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Incidence of iatrogenic malnutrition in patients on enteral nutrition in the University of Nigeria Teaching Hospital

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Abstract:*The study assessed the incidence of iatrogenic malnutrition (also known as physician-induced or hospital induced malnutrition) in patients on enteral nutrition in the University of Nigeria Teaching Hospital Ituku-Ozalla, Enugu. A sample of twenty patients (60% male and 40% female) was studied.The result showed that the elderly (55%) and children(15%) were the most affected. Assessments revealed that about 35% of the patients were malnourished. The causes of malnutrition included non-compliance to feeding time, delay in referring patients to the dieticians by physicians and underlying nutritional related diseases such as dysphagia(35%), renal diseases (15%) and sepsis(15%). Effects of malnutrition in patients included paleness, anaemia, oedema, wasting, susceptibility to diseases, and in severe cases death. Recommendations have been made to reduce the incidence and prevent the harsh effects of malnutrition in hospitalized patients.*

Keywords:*Iatrogenic malnutrition; Clinical nutrition; Dieticians; Hospitalised patients; Enteral nutrition*

I. Introduction

The problem of malnutrition in hospitalized patients was revealed in a 1974 article "The skeleton in the hospital's closet". Today malnutrition in hospitals remains a serious issue. According to the World Health Organization (WHO), malnutrition is the gravest single threat to global public health. Malnutrition maybe an excess of important nutrients in the body or it may also refer to their lack thereof. Usually, causes of malnutrition include poor eating habits with either too much or too little intake of the essential nutrients needed by the body. But not all forms of malnutrition can be attributed to bad eating habits or limited access to food; some may have iatrogenic effect or a result of iatrogenesis.

Iatrogenesis or iatrogenic effect derives from a Greek term meaning "brought forth by the healer" or "physician-produced" (Jacobs, Benavidez, Bacha, Walters& Jacobs, 2008). Iatrogenesis thus describes any medical condition, disease or adverse event resulting from medical treatment (British Medical Association Illustrated Medical Dictionary, 2008).Malnutrition on the other hand describes a state in which a prolonged lack of one or more nutrient retards physical development or causes specific clinical disorders e.g. iron deficiency anaemia, goitre, and so on. Malnutrition is also defined as an impairment of health resulting from a deficiency, excess or imbalance of nutrients. It includes under nutrition and over nutrition (Shubhangini, 2002).

Iatrogenic malnutrition could therefore be defined as malnutrition due to various medications or some complications to medical treatment or procedure. It may be caused by negligence among medical personnel including doctors, nurses, therapists, or caregivers who are attending to a particular patient. Or it could just be an unfortunate side effect of some forms of medication or treatment procedure.The Oxford Concise Medical Dictionary (2002) defines iatrogenic malnutrition as malnutrition that occurs as a result of medical conditions, disease or adverse events resulting from medical treatment. It is a deficiency in energy, protein or other specific foods that produces measurable changes in body function. It is a condition that results from treatment as either an unforeseen or inevitable side effect.

Today, malnutrition in hospitals remains a serious issue and affects patients of all ages—from infants in the neonatal intensive care unit (ICU) to geriatric patients (Grove *et al*, 2008). Many patients reach the hospital in a malnourished state and there malnutrition is worsened by hospitalization while others are admitted into hospital with satisfactory nutritional state but become malnourished during their stay in the hospital (Aboaja, 2010). The link between malnutrition on admission to hospital and risk of it increasing during hospital stay is now well established in all parts of the world where studies have been conducted. Malnutrition among hospitalized patients interferes with recovery thereby increasing hospital stay and health care cost.

Furthermore, the disease itself and its associated complications indicate loss of muscle tissue, which requires long period of rehabilitation. Although nutrition support can partially ameliorate these changes, it is very often either inadequate or not given at all and leads to the so-called iatrogenic malnutrition (Aboaja, 2010).

1.2 Statement of Problem

Despite the realization of hospital malnutrition more than 30 years ago, it remains a significant problem. Many illnesses or injuries for which patients are admitted predispose them to malnutrition. Also prolonged hospital stay in itself, predispose patients to malnutrition. (Singh*et al,* 2006).Malnutrition during hospital admission is a risk factor for an unfavourable outcome. Prolonged hospital stay delays recovery and increases cost. A significant proportion of patients have sub-optimal nutritional intake compared with their needs during hospitalization (Kondrup*et al*, 2002). The reason for sub-optimal intake could be due to drug effects on nutrients. Most times drugs can affect appetite, altering food intake. Drugs may increase or decrease appetite, causing nausea, constipation and/or dry mouth, thereby altering nutrient absorption. Some drugs increase gastro-intestinal(GI) motility, decreasing food absorption. The problem for this study therefore was to examine the incidence of iatrogenic malnutrition on patients on enteral nutrition in the University of Nigeria Teaching Hospital Ituku-Ozalla, Enugu State.

