UNIT 18 PAEDIATRIC AND GERIATRIC NUTRITION – SPECIAL CONSIDERATIONS

Structure

18.1 INTRODUCTION

Every stage has its unique requirements due to different changing needs. Adequate and optimum nutrition support is very important during the early critical periods of life to achieve normal growth and development. Besides, certain groups of children with different types of medical conditions may have feeding difficulties. In this last unit, we will focus on paediatric geriatic problems and their nutritional management. Many of these problems you may have already studied earlier in this course. Here in the first part of this unit we shall review them, particularlyin the context of paediatric nutrition.

Due to the changes in physiologicalfunction with aging, effect on absorption, retention and utilization of nutrients commonly occurs. With age the requirements for macro- and micronutrients also changes. Further, malnutrition and other problems amongst elderly persons have been observed – be it hospitalized patients, nursing home residents or outpatients. With the help of nutritional assessment the elderly at risk can be given preventive and treatment care as required. The second part of this unit deals with nutritional assessment tools and nutrition support for the elderly.

Objectives

After studying this unit you will be able to:

- discuss a few common paediatric problems and their nutritional management,
- enumerate the nutritional assessment tools for the elderly, and
- elaborate on the nutrition support for the elderly.

18.2 PAEDIATRIC PROBLEMS AND NUTRITIONAL MANAGEMENT

The process of accepting and digesting food in adequate amounts to meet nutrition needs is termed as feeding. Certain groups of children with different types

of medical conditions may have feeding difficulties for example infants/children with cardiopulmonary, genetic or metabolic disorder may have poor intake and may lead to slower weight gain. Other conditions like various neurological conditions such as cerebral palsy, structural abnormality or brain injury may affect the motor or swallowing reflex.

The first step in treatment is to assess the child's feeding disorder. This requires a multidisciplinary team who need to diagnose assess and develop appropriate treatment plan. In the following sub-section, we shall learn about a few common paediatric problems and their nutritional management. These problems include congenital heart disease, low birth weight/preterm, lactose intolerance and celiac disease. We begin with congenital heart disease.

18.2.1 Congenital Heart Disease (CHD)

Congenital heart disease is an abnormality at birth in cardiac circulatory structure or function. Optimal management of CHD aims not merely at survival, but at optimizing growth and development.

The relationship between CHD, *malnutrition and growth* is well documented. Different types of cardiac defects are associated with different patterns of growth retardation. Here we are not going into the details related to these cardiac defects. What we must, however, know, is that, patients with acyanotic heart disease show greater growth deficit in weight. Cyanotic heart disease patients have greater growth deficit in stature – demonstrated by both decreased height and weight. Those infants born with CHD also show a greater incidence (6-14%) of intra uterine growth retardation (IUGR), viral illness and chromosomal abnormality.

The various factors related to causing malnutrition among CHD patients are hypoxia (reduction in oxygen supply) and haemodynamic factors, nutritional intake, metabolic requirements and impaired nutrient absorption.

Nutritional and metabolic factors that contribute to the malnutrition of CHD infant are elevated BMR, unable to coordinate to suck, swallow and laborious breathing/ sucking, delayed gastric emptying and impaired gastrointestinal motility, decreased gastric capacity – leading to early satiety, thus compromised energy and protein intake. Hence, the intake is below the requirement and is different from normal.

How can we assess the nutritional status of a CHD infant? Various *assessment methods* can be used, particularly anthropometrical – weight, length (height), head circumference and skin fold,

Weight gain in neonatal age is aimed for 120 g/week (only after heart failure has been resolved). This can be possible with specialized nutritional requirements which are enumerated next.

Specialized Nutritional Requirements

The nutritional requirement for catch up growth for infants with CHD is listed in Table 18.1. By catch up growth we mean to catch up or make up for the earlier defecit in growth caused by CHD. As you may have noticed in Table 18.1, calorie and protein requirements (given as per kg body weight) are increased due to catch up growth and hyper metabolism. Sodium intake is to be closely monitored due to existing congestive heart failure (CHF). Other important nutrients are potassium, vitamins, and iron. Fluid requirements are individualized based on degree of cardiac compromise, diuretic therapy, fluid intolerance, congestive heart failure (CHF), pulmonary hypertension,

Table 18.1: Nutritional requirements for catch up growth for infants with CHD

Age (yr)	0-0.5	0.5-1	1-3
Energy(Kcal/kg)	108	98	102
Protein(g/kg)	2.2	1.5	1.23
Sodium(mg/day)	230	500	650
Potassium (mg/day)	650	850	1100

The following calculation/formula may also be useful to calculate the calorie and protein content:

$$\text{Catch-up growth (Kcal/kg)} = \frac{\text{RDA Kcal/kg for weight} \times \text{ideal weight}}{\text{Actual weight (kg)}}$$

$$\text{Protein (g/kg)} = \frac{\text{8\% of catch-up growth calories}}{\text{Catch-up growth (Kcal/kg)} \times 0.08}$$

Source: Food and Nutrition Board, Recommended Dietary Allowance, 10th ed. National Academy of Science, 1989:284.

Having worked out the calorie, protein and other nutrient requirements, you would realize that meeting these requirements would not be easy. Specialized nutritional formulations may be required, about which we shall read next.

Specialized Nutritional Formulations

Achieving calorie and protein requirements with restricted fluid intake, you would realize, is a formidable challenge. High calorie intake (0.8-1Kcal/ml), we learnt above, is recommended as it helps in weight gain. Increasing formula calorie density can be achieved by either formula concentration or formula supplementation. Let us see how.

Formula Concentration/ Supplementation

Formula *concentration* can be done by decreasing the amount of water added in the mixing of the formula. Standard formula has calorie density 0.67 Kcal/ml. The advancement in density should be gradual with careful monitoring, ensuring gastrointestinal and metabolic tolerance. As for proteins, diet should contain between 8-10 % (energy percent or percentage of energy). Attention needs be paid to the sodiuin content of the feed on increasing the formula by concentration method. In infants with severe CHD and failure to thrive, formula density should not exceed 0.8 Kcal/ml. Severely malnourished CHD infants may develop lactase deficiency and thus use of soya based infant formulas is suggested.

Increased calorie density of a formula may be achieved through *supplementation* with carbohydrate or fat module. Addition of glucose and lipid maintains a lower renal solute load and osmolality. On adding more than one module component, maintenance of calorie distribution is gradual and stepwise. Care is to be taken that with supplementation the percentage of calories from proteins does not fall to less than 6-7 (energy percent or percentage of energy). Breast milk feeding/expressed breast milk is the best food for the infant. Breast milk contains 0.66 Kcal/ml; although provides nutritional and immunologic advantages it is not able to meet adequate calorie and protein intake. Thus breast-feeding may be alternated with high calorie density formula to ensure total intake of 120-140 Kcal/kg /day.

