not reached supplementary parenteral nutrition should be given

### ***Route of administration***

- In patients who tolerate EN and can be fed approximately to the target values no additional parenteral nutrition should be given. In patients who cannot be fed sufficiently enterally, the deficit should be supplemented parenterally

- Carefully consider parenteral nutrition in patients intolerant to EN at a level equal to but not exceeding the nutritional needs of the patients thus overfeeding should be avoided
- There is no significant difference in the efficacy of jejuna versus gastric feeding in critically ill patients

### *Types of formula*

- Whole protein formulas are appropriate in most patients because no clinical advantage of peptide based formula has been shown
- Immune-modulating formulae (formulae enriched with Arginine, nucleotides and  $\alpha$ -3 fatty acids) are superior to standard enteral formulae (these acts as energy substrate for immune cells, reduce inflammatory stimuli and cell mediated immunity as well as scavenge free radicals)
- In elective upper GI surgical patients (see guidelines on surgery)
- In patients with mild and severe sepsis immune modulating formulae may be harmful and therefore are not recommended
- In patients with trauma (see guidelines on surgery)
- In patients with ARDS (formula containing omega 3 fatty acids and antioxidants are recommended)
- For burn patients trace elements (Cu, Se and Zn) should be supplemented in a higher than standard dose
- ICU patients with very severe illness who do not tolerate more than 700ml enteral formulae per day should not receive an immune modulating formulae enriched with Arginine, nucleotide and omega 3 fatty acids
- Glutamine should be added to standard enteral formula in burn and trauma patients
- Glutamine decreases infection complications, strengthens immune defense, improves protein synthesis and nitrogen balance, improves metabolic homeostasis (glucose) and improves gut functions
- There are no sufficient data to support enteral glutamine supplementation in surgical or heterogeneous critically ill patients

## FEEDING OF LOW BIRTH WEIGHT AND PRETERM INFANTS

Low birth weights are defined as babies having less than 2500g at birth. Very low birth weights are those born with less than 1500g. About a third of low birth weight infants are small for gestational age and show intra uterine growth retardation. Pre-term babies are subdivided into three categories depending on the degree of maturity i.e.

- Less than 30 weeks( extremely premature)
- 31-32 weeks
- 35-36 weeks (borderline)

The clinical management and nutritional requirement of the immature or preterm infants is different from a mature infant born after 37 weeks. Preterm infants experience renal, hepatic, gastrointestinal and respiratory problems due to immaturity of organ systems. They are more likely to need assistance with breathing and are less likely to tolerate oral feeds.

### *Factors that cause variation in weight at birth*

- Mother's health
- Mother's nutritional status
- Mother's diet during pregnancy

**Factors affecting women's nutritional status which might predispose the infant born prematurely or of low birth weights are**

- Nutritional intake
- Drug abuse
- Maternal under nutrition-is the major factor causing LBW (Low Birth weight) in developing countries
- Mothers pre-pregnancy weight i.e. preconception weight of 40kg and a height 150 cm
- Low pregnancy weight gain
- Anemia
- Malaria
- Acute and chronic infections e.g. tuberculosis

### *Challenges to optimal nutrition for preterm infants*

Providing adequate nutrition to preterm infant is complicated by immature organ systems, particularly the GI system and metabolic processes.

GI immaturities in the preterm infant include:

- Face and oral musculature
- Inability to coordinate sucking and swallowing, breathing (synchronization)
- Poor pastoral control
- Low esophageal sphincter pressure
- Pharyngeal swallow
- Delayed gastric emptying and stool passage
- Slower upper and lower intestinal motility
- Immature digestion and absorption of carbohydrates, protein and lipids

### **Renal (kidney) functions**

- Concentrating controlling ability
- Sodium excretion
- Ability to maintain acid base balance
- Glucose re-absorption
- Energy glycogen and fat
- Proteins hardly any muscles
- Minerals and micronutrients – low level of Ca, Zn, Iron and others most of which are accumulated in the last ten weeks

In addition, prior to birth the GI tract is sterile and therefore immunologically immature. Normal gut colonization, acquired through contact with the mother and feeding, may be delayed or absent following birth due to isolation of the infant and residence in the new inborn care unit (NICU) setting. Preterm infants may therefore be at risk of acquiring abnormal bacterial flora and developing nosocomial infections.

### ***Key issues in preterm infants***

- Preterm infants, especially those who have been growth restricted in uterus have fewer nutrient reserves at birth than term infants
- Additionally, preterm infants are subject to physiological and metabolic stresses that can affect their nutritional needs, such as respiratory distress or infection

### ***Feeding Premature Infants***

The premature infant's nutritional requirements are substantially different from those of the term infant, and meeting their unique needs can be challenging. The aim of feeding the premature is to provide optimal nutrition early in life, in order to improve survival as well as promote growth and development. This is the cornerstone of the care of preterm infants. Avoiding early malnutrition can have both short- and long-term benefits for the infant. Early care in the new inborn care unit (NICU) is therefore focused on vital organ development

### ***Objectives of nutrition management***

- To promote feeding tolerance
- To improve digestibility
- To promote progress to full feeds
- To promote weight gain
- To enhance neurodevelopment, organ maturity and functioning
- To prevent infections and promote development of immune system

Recommendations for nutritional requirements for pre-terms is based on data from intrauterine growth and nutrient balance studies and assume that optimal rate of postnatal growth for preterm infants should be similar to that of normal fetuses of the same post conception age. In practice, however, target levels for nutrient input are not always achieved and this may result in important nutritional deficits.

### ***Nutritional requirements for preterm***

The recommended nutritional requirements for preterm are as shown in table 67 below:

**Table 67: Recommended Nutritional requirements for Pre term Infants**

<b>Nutritional Requirements</b>	<b>Recommended amounts</b>
Fluid	150 – 200 Mmol
Energy	110 – 130 kcal/kg/day
Protein	3 -4 g/kg/day
Fat	4.5 – 6.8 g/kg/day
Calcium	120 – 230 mg/kg/day (2 – 4.5 Mmol)
Phosphorus	60 – 140 mg/kg/day (Ca: P 1.4 – 2.0: 1)
Sodium	1.3 Mmol
Iron	35 – 45 µmol
Vitamin K	2 – 3 µg

### **Feeding options;**

There are a number of feeding options available for pre-term babies. These are

- Mother's own unmodified breast milk
- Mother's own breast milk fortified
- Preterm formula
- Parenteral nutrition

### **Feeding Pre-terms**

- Enteral feeds: should be given as soon as possible to prevent gut atrophy. If the baby's condition is unfavorable give minimal feeds to keep the gut functional i.e. 10-20ml /kg/day
- Parenteral feeds: if the baby is unable to take enteral feeds, parenteral feeds should be started as soon as possible to prevent severe malnutrition

### **Choice of feeding methods**

The choice of feeding method is determined by several factors. Nonetheless;

- The methods outlined above can be used singularly or in combination depending on the baby's ability
- For small babies (L1500g) breast can be used in combination with kangaroo care
- Babies in kangaroo care gain weight faster and infection rate is reduced

Well infants of gestational age > 34 weeks are usually able to coordinate sucking, swallowing, and breathing, and so establish breast or cup feeding. In less mature infants, oral feeding may not be safe or possible because of neurological immaturity or respiratory compromise. In these infants milk can be given as a continuous infusion or as an intermittent bolus through a fine feeding catheter passed via the nose or the mouth to the stomach.

**Note:**

*A major concern with the introduction of enteral feeds (especially to preterm, IUGR infant or sick infants) is the additional physiological strain on the immature gastrointestinal tract which predisposes them to development of necrotizing Enterocolitis whose risk is inversely related to gestational age and birth weight. The incidence of necrotizing Enterocolitis in very low birth weight infants is 5-10%. The conditions long term morbidity may include substantial neuro-developmental problems, undernutrition and associated infection during a vulnerable period of growth and development.*

**Clinical features of necrotising enterocolitis include**

- Abdominal distension, tenderness or rigidity
- Lethargy, hypotonia, or apnoea
- Hepatic portal gas on abdominal x ray
- Intramural gas (pneumatosis intestinalis) on abdominal x ray
- Intestinal perforations
- Blood or mucus in stool

**Modes of feeding**

- Enteral feeding/oral
- Breastfeeding
- Cup feeding

**Enteral nutrition**

Most preterm infants who develop necrotizing enterocolitis receive enteral feeds. Start minimal enteral nutrition within the first days of life of preterm infants, particularly those who are clinically stable. Initiate using extremely small volumes to “prime” the digestive system and increase the volume as the infant becomes more stable and tolerance is confirmed.

- Feeds nutritionally insignificant volumes of enteral milk (0.5-1.0 ml/hour)
- Aims to stimulate postnatal development of gastrointestinal system
- Use in parallel with total parenteral nutrition
- Increase enteral feeds' volume after pre specified interval, typically 7-14 days
- Calculate feeds based on weight
- Consider starting volume for either expressed breast milk or formula milk
- Babies who weigh less than 2.5kg (low birth weight) start with 60ml/kg/day
- Increase the total volume by 20ml/kg/day until the baby is taking a total of 200ml/kg/day
- Provide breast milk up to 240ml/kg/day but no other types of milk
- Feed 2-3 hourly including night feeds
- Continue until the baby weighs 1800g or more and is fully breastfeeding
- Check the baby's 24 hr intake

- The size of individual feed may vary

*NOTE: When feeding pre-term infants strictly use preterm formulas. Cow's milk or any other form of milk is contra indicated*

### **Breast milk**

- Breast milk provides same advantages to preterm infants as to the full term infant and it is the recommended form of enteral nutrition for preterm infants
- Early immune system development is particularly important for preterm infant to help protect against infection, including NEC. Contributions of breast milk to immune development are well confirmed
- **Human breast milk may not consistently provide all the nutrient requirements of preterm infants** and may vary depending on the stage of lactation at which it is collected. **Micronutrient fortifiers** should therefore be **added to breast milk to achieve desired targets**. Fortification of human milk with calcium and phosphate may improve bone mineral content
- Monitoring of the infant's nutritional status is important to ensure that breast milk is meeting the infant's needs
- Breast milk has non-nutrient advantages for preterm infants including immuno-protective properties and growth factors to the immature gut mucosa
- Some evidence show that preterm infants who receive human breast milk rather than formula milk have a lower incidence of feed intolerance and gastrointestinal upset, as well as lower incidence of necrotising enterocolitis

### **Supporting mothers to express breast milk**

Mothers may be very anxious after preterm delivery, especially if their infant needs intensive care. Although feeding might not be seen as an immediate concern, mothers should be aware that providing breast milk is one of the most important parts of their infant's care. Supporting mothers to provide expressed breast milk may be the most important intervention available for preterm infants. Feeding with expressed human milk reduces the risk of serious infection, which is a major cause of neonatal morbidity and mortality in preterm infants in developing countries.

