**FOOD AND NUTRITION FINAL ASSIGNMENTS**

**Submitted by Madit Majur Gabriel**

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**Under the Supervision of Mr. Stephen Muchami**

**Course Moderator – Capacity Africa Institute**

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**Department of Nutrition**

**Africa Institute for Project Management Studies**

**Muthaiga Shopping Complex, Limuru rd 4th floor Nairobi, Kenya,**

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1. **Imagine you have identiﬁed people in your community who are suffering from vitamin A deﬁciency, iodine deﬁciency disorder and iron deﬁciency anaemia. What can you do to address these problems?**

**Vitamin A, iodine and iron deficiencies**

Iodine deficiency is the primary cause of preventable brain damage in children. Its most devastating impacts occur during foetal development and in the first few years of a child’s life. Globally, 30 per cent of the world’s population live in areas with iodine deficiency.

Vitamin A deficiency affects about one third of children living in low and middle income settings, mainly in sub-Saharan Africa and South Asia. Vitamin A deficiency weakens the immune system and increases a child’s risk of contracting and dying from infections like measles, and diarrheal illnesses.

Iron deficiency can lead to anemia, which increases the risk of hemorrhage and bacterial infection during childbirth and is implicated in maternal deaths. In turn, babies may be born prematurely and suffer from infections, learning disabilities, and delayed development. Almost 40 per cent of pregnant women and more than 40 per cent of children under 5 in developing countries are anemic. About half of these cases are estimated to result from iron deficiency.

**Ways to address the problems**

**Iron**

* Iron is an essential mineral critical for motor and cognitive development. Children and pregnant women are especially vulnerable to the consequences of iron deficiency.
* Low hemoglobin concentration (anemia) affects 43% of children 5 years of age and 38% of pregnant women globally.
* WHO recommends iron and folic acid supplements for reducing anemia and improving iron status among women of reproductive ages.
* Flour fortification with iron and folic acid is globally recognized as one of the most effective and low-cost micronutrient interventions.
* Classroom with children and teacher
* Preventing iron deficiency helps improve children's learning ability and cognitive development.

**Iodine**

* Iodine is one of the most important minerals required by a fetus for brain and cognitive development, though the iodine content in most foods and beverages is low.
* 18 million babies are born mentally impaired because of maternal iodine deficiency and 38 million are born at risk of iodine deficiency. Globally it is estimated that 2 billion people have insufficient iodine intake.
* Fortification of salt with iodine has been one of the most successful nutrition interventions to date–71% of global households have access to iodized salt11.
* Salt iodization has led to an increase in IQ points and significant decline in the prevalence of iodine deficiency disorders, such as goiters, piles of salt

**Vitamin A**

* Vitamin A is necessary to support healthy eyesight and immune system functions; children who are deficient face an increased risk of blindness and death from infections such as measles and diarrhea7.
* Globally, 1 in 3 pre-school aged children and 1 in 6 pregnant women are vitamin A deficient due to inadequate dietary intake.
* Vitamin A supplementation of children 6-59 months has been shown to be highly effective in reducing mortality from all causes in countries where vitamin A deficiency is a public health concern,

1. **What is the impact of malnutrition on communities? How can you help prevent some of the negative effects of malnutrition?**

**Impact of Malnutrition**

Pregnant and lactating women and young children less than three years are most vulnerable to malnutrition.

Scientific evidence has shown that beyond the age of 2-3 years, the effects of chronic malnutrition are irreversible. This means that to break the intergenerational transmission of poverty and malnutrition, children at risk must be reached during their first two years of life.

Child malnutrition is the single biggest contributor to under-five mortality due to greater susceptibility to infections and slow recovery from illness.

Children who do not reach their optimum height or consistently experience bouts of weight loss during childhood are affected in the long term in numerous ways. They do not reach their optimum size as adults (and so may have less physical capacity for work), their brains are affected (resulting in lower IQs) and they are at greater risk of infection (which kills many children during their early years).

Child malnutrition impacts on education attainment. The degree of cognitive impairments is directly related to the severity of stunting and Iron Deficiency Anemia. Studies show that stunted children in the first two years of life have lower cognitive test scores, delayed enrolment, higher absenteeism and more class repetition compared with non-stunted children. Vitamin A deficiency reduces immunity and increases the incidence and gravity of infectious diseases resulting in increased school absenteeism.

Child malnutrition impacts on economic productivity. The mental impairment caused by iodine deficiency is permanent and directly linked to productivity loss. The loss from stunting is calculated as 1.38% reduced productivity for every 1% decrease in height while 1% reduced productivity is estimated for every 1% drop in iron status.