1.3 Specific objectives

The specific objectives of the study therefore included:

1. To determine the incidence of iatrogenic malnutrition in patients on enteral feeds
2. To ascertain promptness in commencing enteral feeds among hospitalized Patients in UNTH
3. To evaluate the adequacy of feeding in patients on enteral feeds in UNTH
4. To suggest possible ways of combating iatrogenic malnutrition among hospitalized patients

1.4 Significance of the study

It is hoped that this study would re-emphasize the need for attention to be given to patients' nutritional status. If possible Dietitians should be invited to assess the nutritional status of patients and develop nutritional care plan for patients. This is to prevent malnutrition while on admission. This study also aims at creating awareness on the importance of attaching dietitians to each patient once admitted.

II. Review of Related Literature

2.1. Incidence of Iatrogenic Malnutrition

Malnutrition occurs during hospitalization after patients have been fed inadequate diets for several weeks. However, estimating the prevalence of hospital – induced malnutrition is difficult because of difficulties involved in recording accurately patients' nutritional status. Over the past 34 years, researchers have used different criteria to define hospital malnutrition, and studies have been conducted worldwide on populations that differ in socio-economic status, educational level, age group and severity of illness. Study group size also varies. A study reported in the 1970s suggested that 30% to 50% of hospitalized people left the hospital in worse nutritional condition than when they arrived as patients. Hospitals generally have improved their menus since then, though hospitalization still does not guarantee optimal nutrition. A study carried out in 1996 on 57 hospitals found that only four hospital routinely offered patients menus that met all federal dietary guidelines, fewer than 20% kept cholesterol below 300mg/day, while half kept salt intake below 6g/day and dietary fibre at more than 20g/day(Robert, 1997). Based on many report worldwide, an estimated 13% to 69% of hospitalized patients are malnourished (Weinsier*et al,* 2008). Malnutrition affects patients of all ages – from infants in the neonatal intensive care unit to geriatric (older patients) (Bristrain*et al*, 1996). It has been associated with an increased length of hospital stay, increased morbidity and mortality, impaired respiratory and cardiac function, decreased immune function and poor growth in infants and children (Correia*et al*, 2005).

Results of a research carried out by Agabain 2006 among 76 patients (on dialysis) with chronic renal failure and 48 controls in Jos University Teaching Hospital, Nigeria, revealed that the mean body mass index was significantly low in the patients compared to the control. Underweight malnutrition was present in 21.6% of the patients compared with one of the control. Protein Malnutrition was also present in 3.2% of patients with chronic renal failure and 21% of the control subjects. In Maiduguri, Borno State of Nigeria, 120 children, 70 males and 50 females between the ages of 6-24 months at the paediatric wards of the University of Maiduguri Teaching Hospital, Maiduguri, Nigeria, laboratory findings showed all the children have one or more form of infections with Protein-Energy Malnutrition (PEM). Up to 41.6% had gastroenteritis, 21.7% had malaria, 6.6% had measles, 5.0% had pulmonary TB and 40% had iron deficiency anaemia. Marasmus was highest in both male and female, 34.3% and 36% respectively for males and females between the ages of 6-12 months while kwashiorkor was highest among children between the ages of 13-18 months in both males and females. (Hamidu et al, 2003). Another research carried out by Hamidu in 2003 in Maiduguri among 120 patients showed a relationship between dietary patterns of malnourished children on hospital admission to the socio-economic status and education level of parents of children at the paediatrics wards of the University of Maiduguri Teaching Hospital and the State Specialist Hospital Maiduguri, Nigeria. The result of the research showed that 80% of the mothers of the malnourished children had no formal education, 18.3% attended primary school,

1.7% Islamic education. This indicates that the dietary pattern, socio-economic status and level of education of mothers predispose their children more to malnutrition while on hospital admission.

In the United Kingdom, malnutrition risks have been identified in 20% to 60% of hospital admission to medical, surgical, elderly and orthopaedic wards. A study of 550 consecutive hospital admission determined malnutrition in 40% of patients. Further hospitalization with surgery or other medical treatments often result in additional weight loss. Although malnutrition is common in hospital admission, it has been reported as undiagnosed in up to 70% cases (Peake*et al*, 2005). Kelll*yet al* (2000) assigned likelihood of malnutrition scores based on serum folate and vitamin C level, anthropometric measurements, lymphocyte count, and hematocyte levels in 134 patients at a Teaching Hospital. Kelll*yet al*(2000) also found that among 219 patients in an academic inner city hospital in the United Kingdom in 1998, 13% were malnourished based on BMI and weight loss and only these patients were referred to the Dietetic Department. In a recent British study of 2,283 patients, malnutrition was determined by weight loss, poor intake, wounds and infections. Prevalence decreased from 23.5% in 1998 to 19.1% in 2003 and referrals to the dietetic department increased after staff education and improvement of food quality (Peake*et al*, 2005).