Next, let us get to know about post surgical nutritional support for a CI-ID patient.

Post-surgical Nutrition ***Support***

Nutrition support should be started as soon as possible. If oral not possible, enteral nutrition support should be provided. Nutritional support can be enhanced with

continuouslinternittent nasogastric feeding either by 24 hours/12 hrs continuous feeding, 12 hours nocturnal continuous feeding, or by Bolus feeds. In case enteral support cannot be provided for more than one week, initiate TPN.

Solid food feeding/weaning to be initiated at the same time as normal term infant.

To sum up, CHD contribute significantly to malnutrition, morbidity and mortality. It is important to recognize patients who are undernourished or at risk, so that they can receive appropriate treatment. The surgery outcome is also observed to be better with improved nutritional status.Thus it is important for proper diet counseling to provide ideal nutrition therapy to improve nutritional status of CHD patients.

Next, let us learn about the nutritional support for the preterm/low birth weight infant.

18.2.2 Preterm/Low Birth Weight

The foetal and neonatal health is mainly dependent on the birth weight and it has been well recognized that perinatal (from birth upto one year) morbidity and mortality is closely related to low birth weight.

You may have come across the terms – premature, small for gestational age, intrauterine growth retardation etc. What do these terms mean? Let us get to know the definition of these terms.

'Low Birth Weight' is weight of infant less than 2500g at birth.

'Prenznturity' is defined when delivery is at less than 37 completed weeks.

Small for Gestational Age (SGA) is defined as infants affected by intrauterine growth restriction (IUGR).

Intrauterine Growth Retardation (IUGR) is *a* condition where the growth of the foetus is abnormal, as a result of reduced blood flow through the placenta (which is the source of the baby's nutrition).

The main possible causes and risk factors for LBW/premature births/SGA are said to be poor nutrition, cigarette smoking, alcohol and drug intake, young age of mother, poor stature, and some complication during pregnancy. Some other factors like faetal infections, congenital malfunctions, chromosomal abnormalities etc. are also seen to be present along with LBW or premature deliveries.

What are the health consequences of these conditions?

There is an increased neonatal mortality and growth deficit: and neurological development due to LBW or preterm delivery or due to IUGR. It is also postulated that developing coronay vascular disease (CVD), high blood pressure, diabetes, hyperlipidemia and obstructive lung disease is associated with low birth weight.

Prevention of IUGR, or preterm birth has been seen in case of mothers who stopped smoking and are on a balanced protein energy diet and with control of urinary tract and vagina infection.

We shall elaborate on the nutritional management of preterm infants next..

Nutrition Management and Feeding the Premature Infant

There are numerous nutritional risk factors in premature infants. These include:

- Elevated metabolic rate, thus increasing the protein, fat, energy requirements.

  Excessive urinary and evaporative losses.
- Immature gastrointestinal tract (poor gastric emptying and improper peristalsis).
- Respiratory distress and hypoxia,

There are number of feeding problems faced by the premature infant due to:

- Poor sucking reflex,
- Difficulty in swallowing and breathing,
- Small gastric capacity,
- Reduced intestinal motility, and
- Getting tired easily after being fed or handled.

As for the nutritional requirements, there is an increased nutrient need due to catch-up growth with approximately 110-130 Kcal/kg body weight/day. The nutrient requirements are elaborated further herewith.

Nutrient requiremetst.

Energy: For preterm infants 1.20 Kcal/kg/day,
For normal infants 108 Kcal/kg/day.

Proteins: Care to be taken to give adequate protein (for proper growth), if excess proteins /insufficient intake, metabolic acidosis /azotemia may occur.

For preterm an intake of 3.5-4.0 gm/kg/day and for normal infant 2.2 gm/kg/day.

Vitamin *and mineral:* Care to be taken for calcium and phosphorus intake in preterm infant. Due to inefficient sodium conservation mechanism in preterm infants, the sodium requirement is increased to 3.0-3.5 meq/kg/day. From 2 weeks to 2 months, both preterm and term infants require iron supplementation (2-3 mg/kg/day of supplemental iron.

Fluid needs – In case of premature infants:

- weighting less than 1000 g fluid needs is 150 ml/kg/day.
- weighing more than 1000 g fluid needs is 100-150 ml/kg/day.
- for term infant's fluid needs is100 ml/kg/day.

So then considering the feeding problems and the enhanced nutrient requirement what are the feeding options for premature or lBW infants. Read and find out.

Feeding Options for *Premature/LBW Babies*

Different workers have tried different method and since all methods are successful, it is dependent on the individual infant's needs and problems without imposing stress on the infant's metabolic and excretory system.

Some studies have shown that tube feeding be done for infants born less than 34 weeks of gestation as these infants have sucking, fatigue and swallowing reflex problems. In another study, infants having very low birth weight (less than 1500 g) were initially fed by tube feeding (half strength formula) for 3-4 days until stable and then gradually increased the strength of the formula depending on the tolerance. In case of absence of complication like reflux, abdominal distension, diarrhoea etc, oral intake can be started.

Some researches have observed that SGA infants who weighed between 1800-2500 mg, given on-demand bottle-feeding responded well. Thus, emphasis is more on bottle-feeding and breast-feeding to avoid the various complications of tube feeding. It has been observed that with full term, as well as, premature normal infants, on-demand feeding schedule is better than scheduled feedings. The reason is its ability to:

- controls calorie intake.
- avoid over or under feeding.
- consume adequate fluid and nutrient intake in less time.

- less health care costs.

  improves fat absorption.
- reduces risk of NEC (Necrotizing enterocolitis).
- enhances mother-baby bonding.

For preterm infants, it has been observed that except for a few nutrients (e.g. vitamin C, D, sodium, folic acid), the breast milk of mother (of the preterm infants) has been found to be higher in nutrients and is unique for low birth weight babies. The weaning age for the preterm infants should be delayed and be based on the corrected chronological age. However, in cases of nervous system disorders, hyperbilirubinemia, heart problems etc, a modified demand feeding is better.

However, if infants cannot be breast fed or bottle-fed, under such circumstances enteral or parenteral nutrition may be provided. Table 18.2 gives the calorie and protein intake of preterm infants on enteral and parenteral support.