Several initiatives may help mothers to express breast milk successfully:

- Supporting the mother on how to correctly position and attach their infants to the breast
- Stimulation of oxytocin reflex
- Early discussion of the importance of breast feeding
- Provision of relevant written information, education and communication (IEC) materials
- Encouraging frequent breast milk expression to empty the breast
- Simultaneous expression of both breasts
- Breast massage
- Skin to skin contact (Kangaroo method)

### How to express breast milk

- Place finger and thumb each side of the areola and press inwards towards the chest wall.
- Press behind the nipple and areola between your finger and thumb
- Press from the sides to empty all segments

### *Formula milks*

Despite optimal maternal support, expressed breast milk may not always be available. As an alternative, preterm infants may be fed with a variety of artificial formula milks. Broadly, these may be "term" formulae (based on the composition of mature breast milk), or calorie, protein, and mineral enriched "preterm" formulae (tailored to support intrauterine nutrient accretion rates). Concerns about feeding tolerance with cow's milk formula – characterized by vomiting, larger gastric residuals, gas and constipation – have prompted studies on the implications of protein source and type. In term formulas, improved digestibility has been observed with hydrolyzed formulas as compared to formulas with intact protein, and whey protein-based formula has been shown to promote a faster gastric emptying rate than casein. Therefore cow's milk should be discouraged. It is difficult to develop optimal recommendations for minimal effective volumes and quantity of volume increases considering that preterm infants differ widely with respect to developmental stage, particularly GI maturity.

**Very preterm infants** often have relatively delayed gastric emptying and intestinal peristalsis and may be slow to tolerate the introduction of gastric tube feeds. In such circumstances give intravenous nutrition (e.g. Amino venous, dextrose or Lipovenous 10% formulations) while enteral nutrition is being established or when enteral nutrition is not possible (e.g. because of respiratory instability, feed intolerance, or serious gastrointestinal disease).

**Total parenteral nutrition** should consist of glucose and amino acid solution with electrolytes, minerals, and vitamins, plus fat as the principal non-protein energy source. Bloodstream infection is the most common important complication of parenteral nutrition use. Delivery of the solution via a central venous catheter rather than a peripheral catheter is not associated with a higher risk of infection. Extravasation injury is a major concern when parenteral nutrition is given via a peripheral cannula. Subcutaneous infiltration of a hypertonic and irritant solution can cause local skin ulceration, secondary infection, and scarring.

### **Routes of administration of parenteral nutrition**

Intravenous solutions can be provided in different ways. The methods used depend on the person's immediate medical and nutrient needs, nutrition status and anticipated length of time on IV nutrition support. They include:

- Peripheral Parenteral Nutrition (PPN)
- Central Parenteral Nutrition (TPN)

*Note: The general decision to use PPN instead of CPN is based on comparative energy demands anticipated*



## CHAPTER NINE: DRUGS AND NUTRITION

### DRUG-NUTRIENT INTERACTIONS

A nutrient-drug interaction may impact the body in several ways. Certain foods can affect the rate at which the body uses a medication. A drug will not work as well if a certain nutrient in a food speeds up or slows down its absorption.

### FUNCTION OF A DRUG

A drug is taken to prevent or treat sickness and disease. It is important to know what happens in the body when a drug is taken in order to better understand the interaction between nutrients and drugs. The action of a drug taken orally generally occurs in four steps: (1) the drug dissolves in the stomach, (2) the drug is absorbed into the blood and moves via the blood to the area of the body that needs it, (3) the body reacts to the medicine, and (4) the body gets rid of the drug by way of detoxifying it either in the kidney, liver, or both.

### ADVERSE EFFECTS OF NUTRIENT-DRUG INTERACTIONS

Some drugs may affect the absorption of nutrients, while some foods—for example, those containing caffeine—can amplify or modify the effects of certain drugs. Taking drugs with hot beverages could also make them less effective. Short- or long-term instances of nutrient-drug interactions may be life threatening. A nutrient-drug interaction may also impact the nutritional status of the body. Nutrient-drug interactions can occur with both prescription and over-the-counter medicine.

### IMPACT OF FOOD ON EFFECTIVENESS OF A DRUG

Medication has ingredients, just as food does, that allow it to function correctly when taken in order to help the body in some way. A food may interfere with the effectiveness of a drug if the food interacts with the ingredients in the medication, preventing the drug from working properly. Either nutrients in food may delay absorption into the body or speed up elimination from the body, either or which can impact a drug's effectiveness. For example, the acidic ingredients in fruit juices are capable of decreasing the power of antibiotics such as penicillin. Tetracycline, another infection-fighting drug, is impacted by the consumption of dairy products. Many medications that are taken to fight depression can be dangerous if mixed with beverages or foods that consist of tyramine, which is found in items such as beer, red wine, and some cheeses.

Food can also impact the effectiveness of a drug due to the way it is consumed. Generally, medicine is to be taken at the same time food is eaten. This is because the medicine may upset the stomach if the stomach is empty. However, sometimes taking a drug at the same time that food is eaten can interfere with the way the medicine is absorbed by the body.

### IMPACT OF DRUG-NUTRIENT INTERACTION ON NUTRITIONAL STATUS

A drug has the capacity of interfering with a person's nutritional status. Appetite may be stimulated by a certain drug, resulting in an increase in nutrient intake due to more food being eaten. However, drugs may also cause a decrease in appetite, leading to a decrease in nutrient intake. In this case, a drug could possibly cause a nutritional deficiency. Nutritional status may also be impacted by a drug's effect on the three main nutrients: carbohydrates, fat, and protein. A drug may speed up or slow down the breakdown of these three nutrients, which are essential to the body's functioning. When a drug affects the absorption of nutrients from food into the body, less energy is available to be used by the body. The impact of the nutrient-drug interaction may vary according to the medicine taken, the dose of the medicine given, and the form taken (e.g., pill, liquid).

### THE ELDERLY AND NUTRIENT-DRUG INTERACTIONS

Elderly persons are at a significant risk for nutrient-drug interactions. This population often takes the highest amount of medications, and with the use of multiple drugs, certain problems may exist. A loss of appetite, a reduced sense of taste and smell, and swallowing problems all may result from medication use in elderly people.

Malnutrition is a common problem among older adults. Therefore, nutritional status may be already impacted by decreased nutrient intake. This may only worsen the effect of a possible nutrient-drug interaction. Elderly people who take many drugs on a routine basis for long periods are at greatest risk of nutrient depletion and nutritional deficiencies.

A nutrient-drug interaction may impact the body in several ways. Certain foods can affect the rate at which the body uses a medication. A drug will not work as well if a certain nutrient in a food speeds up or slows down its utilization.

### DRUG AND FOOD INTAKE

- Some drugs alter the appetite especially amphetamines reducing nutrient intake
- Methotrexate drugs interferes with taste or smell and may cause mouth sores and inflammation
- Digitalis can induce nausea and vomiting hence leading to nutrient loss
- Phenobarbital can cause dry mouth
- Cyclophosphamide induces mucosal ulcers

### DRUGS AND NUTRIENT ABSORPTION

- Antacids can interfere with iron absorption by changing the acidity of the digestive tract
- Climeidine can improve fat absorption by altering digestive juices
- Laxatives speed motility of the digestive tract causing malabsorption of many nutrients
- Neomycin may reduce lipase activity hence interfering with fat digestion
- Chemotherapy drugs can damage mucosal cells thereby affecting nutrient absorption
- Some antacids bind phosphorus hence hindering its' absorption

#### DRUGS AND NUTRIENTS INTERACTION

- Acting as structural analogs e.g. anticoagulants and vitamin K
- Competing with each other for metabolic enzyme systems e.g. phenobarbitol and folate
- Altering enzyme activity and contributing pharmacological active substance e.g. monoamine oxidase inhibitors and tyramine

#### DRUGS AND NUTRIENT EXCRETION

- Some diuretics increase the excretion of sodium and potassium
- Aspirin displaces folate from its' plasma protein carrier hence affecting its' excretion
- Some drugs inhibit or stimulate excessive secretions
- Atropine drugs (e.g. hyoscine spasmolytic) inhibit secretions in the gastrointestinal tract. Interfering with food lubrication and digestion
- Aspirin (antipyretic analgesic) lowers the gut PH steeply and causes physical corrosion of the mucosal lining. Patients with ulcers should not use aspirin

#### ALTERATION OF NUTRIENT BIOTRANSFORMATION AND BIOAVAILABILITY

- Tetracycline inhibit protein synthesis while chloramphenicol (antibiotic) and amphotericin B (antifungal) are potent catabolic agents
- Insulin (antidiabetic) and certain anabolic steroids promote protein synthesis
- Carbohydrate biotransformation is interfered with by glucagon which demolishes glycogen reserves in the liver
- Sulphonamides (anti-infective) produce hypoglycemia as a side effect by enhancing insulin production
- Chlorpromazine (antipsychotic) promotes lipid synthesis while carbamazepine (anticonvulsant) stimulates its' breakdown
- Fat soluble vitamins are mopped up by drugs formulated with mineral oils and are rendered unavailable for beneficial biotransformation

#### CHEMICAL REACTIONS

- Minerals in dairy products (calcium) combine with tetracycline to form insoluble complexes of no nutritional value. Tetracycline causes severe nausea and vomiting that makes food repulsive
- Aluminum containing antacids bind phosphates from the body thus reducing ATP energy reserves. The client becomes weak and disoriented.

#### EFFECTS OF FOOD ON DRUGS

- Pyridoxine in food blocks the effects of levodopa used in the treatment of parkinsonism
- Foods rich in dopamine (cheese, chicken, liver, red wine, bread, beans etc) cause hypertensive crisis and life threatening cerebrovascular accidents when taken alongside certain antidepressants; procarbazine and isoniazid
- Alcohol when taken with metronidazole, chloramphenicol or nitrofurantoin cause disulfiram reactions
- Alcohol produces prolonged hypoglycemic effects when taken with insulin and oral hypoglycemic agents
- Some foods e.g. candy can change the acidity of the gastrointestinal tract thereby causing the slow acting asthma medication to dissolve too quickly

- Foods that stimulate secretion of digestive juices increases absorption of some drugs e.g. griseofulvin
- Aspirin is absorbed more slowly when taken with food
- Vitamin C can alter urinary PH and limit the excretion of aspirin

#### AVOIDING DRUG-NUTRIENT INTERACTIONS

Drug-food interactions which are a potential threat to good nutrition should be avoided at all costs, unless the benefit expected outweighs the potential risk. Ensure the following;

- Take drugs at correct dose and frequency to reduce the severity of the side effects
- Take a gut-irritating drug with or after meals to reduce the chances of discomfort
- Drug administration and meal times may be staggered to avoid unintended interactions
- A drug likely to interact unfavorably with food may be given parenterally
- A drug causing epigastric pain may be given likewise or rectally or as a necessary
- Taking syrup or a liquid drug may prevent prolonged stay of the drug in the gastrointestinal tract hence reducing chances of interaction with food
- If taking phenelzine drug (antidepressant) abstain from eating liver

Table 68 below shows common drug nutrient interactions.