2.2 Enteral Nutrition

Enteral nutrition can be provided either orally or by tube feeding. By definition, Enteral means "within" or by the way of the gastrointestinal tract. It is the preferred route for nutritional support since the gut barrier and immune functions are preserved and systemic infections and other complications are reduced (Carr *et al*, 1996). Many studies support the implementation of enteral nutrition as soon as possible after resuscitation. Enteral feeding requires adequate gastric motility and a gastric residual volume in excess of 150ml will usually require feeding solutions to be administered slowly. However, it is not necessary to have bowel sounds for successful enteral nutrition. (Macfie, 2000).

Enteral feeding is administered to patients in the following conditions:

1. Those who cannot swallow due to paralysis of the muscles of swallowing (diphtheria, poliomyelitis) or cancer of the oral cavity or larynx.
2. Those who cannot be persuaded to eat
3. Those with persistent anorexia requiring forced feeding
4. Semiconscious or unconscious patients
5. Severe mal-absorption requiring administration of unpalatable formula
6. Short bowel syndrome
7. Those who are undernourished or at risk of becoming so
8. Those who cannot digest and absorb
9. Post-surgery
10. Patients with neurological and renal disorders and those with fevers or diabetes
11. Severe diarrhoea

2.2.1. Oral Supplements

Commercially available supplementary sip feeds are used in patients who can drink but in whom appetite is impaired. These feeds typically provide 200kcal and 2g of nitrogen in each 200ml carton (Srilakshmi, 2011).

In order to reduce the risk of aspiration, tubes should not be placed in the stomach unless there is normal gastric emptying and an intact gag reflex and if possible, nasoenteric rather than nasogastric feeding tubes should be employed. This may be valuable in post-operative and critically ill patients in whom gastric motility is impaired.

A satisfactory tube feeding must be

1. Nutritionally adequate
2. Well tolerated by patient so that vomiting is not induced
3. Easily digested with no unfavourable reactions such as distension, diarrhoea or constipation
4. Easily prepared, and
5. Inexpensive

2.2.3 Types of Enteral Foods

Natural Liquid Foods

Foods like whole or skim milk, eggs and some form of carbohydrate such as cooked strained cereals, sugar or molasses can be given. Vegetable oil or cream and non-fat dry milk are also incorporated to increase the caloric and protein levels respectively, foods like "complan" can be added to different foods to increase the nutritive value.

Blenderized Foods

Here, the ordinary food items which cannot be swallowed are blended to make thin liquid which can pass through nasogastric tube.Blenderized diets are well tolerated and are only infrequently associated with diarrhoea. They are less expensive than commercial formulas.

In Blenderized foods,

1. Water is added to make the volume to 1500ml
2. Gives 1500 calories
3. Each ml provides one calorie
4. Gives 50g protein
5. Cost is no more than an average meal in hospital

Table 1: Composition ofblenderized food for tube feeding for hospital practice

Ingredient	Amount(g)	Calories(kcal)	Protein(g)
Rice	100	345	6.8
Green gramdal	40	140	8.8
Bread	20	50	1.6
Milk	200mls	234	8.6
Skim milk powder	60	215	23.0
Spinach	50	13	1.0
Pumpkin	50	12	0.7
Carrots	50	24	0.4
Banana	70	81	0.8
Sugar	60	240	-
Refined oil	20	180	-
Butter	7	51	-

Source: Kawli, Sreenivasan, Eapen and Pradhan (1982),pp. 226-230

Elemental Diets

Normal foods may be replaced by preparation of protein or amino acids, fats and carbohydrates in easily assimilable forms. Such preparations are known as elemental diets. For tube feeding, commercially supplied polymeric mixtures can also be used. "Complan" is a commercial mixture of milk protein casein, carbohydrates (lactose) and fat. "Complan" can be given to supply 2000kcal of energy (Srilakshmi, 2011).

The commercial preparations possess the advantage of convenience, constant composition, pre-sterilization, minimal preparation time and ease of administration. The disadvantages are high cost and unpleasant taste and sometime high osmolarity. Patients with pancreatic insufficiency, malabsorption or massive bowel resection may require an elemental formula.

2.2.4 Feeding Requirements

A concentration of about 1kcal per millilitre is satisfactory. Lesser concentration increases the volume which must be given to meet the nutrient and energy needs. A concentration of 1.5kcal/ml is given for patients with increased caloric needs or patients with fluid restrictions. Greater concentration is more likely to produce diarrhoea and may be too thick to pass through the nasogastric tube.

Table 2: Feeding requirements in tube feeding

Nutrient	Amount
Fluids	30ml/kg
Energy	32kcal/kg
Protein	1g/kg (body weight if there are no external losses)
Sodium	30-40mmol
Potassium	1mmol/g of protein

Source: Passmore and Eastwood (1986)

There are different infusion techniques and they include:

Continuous infusion method

This method is the administration of a fluid into a blood vessel usually over a prolonged period of time. It usually consists of small pulses of infusion, usually between 500 nanoliters and 10 millilitres, depending on the pump's design, with the rate of these pulses depending on the programmed infusion speed.