Table **18.2:** Estimated **calorie** and protein intake of preterm infants

	Body Weight (g)		
Nutrients	900-1200	1200-1500	1500-1800
Proteins (TPN)	3.5	3.4	*3.2*
Proteins (EN)	4.0	3.9	**3.6**
Energy (TPN)	101	108	109
Energy (EN)	119	127	128

TPN: Total parenteral nutrition EN : Enteral Nutrition

Source: Clinical Perinatology 29(2): 225-244; 2002; Ziegler *EE*, Thureen PJ and Carlson SJ- Aggressive nutrition of very LBW infant.

For enteral feeding following need to be considered:

- In preterm calorie density to be 0.8 Kcal/ml,
- LBW formulas used: protein – a ratio of 60:40 whey to casein; fat – having MCT (medium chain triglyceride) for better absorption, LCT (long chain triglyceride) for essential fatty acids.
- In full term infants – formulas providing adequate proteins, carbohydrate, fats and other nutrients.

Parenteral Nutrition Support

Parenteral nutrition support is the provision of dextrose, amino acids, electrolytes, vitamins, minerals and trace elements with or without fat. The initial considerations are:

- Calorie and protein goals – based on nutritional assessment and keeping in mind the maintenance and growth needs.
- The duration of TPN and thus choosing the different access routes (central/ peripheral).
- Total fluid allowance.

Parenteral nutrition is more used for preterm infants who are less than 1500 g and less than 30 weeks of gestation age, as their GI tract is immature. As both risks and benefits are found to be associated with TPN, thus, various nutrition routes are used as per required individually.

Components of TPN

Glucose: Initiated at the rate of 6 mg/kg/min and increased upto 12-14 mg/kg/min, but care to be taken to prevent hyperglycemia.

Proteins: 1.5-2.0 g/kg/day and increased to 3.5-4.0 g/kg/day, cystiene is considered to be an essential nutrient for preterm infant.

Lipids: The recommendations vary from 0.5-1.0 g/kg/day to 3.00 g/kg/day.

Electrolytes: Sodium *3.0-4.0* mmol/kg/day and potassium 2.0-3.0 mmol/kg/day.

Vitamins: The suggested parenteral intake of vitamin is:

Vitamin A:	280-500 µg/kg/day
Vitamin E:	2.8 µg/kg/day
Vitamin K	100 µg/kg/day
Vitamin D:	4 µg/kg/day
Ascorbic Acid:	25 µg/kg/day
Thiamine:	350 µg/kg/day
Riboflavin:	150 µg/kg/day
Pyridoxine:	180 µg/kg/day
Niacin:	6.8 µg/kg/day
Pantothenate:	2.0 µg/kg/day
Biotin:	6.0 µg/kg/day
Folate:	56 µg/kg/day
Vitamin B_{12}	0.3 µg/kg/day

From our discussion above, it is evident that feeding the lBW infant is challenging. Monitoring of the nutritional status of these infants is essential to observe the growth. The various parameters used are daily body weight record, weekly length and head circumference and periodic biochemical parameter assessment.

We may end our discussion by summing up that specialized nutrition needs for preterm and/or low birth weight infants should be carefully monitored for prevention of morbidity and promoting optimal growth and development.

Next, we move on to lactose intolerance, which you may recall studying in Unit 14 earlier, is the inability to digest significant amounts of lactose, the major sugar found in milk. This is one of the common problem encountered during childhood. Let us learn the practical significance of lactose intolerance in children.

18.2.3 Lactose Intolerance

Lactose is the name of the sugar found in milk. Lactose intolerance, you must be aware by now, occurs when the body is unable to breakdown the lactose that is in consumed foods. In children, lactose intolerance is presented with persistent diarrhoea lasting more than 14 days. Other symptoms may include stomach pain, cramping and gas. Shedding of lactase producing villi in the intestine cause the lactose malabsorption. It is mostly a transitory phenomena and patients recover when the mucosa returns to normal. During the malabsorption period, a lactose free restricted diet is given to control the diarrhoea.

Confirmatory test for lactose intolerance is the test of stools for its pH and reducing substance. It is confirmed for lactose intolerance if the pH is below 5.5, and reducing substance are more than 1% in stool.

While most infants can tolerate milk-based and dairy products, many children develop an intolerance as they mature. Usually the first line of defence is to avoid dairy products altogether. The diet intervention is further elaborated next.

Diet intervention

Lactose is present in dairy producls such as milk, cheese, yoghurt, ice cream etc. Hidden sources of lactose may include bread, candy, cookies, biscuits, sauces, gravies, soups etc. Hence, depending upon the amount of lactose an individual can handle, major or minor dielary restrictions may be imposed.

Most lactose-intolerant children can digest yoghurt and buttermilk. On settling of the diarrhoea, they should begin with yoghurt which is better tolerated as during its fermentation it becomes richer in bacteria which produces β galactoside - this hydrolyzes lactose. Later milk (50 ml/kg/day) may be tried if tolerated .

Because dairy products are restricted or avoided, which are a major source of calcium, an important mineral for children to tlcvelop strong bones, it is essential that other foods rich in calcium be given to make up for the loss. Tofu, broccoli, pulses (bengal gram whole, horse gram, rajmah), nuts and oilseeds, green leafy vegetables (particularly amaranth, fenugreek), fish and sea foods are excellent sources of this mineral besides dairy products.

Further, use of lactose free formulas can be advised, like soya feeds. Amylase rich foods arc advised and rice based ORS advised.

With this, we end our discussion of lactose intolerance. We will take up celiac disease next.

18.2.4 Celiac Disease

Celiac disease (also called gluten enteropathy), as you may recall studying in Unit 14, sub-section 14.2.8.1, is an intestinal disorder that results from an abnormal immunological reaction to gluten. a protein found in wheat, barley, rye, and, to a lesser extent, oats. It is *characterized by* enteropathy of small intestines. It is said to be due to genetic, as well as, environmental factors. It is seen all over the world, as well as, in India. The *clinical manifestation* of celiac disease in chilclrcn below 3-4 yrs of age is chronic diarrhoea, abdominal distension, extreme irritability and failure to thrive. The *diagnosis* of celiac disease is established with the help of three biopsies. *Long term implication* of untreated celiac disease could be growth stunting, osteoporosis and dental enamel defects.

Treating the patient with celiac disease emphasizes the importance of maintaining dietary compliance. The nutritional management of celiac disease is therefore highlighted next.