**Table 68: Common drug nutrient interactions**

Therapeutic Class	Drug	Nutrient Interaction
Alcohols	Ethanol	Reduced absorption of fat, retinol, thiamin, cobalamin and folate; impaired utilization and storage of retinol; increased urinary excretion of zinc and magnesium.
Analgesics	Aspirin	Increased urinary excretion of ascorbic acid; may cause GI bleeding and subsequent iron deficiency; increased folate and vitamin D requirements.
Antacids	Al or Ca containing	Reduced iron, copper, phosphate and magnesium absorption.
Antibiotics	Penicillin's Amino glycosides Chloramphenicol	Increased urinary excretion of amino acids; reduced intestinal vitamin K and cobalamin synthesis; possible malabsorption of fat, cobalamin, calcium, magnesium and carotenoids.
Anticoagulants	Coumadin	Vitamin K decreases & tocopherol increases drug effect.
Anticonvulsants	Phenobarbital Phenytoin	Folate antagonists; Increased vitamin D, vitamin K and pyridoxine requirements; Impaired vitamin D metabolism leading to hypomagnesaemia, hypocalcemia and hypophosphatemia.
Antidepressants	Imipramine	May induce riboflavin deficiency; increased appetite.
Antihypertensive	Hydralazine	Pyridoxine antagonist; increased urinary excretion of manganese and pyridoxine.
Antimalarials	Pyrimethamine Sulfadoxine	Folate antagonists.
Antineoplastics	Methotrexate	Folate antagonist; may impair fat, calcium, cobalamin, lactose, folate and carotene absorption.
Antitubercular	Isoniazid	Accelerated metabolism of pyridoxine - subsequent pyridoxine deficiency blocks conversion of tryptophan to niacin leading to niacin deficiency; reduced calcium absorption; reduced conversion of Vitamin D by the liver.
Antiulcer	Cimetidine	Impaired cobalamin absorption.
Cardiac Glycosides	Digoxin  Hydrocortisone Prednisone Dexamethasone	Increased urinary excretion of calcium, magnesium and zinc, Anorexia. Reduced calcium and phosphate absorption; increased urinary calcium, potassium, ascorbic acid, and zinc and nitrogen excretion. Increased pyridoxine and vitamin D metabolic requirements.
Diuretics	Furosemide Thiazides Spironolactone	Increased urinary potassium, sodium, and chloride, magnesium, zinc and iodine excretion; reduced calcium excretion leading to hypercalcemia and hypophosphatemia with Thiazides, increased calcium excretion with furosemide. Increased urinary sodium and chloride; reduced urinary potassium excretion.
Hypocholesterolemic Agents	Cholestyramine Colestipol	Reduced absorption of fat, fat soluble vitamins, calcium, cobalamin, and folate.
Laxatives	Bisacodyl Phenolphthalein Mineral Oil	Abuse leads to general malabsorption, steatorrhea and dehydration. Malabsorption of fat soluble vitamins, electrolytes, calcium.
Oral Contraceptives	Conjugated estrogens Ethinyl estradiol Mestranol	Increased folic acid & possibly pyridoxine & ascorbic acid requirements; reduced calcium excretion, altered tryptophan metabolism.
Stimulants	Caffeine	Increased urinary calcium excretion.

Source: University of Washington (1997)

## ANTIRETROVIRAL DRUGS AND FOOD RECOMMENDATIONS

To reduce unfavorable food –drug interactions special food recommendations are given for various ARV drugs, as shown in the table below;

**Table 69: ARV Drugs and Food Interactions**

Drug	Food recommendation
Efavirenz	Can be taken without regard to meals Avoid high fat meals and alcohol and st john's wort
Nevirapine	Can be taken without regard to meals. avoid st john's wort
Lamivudine	Can be taken without regard to meals. Avoid alcohol
Stavudine	Can be taken without regard to meals. Avoid alcohol
Zidovudine	<ul style="list-style-type: none"> <li>• Take without food</li> <li>• If it causes nausea and vomiting take with low fat meal</li> <li>• May require Zinc and copper supplementation</li> <li>• Avoid alcohol</li> </ul>
Abacavir	Can be taken without regard to meals. Avoid alcohol
Didanosine	<ul style="list-style-type: none"> <li>• Take on an empty stomach (30 minutes before or 2 hours after eating)</li> <li>• Take with water only (food reduces its' absorption)</li> <li>• Avoid alcohol, Grape fruit juice, Antacids containing aluminum or magnesium</li> </ul>
Tenofovir	Take with a meal. Avoid alcohol
Indinavir	<ul style="list-style-type: none"> <li>• Take on an empty stomach (1 hour before or two hours after a meal or with a light non fat meal</li> <li>• Take with plenty of water to avoid kidney problems-at least 1.5 liters of fluids daily to prevent kidney stones</li> <li>• Avoid grape fruits and st john's wort</li> </ul>
Lopinavir	<ul style="list-style-type: none"> <li>• Take with food</li> <li>• Should be taken with a moderate fat meal for better absorption</li> <li>• Avoid john's wort</li> </ul>
Nelfinavir	<ul style="list-style-type: none"> <li>• Take with food</li> <li>• High fat food preferred for better absorption</li> <li>• Avoid john's wort</li> </ul>
Saquinavir	<ul style="list-style-type: none"> <li>• Take with a meal or light snack</li> <li>• Take within 2 hours of a high fat meal</li> <li>• Avoid john's wort garlic and supplements</li> </ul>
<ul style="list-style-type: none"> <li>• Sulfonamides,</li> <li>• sulfamethoxazole,</li> <li>• cotrimoxazole,</li> </ul> antibiotics for treating/prophylaxis for pneumonia and toxoplasmosis.	<ul style="list-style-type: none"> <li>• Take with food</li> <li>• Take on an empty stomach, one hour before or two hours after meals</li> <li>• Avoid alcohol</li> </ul>
Isoniazid	<ul style="list-style-type: none"> <li>• One hour before or two hours after meals</li> <li>• Supplement with 50mg pyridoxine in all TB/HIV pts (to prevent peripheral neuropathy and anaemia)</li> </ul>

Source Kenyan Nutrition and HIV guidelines (2007)

## NUTRITIONAL SUPPLEMENTS

It is important to have set standards for commercial nutritional supplements for health facilities, to ensure that the supplements procured provide considerable contribution to the nutritional status of the patients/clients. The table below provides a summary of the basic requirements of commercial supplements.

**Table 70: Basic Requirements for Commercial Nutritional Supplements for Hospitals**

Type of Nutritional Supplement.	Basic requirements.
Nutritionally complete liquid diets.	Approximately 1 Kcal per ml; 3.8-4.4gm protein per 100 ml; Shelf life of >1yr. Feed with fiber for diabetic pts. High energy protein drink with hydrolyzed protein for pts with GIT disturbances to provide 1.2kcal/ml and 3.5-4.0 gm protein per 100ml The drink should also be milk protein free, fat and lactose free and gluten free. In assorted flavors.
Preterm and low birth weight infant formula.	13-15gm protein per 100g powder; 54-56 gm CHO per 100g powder; 23-25gm fat per 100g powder; Shelf life of >1yr.
Infant formula for infants of normal weight (above 2,500gm) aged below 6 months.	11-12gm protein per 100g powder; 56-58gm CHO per 100g powder; 25-28gm fat per 100g powder; Whey predominant with lactose as carbohydrate source; Shelf life of >1yr.
Pediatric nutritionally complete diet for children 1-10 years.	3.0-4.0 gm protein per 100 ml; 10-20gm CHO per 100ml; 5-7gm fat per 100ml; Enriched with vitamins and minerals; Shelf life of >1yr.
Follow-up infant formula for children above six months with probiotics and iron.	2.2-2.7gm protein per 100 ml; Casein predominant; shelf life of >1yr.
Nutritionally complete balanced diet for Enteral and oral use.	Low osmolarity and isocaloric feed, enriched with insoluble and soluble fiber; 35-40gm protein per liter; 120-190gm CHO per liter; 25-40gm fat per liter; Enriched with micronutrients. Shelf life of >1yr.
Nutritionally complete balanced diet for Enteral tube or oral feeding of patients with hyperglycemia.	<ul style="list-style-type: none"> <li>• Isocaloric diet enriched with fiber</li> <li>• 0.9-1kcal/ml</li> <li>• 35-40gm protein per liter</li> <li>• 80-115gm CHO per liter</li> <li>• 40-45gm fat per liter</li> <li>• Shelf life of &gt;1yr</li> </ul>
High protein and energy sip feed for catabolic patients.	<ul style="list-style-type: none"> <li>• 8-10gm protein per 100 ml</li> <li>• 1.5-1.7kcal/ml</li> <li>• Shelf life of &gt;1yr</li> </ul>
Breast milk fortifier for premature or low birth weight infants.	<ul style="list-style-type: none"> <li>• To provide 350-400 kcal</li> <li>• 20-25gm protein per 100gm powder</li> <li>• 65-70gm CHO per 100gm powder</li> <li>• Shelf life of &gt;1yr</li> </ul>





## CHAPTER TEN: BEHAVIOUR CHANGE COMMUNICATION (BCC)

### OVERVIEW OF BEHAVIOUR CHANGE COMMUNICATION

Human behavior is a very complex area. This chapter draws on key sources from the disciplines of social psychology, economics and behavioral economics (where the first two disciplines overlap). 'Individual behaviors are deeply embedded in social and institutional contexts. We are guided as much by what others around us say and do, and by the "rules of the game" as we are by personal choice.'

The factors that influence behavior fall into the following broad levels: personal; social; local environment; and wider environment. Providing information is therefore a first step towards influencing behavior change rather than an end point. Communication can be effective in highlighting social norms and prompting people to act in accordance with them.

Given the likely growth in diversity, communication interventions to affect health behavior are an increasingly important strategy for improving the health. Constructing such interventions to effectively influence individuals in diverse populations to engage in healthy behavior however relies on an understanding of the social and cultural contexts that shape the behavior of individuals, families, and communities. Belief systems, religious and cultural values, and group identity are all powerful filters through which information is received and processed.

### WHAT IS BEHAVIOR CHANGE COMMUNICATION?

This is a strategy, which refers to the systematic attempt to modify/influence behavior, or practices and environmental factors related to that behavior, which directly or indirectly promote health, prevent illness or protect individuals from harm. It involves interactive process with clients to develop tailored messages and approaches using a variety of communication channels to develop positive behaviors; promote and sustain individual, community and societal behavior change; and maintain appropriate behaviors.

### WHAT IS THE DIFFERENCE BETWEEN BCC AND IEC?

Experience has shown that providing people with information and telling them how they should behave ("teaching" them) is not enough to bring about behavior change. While providing information to help people to make a personal decision is a necessary part of behavior change, BCC recognizes that behavior is not only a matter of having information and making a personal choice. Behavior change also requires a supportive environment. Behavior change communication" is influenced by "development" and "health services provision" and the individual is influenced by community and society. Community and society provide the supportive environment necessary for behavior change. IEC is thus part of BCC while BCC builds on IEC.

### WHAT IS COMMUNICATION?

This is a process of transmitting and receiving information on a particular topic between people i.e. the sender and the receiver.

## TYPES OF COMMUNICATION

- Intra-personal: Communication with oneself
- Interpersonal: Face to face communication between individuals
- Mass communication: An individual communicating with many people such as through radio.
- Organizational communication: Communication among groups or within groups

*Establishing rapport* is establishment of a relationship that is harmonious or empathetic. It implies building trust, having each others' best interest in mind and having mutual respect.