Intermittent infusion method

It is used when a patient requires medications only at certain times, and does not require additional fluid. It can use the same technique as an intravenous drip, but after the complete dose of medication has been given, the tubing is disconnected from the IV access device and the medication is injected directly (slowly, if it might irritate the vein or cause a too-rapid effect)it has a high infusion rate, alternating with a low

programmable infusion rate to keep the cannula open. The timings are programmable. This mode is often used to administer antibiotics or other drugs that can irritate a blood vessel.

2.3. Nutritional Assessment

Nutrition assessment and screening of patients prior and on admission should occur within the first 24hours of admission. Screening criteria usually include weight and height, recent weight change, oral intake, excessive alcohol intake, and sometimes diagnosis (Mueller *et al*, 2007). A review of past medical history, physical examination, biochemical assessment and a detailed diet history provides insight into a patient's baseline nutritional status.

Whitney and Randy (2008) defined Nutritional Assessment as a comprehensive analysis of a person's nutritional status that uses health, socioeconomic, drug and histories, anthropometric measurements, physical examination and laboratory or biochemical tests. Malnutrition signs are easy to miss, they resemble the symptoms of other diseases e.g., diarrhoea, skin rash, pain and the likes. A person who has learned how to use assessment techniques to detect malnutrition can tell when these conditions are caused by poor nutrition and can take steps to correct them (Whitney &Randy, 2008). Therefore, to detect malnutrition in individuals, health care professional use four nutritional assessment methods:

2.3.1 Historical Information

This is a way of evaluating nutrition status. It is used to obtain information about a person's history with respect to health status, socioeconomic status, drug use and diet. The health history reflects the person's medical records and may reveal a disease that interferes with the person's ability to eat or the body to use nutrients. The patient's family history or major disease is also needed, especially for conditions such as heart disease. Economic circumstances, social factors such as marital status, ethnic background and educational level also influence food choices and nutritional status.

A sample nutritional history format

1. How many meals and snacks do you eat each day?
Meals ---------- Snacks ----------
2. How many times a week do you eat the following meals away from home?
Breakfast ---------- Lunch ---------- Supper ----------
3. What types of eating places do you frequently visit? (Check all that apply)
Fast-food ---------- Supper/cafeteria ----------
Restaurant ---------- Other ----------
4. On average, how many pieces of fruit or glasses of juice do you eat or drink each day?
Fresh fruit ---------- Juice (8 oz cup) ----------
5. On average, how many servings of vegetables do you eat each day? ----------
6. On average, how many times a week do you eat a high- fibre breakfast cereal? ---------
7. How many times a week do you eat red meat (beef, lamb, veal) or pork? ----------
8. How many times a week do you eat chicken or turkey? ----------
9. How many times a week do you eat fish or shellfish? ----------
10. How many hours of television do you watch every day? ----------
11. Do you usually snack while watching television? Yes ---------- No ----------
12. How many times a week do you eat desserts and sweets? ----------
13. What types of beverages do you usually drink? How many servings of each do you drink a day?

Water ----------	Milk:	Alcohol:
Juice ----------	Whole milk ----------	Beer ----------
Soda ----------	2% milk ----------	Wine ----------
Diet soda ----------	1% milk ----------	Hard liquor ----------
Sports drinks ----------	Skim milk ----------	
Iced tea ----------		
Iced tea with sugar ----------		

Source: www.aafp.org.

2.3.2 Anthropometric Data

This helps to reveal nutrition problems. It involves measurement of physical characteristics of the body, such as height, weight, tricep, skin-fold thickness, head and arm circumferences, waist and hip ratios. The assessor compares measurement taken on an individual with standards specific for gender and age or with previous measures on the same individual. Measurement out of line with expectations may reveal such problems

as growth failure in children, wasting or swelling of body tissue in adults and obesity conditions that may reflect energy or nutrient deficiencies or excesses.

Anthropometric Classification of Nutrition

There are five nutritional classifications:

1. Normal
2. Low height-for-age (stunted)
3. Low weight-for-height (wasted)
4. Low height-for-age and low weight-for-height (stunted and wasted)
5. Overweight

2.3.3. Physical Examinations

This nutritional assessment technique looks for clues to poor nutritional status. This is used to detect physical signs associated with nutrient deficiency, toxicity, and imbalance or even non- nutrition conditions. Sites like hair, eyes, skin, tongue and fingernails are thoroughly examined to check for malnutrition signs and symptoms. The posture of a patient may also be considered. This technique may also be used to confirm data collected from other assessment measures.