Nutritional Management of Celiac Disease

A gluten-free diet is the major therapy for celiac disease patients, particulary children, and may be needed for lifelong adherence,

Gluten-free diet, as we learnt earlier, is a diet including food and drink, which does not contain gluten. In other words, a diet in which food having gliadin or related prolamin fraction has lo be excluded e.g. wheat, rye and barley. Usage of oats is still under consideration. Various common natural gluten-free flows and cereals to be used in celiac disease are rice, maize, chick pea flour (Channa atta), black gram flour (besan), corn flour, potato flour, bajra, singhara ka atta, kuttu ka atta, soyabean flour. Other food sources that are safe in celiac disease include meats (poultry, fish, meat), milk, fruits and vegetables, butter, oil etc. Very Few commercial gluten - free products are available in our country. It is indeed very important to monitor the child on gluten-free diet.

A well-balanced diet with emphasis on intake of the following nutrients is recommended.

Energy: initially the children are seen to be malnourished, thus 100-120 Kcal/kg body weight/day with gradual increase to 150 Kcal/kg body weight/ day to be given younger children can be given frequent feeding – upto 6-8 feeds in a day.

Proteins: should be provided upto 15en% (percent of energy). The intake can be increased from 0.5 to 1g/kg body weight/day.

Fat: intake of fat can be from *25* to 50en% (i.e. 25-50 percentage of energy from fat of the total calories).

Micronutrients : supplementalion of various micronutrients is advised for celiac disease. These include vitamin **A,** folic acid, copper, calcium potassium and zinc.

Counseling and compliance: If symptoms do not improve, the child's diet should be reviewed and evaluated. A decrease in diarrhoea, increase in height and weight are some of the signs for improvement of the celiac disease condition. Proper diet counseling and follow up is very important to ensure compliance to the gluten - free diet.

With this we end our study of some common paediatric problems and their nutritional management. Next, we shall move on to geriatric nutrition. But first we would like you to answer the check your progress exercise 1 and assess your understanding of the topic covered so far.

Check Your Progress Exercise 1

1. List a few paediatric problems, which have special nutritional requirements.

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2. Why does the calorie and protein requirement increase in CHD?

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3. List the energy, protein and fluid requirements for a preterm infant.

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4. Which food/food component is not tolerated during celiac disease and why?

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Now get ready to learn about geriatric nutrition.

18.3 GERIATRIC NUTRITION

Aging has been defined as *"a series of time related processes that ultimately bring life to a close."* Persons of *60* years of age and older are defined as elderly by WHO. Successful aging is said to be multidimensional and has been defined as *"encompassing the avoidance of disease and disability, maintenance of cognitive and physical function and sustained social and productive activity"*.

By 2020, around 13%of global population (1 billion people) would be above 60 years of age. It is expected that 1/3rd of this total population will be in developing countries. The increment being approximately 3% per year in developing countries and 1% per year in developed countries. It is important that the elderly live a healthy and functional life than live with chronic disabilities. Since elderly are more susceptible to chronic and degenerative problems it would be interesting to know more about the physical and physiological changes linked with aging. You may recall reading the same in the Advance Nutrition Course in Unit 16 as well.

18.3.1 Physical and Physiological Changes

Every stage has its unique requirements due to different changing needs. With respect to nutrition and health, four different basic areas are of importance – physical, psychosocial, socioeconomic and nutritional changes. Let us review these changes.

A. ***Cellular senescence*** – Aging brings about an irreversible state of growth arrest at the cellular level. Though the cells are viable and metabolically active but their genetic function are different from the normal cells. Various clinical biomarkers have shown that oxidative stress at cell/mitochondria level increases with aging that is characterized by lower concentration of carotene, vitamin E and C levels.

B. Physiological changes – The various physiological changes include:

1) *Integumentary Tissues:* The skin, hair and nails covering and protecting the body are the intengumentary tissues. Depigmentation of hair and wrinkling of skin (due to alteration in connective tissue composition) is observed with aging.

   Wound healing becomes slower with age. The dermis of skin where 7-hydroxy cholesterol is converted to cholecalciferol (Vitamin. D) also decreases with age, thus the older persons require longer exposure to sun to produce the given quantity of the vitamin.

2) Body *Composition*: After 30 years of age 1-2% decline in lean body mass annually is observed. The total body water, bone mass and lean body mass decreases. The body fat mass increases, weight gain is commonly observed in men (central abdominal area) and in women (post menopause).

   With aging the cardiac, renal and pulmonary functions decrease.

3) Pulmonary and Respiratory System: With aging the chest wall becomes stiffer and less compliant and the muscular force of the diaphragm is reduced causing less compliance and less recoil of lungs. Thus, there is decrease in the maximum amount of air movement in and out of the lungs. With the decreasing function, the hygiene of respiratory airways -ability to clear microbial pathogens in compromised.

4) Cardiovascular and Circulatory System: Aging affects the cardiac muscle causing a diminished resting cardiac output. The capacity of myocardium for cellular repair is also reduced with aging. With aging, there is stiffening of the blood vessels, causing rise in systolic blood pressure. The integrity of the blood vessels is also altered.

5) Renal and Urogenital System: Various studies have shown a decrease in the creatinine and insulin clearance. Due to the changes in glomerular structure of the kidney and circulatory senescence (aging) filtration is affected and thus the renal clearance. However, this per se does not affect the net nitrogen excretion.

   With aging, the male urogenital system undergoes hypertrophy of prostate gland and this affects the urine flow from the blader.

6) *Oral cavity and alimental-y tract:* Various functional changes and decline in secretory function occur in the digestive tract with aging. These include:

Oral cavity – The dentition are affected, (loosening of teeth, tooth decay and gum deterioration with age), saliva secretion decreases leading to dry mouth (xerostomia).

Gastric – Reduced gastric secretion and gastric emptying is common in elderly. Some authors consider it to be due to aging whereas other investigators consider it to be due to helicobacter pylori. This affects the iron availability from the diet. Vitamin B_{12} deficiency also observed due to decreased gastric intrinsic factor.

Due to the reduction in intestinal/ colon motility and poor muscle tone of abdomen along with decrease in dietary fiber intake and low physical activity associated with aging, constipation is a common problem observed.

7) *Musculoskeletal System:* Osteopenia (decrease in bone mineral content) is observed with aging. There is an average of 30% decline in the bone mineral density from 30-40 yrs of age to 90 years. Other factors affecting low bone mass are smoking, alcohol consumption, reduced physical activity, lower calcium intake and absorption and use of steroids. In women, immediately following menopause, the rate of bone loss is higher due to decrease in estrogen production. Musculoskeletal atrophy and decrease in functional loss of muscle strength is also observed due to decrease in anabolic hormones affecting the physical function and the metabolic rate.