## IMPORTANCE OF RAPPORT IN CLIENT-PROVIDER INTERACTION

- Establishing rapport is a critical step in effective communication
- It's enables clients/patients to express themselves adequately
- When rapport is well established, information is well understood, and clients are likely to comply with advice

## BEHAVIOR CHANGE INTERVENTION

This is a combination of activities/interventions tailored to the needs of a specific group and developed with that group to help reduce risk behaviors and vulnerability to health problems by creating an enabling environment for individual and collective change. Before designing a BCC intervention, it is important to be clear about exactly whose behavior is to be influenced and which aspect of their behavior should be the focus for change. Different clients have different nutritional risk and vulnerability factors. Even within the same broad group, there may be subgroups with distinct characteristics for example in a group of diabetes clients, the pregnant women may need specific attention outside the routine nutrition care given to the other clients. Different target groups will require different approaches. Therefore, when making decisions about which target groups and which factors to address, it is necessary to consider:

- Which target groups are most vulnerable;
- Which risk / vulnerability factors are most important;
- Which factors may be related to the impact of conflict and displacement;
- Which target groups and risk / vulnerability factors the community wants to address;
- What could be motivators for behavior change;
- What could be barriers to behavior change;
- What type of messages will be meaningful to each target group;
- Which communication media would best reach the target group;
- Which services/resources are accessible to the target group;
- Which target groups and risk / vulnerability factors are feasible in terms of expertise, resources and time

## STEPS TO BEHAVIOR CHANGE

These are the ideal steps one follows towards behavior change. They may apply to health workers or community members

### **Knowledge:**

- One first learns about a new behavior
- Recalls messages and understands meaning of the messages
- Can name strategies and practices

### **Approval:**

- One then approves of the new behavior
- Responds favorably to messages
- Discusses the information with personal network (professional, colleagues, family and friends)
- Thinks professional colleagues, family, friends and community approves of practices

### **Intention:**

- One then believes this behavior is beneficial to them and intends to adopt it
- Recognizes that behavior change strategies can meet a personal health and nutritional need
- Intends to adopt the agreed practices

### **Practice:**

- One then attempts new behavior and continues to practice

### **Advocacy**

- One can then promote the new behavior through their social or professional networks as a satisfied practitioner
- Experiences and acknowledges personal benefits of adopting behaviors that enhance health

## HEALTH EDUCATION

This is a part of health behavior and communication. Health education for high-risk persons, patients, their families, and the surrounding community and in-service training for health care providers are all part of health care today. The changing nature of health service delivery has stimulated greater emphasis on health education in physicians' offices, health maintenance organizations, public health clinics, and hospitals. Primary care settings, in particular, provide an opportunity to reach a substantial number of people. Health education in these settings focuses on preventing and detecting disease, helping people make decisions about healthy lifestyles, and managing acute and chronic illnesses.

Health education is an important component of health promotion. It refers to learning experiences to facilitate individual adoption of healthy behaviors. Health promotion is no longer understood as limited to educational efforts and individual changes. It also includes the promotion of public policies that are responsible for shaping a healthy environment. The goal of health promotion is to facilitate the environmental conditions to support healthy behaviors. Individual knowledge, as conceived in traditional approaches, is insufficient if groups lack basic systems that facilitate the adoption of healthy practices. The mobilization of a diversity of social forces including families and communities is necessary to shape a healthy environment. A good example is in the promotion of appropriate infant feeding practices, the immediate family and the community at large has a large influence on the decisions a mother makes on how to feed her baby. This means that key messages on issues of infant feeding should also target this secondary and tertiary audience.

## NUTRITION EDUCATION

This is a form of health education but specific to nutrition and nutrition related issues. Nutrition education includes different kinds of interventions such as conventional education, social marketing, health communication, and empowerment actions. Consequently, a vast range of activities such as peer education, training of health workers, community mobilization, and social marketing are considered examples of nutrition education interventions.

Typically, nutrition education for a long time consisted of little more than "talks" given at health centers. Today, this approach is considered largely ineffective unless it is fully integrated into a broader program of nutrition education with well-defined strategies for communication.

The reasons for failure of "conventional" nutrition education have been the subject of numerous in-depth analyses. The "conventional" approach is limited because it excludes analysis of the causes of the health problem at hand and makes use of only one isolated channel of communication (an interpersonal channel between the health worker and the population) and ineffective educational methods.

During the last two decades, interdisciplinary teams in collaboration with persons involved in nutrition education field activities have developed new approaches to nutrition education. In nutrition education, there are two distinct situations, namely, patient education and public education.

- Patient education - Occurs during personal contact between the health worker and his patient. This is person-to-person communication during which the health worker communicates with an individual in order to improve the parents' or their child's nutritional status.
- Public education - Consists of interventions for improving the health of the general public. Nutrition education is concerned with modifying social communication to bring about middle or long-term changes in the common behavior of the population. When interpersonal communication forms part of the proposed strategy, it has a complementary role, reinforcing other activities aimed at changing the behavior of an entire social group.

### **NUTRITION COUNSELING:**

This is face-to-face communication between two people whereby one person helps another person make a decision or plan and act on it. During counseling there is need for information control.

Controlling information ensures that;

- Too much information is not given at ago
- The information is not confusing
- Information moves from known to unknown
- The information moves from simple to complex
- The core/essential information (the need to know) is separated from the nice/non essential to know
- The information remains to the objectives

### STEPS IN COUNSELING

The counseling process involves two techniques for counseling. These follow methodologically six (6) key steps summarized by the acronym “**GATHER**” which is the **practical counseling process**:

1. **GREET** the clients (establishing rapport)
2. **ASK** clients (gathering information)
3. **TELL** (provide information)
4. **HELP** the client make informed decision
5. **EXPLAIN** to the client all the details
6. **RETURN/REFER/REALITY CHECK** (Return visits or referrals should be planned where necessary)

Another common technique used in counseling is summarized in the acronym SOLAR

1. **Sit** Squarely
2. **O**pen Space
3. **L**ean forward as a sign of listening
4. **E**ye contact
5. **R**elax and reassure

## CHAPTER ELEVEN: STANDARD OPERATING PROCEDURES

### QUALITY ASSURANCE AND CONTROL

Quality control is a process employed to ensure a certain level of quality in a product or service. In the field of nutrition it is a system of routine technical activities used to measure and control the quality of nutrition services. The basic goal of quality control is to ensure that nutrition management and care meet specific requirements and are dependable, satisfactory and cost effective. The quality control is not only for products products, services and processes but also personnel.

It is designed to

- Provide routine and consistent checks to ensure data integrity, correctness and completeness
- Identify and address errors and omissions
- Document and record all QC activities in nutrition care

Quality assurance is a planned system of review of procedures conducted by personnel not directly involved in offering the nutrition and dietetics services. It involves testing of products and services to ensure that they meet the standards of quality. The reviews help to verify the objectives of care are met, ensure the care represents the best practice given the current state of scientific knowledge and data and support the effectiveness of the quality control programme.

Quality assurance and control is a good practice in nutrition and dietetic care. Its activities include general methods such as accuracy checks for example in anthropometric measurement, use of standardized procedures in day to day operations, data recording and reporting.

### STANDARD OPERATING PROCEDURES

A standard operating procedure consists of a set of instructions having the force of a directive, and covering those features of operations that lend themselves to a definite or standardized procedure without loss of effectiveness. Standard operating procedures are detailed written instructions to achieve uniformity in performance of a specific function. They provide detailed description of commonly used procedures in various sections or departments.

#### IMPORTANCE

- They provide for uniformity in service delivery across board
- Help to standardize nutrition care in various sections
- Serves as a reference point in monitoring and evaluation of the care given to clients
- It allow for comparability across board due to standardization in practice

Standard Operating Policies and Procedures can act as effective catalysts to drive performance-improvement and improve organizational results. Every good quality system is based on its standard operating procedures (SOPs). Table 71-4 provides framework for nutrition care and practice for the four steps of nutrition care process.

## FRAMEWORK FOR NUTRITION CARE

**Table 71: Framework for Nutrition Assessment SOP**

Factors and Bench marking of Best Practice	Measure of best Practice	Action required	Review of Action taken to date(to be filled in by user)
<p><u>Factor 1</u> Screening/Assessment: To identify nutrition-related problems and client needs.</p> <p><u>Best Practice</u> <b>Nutrition screening:</b> Screening progresses to further assessment for all patients identified with problems or at risk.</p>	1. Member of the multi-disciplinary team to assess the patient within 12 hours of admission (in patients) and 30 minutes for outpatient.	1. Implement best practice in all areas.	<i>E.g. All wards have the nutritional screening in cadex</i>
	2. Nutrition screening and assessment tool (appendix 2).	2. Collect client data on nutritional adequacy ,health status and functional and behavioral status	<i>e.g., equipment data collection tools were availed to all sections. It was discussed that this information necessary for the nutrition care plan</i>
	3. Requires making comparisons between the information obtained during screening and assessment and reference standards.(appendix 3)	3. Use standard data collection tools (appendix 2)	<i>Standard charts and job aids were availed to all sections</i>
	4. Reassessment and analysis of patient/client needs.		



**Table 72: Framework for Nutrition Diagnosis SOP**

Factors and Bench marking of Best Practice	Measure of best Practice	Action required	Review of Action taken to date(to be filled in by user)
<p><u>Factor 1</u> Nutrition Diagnosis: Identification and labeling that describes an actual occurrence, risk of, or potential for developing a nutritional problem.</p> <p><u>Best Practice</u> <b>Nutrition                      Diagnosis statement</b></p>	<p>A Nutrition Diagnostic Statement written in a PES format states the Problem (P), the Etiology (E), and the Signs &amp; Symptoms (S).</p>	<ol style="list-style-type: none"> <li>1. Implement best practice for all clients</li> <li>2. Ensure that the Diagnostic statement is:               <ol style="list-style-type: none"> <li>i. <i>Clear and concise</i></li> <li>ii. <i>Specific: patient/client</i></li> <li>iii. <i>Related to one client problem</i></li> <li>iv. <i>Accurate: relate to one etiology</i></li> </ol> </li> <li>3. Use the standard references to identify and label correctly (appendix 3)</li> </ol>	<p><i>E.g. check patient notes for Nutrition Diagnosis</i></p> <p><i>e.g., the diagnostic statements are written in PES format with the keywords (...As Evidenced By"...and Related To...)</i></p> <p><i>e.g., correctness of nutrition diagnostic statements</i></p>

**Table 73: Framework for Nutrition Intervention SOP**

Factors and Bench marking of Best Practice	Measure of best Practice	Action required	Review of Action taken to date(to be filled in by user)
<p><u>Factor 1</u> Nutrition Intervention: purposefully planned actions designed with the intent of changing a nutrition-related behavior, risk factor, or aspect of health status for an individual.</p> <p><u>Best Practice</u> <b>Nutrition Intervention:</b> The selection of nutrition interventions based on nutrition diagnosis that provides the basis upon which outcomes are measured and evaluated.</p>	<p>All interventions must be based on scientific principles and rationale and, when available, grounded in a high level of quality research (evidence-based interventions).</p>	<ol style="list-style-type: none"> <li>1. Select the most appropriate intervention.</li> <li>2. <b>Plan the nutrition intervention</b> (formulate &amp; determine a plan of action)               <ol style="list-style-type: none"> <li>i. Prioritize.</li> <li>ii. Consult other practice guides or job aids.</li> <li>iii. Determine patient-focused expected outcomes</li> </ol> </li> <li>3. <b>Implement the nutrition intervention</b> <ol style="list-style-type: none"> <li>i. Communicate the plan of nutrition care;</li> <li>ii. Carry out the plan of nutrition care; and</li> <li>iii. Continue data collection and modify the plan of care as needed.</li> </ol> </li> </ol>	<p><i>E.g., interventions are selected based on nutrition diagnosis statement</i></p> <p><i>e.g., the intervention formulated was case – specific and followed the recommended guidelines for nutrition care</i></p> <p><i>e.g., patient notes with plan of care clearly outlined and goals set for the patient/client</i></p>