Nutritional signs of Malnutrition and Good Health

Malnutrition	Good Health
Poor weight gain, weight loss	Healthy skin and shiny hair
Weakness of muscles and fatigue	Healthy weight
Tiredness and lack of energy	Normal blood pressure level
Increased susceptibility to infections	Healthy cholesterol
Delayed and prolonged healing of even small wounds and cut	Clear vision
Irritability and dizziness	Mental alertness
Dry skin and hair	Regular bowel movement
Persistent diarrhoea or long term constipation	Good muscle tone
Irregular menstruation or depression	Healthy bones

Source:www.fitday.com/fitness-articles/nutrition/healthy-eating/good-nutrition.html

2.3.4. Laboratory/ Biochemical Analysis

The biochemical analysis uses samples like blood or urine which contain nutrients, enzymes, and metabolites that reflect nutritional status. It is also used to check electrolyte imbalance and nutrient deficiencies. The results obtained are compared with normal values for a similar population. A goal of nutrition assessment is to uncover early signs of malnutrition before symptoms appear, and laboratory tests are most useful for this purpose. They can also confirm suspicions raised by other assessment methods.

Table of Biochemical test of good nutrition

Nutrients	Values
Glucose	117mcg/dl (80-120)
BUN(blood urea nitrogen)	24mg/dl (8-29)
Creatinine	0.8mg/dl (0.4-1.2)
Sodium(Na)	140mEq/l (10-118)
Potassium(K)	5.2mEq/l (4.4-6.1)
Chloride	104mEq/l(10-118)
CO_2(carbon dioxide)	22mEq/l(22-285)
Calcium	9.6mg/dl(9.4-11.6)
Phosphorus	5.6mg/dl(2.5-6.2)
Total Protein(TP)	6.3gm/dl(5.8-8.1)
Albumin	2.9 gm/dl(2.6-4)
Bilirubin	0.6 mg/dl(0.2-0.7)
Cholesterol	204 mg/dl(129-330)
Triglyceride	82 mg/dl(36-135)
ALKP(alkaline phosphatase)	65 U/l (20-70)
AST(aspirate aminotransferase)	30 U/l(14-42)
ALT(alanine aminotransferase)	45 U/l(15-52)
GGT(gamma-glutamyltransferase)	5 U/l(1-12)
Amylase	850 U/l(280-950)
CK (creatine kinase)	47 U/l(0-130)

Source: www.9sites.org

Each of these methods involves collecting data in various ways and interpreting each finding in relation to others creates a total picture (Whitney &Randy, 2008). The National Nutrition Monitoring and Related Research Act on Nutrition mandated that hospitals establish nutrition screening and assessment guidelines. It

recommended that nutrition screening should occur within the first 24 hours of admission. Screening criteria usually include weight, height, recent weight change, oral intake and sometimes diagnosis (Krystofiak*et al*, 2007).

Nutrition Screening and Assessment Guideline

Screening has to address three or four basic questions:

1. Recent weight loss – is BMI <20.5?
2. Current body mass index – has the patient lost weight since on admission?
3. Disease severity – is the patient severely ill? (e.g. in intensive therapy)
4. Recent food intake – has the patient had a reduced dietary intake in the last week?

2.4. Causes of Iatrogenic Malnutrition

Many patients are already malnourished at the point of admission while others become malnourished during their hospital stay. The aetiologies include alterations in the intake, digestion, absorption and/or metabolism of food. Risk factors include gastrointestinal disorders, chronic diseases, malignancies, low socio-economic status, psychological disorder, old age, alcohol and drug abuse (Correia*et al*, 2003). Several disease states and acute events can predispose patients to malnutrition, the degree of which is usually determined by the severity of the illness. (ASPEN, 2002). The most obvious are those that prevent oral food intake such as cancer, tumours or strictures in the oesophagus, stroke and degenerative neurologic disorders that result in dysphagia. Conditions such as chronic obstructive pulmonary disease, chronic infections and cancer can result in increased metabolic demand and weight loss due to cachexia and poor oral intake. Illnesses always decrease patient appetite as a result of pains nausea, weakness and altered mood or mental status. They can be dissatisfied with repetitive menu cycle, dietary restriction, and the food which can be the type they prefer (Clare *et al*, 2002).
The following are the causes of iatrogenic malnutrition in hospitalized patients.

2.4.1. Activities of Healthcare Professionals

Malnutrition increases in patients during hospitalization. According to the "Low Rate of Nutrition-Related Disorders", one potential cause of worsening nutritional status may be inadequate medical staff awareness about the importance of nutrition in hospitalized patients(Saeed et al, 2006). Deborah(2005) revealed that lack of attention to functional impairment by physicians to patients upon admission and adverse drug effects are the most common causes of iatrogenesis. Adverse drug effects account for approximately 15% of hospital admission in patients over 60 years old as compared to 60% for younger patients. About 62% of adverse drug effects resulting in hospital admission are potentially preventable and 25% may be life threatening. Majority may be due to adequate drug therapy, monitoring therapy or inadequate dosage.

Clinicians sometimes hold enteral nutrition out of suspicion that it causes diarrhoea, when infant diarrhoea is due to other factors such as the underlying illness, altered anatomy, infection and medication.
Green (1999) stated that health care professionals contribute to disease- related malnutrition in the following ways:

1. Failure to recognize and document the problem.
2. Obsolete practices relating to nutritional screening assessment and support.
3. Unclear accountability, leadership, inadequate assistance and support at most times in hospital.