8) *Gonads and Reproductive System*: With aging, there is decrease in pituitary hormone secretion causing decrease in gonadal hormone production, which causes number of changes. In women with the decrease and cessation of oestrogen hormone, menopause occurs.

9) *Endocrine Systems and Metabolism:* As mentioned earlier, the main endocrine gland–pituitary gland secretion decreases. Another important feature in elderly is decline in insulin production and thus declines in glucose tolerance. The diet-induced thermogenesis, basal and resting metabolism is reduced with aging.

10) *Hepatopoietic and Immune System:* Though the circulating red blood cells or the white cell count or platelet number does not normally change with age, but some other changes occur like vitamin B_{12} malabsorption affecting the red blood cell production. The white cells, with aging, due to disrupted signaling causes changes like intrinsic function deficits–hypo responsiveness to proliferation etc.

11) *Central and Peripheral Nervous System:* Age related changes occur in various *senses* related to the cranial nerves–vision, hearing, taste and smell, These are discussed next.

Vision – Presbyopia (loss of accommodation function and loss of muscular function) and opacity of the lens (cataract) occur with aging. Some studies suggest that there could be delay in cataract formation if diets rich in antioxidant vitamins are consumed.

Age related *hearing loss* in another feature observed with aging.

With aging *taste and smell* activity also decreases (hypogeusia and hyposemia respectively), thus affecting the appetite of the persons. Decrease in some micronutrient (Zn, Cu, some vitamins) are also said to be associated with decrease flavour perception.

Cognitive functions like intellectual, reasoning memory functions tend to decrease with age either as a consequence of neurodegenerative change. Important role of vitamin B and antioxidants have been mentioned by some authors.

Peripheral nervous system The vibratory and pain perception declines/dulled with age and this may have adverse implication in early organic disease detection. With respect to central nervous system, myelination of axons of nerve needs to be maintained and may be vulnerable to stress and free radicals.

12) ***Drug metabolism*** (Polypharmacy) – As older persons are sometimes prescribed number of medications, care is to be taken, as there is reduction in renal and hepatic clearance. Medications that may have possible interaction with appetite and gastrointestinal function and electrolyte imbalance include anticonvulsants, antidepressants,non-steroidal anti-inflammatoryagents, anti-arrhythmias, diuretics etc.

C. Psychosocial changes – is dependent on the integrity vs. despair of the individual and is also seen to affects the individual's health and nutrition.

D. ***Socioeconomic status (SES)*** – The nutrition has also been found to be related to the **SES** of the individual, which may change with retirement, and other health issues of the elderly.

The various changes described above influence the nutrient need and nutritional management of elderly. We shall review the nutrient requirement and changes required for the elderly next.

18.3.2 Nutritional Changes and Requirement

Nutrition is affected in two way – due to the changes in physiological function with aging having effect on absorption, retention and utilization of nutrients and on the other hand the extent to which a particular nutrient or diet pattern affects the senescence /aging. To a certain extent, optimal nutrient intake, food and selection can help in a better life of an aged person in addition to his/her genetic constitution. By 1970, it was suggested that with age the requirements for macro-and micronutrients change. The RDA have been given for 51+ age group by National Research Council (1989,US). These requirements include:

Energy ***and Protein:*** Decreased physical activity and changes in body composition and decreased basal metabolic rate affects the macronutrient energy, protein requirements. It has been established that 0.8 gm ***protein*** /kg body weight/day in universally recommended providing about 15-20 en% (percent of energy). The protein intake may be increased or decreased depending on illness/ convalescence.

The estimated ***energy*** requirements decrease by 0.5-1.0 % per year and are based on physical activity level, weight, height and age of the individual - 25-30 Kcal/kg/day (increased in hypermetabolic state). With aging loss of muscle mass and strength (sarcopenia) is observed. It has been seen that decrease in physical activity causes these body composition changes. These processes lead to a lower energy requirement. Due to the decrease in lean tissue, the BMR declines by about 5 % per decade. Thus for maintenance of lean body mass, physical activity is most important. It is also important to emphasize the elderly to maintain adequate energy intake to prevent either underweight or overweight. Underweight may be observed in persons who have 'anorexia of aging' and depression. They may have gait instability, falls, fractures, delayed wound healing etc.

Carbohydrate: It is usually recommended that approximately 55en% (percent of energy) be provided from carbohydrate foods with emphasis on complex carbohydsates, Aging has been associated with decreased glucose tolerance and it can be corrected to an extent with increased dietary fiber and exercise.

Fats: In elderly fat intake is recommended to be limited to 20en% (percent of energy) with emphasis on quality of fats used. Emphasis is on right proportion of PUFA, MUFA and **SFA** for prevention of coronary artery disease.

Vitamin and Minerals: Decreased gastric secretion and intestinal motility affect the absorption and intake of nutrients especially calcium, iron, vitamin B_{12} and fiber in the diet. The dietary fiber intake is also reduced with age.

- *Calcium, Phosphorus and Vitamin D*: As mentioned earlier, due to the change in skeletal system, vitamin D and calcium needs increase with age. Bone mineral loss as part of aging needs special emphasis on calcium and phosphoms intake. The upper intake level of phosphorus is lower than the requirement for younger adult. Keeping in view the greater prevalence of impaired renal function with aging FAO/WHO recommends a lower magnesium intake than the younger adult.

- *B-Complex Vitamins:* Various *B* complex vitamins especially B_{12}, folic acid, B_6 and ribvoflavin are found to affect favourably the cognitive function and n-3 fatty acids help in preserving the cerebral at the cellular level.

- *Vitamin A, Iron and Zinc:* The recommendation for iron is said to decrease in elderly women. Intake of vitamin E and zinc is said lo help in the immune and defense system.

Water and electrolyte: Intake for individuals are said to be consistent throughout adulthood. For adults 30 ml/kg body weight /day is recommended. There may be increased risk of dehydration among elderly when on diuretics or laxatives as they have a lower thirst and have decrease urine concentrating ability.

Thus, we may conclude that for elderly a healthy diet with emphasis on green vegetable, fruit, whole grain product, low fat milk products, fish and legumes along with life style modification in physical activity and smoking is important. Unnecessary and overdose of supplements should be avoided, but on the other hand adequate supplementation as required would help in improving the nutritional status of the elderly.

However, how do we assess the nutritional status of the elderly? Read the following section(s) and find out.

18.3.3 Nutritional Assessment

Nutritional risk factor is defined as "characteristic or occurrence that increases the likelihood that an individual has or will have problems with nutritional status". Various factors contributing lo this are age, poverty, disease, dietary intake, and physical condition.