**Table 74: Framework for Nutrition Monitoring and Evaluation SOP**

Factors and Benchmarking of Best Practice	Measure of best Practice	Action required	Review of Action taken to date(to be filled in by user)
<p><u>Factor 1</u> Monitoring and evaluation: To determine the degree to which progress is being made and goals and desired outcomes of nutrition care are being met</p> <p><u>Best Practice</u> <b>Nutrition Monitoring and Evaluation:</b> Use of selected outcome indicators (markers) that are relevant to the patient/client defined needs nutrition diagnosis, nutrition goals, and disease state.</p>	<p>An active commitment to measuring and recording the appropriate outcome indicators (markers) relevant to the nutrition diagnosis and intervention strategies</p>	<p>1. Monitor progress</p> <ul style="list-style-type: none"> <li>• Check patient understanding and compliance;</li> <li>• Provide evidence whether the intervention strategy is or is not working;</li> <li>• Gather information indicating reasons for lack of progress.</li> </ul>	<p><i>E.g. data is collected on indicators that monitor progress</i></p>
		<p>2. Measure outcomes</p> <ol style="list-style-type: none"> <li>i. Select SMART outcome indicators</li> <li>ii. Use standardized indicators</li> </ol>	<p><i>e.g., data is submitted based on the standardized indicators</i></p>
		<p>3. Evaluate Outcomes</p> <ol style="list-style-type: none"> <li>i. Compare current findings with previous status, intervention goals, and/or reference standards</li> </ol>	<p><i>e.g., outcomes from synthesized data is used to inform decision making for determination for continuation of care</i></p>

## CHAPTER TWELVE: MONITORING AND REPORTING

**Monitoring** is the systematic collection and analysis of information as the activity progresses. It is aimed at improving the efficiency and effectiveness of an activity or intervention and is based on targets set and activities planned during the planning phases of work. It helps to keep the work on track, and can let service provider and/or management know when things are going wrong. If done properly, it is an invaluable tool for good management, and it provides a useful base for evaluation. It enables you to determine whether the resources you have available are sufficient and are being well used, whether the capacity you have is sufficient and appropriate, and whether you are doing what you planned to do.

**Evaluation** on the other hand is the comparison of actual activity impacts against the agreed strategic plans. It looks at what you set out to do, at what you have accomplished, and how you accomplished it. It can be **formative** (taking place during the life of an activity, project or organization, with the intention of improving the strategy or way of functioning of the activity, project or organization). It can also be **summative** (drawing lessons from a completed activity, project or on discharge of a patient from a particular intervention).

Through monitoring and evaluation, one can:

- Review progress
- Identify problems in planning and/or implementation of an activity
- Make adjustments so that you are more likely to “make a difference” whether it’s in the management of a patient or a program

## DATA QUALITY

### IMPORTANCE OF DATA QUALITY

Missing values such as age, sex provide a challenge in stratified data reporting for instance it would be impossible to attribute whether certain results were influenced by gender when gender variable is not recorded. It would also not be possible to determine whether interventions best suited a particular client/patient when the very vitals that determine their eligibility (such as weight, height, MUAC) are not recorded.

### IMPROVING DATA QUALITY

Data use within the facility is important for patient management. It is important therefore to continually improve on data quality as well as use the knowledge to improve the data gathering process. This then becomes a continuous process proceeded by data gathering, profiling, quality improvement and integrating lessons learnt thereby enriching the data collected subsequently and the program learning process. This process is depicted in the diagram 12.1 below.

### PROFILING:

The process of profiling observations relating to data quality will be done by conducting routine data analysis every month.

### QUALITY IMPROVEMENT

Issues to improve on shall be addressed through support supervision site visits and performing of regular quality checks based on a checklist.

### INTEGRATION OF LESSONS LEARNED

Integration of lessons learned into the data collection, analysis system shall lead to enrichment of data collected subsequently. Control mechanisms shall be introduced to help in monitoring of quality. Figure 18 below data quality integration cycle.

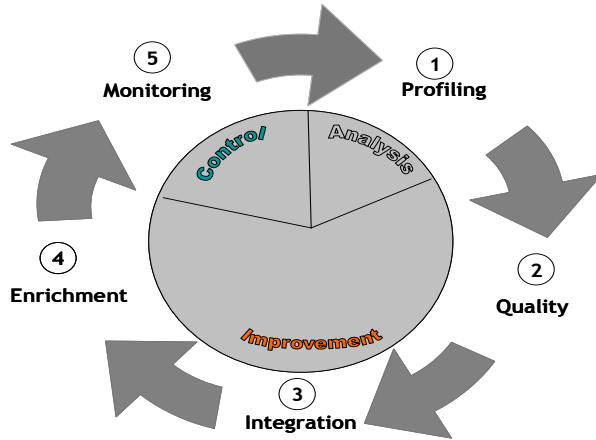


Figure 18: Platform for data quality integration

## USES OF DATA

### IMPLEMENTATION PLANNING

Monthly data can be used to compare trends over time. These trends help in planning for future needs and activity demands. It is therefore important that optimal tracking of processes is done well so that information derived from process tracking can be used to inform activity implementation. By observing trends over time, implementer is able to make adjustments to previous projections based on current trends. This continuous process enables timely planning and efficient use of resources.

*In case of patient care, data helps the health care provider to monitor the patient progress and inform on planning appropriate interventions.*

### FORECASTING

Using data collected over time will help implementer to make projections for the future. For instance, using daily consumption data will allow the implementer to see the daily and monthly demands and project demands for subsequent months.

### INFORMING FUTURE ACTIVITIES

To inform future activities, an evaluation of the current activity should be done. Lessons learned then serve the purpose of informing decision makers what works and what does not.

## CRITICAL PRACTICES FOR MONITORING AND EVALUATION

Routine data quality checks as well as continuous data quality checks helps to improve the quality of indicators. Reporting requires that data should meet the following requirements:

1. **Accuracy:** It is important to accurately record the patients'/clients' vitals such as weight, height, MUAC, HB etc. Equipment-routine maintenance to be done in each facility
2. **Reliability:** Recording accurately is not the only requirement since recorded data needs to be reliable so that the conclusions drawn from analysis are not spurious. For example, the

height of an adult should remain the same most of their adult life, and should not vary on every date of distribution. Remember, garbage-in garbage-out

3. **Timeliness:** For effective management of patients, the data collected needs to be collected in good time so as not to delay the decision making process
4. **Completeness:** Indicators are generated from a combination of data components. It is therefore important that the data collected is complete so that the information generated is whole. Good data should be complete, that is, it has every necessary part or every detail that is wanted. For example, in calculating BMI, both variables (weight and height) are needed. It follows that when one misses, BMI cannot be calculated. Similarly, a computer generates accurate Z scores, when date of birth and anthropometric measurements are recorded
5. **Precision:** For all measurements, it is important that the correct readings from the measuring instrument are collected. Ensure that all anthropometric equipment is calibrated before taking measurements
6. **Storage** -all equipments should be properly stored for safety
7. **Confidentiality:** For all patient records, it is important to maintain confidentiality. This means that details of a patient's records cannot be divulged to unauthorized persons. Medical records should also be kept under lock and key

## INDICATORS

### INPUT INDICATORS

- Proportion of facilities or sites with functional pediatrics and adult scales
- Proportion of facilities or sites with nutrition counseling cards and/or nutrition job aids
- Proportion or number of facilities or sites with at least one service provider (nutrition, counselor) trained in a GOK-approved course
- Proportion of facilities or sites with copies of national nutrition guidelines

### OUTPUT INDICATORS

- Number and proportion of patients counseled in nutrition in past three months
- Proportion of patients who had weight monitored in past three months(classify by age)
- Number and proportion of facilities/sites (providing care and treatment) that are providing nutritional education and counseling services
- Proportion of nutrition counseling sessions scoring satisfactory or higher on a counseling checklist
- Proportion of patients receiving therapeutic or supplementary food support

### OUTCOME INDICATORS

1. Proportion of patients who know appropriate dietary responses to symptoms
2. Proportion of patients consuming nutritionally adequate meals and two snacks the day prior to appointment

3. Proportion of patients who (complied) used one or more recommended nutritional practices to manage symptoms over past 7 days
4. Length of hospital stay for patients under nutrition care
5. Number of facilities utilizing the national nutrition guidelines
6. Number of trainings/continuous medical education sessions done

#### IMPACT INDICATORS

- Proportion of patients with <500 grams body weight loss in past ONE month
- Proportion of patients with BMI  $\geq 18.5$  / MUAC > 21cm
- Proportion of children with < 3 SD or MUAC <12.5 cm
- Proportion patients with same or decreased severity of symptoms since last appointment
- Proportion of patients on therapeutic feeds
- Proportion of patients on nutrition counseling
- Proportion patients performing 30 minutes or more of moderate to intense physical activity the day prior to appt (e.g. walking, housework, agricultural work, exercise)
- Proportion of health care providers trained on the guidelines
- Proportion of clients discharged from the program cured



## GLOSSARY

**24-hour recall**-a method of dietary assessment in which the individual is asked to remember everything eaten during the past 24 hours

**Acidosis** – a state whereby the pH of arterial blood drops below the normal range of 7.35-7.47 due to an increase in bicarbonate levels or a reduction in bicarbonate levels

**Anthropometry**- the science of measuring the size, weight and proportions of the human body

**Anti-retro Viral therapy** - Treatment of persons with AIDS using drugs that specifically deals with treatment of viruses including the HIV virus

**Arteriosclerosis**- sclerosis (hardening) and thickening of the arterial wall, with loss of elasticity

**Assessment** –the science of determining nutrition status by analyzing clinical, dietary and social history; anthropometric data; biochemical data and nutrient drug interaction

**Asymptomatic** - A person infected with a disease but without clinical signs and symptoms

**Atherosclerosis** –a form of arteriosclerosis; a complex process of thickening and narrowing of the arterial walls caused by the accumulation of lipids, primarily cholesterol in the intimal or inner layer in combination with connective tissue and calcification

**Azotemia** - the accumulation in the blood of the abnormal quantities of urea, uric acid, creatinine and other nitrogenous wastes

**Basal energy expenditure**- the amount of energy used in 24 hours by a person who is lying quietly, 12 hours after the last meal, in comfortable temperature and environment

**Basal metabolic rate** –the basal energy expenditure expressed as kcal/kg/ hour

**Bioavailability**-the degree to which a drug or other substances become available to the target tissue

**Blood glucose monitoring or self monitoring of blood glucose (SMBG)** - a method whereby individuals can test their blood glucose levels. A drop of blood is placed on a chemically treated strip which changes color according to the amount of glucose in the blood. The level of blood glucose can be determined by visually comparing the strip to a color chart or by inserting the strip into a meter that reads the correct level of glucose.