All these are as a result of lack of knowledge and practical training, lack of evidence-based standards and guidelines, lack of specialists in clinical nutrition and lack of awareness of services available.

2.4.2. Length of Hospital Stay

The nutritional status of patients is known to worsen during hospital stay which is partly due to poor recognition by the medical staff and adverse clinical routine (Kritina*et al,* 2008). Length of hospital stay is significantly longer in malnourished patients and higher treatment costs are reported in malnutrition. Patients who are not motile (non-ambulatory) over a period of time experience muscle wasting due to weakness of the muscle and cell depletions.

2.4.3. Inadequate Nutrient Intake

Nutritional intake of patients often decreases during hospitalization.

Patients are required to be on Nil Per Oral (NPO) prior to many investigations and procedures, as well as before and after surgery. Delay of the need for several procedures result in prolonged periods without nutrition. Patients' appetite usually decrease during illness due to pain, nausea, weakness and altered mood or mental status, and they can become dissatisfied with repetitive menu cycles, dietary restriction, and the food which may not be the type they prefer (Kondrup, *et al*, 2002). Most commonly, malnutrition is caused by a

combination of decreased oral intake due to anorexia and increased nutrient requirement due to underlying disease. (Escott- Stump, 2008). Diseases that prevent oral food intake include oral cancer, tumors or strictures in the throat or oesophagus, stroke and degenerative neurologic disorders that result in dysphagia, trauma and others who are ventilator dependent rely on the timely initiation of nutrition support.

Nutrient losses may occur through the skin in certain dermatological diseases characterized by desquamation and exudation of fluids rich in electrolyte and protein as well as in severe burns cases. Intestinal fistulas are inflammatory diseases of the digestive tract or maybe as a result of surgery, resulting in high losses of nutrients, water and electrolytes.

Patients with gastrointestinal disorders are among those who are most prone to developing malnutrition. Patients with gastroenteritis, gastric outlet or bowel obstruction and disorders present with varied degrees of malnutrition depending on how long they waited to seek medical care. Surgical resections of the gastrointestinal (GI) tract for cancer or Cohn's disease can result in severe mal-digestion and malabsorption of nutrients and can cause digestive disorders such as cystic fibrosis. Gastric by-pass procedures while effective for weight loss predispose patients to serious micronutrient deficiencies. Chronic liver disease can contribute to poor nutrient digestion and absorption, patients with pancreatitis often present with malnutrition (Green, 1999). In a population of patients preparing for GI or hernia surgery, the use of Subjective Global Assessment identifies malnutrition in half of the patients with almost 20% being severely malnourished (Correia, 2001).

Hyper- metabolic states are characterized by an acceleration of metabolic processes caused by the disease. Major surgery involves greater intensity and duration that will increase catabolic effects. Disorders associated with very severe or prolonged disease conditions, lead to a hyper-metabolic stress response from the body, thus altering metabolism and fuel utilization. The extent of alteration depends on severity and the type of stress involved. Fever increases the basal metabolism by a little more than 10% for each degree temperature rise. Elective operations increase resting energy expenditure by up to 10%, multiple fractures, stab wounds, or gunshot wounds cause an increase up to 30%, severe sepsis up to 60%. Extensive third-degree burn can even cause more than a doubling of the energy expenditure. Conditions such as chronic obstructive pulmonary disease, chronic infections and cancer can result in increased metabolic demand and weight loss due to cachexia and poor oral intake (American Society of Parenteral and Enteral Nutrition, ASPEN, 2007).

2.5. Effects/Complications of Malnutrition

Malnutrition is characterized by an impairment of a number of physiological functions. Respiratory muscle functions are deteriorated as are other bodily functions such as cardiac, sexual and immune functions as well as thermoregulation. Malnutrition leads to depression, irritability, anxiety, reduced ability to maintain concentration and reduced sexual drive. In children, malnutrition impairs growth and delays sexual maturation (Morley & Lucas, 1993). "Protein- Energy Malnutrition has been associated with a number of health consequences including decreased bone mass, immune dysfunction, anaemia, reduced cognitive function and poor wound healing" (Donini*et al*, 2003).

Under nutrition in critical periods impairs the development of normal immune system leading to more chronic and frequent infections (Genninggham-Rundles *et al*, 2005). Lack of adequate macronutrients or some micronutrients (like zinc, selenium, iron and the antioxidant vitamins) can lead to clinical significant immune deficiency and infections in children (Ibid). A woman with low body mass index (BMI < 18Kg/m) may have difficulty becoming pregnant and preconception under nutrition shortens gestation in women who do become pregnant. (Ryaco*et al,* 2005).