Nutritional assessment methods commonly used are enumerated herewith.

1. *Bodyweight measurements* remain to be the most practical and cost effective parameter. Rapid weight loss such as 2% in one week or up to 10% in 6 months is considered significant and BMI calculation is useful for comparison since skin fold measurements are not effective due to skin turgor changes.

2. *Physical Examination:* Based on the physical examination such as presence of oedema and vitamin deficiency symptoms, diagnosis can be made.

3. *Biochemistry* : Hypoalbuminemia is not considered to be an index of under nutrition, but it is of importance to identify the high risk subset of older persons requiring nutritional intervention. Levels less than 3 g/dl needs caution and intervention.

4. *Haematology* : A lower total lymphocyte count (TLC) is also helpful in stratification of severity of undernutrition. If levels are less than <1500, it is associated with decrease immune function and malnutrition.

Nutritional status assessed traditionally with the use of anthropometric, biochemical, clinical and dietary analysis has drawbacks. These include:

- Data for elders is compared with normal values for younger persons.
- Physical condition of elders makes some measurements difficult.
- RDA's for those over 50 years of age not available.
- Nutrient deficiency signs and symptoms are inappropriately attributed to normal aging.

Nutritional screening programmes, therefore, have been designed to assess for presence of malnutrition and some of the causes. Next, we shall look at the nutritional assessment tools, which may be used for the assessment of at risk elderly individuals.

Nutritional Assessment Tools

Malnutrition/protein energy malnutrition amongst elderly persons has been observed in various studies – be it hospitalized patients, nursing home residents or outpatients. With the help of the assessment tools the elderly at risk can be given preventive and treatment care as required.

The assessment can be done by observation of following tools.

1. ***Nutrition Screening Initiative (NSI)*** : ***(NSI)*** tries to identify basic risk factors - inappropriate food intake, poverty, social isolation, disability, acute / chronic disease, chronic medication use, and the age of subject. It is a valuable epideiniological tool and increases awareness of undernutrition among patients and caregivers.

Drawback – A large number of personnel required at different screening levels, there is lack of professional supervision and patient compliances in the beginning.

2. ***Mini Nutritional Assessment (MNA) Tool*** : It is a comprehensive and simple tool, which is able to categorize the subjects into three different categories like well nourished, at risk and undernourished. In most of the cases this tool eliminates the need for more invasive test such as blood sampling.

The MNA was developed and validated jointly by the Center for Internal Medicine and Clinical Gerontology of Toulouse (France), the Clinical Nutrition Programme at the University of New Mexico (United States), and the Nestle Research Center in Lausanne (Switzerland). The objective of this tool was to screen and assess the nutrition status as part of the standard evaluation of elderly patients in clinics, nursing homes, hospitals, or among those who are otherwise frail. The MNA is easy to administer, patient friendly, inexpensive, very sensitive (96%), highly specific (98%), and reproducible.

The MNA comprises 18 items grouped in four sections: (1) anthropometric assessment (weight, height, arm and calf circumferences, and weight loss); (2) general assessment (six questions related to lifestyle, medication, and mobility); (3) dietary assessment (eight questions related to number of meals, food and fluid intake, and autonomy of feeding); and (4) subjective assessment (self-perception of health and nutrition).

The response to each item in the MNA had a numerical score. The total MNA score is calculated as the sum of the points assigned to the responses of the 18 items. The maximum value of the final score is **30.** According to the obtained score using the questionnaire the MNA stratifies patients in: well nourished ($24 = MNA < 30$), at risk of undernutrition ($17 = MNA = 23$), and undernourished ($MNA < 17$).

The MNA is specifically designed to guide nutritional intervention by identifying the risk factors requiring correction. In fact, it is both a screening and assessment tool for the identification of malnutrition in the elderly. The management and nutritional intervention guidelines using MNA are as follows:

A. For *those* ***categorized as*** well-nourished

They need only be reminded of the importance of continuing good dietary habits. The MNA assessment should be repeated to detect any changes in status.

B. *Persons at risk of undernutrition*

An MNA score between 17 and 24 indicates that the patient is at risk for malnutrition with a good prognosis, given early intervention. Thus, factors leading to undernutrition must be identified and strategies should be devised to treat those conditions. The MNA examination should be readministered 3 to 6 months later to evaluate the success of intervention and to determine if the patient remains at risk of malnutrition.

C. Undernourished persons

An MNA score below 17 indicates that the patient is suffering from undernutrition. Thus in this situation the diagnosis must be confirmed by laboratory tests, besides improving the nutrient intake and frequent monitoring will be necessary.

In community-dwelling elderly persons, the MNA detects risk of malnutrition and life-style characteristics associated with nutritional risk while albumin levels and the BMI are still in the normal range. Also, MNA is associated with diminished cognitive function, diminished ability to care for one's self, and with reduced functional capacities. In outpatients and in hospitalized patients, the MNA is *predictive of outcome and cost of care*. Nutritional status assessed on admission by the MNA reflects the patient's nutritional condition, degree of autonomy, and current treatment. In home care patients and nursing home residents, the MNA is related to *living conditions, meal patterns, and chronic medical conditions and allows targeted intervention.*

The MNA was designed to provide the health care professionals with a quick, macroscopic view of a number of important areas that affect the nutritional well-being of an elderly patient. As such, it is not useful in assessing whether a patient has a specific vitamin or mineral deficiency, especially in the case of Vitamin D, folate, vitamin B_{12}, iron and zinc. Anolher weakness of the MNA is that a number of questions target independent-living elders but not elders in long-term care or elders receiving nutrition support.

A sample of the mini nutritional assessment tool is given in Table 18.3 for your reference.

3. ***Scales (Screening Tool)***: The basic biochemical and anthropometric parameters are used in this screening.

4, Recognizing the different causes of under nutrition by simple mnemonics - WEIGHT LOSS. Let us see what it stands for.

W – Wandering and forgetting to eat / weight loss due to 'anorexia of aging'.

E – Emotional /psychological problems like depression etc. and their medication have effect on food intake.

I – Insufficient funds.

G – Gastrointestinal tract problems.

H – Hypo/hyperthyroid or other endocrine problems should be looked into as they cause weight loss, depression, gastrointestinal tract problem.

T – Tremors or other neurological problems interfering feeding.

L – Low salt or unappetizing diet due to diet restriction because of variety of medical illness.

O – Oral problems like tooth loss or use of dentures also effects intake of food.

S – Swallowing – Dysphagia related various neurological problems.

S – Shopping and food preparation.

Having learnt about the nutritional assessment tools let us look at some problems linked with elderly.