**Body mass Index (BMI)**- weight in kg divided by height in meters squared; a definition of the level of adiposity.

**Calorie** –the amount of energy required to raise the temperature of 1 ml of water at a standard initial temperature by 1° C

**Cancer cachexia**- the weak, malnourished and emaciated condition that results from cancer

**Catheter**- a very fine tube that can be threaded into the lumen of a blood vessel for infusion of fluids or withdrawal of blood

**CD4 cells** - A subset of specialized lymphocytes that are essential in fighting (attacking) infections used as a marker for HIV progress

**Cholesterol** - A fat-like substance that is produced in the liver, and also found in animal-source foods. It circulates in blood as low-density lipoproteins (LDL) and high-density lipoproteins (HDL)

**Dehydration**-excessive loss of body fluid

**Dextrose**- a form of glucose that contains water, dextrose provides 3.4cal/g not 4.0cal/g as glucose

**Diabetic ketoacidosis**- severe, uncontrolled diabetes, resulting from insufficient insulin; ketone bodies build up in the blood. If not treated with insulin and fluids immediately it can lead to coma and even death

**Diet prescription**-part of the implementation of nutrition care; designates the type, amount, frequency of feeding, the amount and form of protein, carbohydrates, fat, fluid, vitamins and minerals

**Dietary history**- a detailed dietary assessment which may include a 24hour recall, food frequency questionnaire, and additional information such as weight history previous diet change, use of supplements and food intolerance

**Drug nutrient interaction**-the result of the action between a drug and a nutrient that would not happen with the nutrient or the drug alone

**Eclampsia** –the late stage of pregnancy induced hypertension characterized by proteinuria and often grand mal seizure occurring near the time of labor

**Edema**- abnormal accumulation of fluids in the intercellular tissue spaces or body cavities

**Electrolytes**- a substance that dissociates into positively and negatively charged ions when dissolved in water

**End stage renal disease**-a disease characterized by the kidney inability to excrete waste products, maintain fluid and electrolyte balance and produce hormones

**Enteral nutrition**-the delivery of nutrients directly into the gastro intestinal tract (stomach, duodenum or jejunum) commonly known as tube feeding

**Essential fatty Acids**-fatty acids which the body needs but cannot synthesize. The two main essential fatty acids are linoleic and  $\alpha$ -linolenic acid

**Extremely low birth weight infants (ELBW)** - referring to an infant who weighs less than 1000g (2 ¼ lb) at birth

**Fatty Acid**- a straight carbon chain, usually with an even number of carbons and carboxyl group at one end and a methyl group at the other end

**Fibre** - the group name for carbohydrates that are not digested in the human gastrointestinal tract

**Gastric residuals** - the volume of feeding remaining in the stomach from a previous feeding

**Gestational age** - the age of infant at birth as determined by the length of the pregnancy (the number of weeks since the last menstrual period) it can also be determined by clinical assessment.

**Gestational diabetes** - diabetes that occurs only during pregnancy

**Glomerula filtration rate (GFR)**-the quantity of glomerula filtrate formed per unit in all nephrons of both kidneys

**Hemodialysis** – a method of clearing waste products from the blood in which blood passes by the semi permeable membrane of the artificial kidney and waste products are removed by diffusion.

**Hepatic encephalopathy**- a clinical syndrome developing in advanced liver disease characterized by impaired neuromuscular disturbance and altered consciousness; progression is described in four stages

**Hepatitis A** - hepatitis caused by hepatitis A virus that is transmitted by the fecal oral route; recovery is usually complete and long term consequences are rare.

**Hepatitis B**- hepatitis caused by hepatitis B virus transmitted primarily via blood and body fluids can lead to chronic hepatitis and cirrhosis.

**Hepatitis C**- hepatitis caused by a blood borne retrovirus; transmission sources include infected needles, tainted blood products, sexual contact or saliva

**Hepatitis D**- hepatitis transmitted from intravenous or sexual sources, generally becomes chronic.

**High density lipoproteins (HDL)**- a plasma lipoprotein containing mostly protein and less cholesterol and triglycerides; high levels associated with lower risk of coronary heart disease probably because it removes cholesterol from the artery intima

**Highly Active Anti-Retroviral Therapy (HAART)** - Combinations of several anti-retroviral drugs which inhibit HIV multiplication in the body, improve health status, and delay development of AIDS

**HIV** - The human immunodeficiency virus that causes AIDS

**Human milk fortifier**-a supplement of protein, carbohydrates, fats, minerals and vitamins added to human milk to make it more appropriate for the premature infant

**Hydrogenation** - the process of adding hydrogen to unsaturated fatty acids to increase saturation and stability

**Hypertension**- Persistently high arterial blood pressure defines as systolic blood pressure  $\geq 140$ mmHg and diastolic blood pressure  $\geq 90$ mmHg

**Hypertonic** -a formula with an osmolality greater than blood ( $>300$ mOsm/kg)

**Hypothyroidism** - Reduced functional activity of the thyroid gland

**Immunosuppressant** - A weakened body defense system, creating vulnerability to infection and other disorders.

**Infant mortality**- infant deaths in the first year of life

**Infant mortality rate**- no of infant deaths in the first year of life per 1000 live births

**Intermittent feeding**- tube feeding administered at specified time periods throughout the day, generally in smaller volume than a bolus feeding but greater than continuous feeding. It is administered in equal portions at selected intervals

**Isotonic**- a formula that has approximately the same osmolality as blood, about 30mOsm/kg

**Jaundice**- a syndrome characterized by hyperbilirubinemia and deposition of bile pigments resulting in yellowing of the skin, mucous membrane and sclera

**Joule** –the measure of energy in terms of mechanical work; 1 kilocalorie is equal to 4.184 kilojoules

**Kilocalorie (KCAL or CAL)**-1000 calories; sometimes written as calorie

**Kwashiorkor** – a form of protein energy malnutrition associated with extreme dietary protein deficiency and characterized by hypoalbuminemia, edema and enlarged fatty liver, subcutaneous fatty is usually preserved and muscle wasting may be masked by edema

**Lactation**- the period of milk secretion

**Lipoproteins** – a diverse class of particles that contain varying amounts of triglycerides, cholesterol, phospholipids and proteins which solubilize lipids for blood transport

**Long chain fatty acids**- a fatty acid with  $\geq 14$  carbons

**Low birth weight (LBW)**-an infant who weighs less than 2500g (5 ½ lb) at birth

**Low density lipoprotein**- the lipoprotein which is the major cholesterol carrier in the blood; high levels are associated with increased risk of coronary heart disease; main target for interventions

**Malabsorption** - Failure by the digestive tract to absorb nutrients leading to deficiencies.

**Marasmic kwashiorkor** - form of protein energy malnutrition characterized by loss of subcutaneous fatty and edema; reflects a deficiency of both energy and protein

**Marasmus**- chronic form of protein energy malnutrition in which the deficiency is primarily energy; in advanced stages it is characterized by muscular wasting and absence of subcutaneous fatty

**Medium chain fatty acids**-a fatty acid with 8-12 carbons

**Medium chain triglycerides oil (MCT OIL)**-a synthetic oil which contains only medium chain triglycerides and can be directly absorbed into the portal blood bypassing the lymphatic system.

**Medium chain triglycerides**- triglycerides with fatty acids 8-12 carbons

**Metabolic acidosis**-acidosis caused by an increase in circulating non-carbonic acid and/or an excessive loss of bicarbonate

**Metabolic rate**- the expression of the rate at which the body utilizes oxygen

**Monomeric formula**- an enteral feeding formula designed for easy digestion and absorption by supplying macronutrients, particularly proteins in a hydrolyzed or partially hydrolyzed form such as peptides or amino acids

**Monounsaturated fatty acid (MUFA)** - a fatty acid containing one double bond

**Nasoenteric tube**- a tube inserted through the nasal passage into the stomach, duodenum or jejunum

**Necrotizing enterocolitis** – inflammation or death of gastro intestinal tract

**Negative nitrogen balance** - a catabolic state in which less nitrogen is retained than excreted

**Nephritic syndrome** - a condition resulting from loss of glomerular barrier to protein and characterized by massive edema and proteinuria, hypoalbuminemia, hypercholesterolemia, hypercoagulability and abnormal bone metabolism

**Nephritic syndrome** - the syndrome of hematuria, hypertension and mild loss of renal function that results from acute inflammation of the capillary loops of the glomerulus

**Nitrogen balance** - the state of the body with regard to ingestion of nitrogen as protein and excretion of nitrogen in urea, feces, sweat, hair, skin and nails in which the amount retained is equal to the amount excreted

**Nutrient** - A substance or component of food, including carbohydrates, proteins, fats, vitamins, minerals and water.

**Nutrition status** - a measurement of the extent to which the individuals physiologic need for nutrients is being met

**Nutritional assessment** - the process by which the nutritional status of an individual is determined; usually includes dietary history, and intake data, biochemical data, clinical examination and health history; anthropometric data and psychosocial data

**Nutritional care process** - the process of planning and meeting the nutritional needs of the individual

**Nutritional screening** - a standard, easy, efficient procedure to identify those at nutritional risk who require nutritional assessment

**Oliguria** – decreased urine production of less than 500ml/day

**Omega 3 fatty acids** - fatty acids with the first double bond located at the third carbon from the methyl end

**Opportunistic infections** - Illnesses caused by various organisms, some of which do not cause disease in people with a normal functioning immune system.

**Osmolarity** - the measure of the number of particles in a solution; expressed as miliosmoles per kilogram (mOsm/kg)

**Ostomy** – a surgically created opening (stoma) made to deliver feedings directly into the stomach or intestines as in as in gastrostomy, jejunostomy, esophagostomy

**Over-nutrition** -Excessive nutrients and nutritional stores in the body, causing obesity.

**Parenteral nutrition**- (PN) the delivery of nutrients directly into the circulation

**Peripheral parenteral nutrition**- (PPN) - delivery of nutrients into a peripheral vein

**Peritoneal dialysis**-a method of removing waste products from the blood in which diffusion carries them from the blood through the semipermeable peritoneal membrane and into the dialysate

**Pica**- compulsive ingestion of unsuitable substances having little or no nutritional value

**Polymeric** - when referring to nutrients the form in which the nutrients appear before it is digested into its smaller parts

**Polymeric formula** - enteral formula composed primarily of intact macronutrients, particularly whole proteins, used primarily for stable patients. Also known as intact or standard formulas

**Polyunsaturated fatty acids** - a fatty acid containing at least two double bonds

**Positive nitrogen balance**- the anabolic state in which more nitrogen is retained than excreted

**Pre-clampsia** - the early stage of pregnancy induced hypertension

**Pregnancy induced hypertension**- a severe hypertension that may develop during pregnancy which is accompanied by proteinuria, edema and rarely convulsion and coma. Usually occurs after 20 weeks gestation

**Premature (preterm)** - referring to an infant born before 38 weeks gestation

**Protein** - a complex nitrogen compound made up of amino acids in peptide linkages

**Protein energy malnutrition** - a class of clinical disorder resulting from varying combinations and degrees of protein and energy deficiency

**Protein isolates** - semi purified, high biological value proteins that have been extracted from milk, soybeans, eggs

**Purines** – the nitrogenous base adenine and guanine which are constituents of nucleoproteins whose metabolic end products is uric acid

**Recommended dietary allowance (RDA)** level of nutrient intake of essential nutrients charged adequate to meet the needs of practically all healthy persons; RDAs are generally set at levels high enough to exceed the actual nutrient requirements of most people

**Refeeding syndrome** - a potentially fatal complication that occurs from an abrupt change from a catabolic state to an anabolic state and an increase in insulin caused by a dramatic increase in kilocalories

**Renal osteodystrophy** - metabolic bone disease as a complication of end stage renal disease

**Residue**-what remains in the GI tract after digestion, namely fiber, undigested food, intestinal secretions, bacterial cell bodies and cells shed from the intestinal lining