It is known that adequate nutrition is needed for many important aspects of brain functioning and it has been shown that optimal nutrition promotes both functional health status and mental wellbeing (Drewnowski*et al*, 2001). Malnutrition is however, a complex problem and is not limited to protein deficiency. Micronutrient malnutrition such as deficiency of a particular vitamin or mineral can have a range of adverse health effects. It is important to consider the psychological effects such as depression, anxiety, irritability, apathy, sleep pattern and loss of concentration (Stanza *et al,* 2007)

2.5.1 Effects of Iatrogenic Malnutrition

According to the British Dietetics Association (2006), malnutrition in hospital causes a reduction in muscle and body tissue mass and also results in altered metabolic and physiological function which has adverse effects on health. Muscle wasting and weakness decrease mobility and stamina and impair functions of the lungs and heart. Malnutrition is also associated with poor wound healing, impaired immune response and delayed recovery from illness with a higher incidence of post-operative complications. Correcting under nutrition has many health benefits including improved recovery from diseases and illness with fewer complications and short hospital stay. Malnutrition can lead to weight loss, poor wound healing, decreased intestinal motility, anaemia, oedema or dehydration and the presence of ulcers. The circulatory blood volume and the concentration of the serum proteins, haemoglobin and electrolytes may be reduced (Srilakshmi, 2011).

2.5.2. Complications of Enteral Nutrition

Enteral which is generally known as tube feeding, may produce several complications in a patient if used for a long time. These complications include: aspiration into the lungs of stomach contents, oesophageal erosion, vomiting, bloating, cramps, fluids and electrolytes imbalance, hyperglycaemia, congestive heart failure, hyperosmolar coma, and essential fatty acid deficiency. A weight gain of over 0.7kg per day indicates excess of extracellular fluid which may lead to congestive heart failure. Serum electrolytes, glucose and urea must be periodically checked. Cough reflex may be depressed as in old or infirm patient or in-patients with pulmonary problem. Diarrhoea may be secondary to rapid feeds, hyperosmolar feed solutions, and lactose deficiency in a patient fed with milk or milk products or associated antibiotic therapy (Antia& Abraham, 2002).

Other complications of tube feeding include:

1. Injury or ulceration of nasal, buccal or pharyngeal mucosa.
2. Perforation of hypo pharynx, oesophagus, trachea, bronchus, lung, pleural cavity, or mediastinum.
3. Coiling of tube in mouth, oesophagus, hiatal hernia, or stomach.
4. Blockage of tube with clotted formula, undissolved medications, or foreign bodies.
5. Rupture of tube during flushing or attempt to clear blockage.
6. Loss of tube into gastrointestinal tract.
7. Reverse or downward migration of tube, gastric outlet obstruction.
8. Accidental or intentional extubation necessitating replacement.
9. Enlargement of enterostomy stoma with leakage and skin irritation.
10. Aspiration
11. Infections of sinuses and middle ear
12. Compromise of lower oesophageal sphincter, and reflux oesophagitis
13. Upper gastrointestinal bleeding.
14. Emotional distress due to changed body image.
15. Loss of patient autonomy and mobility with use of restraints.
16. Disturbances of fluid and electrolyte balance.
17. Inadequate nutrient administration.
18. fistulas
19. intraperitoneal leakage
20. Formation of granulation tissue around stoma. (Mobarhan and Trumbore, 1991).

Another complication of enteral nutrition is “refeeding syndrome”. This is simply refeeding of severely malnourished patient which may result in acute intracellular shift of electrolytes as cell anabolism is stimulated. Refeeding can cause acute decrease in the circulatory levels of potassium, magnesium and phosphorus. Hence these electrolytes should be monitored and replaced as needed to maintain normal circulating levels by supplementation. (Srilakshmi, 2011).

2.6. Treatment/Management of Iatrogenic Malnutrition in patients on Enteral Nutrition

Early detection of malnutrition by routine screening of vulnerable groups (those with chronic diseases and the elderly) can do much to identify those who would benefit from dietary support measures and nutrition intervention. Treatment of malnutrition usually consists of replacing missing nutrient, treating symptoms needed and treating any underlying medical conditions. Managing nutritional status starts with a nutritional assessment. This enables a clinical nutrition or registered dietician to confirm the presence of malnutrition, assess the effect of the disorder and formulate diets that will restore adequate nutrition (Kraft *et al*, 2005).

In case of patients who can eat orally, between meal snacks and liquid nutrients supplements can be helpful. The development of menus providing nutritionally adequate and appealing meals that the patient can eat and where necessary, supply additional food and nutrient supplement may be all that is needed for some patients while others may require more intensive artificial nutritional support through a tube or intravenously. (British Dietetics Association, 2006). Children with severe acute malnutrition need to be treated with specialized therapeutic diets – F75, F100 or HEMIX, alongside the diagnosis and management of complications during in-patient care (WHO, 2002). Treatment emphasizes frequent nutrient dense energy meals like, HEMIX and resolution of underlying causes of malnutrition, poverty, infection and illness.