Table 18.3: Mini Nutritional Assessment Tool

Last name:_____ First name:_____ Middle initial:_____ Sex: ——
Date:_____ Age:_____ Weight (kg):_____ Height (cm):_____

SCREENING QUESTIONS

1. Has food intake declined over the past three months due to loss of appetite, digestive problems, chewing or swallowing difficulties?
   0 = Severe loss of appetite
   1 = Moderate loss of appetite
   2 = No loss of appetite
2. Weight loss during the last 3 months?
   0 = weight loss greater than 3 kg (6.6 lbs)
   1 = does not know
   2 = weight loss between 1 and 3 kg (2.2 and 6.6lbs),
   3 = no weight loss
3. Mobility ?
   0 = bed or chair bound
   1 = able to get out of bed/chair but does not go oul
   2 = goes out
4. Has the patient suffered psychological stress or acute disease in the past three months?
   O = yes
   2 = no
5. Neuropsychological problems?
   0 = severe dementia or depression
   1 = mild dementia
   2 = no psychological problems
6. Body mass index (BMI)? (weight in kg/height in m 2)
   0 = BMI less than 19
   1 = BMI 19 to less than 21
   2 = BMI 21 to less than 23
   3 = BMI 23 or greater

If the score is 12 points or greater, the patient is not at nutritional risk and there is no need to complete the rest of the questionnaire.

If the score is 11 points or less, the patient may be at nutritional risk and the full MNA@ assessment should be completed. This will provide a malnutrition indicator score.

The patient should answer questions (1-6). The following assessment questions should be answered from patient's records or using professional judgment. When interviewing the patient it maybe necessary to ask several questions to obtain the needed information.

NUTRIONAL ASSESSMENT QUESTIONNAIRE

		Points	
1.	Body mass index (weight in kg ÷ height in m^2):		
	a. < 19	= 0 points	☐
	b. 19 to A < 21	= 1 point	
	c. 21 to < 23	= 2 points	
	d. > 23	= 3 points	
2	Midarm circumference:		
	a. < 21cm	= 0 points	☐
	b. 21 to < = 22 cm	= 0.5 point	
	c. > 22 cm		
3.	Calf circumference:		
	a. < 31 cm	= 0 points	☐
	b. > =31 cm	= 1 point	
4.	Weight loss during past 3 months:		
	a. > 3kg	= 0 points	☐
	b. Does not know	= 1 point	
	c. 1 to 3 kg	= 2 points	
	d. No weight loss	= 3 points	

General assessment			
5.	Lives independently (not in a nursing home or hospital):		
	a. No	= 0 points	☐
	b. Yes	= 1 point	
6.	Takes more than three prescription drugs per day:		
	a. Yes	= 0 points	☐
	b. No	= 1 point	
7.	Has suffered psychologic stress or acute disease in the past 3 months:		
	a. Yes	= 0 points	
	b. No	= 1 point	☐
8.	Mobility:		
	a. Bed-bound or chair-bound	= 0 points	☐
	b. Able to get out of bed or chair, but does not go out	= 1 point	
	c. Goes out	= 2 points	
9.	Neuropsychologic problems:		
	a. Severe dementia or depression	= 0 points	☐
	b. Mild dementia	= 1 point	
	c. No psychologic problems	= 2 points	
10.	Pressure sores or skin ulcers:		
	a. Yes	= 0 points	☐
	b. No	= 1 point	
Dietary assessment			
11.	How many full meals docs the patient eat daily?		
	a. One meal	= 0 points	☐
	b. Two meals	= 1 point	
	c. Three meals	= 2 points	
12.	Selected consumption markers for protein intake:		
	a. At least one serving of dairy products (milk, paneer, curd) per day:		☐
	b. Two or more servings of legumes or eggs per week:		
	c. Meat, fish or poultry every day:		
	0 or 1 yes answers = 0 points		
	2 yes answers = 0.5 point		
	3 yes answers = 1 point		
13.	Consumes two or more servings of fruits or vegetables per day:		
	a. No	= 0 points	☐
	b. Yes	= 1 point	
14.	Decline in food intake over the past 3 months because of loss of appetite, digestive problems, or chewing or swallowing difficulties:		
	a. Severe loss of appetite	= 0 points	☐
	b. Moderate loss of appetite	= 1 point	
	c. No loss of appetite	= 2 points	
15.	Cups of fluid (e.g., water, juice, coffee, tea, milk) consumed per day (1 cup = 8 oz):		
	a. < 3 cups	= 0 points	☐
	b. 3 to 5 cups	= 0.5 point	
	c. > 5 cups	= 1 point	
16.	Mode of feeding:		
	a. Needs assistance to eat	= 0 points	☐
	b. Self-fed with some difficulty	= 1 point	
	c. Self-fed with no problems	= 2 points	
17.	Does the patient think that he or she has nutritional problems?		
	a. Major malnutrition	= 0 points	☐
	b. Moderate malnutrition	= 1 point	
	c. No nutritional problem	= 2 points	
18.	How does the patient view his or her health status compared with the health status of other people of the same age?		
	a. Not as good	= 0 points	☐
	b. Does not know	= 0.5 point	
	c. As good	= 1 point	
	d. Better	= 2 points	
Assessment total (maximum of 30 points): ▼ ▼ Malnutrition indicator score: > = 24 points = well nourished; 17 to 23.5 points = at risk for malnutrition; < 17 points = malnourished.			

18.3.4 Health and Feeding Problems among Elderly

Malnutrition, both obesity and undernutrition, are common problems linked with elderly. Some of the common disorders such as Alzheimer's disease, Parkinson's disease etc. are also age related about which you may recall studying in the last unit. Dysphagia (difficulty in swallowing), though not a disease, is a disorder which may accompany several neurological disorders. We shall not dwell on the nutritional management of these neurological disorders here in this unit since we have already covered them earlier.

Here, let us look at obesity as a problem among elderly. Obesity, we know, is correlated to number of diseases like coronary artery disease, diabetes, sleep apnea, osteoarthritis, peripheral vascular disease. Hence, its treatment and management is crucial. The mainstay of treatment of obesity in elderly should be combination of exercise, healthy eating and behaviour modification, with emphasis on micronutrient supplementation. Do look up the unit on weight management i.e. Unit 9 given earlier in this course to revise the dietary goals for management of obesity. These you would find will be applicable to quite an extent in case of elderly as well.

Undernutrition, among elderly, can be diet induced or may be due to other reasons. We will next elaborate on nutrition support for the elderly during undernutrition next.