**Resting Energy Expenditure**- the amount of energy used by a person in 24hrs when at rest, 3-4hrs after a meal

**Saturated fats** - Fats responsible for high levels of cholesterol in body, therefore increasing the risk of heart disease

**Saturated fatty acids** - a fatty acid that has no double bond with a general formula  $C_nH_{2n}O_2$ .

**Screening** - a process that begins to identify nutritional problems and risk factors

**Short chain fatty acids** – a fatty acid with 4-6 carbons

**SI** - a uniform system of reporting numerical values of biochemical data permitting interchangeability of information between health care providers of different countries

**Symptomatic** -.Infection with signs and symptoms

**Thermic effect of food** - the fraction of total energy expenditure contributed by the process of digestion, absorption and metabolism of food; the increase of metabolism that is stimulated by eating

**Total Energy Expenditure** - the sum of resting energy expenditure, energy expended in physical activity and the thermic effect of food; the energy expended by an individual in 24 hours

**Total parenteral nutrition** - delivery of nutrients into a larger central vein usually the superior vena cava

**Transitional feeding** - nutritional support during the time when the patient is moved from one form of feeding to another

**Triglycerides** – a lipid consisting of three fatty acids chains attached to a glycerol molecule

**Under-nutrition** - Inadequate nutrients or food intake in the body

**Urea** – the chief nitrogen end product of protein metabolism and the chief nitrogen constituent of urine

**Uremia** - increased level of nitrogen wastes in the blood having a clinical syndrome of malaise, weakness, nausea and vomiting, muscle cramps itching, metallic mouth taste and often neurological impairment

**Very low birth weight (VLBW) babies** - referring to an infant who weighs less than 1500g (3 1/3 lb) at birth

**Viral load** - Amount of human immunodeficiency virus in blood used as a marker for progress of HIV to AIDS

**Virus** - Smallest of all disease-causing micro-organisms

**Vitamins** - Nutrients with main function to protect the body against infection

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**APPENDIX II: NUTRITION SCREENING AND ASSESSMENT TOOLS**

**SAMPLE NUTRITION SCREENING FORM**

FACILITY NAME.....

NAMES .....  
 (Last) (Middle) (First)

Age ..... Sex .....Date of admission.....

IP NO. ....BED NO.....Residence .....

HT ..... WT..... BMI ..... IBW .....MUAC .....

Nutrition status.....

Diagnosis ..... Cause .....

**Level of nutritional risks**

- ..... LOW
- ..... Moderate
- ..... HIGH

	CRITERIA	NORMAL	MODERATE	SEVERE
1	WT loss	-	Less than 10%	More than 10%
2	Food retention	-	Nausea and vomiting	Severe diarrhoea and anorexia
3	Body mass index(B.M.I) or Z score	18.5 - 24.9 ≥-2 to +2	17.0 -18.4 Or 25 – 29.9	Below 17 or Above 30

			2 - 3 Or 2 - 3	Below -3 Or above 3
4	MUAC –adults -children	≥23cm ≥13.5cm	16-23 11-<13.5	<16 <11
5	HB level		Below 10	Below 6
6	Oedema	-	++	+++
7	Functional activity	-	Disfunction <3 Weeks	Bed ridden > Weeks

Screening done by .....

Name

signature

**SAMPLE OF PAEDIATRIC NUTRITION ASSESSMENT FORM**

Date of admission	Ward	IP/OP No.		Bed No.			
<b>Bio data</b>							
Name..... Date of Birth..... Sex..... Birth Weight..... Birth Order..... School going..... Household size..... Caregivers Marital Status..... Caregiver's occupation..... Caregiver's relationship to the child.....Residence.....Landmark.....							
<b>Anthropometric Assessment</b>							
Weight (kg)		Height (cm)		MUAC		Head Circumference	
Reference Standards							
BMI for age		Ht/A		Wt/Ht		Wt/A	
<b>History</b>							
<b>Breastfeeding</b>							
Is the child breastfeeding (a) Yes (b) No (c) N/A						Duration (specify)	
If yes, what form of feeding (a) Exclusive breastfeeding							
(b) Mixed feeding							
If not breastfeeding, what is the child fed on (a) infant formula (b) Home modified animal milk (c) others specify.....							
<b>Complementary</b>							
Is the child being fed other foods (a) Yes (b) No (c) N/A							
If yes, which food was introduced first							
At what age was the child introduced to other foods							
Does the child experience adverse reactions by eating a particular food? (a) Yes (b) No If Yes, (explore which food and difficulty)							

.....			
Is the child on any food or micronutrient supplementation? (a) Yes (b) No If Yes, Specify ..... .....			
<b>Medical</b>			
Is the child on treatment of any known medical condition (a) Yes (b) No If yes, explain ..... .....			
Is there family history of the following chronic conditions			
(a) Diabetes Yes No (b) Hypertension Yes No (c) TB Yes No (d) Cancer Yes No			
HIV status (a) Reactive (b) Non-reactive (c) unknown If unknown refer to HTC* Services (* HIV Testing & Counselling)			
Is the child on any herbal remedies (a) Yes (b) No If Yes explain.....			
Is the child currently on any medication (a) Yes (b) No If yes,(specify)			
Is the child allergic to any known medication (a) Yes (b) No If yes,(specify)			
<b>Social</b>			
Is the father alive Yes No Occupation			
Is the mother alive Yes No Occupation			
Is there any cultural belief or taboos that affect nutrition ..... .....			
Is the child manifesting any delayed milestones Yes No if yes, explain ( <i>Refer to Mother child booklet</i> )			
<b>Clinical/Medical Examination (Notes)</b>			
<b>Biochemical investigations ( Refer to guideline for normal levels)</b>			
FHG..... HB..... CD4 cell count..... DNA PCR..... RBS..... Lipid profile.....			

LFTs..... Albumin.....		
<b>Dietary Intake</b>		
7day food freq		
<b>Diagnosis</b>		
<b>Prescription/Recommendation</b>		
<b>Nutrition Care Plan</b>		
Name of Officer	Designation	Date

**NUTRITION ASSESSMENT AND CARE FOR PAEDIATRICS**

Patient Name: \_\_\_\_\_

Diagnosis: \_\_\_\_\_

IP/No. \_\_\_\_\_ Date: \_\_\_\_\_

Age: \_\_\_\_\_ Sex: \_\_\_\_\_ Ward: \_\_\_\_\_

**Family History**

Child birth order: \_\_\_\_\_ Parent's marital status: \_\_\_\_\_

Total No. of siblings in family and their ages: \_\_\_\_ / \_\_\_\_ / \_\_\_\_ / \_\_\_\_ / \_\_\_\_ - \_\_\_\_ / \_\_\_\_ / \_\_\_\_ / \_\_\_\_ / \_\_\_\_

Mother's age: \_\_\_\_\_ Occupation: \_\_\_\_\_

Father's age: \_\_\_\_\_ Occupation: \_\_\_\_\_

Residence \_\_\_\_\_

Other psychosocial information: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

**Nutrition History**

Breast feeding history (if relevant) \_\_\_\_\_

Weaning age and food used \_\_\_\_\_

Usual and current dietary intake \_\_\_\_\_

**Anthropometric Assessment**

Birth Wt. (Kg) \_\_\_\_\_ Adm. Wt. (kg) \_\_\_\_\_ Height (cm) \_\_\_\_\_

Ref. wt. for Age (kgs) (Z scores) \_\_\_\_\_ wt. for age % (zcores) \_\_\_\_\_

**Other clinical and Biochemical assessment**

.....  
.....  
.....

Opinion/conclusion ( nutritional status markers which have led you to this opinion)

.....  
.....  
.....

Nutrition care

Plan:.....

1. ....
2. ....
3. ....
4. ....

Signed: .....

**Nutritionist/Nutrition Assistant.**



**ADULT NUTRITION ASSESSMENT FORM**

Patients Name \_\_\_\_\_ Ward \_\_\_\_\_

IP No \_\_\_\_\_ Sex \_\_\_\_\_ Age \_\_\_\_\_ DOA \_\_\_\_\_ DOD \_\_\_\_\_

Referred from \_\_\_\_\_

Principle diagnosis \_\_\_\_\_

Nutrition implication \_\_\_\_\_

**NUTRITION ASSESSMENT**

Anthropometric assessment

Height (m) \_\_\_\_\_ Weight (kg) \_\_\_\_\_ BMI (kg/m<sup>2</sup>) \_\_\_\_\_ IBW \_\_\_\_\_

MUAC (cm) \_\_\_\_\_

Remarks \_\_\_\_\_

Biochemistry \_\_\_\_\_

Clinical \_\_\_\_\_

Diet history

Taboos, allergies, intolerance \_\_\_\_\_

Feeding pattern (home based)

Breakfast \_\_\_\_\_

Lunch \_\_\_\_\_

Supper \_\_\_\_\_

Comments/Remarks \_\_\_\_\_

Approximate total nutrient intake

PROT (gms) \_\_\_\_\_ CHOS(gms) \_\_\_\_\_ FATS(gms) \_\_\_\_\_ KCALS \_\_\_\_\_

OTHERS \_\_\_\_\_

Type of diet \_\_\_\_\_

Current \_\_\_\_\_  
\_\_\_\_\_

CARE PLAN

Prescribed diet \_\_\_\_\_

PROT (gms) \_\_\_\_\_ CHOS(gms) \_\_\_\_\_ FATS(gms) \_\_\_\_\_ KCALS \_\_\_\_\_

OTHERS \_\_\_\_\_

Consistency of diet \_\_\_\_\_

Route of Administration \_\_\_\_\_

Remarks /Future plan \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Nutritionist \_\_\_\_\_ Signature \_\_\_\_\_ date \_\_\_\_\_

NUTRITION CARE REVIEW SHEET

DATE	REMARKS	NUT/SIG

--	--	--





NUTRITIONIST:

.....

.....SIGN:

**WEIGHT MONITORING ADULTS**

NAME: .....IP/OP NO: .....  
 WEIGHT.....HEIGHT: ..... DATE: .....

Weight (kgs)

120																			
115																			
110																			
105																			
100																			
95																			
90																			
85																			
80																			
75																			
70																			
65																			
60																			
55																			
50																			
45																			
40																			
35																			
30																			
25																			
20																			
DATE																			



BMI																				
-----	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

NUTRITIONIST: .....CODE: .....

SIGN: .....

**ADULTS FEEDING REGIME**

IP NO. \_\_\_\_\_

DIAGNOSIS: \_\_\_\_\_  
\_\_\_\_\_

NAME: \_\_\_\_\_ AGE: \_\_\_\_\_ SEX: \_\_\_\_\_ WEIGHT: \_\_\_\_\_  
\_HEIGHT: \_\_\_\_\_ BMI: \_\_\_\_\_ MUAC: \_\_\_\_\_ DATE: \_\_\_\_\_

Total Kcal: \_\_\_\_\_ Fats: \_\_\_\_\_ CHO: \_\_\_\_\_  
Proteins: \_\_\_\_\_

Fluids: \_\_\_\_\_ Mode of Feeding: \_\_\_\_\_

Time	Food Type	Quantity	Protein(gm)	CHO(GM)	Fats (gm)	Fluids(ml)	Total calories(Kcal)


Comments/  
Recommendation \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Prepared by: \_\_\_\_\_

**MATERNITY WARDS WEEKLY SUMMARY SHEET**

MONTH: \_\_\_\_\_ YEAR: \_\_\_\_\_

	WK 1	WK 2	WK 3	WK 4	TOTALS
Total number of deliveries					
Total number of normal weight children					
Total number of low birth weight children					
Total number of premature					
Number of prematures fed by EBM					
Number of premature fed by cow's milk					
Number of premature fed by infant formula					
Total number of deaths (infant deaths reported)					
Number of maternal deaths reported.					
Still births					
Total number of postnatals supplemented with vitamin A					
number of postnatals with					

anaemia					
Total no of postnatal mothers with diabetes					

Comments:

Nutritionist: \_\_\_\_\_ Sign: \_\_\_\_\_

Date: \_\_\_\_\_

**INITIAL BASELINE NUTRITION ASSESSMENT FORM**

Name.....Patient No.....Date.....