Maternal malnutrition increases the risk of poor pregnancy outcomes including obstructed labor, premature or low-birth-weight babies and postpartum hemorrhage. Severe anemia during pregnancy is linked to increased mortality at labor.

Low-birth-weight is a significant contributor to infant mortality. Moreover, low birth-weight babies who survive are likely to suffer growth retardation and illness throughout their childhood, adolescence and into adulthood. Growth-retarded adult women are likely to carry on the vicious cycle of malnutrition by giving birth to low birth-weight babies.

**Improved ways to prevent negative effects of malnutrition**

* **Encourage healthier food choices**. The best foods are those that are full of nutrients, such as fruits, vegetables, whole grains, and lean meats. Help your loved one limit his or her intake of solid fats, sugars, alcoholic beverages, and salt. Suggest ways to replace less healthy foods with healthier choices.
* **Snacking on healthy foods** is a good way to get extra nutrients and calories between meals. It may be especially helpful for older adults who quickly get full at mealtimes.
* **Make food taste good again**. If your loved one is on a restricted diet, herbs and spices can help restore flavor to bland foods. Just remember to avoid herb or spice blends that are heavy in salt.
* **Consider adding supplements to one’s diet**. He or she may benefit from a supplement shake or other nutritional supplements. Talk to their doctor about these options.
* **Encourage exercise**. Even a little bit of exercise can help improve one’s appetite and keep his or her bones and muscles strong.
* **Plan social activities**. Make mealtimes and exercise a social activity. Take your loved one on a walk around the block. Encourage him or her to meet a neighbor or friend for lunch. Many restaurants offer discounts for seniors.

1. **Describe and explain the digestion and absorption of carbohydrates**

**Carbohydrates**

There are three main types of carbohydrates: starches, sugars and dietary fiber. Starches and sugars are considered the energy-yielding carbohydrates because they are fully digestible and, once absorbed, they provide the body with 4 calories of energy per gram of carbohydrate. Alternatively, fiber is a type of carbohydrate which is not fully digestible because humans lack the enzymes to break down fibers. As such, fiber is the main carbohydrate which is eliminated through excretion.

**Digestion of carbohydrates**

The two digestible carbohydrates are starches and sugars, and both of these carbohydrates are digested, or broken down into their most elementary form, along the gastrointestinal tract. Amylase, an enzyme which breaks apart starches, is found in the mouth and in the small intestine. Similarly, the three major enzymes which break apart sugars sucrose, maltase and lactase are also found in the mouth and in the small intestine. Once these digested starches and sugars begin to move through the small intestine, they are able to be absorbed.

**Absorption of Carbohydrates**

Once carbohydrates are broken down into their simplest forms, they are quickly absorbed along the upper and lower parts of the small intestine. Small, finger-like projections, called villi, absorb the carbohydrates, then they are transferred to the blood stream and carried to muscles and the liver.

1. **What is nutrition? List the main functions of nutrients.**

**Nutrition** is the process of digestion and absorption of foods and the body’s use of it for growth and replacement of cells.

**Main Functions of Nutrients**

* Providing the body with energy
* Building and repairing body tissue
* Regulating body processes

1. **What is the importance of calcium? Name and explain the two factors that enhance and** **that interfere with the absorption of iron in the body.**

**Importance of calcium**

Calcium is the most abundant mineral in the body. Almost all of the calcium in the body is found in the skeleton - more than 98% in fact. Therefore, a calcium rich diet is very important in the development of your infant’s bones and in the maintenance of your own bones.

Calcium is also important in the building and maintenance of teeth and it plays a key role in our cells. In our cells it is involved in many processes, such as in the contraction of our muscles and in the transmission of signals in nerves.

The main source of calcium is milk, cheese and yogurt. Canned fish with edible bones, some nuts and a few fruits and vegetables also contain calcium. The amount of calcium found in the plant based foods like fruits and vegetables is somewhat smaller than that found in dairy foods.

**Factors that enhance and that interfere with the absorption of iron in the body**

* Body iron stores - absorption is increased in iron deficiency and reduced in iron overload
* Rate of erythropoiesis - absorption is increased by increased erythropoiesis, independent of body stores.
* Chemical state of iron:
* Ferrous (Fe2+) iron is more easily absorbed than ferric (Fe3+) iron and this change is largely dependent on the presence of luminal gastric acid and ceruloplasmin within the intestinal mucosal cell
* Iron in meat as haem is more easily absorbed than non-haem iron e.g. in vegetables; it is also less prone to the influence of gastric pH.