18.3.5 Nutrition Support – Parenteral/Enteral/Oral

Undernutrition either due to dietary deficit a due to a medical complication may arise in the elderly. The nutritional support, therefore, needs to be individually modified based on changes in metabolism. Let us review each of the nutrition support i.e. parenteral, enteral and oral and their indications.

Parenteral feeding is used in cases when neither oral nor enteral feeding is possible. For example, in case of non-functional GI tract. Close monitoring is required in this feeding. Use of low osmolality nutritional preparation is also emphasized.

During prolonged use, central line is preferred and care needs to be taken to prevent catheters related infections.

Use of pharmacological methods is the second line of treatment for undernutrition, if the initial nutritional support fails.

Enteral feeding: Enteral, as you may already be aware, is defined as provision of nutrition support through the GI tract or by accessing the gut. The pre-requisites/ special features'include:

- To be resorted to if individual is unable to feed orally.
- If GI tract intact, resort to enteral feeding.
- For short term support nasogastric or nasoenteric; for prolonged use of enteral route – gastrostomy/jejunostomy to be used.
- Choice from the different polymeric formulas, preferably of low viscosity so that easier route in case of small bone tubes.
- Specific formulation can be given as and when required by patient e.g. diabetic or renal feeds.
- Continuous feeding to begin with half strength feed (at the rate of 30 ml/hr; followed by full strength at 25 ml/hr) preferred over bolus feeding due to risk of aspiration,
- Cyclical feeding is another example of continuous feeding when feeds are given for a particular time of day e.g. 12-18 hours. Interrupted feeding is also found to be most practical method. It is continuous feed for 4-6 hours intermitted with few hours of no feeding.

- While feeding, positioning the patient at an angle of 30° decreases risk of aspiration.
- PEG (percutancous endoscopic gastrostomy) is another good way of feeding.
- Usually caloric concentration of feeds is around 1/Kcal/ml

Finally, let us get to know about the oral nutrition repletion.

Oral Nutritional Repletion: This is the most ideal feeding method. The nutrient requirement are highlighted herewith.

Energy Requirements

Based on the *Benedict – Harris* equation for men and women, the daily energy requirements can be calculated.

For Men : 66 t 13.7 W t 5 H – 6.8 **A**

For Women: 66.5 + 9.6 W + 1.8 H – 4.7 A, where W = weight (kg), H = Height (cm), A = Age (Yrs)

OR

For practical purposes 35 Kcal/kg/day in case of hyper metabolic condition and baseline requirement of 25-30 Kcal/kgBW/day.

In case the elderly is having pulmonary insufficiency; the fat en% (percent of energy) should be increased to 50%.

Proteins: Normally 1g/kg BW /day is the protein requirement which may be increased to 1.5 g/kgBW/day in stress conditions. However, in case of renal and hepatic insufficiency protein intake is reduced as per condition.

Fluid and Electrolytes: Care to be taken that adequate fluid be given to the elderly. If patient is unable to take the required daily needs, then formulated nutritional supplements could be given if oral intake is poor.

If taking orally (supplemented feed), should take care regarding the following:

- Correct flavour of feed
- To be given in between meals; approximately 1 hour before meals
- In case of malabsorption syndromes, hydrolyzed preparations given.

Vitamins and trace elements: Decreased gastric secretion, absorption interaction wit11 medication may increase certain vitamin and trace elements requirement. For e.g. calcium, vitamin. **A,** C, D, E, B_6 and zinc requirements.

Requirements in special situations: In disease conditions like renal, cardiac, hepatic insufficiency etc., the requirements are as per the disease state, about which we have already studied earlier in this course.

To sum up, having gone through the discussion above, you may have realized that it is a challenge to meet the nutritional requirements of elderly due to the various factors.

Check Your Progress Exercise 2

1. Give the basic nutritional requirements of elderly.

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2. Describe any one assessment tools for assessing nutritional status of elderly.

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3. Give the situation when parenteral and enteral feeding is indicated in the elderly.

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18.4 LET US SUM UP

This unit focused on the paediatric **and** geriatric problems and their nutritional management.

Initially, the common paediatric problems such as congenital heart disease, low birth weight, lactose intolerance, celiac disease were highlighted. Their symptoms etiology were described, with particular focus on their nutritional management.

The second part of the unit dealt with the physiological changes linked with ageing and the nutritional changes and requirement related to this phase. Nutritional screening programmmes to assess the presence of malnutrition and some of the causes among elderly was covered, followed by health and feeding problems and the nutritional support for the elderly.

18.5 GLOSSARY

Acyanotic Heart Disease : broad term of congenital heart defect involving the walls of the chamber or obstruction in the valves.

en : percentage of energy of total calories.

Gastrostomy : refers to a surgical opening into the stomach. Creation of an artificial external opening into the stomach for nutritional support.

Geriatrics : the branch of medicine specializing in medical problems associated **with** old age.

Hypoalbuminemia : refers to an abnormally low level of albumin in blood.

Hypoxia : reduction of oxygen supply to tissues below physiological levels.

Jejunostomy : refers to surgical creation of an opening between the jejunum and the anterior abdominal wall; to allow enteral feeding.

Senescence : the process of growing old; a consequence of advancing age or of a premature aging process from disease.

18.6 ANSWERS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress **Exercise 1**

1. Few common paediatric problems, which have special nutritional requirements include congenital heart disease, low birth weigh, lactose intolerance, celiac disease etc.

2. The calorie and protein requirements increase in CHD to provide for catch-up growth and hypermetabolism.

3. The energy, protein and fluid needs of a preterm infants are: energy – 120 Kcal/ kg/day, protein–3.5 - 4.8 g/kg/day and fluid intake for infant weighing less than 1000 g - 150 ml/kg/day and for infant weighing more than 1000 *g* - 100 to 150 ml.kg/day.

4. In lactose intolerance lactose found in milk is not tolerated. In celiac disease gluten found in wheat, bajra, barley.

Check Your Progress **Exercise 2**

1. The nutritional requirement for elderly include: energy – 25-30 Kcal/kg/day, proteins – 0.8 g/kg body weight/day, carbohydrates to provide 55en% (percent of energy), fats to be limitted to 20en% (percent of energy) and fluid intake of 30 ml/kg body weight along with other vitamins and minerals.

2. ***Mini Nutritional Assessment (MNA) Tool:*** *It* is a comprehensive and simple tool, which is able to categorize the subjects into three different categories like well nourished, at risk and undernourished..

3. ***Parenteral feeding*** is used in cases when neither oral nor enteral feeding is possible. For example, in case of non-functional GI tract.

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