Age.....Weight (kg).....Height (cm).....BMI.....IBW.....

MUAC (cm).....HB.....Skin fold thickness.....

CD4+.....ARVs.....

Marital status.....Occupation.....

No of dependants.....No of households.....

Residence .....Nearest school.....

**Clinical assessment**

**a) Signs** **present** **absent**

- Swelling
- Oral thrush
- Eye paleness
- Oedema

**b) Presence of symptoms that impede intake or absorption. Do you experience any of these?**

- Nausea Yes No
- Vomiting Yes No
- Diarrhea Yes No
- Constipation Yes No
- Difficulty chewing/swallowing Yes No
- Fatigue Yes No
- Heartburn Yes No
- Lack of appetite Yes No
- Others (specify).....

**c) Medications**

ARVs  Yes  No Nutrition supplements Yes  No

OI prophylaxis  Yes  No Others Yes  No

**d) Water source and drinking safety**

What is your source of water?

- i. Borehole
- ii. River/stream
- iii. Public standpipe/Tap water
- iv. Others

Do you treat or boil drinking water?  Yes  No

Fuel source  Firewood  Charcoal   Electricity  Paraffin  Solar  
 others.....

**e) Physical activity/ functional level**

In the past 7 days have you done any of the following activities?

- |      |  |     |    |
|------|--|-----|----|
| i.   | Worked on your own farm or with your livestock | Yes | No |
| ii.  | Worked as a casual laborer                     | Yes | No |
| iii. | Worked in your own business or enterprise      | Yes | No |
| iv.  | Worked in a formal salaried employment         | Yes | No |
| v.   | Others .....                                   | Yes | No |

**f) Access to adequate food**

In the last three days did the patient have access to any of the following foods?

Carbohydrates		Proteins	
Ugali	<input type="checkbox"/> Yes <input type="checkbox"/> No___	Meat	<input type="checkbox"/> Yes <input type="checkbox"/> No___
Rice	<input type="checkbox"/> Yes <input type="checkbox"/> No___	Fish	<input type="checkbox"/> Yes <input type="checkbox"/> No___
Githeri	<input type="checkbox"/> Yes <input type="checkbox"/> No___	Chicken	<input type="checkbox"/> Yes <input type="checkbox"/> No___
Sweet potatoes	<input type="checkbox"/> Yes <input type="checkbox"/> No___	Beans	<input type="checkbox"/> Yes <input type="checkbox"/> No___
Chapatti	<input type="checkbox"/> Yes <input type="checkbox"/> No___	Peas	<input type="checkbox"/> Yes <input type="checkbox"/> No___
Potatoes	<input type="checkbox"/> Yes <input type="checkbox"/> No___	Soyabeans	<input type="checkbox"/> Yes <input type="checkbox"/> No___
Bread	<input type="checkbox"/> Yes <input type="checkbox"/> No___	Milk	<input type="checkbox"/> Yes <input type="checkbox"/> No___
others	<input type="checkbox"/> Yes <input type="checkbox"/> No___	Eggs	<input type="checkbox"/> Yes <input type="checkbox"/> No___

Vegetable		Fruits	
Sukuma wiki	<input type="checkbox"/> Yes <input type="checkbox"/> No___	Ripe bananas	<input type="checkbox"/> Yes <input type="checkbox"/> No___
Spinach	<input type="checkbox"/> Yes <input type="checkbox"/> No___	Avocadoes	<input type="checkbox"/> Yes <input type="checkbox"/> No___
Managu/kienyeji	<input type="checkbox"/> Yes <input type="checkbox"/> No___		<input type="checkbox"/> Yes <input type="checkbox"/> No___
	<input type="checkbox"/> Yes <input type="checkbox"/> No___		<input type="checkbox"/> Yes <input type="checkbox"/> No___



Cabbage	Yes      No___	oranges	Yes      No___
Carrots /pumpkins	<input type="checkbox"/> Yes <input type="checkbox"/> No___	Mangoes	<input type="checkbox"/> Yes <input type="checkbox"/> No___
Amaranth	<input type="checkbox"/> Yes <input type="checkbox"/> No___	Pineapple	<input type="checkbox"/> Yes <input type="checkbox"/> No___
Others	<input type="checkbox"/> Yes <input type="checkbox"/> No___	Others	<input type="checkbox"/> Yes <input type="checkbox"/> No___
Note : eating less than 3 vegetables/ fruit servings in 72 hours is= inadequate quality			

How do you get food?

- i. Farm
- ii. Buying
- iii. Donated in kind

**24-HOUR RECALL OF DIETARY INTAKE**

Name of patient/code.....

Date of interview.....

**What day was yesterday? (tick correct one)**

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
--------	---------	-----------	----------	--------	----------	--------

The patient will give response to the following questions

- a) Starting from morning to evening yesterday, please name all foods and drinks you Consumed and the ingredients that were used
- b) What amount of food and drinks did you consume and how were they prepared

Time/ Meal	Name of Dish/food	Name and amount of ingredients used	Amount taken e.g. cup, plate, tsp	Method of Preparation
B/FAST				
SNACK				
LUNCH				

SNACK				
SUPPER				
SNACK				

Codes for method of preparation: 1=Eaten raw 2= Boiled 3 =Roasted 4= Deep fried

5=Shallow fried 6= Baked 7= stewed 8=others (specify)

MINISTRY OF MEDICAL SERVICES

FACILITY DAILY ACTIVITY REGISTER FOR NUTRITION AND HIV/AIDS

Biobeta				Assessment											Nutrition Intervention					Follow up				
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	
Date	Client Unique No.	Client names	Revisit Tick (✓)	Serostatus (P/N) : P = 1, N = 2	Date of Birth (dd-mm-yy)	Age (yrs)	Gender (M/F) : M = 1, F = 2	Residence & Landmark	Telephone No	Pregnant/ Postpartum (P/PP): P = 1, PP = 2	Weight (kg)	Height/Length (cm)	Weight for Height (WFH) Z score (0 - 59 mths)	BMI for Age(5-17 yrs)	BMI (adults over 18 yrs)	MUAC (cm)	Hb (g/dl)	On ARVs (Y/N): Y = 1, N = 2	Nutrition counseling (Tick✓): Infant and Young Child Feeding (IYCN), Critical Nutrition Practices (CNP)	Nutrition Support (Tick✓) Therapeutic feeding =TF, Supplementary feeding =SF, Multiple micronutrients =MM	Infant feeding practice (Tick✓): Exclusive Breastfeeding upto 6 mths = EBF, Exclusive Replacement upto 6 mths = ERF, Mixed Feeding upto 6 mth = MF	TCA (dd/mm/yyyy)	Remarks	
<b>Total</b>			1	2			1			1								1						

Facility Daily Summary Sheet:

Total number of HIV positive clients seen: N: <input type="checkbox"/> R: <input type="checkbox"/>	Total No. of clients receiving nutrition support:	Counseling: TF <input type="checkbox"/> SF <input type="checkbox"/>		MM <input type="checkbox"/>		EBF (3 mths) <input type="checkbox"/> EBF (6 mths) <input type="checkbox"/>		ERF <input type="checkbox"/> MF: <input type="checkbox"/>	
No. of children (0-59 months with WFH less than -2 score): N: <input type="checkbox"/>	No. of children (5-17 yrs) with BMI-for-Age less than -2 score: N: <input type="checkbox"/>	N: <input type="checkbox"/>	N: <input type="checkbox"/>	N: <input type="checkbox"/>	N: <input type="checkbox"/>	N: <input type="checkbox"/>	N: <input type="checkbox"/>	N: <input type="checkbox"/>	N: <input type="checkbox"/>
No. of adults (over 18yrs) with BMI less than 18.5: N: <input type="checkbox"/>	No. of adults (over 18 yrs) with BMI more than 30: N: <input type="checkbox"/>	R: <input type="checkbox"/>	R: <input type="checkbox"/>	R: <input type="checkbox"/>	R: <input type="checkbox"/>	R: <input type="checkbox"/>	R: <input type="checkbox"/>	R: <input type="checkbox"/>	R: <input type="checkbox"/>
No. of pregnant women with MUAC less than 22cm: N: <input type="checkbox"/>	No. of postpartum women with MUAC less than 22cm: N: <input type="checkbox"/>	N: <input type="checkbox"/>	N: <input type="checkbox"/>	N: <input type="checkbox"/>	N: <input type="checkbox"/>	N: <input type="checkbox"/>	N: <input type="checkbox"/>	N: <input type="checkbox"/>	N: <input type="checkbox"/>
		R: <input type="checkbox"/>	R: <input type="checkbox"/>	R: <input type="checkbox"/>	R: <input type="checkbox"/>	R: <input type="checkbox"/>	R: <input type="checkbox"/>	R: <input type="checkbox"/>	R: <input type="checkbox"/>

MINISTRY OF MEDICAL SERVICES

FORM B: DISTRICT MONTHLY SUMMARY SHEET FOR NUTRITION AND HIV/AIDS

Name of District: \_\_\_\_\_ Date: \_\_\_\_\_

Total No. of Facilities in District: \_\_\_\_\_ Total No. of Facilities Reported: \_\_\_\_\_

INDICATOR	Children (0-59 mths)				Children (5-17 yrs)				Adults (over 18 yrs)				Grand Total				
	Male		Female		Male		Female		Male		Female		Male		Female		
	New	Revisit	New	Revisit	New	Revisit	New	Revisit	New	Revisit	New	Revisit	New	Revisit	New	Revisit	
Total number of HIV positive clients seen																	
No. of children (0-59 mths) with WFH less than - 2 Z score																	
No. of children (5-17 yrs) with BMI for Age less than - 2 Z score																	
No. of adults (over 18 yrs) with BMI less than 18.5																	
No. of adults (over 18 yrs) with BMI more than 30																	
No. of pregnant women with MUAC less than 22cm																	
No. of postpartum women with MUAC less than 22cm																	
Total number of clients receiving nutrition support	No. receiving nutrition counseling																
	No. receiving therapeutic feeding (TF)																
	No. receiving supplementary feeding (SF)																
	No. receiving multiple micronutrients (MM)																
Mothers receiving counseling on IYCN	Prenatal Counseling																
	Postnatal Counseling																
Infant Feeding Practices	No. Exclusively Breast Feeding (EBF) upto 3 months																
	No. Exclusively Breast Feeding (EBF) upto 6 months																
	No. Exclusively Replacement Feeding (ERF) upto 6 months																
	No practicing Mixed Feeding(MF)																
Total Number.																	

COMPILED BY: \_\_\_\_\_

CONFIRMED BY: \_\_\_\_\_

COMMENTS: \_\_\_\_\_



**World Health  
Organization**