1. **Discuss two reasons why it is essential to include carbohydrates in your diet. Why is it necessary for the body to spare protein?**

**Carbohydrates and your health**

Despite their bad rap, carbohydrates are vital to our health for a number of reasons:-

**Providing energy**

Carbohydrates are body's main fuel source. During digestion, sugars and starches are broken down into simple sugars. They're then absorbed into your bloodstream, where they're known as blood sugar (blood glucose).

From there, glucose enters your body's cells with the help of insulin. Glucose is used by your body for energy, and fuels all of your activities whether it's going for a jog or simply breathing. Extra glucose is stored in your liver, muscles and other cells for later use, or is converted to fat.

**Protecting against disease**

Some evidence suggests that whole grains and dietary fiber from whole foods help reduce your risk of cardiovascular diseases. Fiber may also protect against obesity and type 2 diabetes. Fiber is also essential for optimal digestive health.

**Controlling weight**

Evidence shows that eating plenty of fruit, vegetables and whole grains can help you control your weight. Their bulk and fiber content aids weight control by helping you feel full on fewer calories. Contrary to what low-carb diets claim, very few studies show that a diet rich in healthy carbohydrates leads to weight gain or obesity.

**Protein Sparing Action**- Fats and carbohydrates, if supplied in the diet in sufficient amounts to meet caloric needs, will spare protein so that it can be used for protein metabolism. When calories are inadequate protein is used as a source of calories.

1. **Discuss the role of lipids in our diet and their critical functions in the body.**

Lipids comprise a group of compounds such as fats, oils, steroids and waxes found in living organisms. Both prokaryotes and eukaryotes possess lipids, which play many important roles biologically, such as membrane formation, protection, insulation, energy storage, cell division . In medicine, lipids refer to blood fats.

1. **Explain the importance of fats to the bioavailability of other nutrients.**

There are many factors, both dietary and physiological, that influence nutrient bioavailability. Examples include:

* The physical form of the nutrient within the food structure and the ease with which the nutrient can be released from that structure;
* The chemical form of the nutrient in a foodstuff and its solubility in the lumen;
* The presence of proteolytic enzyme inhibitors (commonly associated with legumes such as soybeans) which reduce the body's ability to digest protein;
* The presence of enzymes such as thiaminase which partially hydrolyzes thiamin and makes it less biologically active.

Diet related factors include:

* Food structure
* Physicochemical form of the nutrient
* Enhancers of absorption, e.g., ascorbate (for iron), some organic acids, sugars, amino acids, bulk lipid (for fat-soluble vitamins), and specific fatty acids
* Inhibitors (primarily of inorganic micronutrient absorption), e.g., phosphates (especially phytate), polyphenols (including tannins), and oxalate
* Competition for transport proteins or absorption sites, e.g., between metals.

Physiological factors include:

* Gastric acidity
* Intestinal secretions
* Gut motility
* Luminal redox state
* Body status (e.g., tissue levels, nutrient stores)
* Short-term homeostatic mechanisms mediated through the mucosal absorptive cells
* Anabolic demands (e.g., growth in infancy and childhood, pregnancy, and lactation)
* Endocrine effects
* Infection and stress
* Genetic polymorphisms and inborn errors of metabolism
* Gut microflora.

1. **Discuss the role of fats as an energy source for the body.**

Fat is an essential part of your diet. It provides energy, absorbs certain nutrients and maintains your core body temperature. You need to consume fat every day to support these functions, but some types of fat are better for you than others. Good fats protect your heart and keep your body healthy, while bad fats increase your risk of disease and damage your heart.

1. **Define chylomicron. Describe the role of bile salts in the digestion of triacylglycerols and** **phospholipids.**

**Chylomicron** is a lipoprotein rich in triglyceride and common in the blood during fat digestion and assimilation.

**Role of bile salts in the digestion of triacylglycerols and phospholipids**

The key issue in the digestion and absorption of fats is one of solubility: lipids are hydrophobic, and thus are poorly soluble in the aqueous environment of the digestive tract. The digestive enzyme, pancreatic lipase, is water soluble and can only work at the surface of fat globules. Digestion is greatly aided by emulsification, the breaking up of fat globules into much smaller emulsion droplets. Bile salts and phospholipids are amphipathic molecules that are present in the bile. Motility in the small intestine breaks fat globules apart into small droplets that are coated with bile salts and phospholipids, preventing the emulsion droplets from re-associating.

The emulsion droplets are where digestion occurs. Emulsification greatly increases the surface area where water-soluble pancreatic lipase can work to digest TAG. Another factor that helps is colipase, an amphipathic protein that binds and anchors pancreatic lipase at the surface of the emulsion droplet.