Patients who cannot or will not at or who are unable to absorb nutrients taken by mouth may be fed intravenously (ASPEN, 2002). According to the American Society for Parenteral and Enteral Nutrition ASPEN guidelines (2002), patients who are either unable or expected to be unable to take sufficient oral nutrition for 7 to 14 days are candidates for nutrition support. Enteral nutrition should be used if the gastrointestinal tract is functional and Parenteral nutrition should be used only if the gastrointestinal tract is not functioning or cannot be accessed (Grover *et al,* 2008).

Studies have shown that enteral nutrition has the following advantages:

1. Maintenance of the structural and functional integrity and weight of the intestines
2. Aid in better insulin response to food absorbed through the intestine
3. Does not easily produce electrolyte and trace element imbalances
4. Improves resistance to infections in burns, burn-induced hyper-metabolic response
5. Maintains intestinal structure and function
6. Is effective during liver transplantation and the elemental diet helps to tide over in short-bowel syndrome until functional regeneration occurs in the residual bowel.
7. It is also simple, inexpensive, avoids catheter sepsis and infections,
8. Convenient and easily tolerated (Antia&Abraham, 2002)

Refeeding risk is the most critical aspect early in the treatment of malnourished patients especially those on enteral and Parenteral nutrition. It is important that clinicians initiate feeding at low calorie levels while monitoring serum electrolytes. An intracellular shift of potassium, magnesium and phosphorus can result in dangerously low serum levels, thus clinicians should monitor at least daily with the onset of feeding and replete electrolytes when necessary. Avoidance of excessive fluid administration is also important especially in patients with cachexia. Provision of multivitamin or single nutrient supplements or at least Thiamine repletion is often necessary (Kraft *et al,* 2005). Refeeding syndrome complications can be avoided by anticipating the problem and initially feeding only 20-30kcal/kg, checking initial serum levels of potassium, magnesium and phosphate (Srilakshmi, 2011).

A study describing all hospitalized patients reported that 70% of the patients did not reach a reasonable recommended daily nutrient intake. In most cases, simple measures such as an increased protein and energy intake, is known to have a significant beneficial effect in decelerating the development of malnutrition. An early Swiss study showed that a meagre daily supplement of 20g protein and 254 calories reduced morbidity among ill patients, whether in hospital or not, with attendant significant decrease in length of hospital stay, complications and mortality rates. Similar results have been shown in surgical patients, thus demonstrating that malnutrition in hospital patients can be reduced by appropriate and early identification of the at-risk patient, and that adequate feeding as part of the patient's overall therapy is a cost-effective practice. Patients who require elective intestinal surgery should receive nutritional assessment before their operation (Srilakshmi, 2011).

Despite the realization of hospital malnutrition more than 30 years ago, it remains a significant problem. Many ailments or injuries for which patients are admitted to the hospital predispose them to malnutrition as does hospitalization itself (Kelly *et al*, 2005). The final solution to malnutrition in hospitals probably lies in recognizing human nutrition as a discrete discipline in which all medical graduates should reach minimum level of competence, and some will specialize. Compared with other health care practitioners, Registered Dietitians (RDs) are the most qualified to recognize malnutrition as well as to help prevent and treat it. Prompt identification, treatment and monitoring of malnourished patients as well as helping to educate other health care professionals, will continue to make a positive impact on healthcare delivery (WHO, 2002).

III. Methodology

3.1. Study Area

University of Nigeria Teaching Hospital Ituku-Ozalla, Enugu was used as the site for this project work. This hospital is located in the Ituku/Ozalla community along the Enugu-Okigwe express way. The hospital was established in the early 20th century as a standard general hospital for Africans, built by the colonial masters. It was however, changed to a general hospital then under the Government of the East Central State. It was transferred to a specialist hospital on July 1, 1970. Today the hospital is in its permanent site and covers an area of about 200 acres of land. It has a bed capacity of over 500 beds and tremendous total number of professional and non-professional personnel. This hospital is characterized by its serene and conducive environment which makes it possible for patients and workers to thrive and go about their respective business.

3.2. Sample Population

The subjects in this study were inpatients on enteral feeds in the University of Nigeria Teaching Hospital Ituku-Ozalla, Enugu.

3.3 Data Collection Method

Structured and validated questionnaires were administeredto patients on enteral feeding in the hospital. The questionnaire contained patient's personal information, Anthropometric data, Dietary Assessment, Nutrition-related problems/Diagnosis.

3.4 Anthropometry

The anthropometric measurements involving heights and weights were carried out on the respondents and BMI calculated

For ambulatory patients:

$$\text{BMI} = \frac{\text{Weig ht in kilograms (kg)}}{\text{Heig ht in meters square (m2)}} = {}^{\text{kg}}/_{\text{m}^2}$$

With the BMI calculated, it was compared to WHO (1997) classification.

For non-ambulatory patients, the body weight was estimated using knee height and mid-arm circumference for various groups thus:

Females

6-18yrs Wt= (KHx0.71) + (MACx2.59) -50.43. Accuracy =±7.65kg

19-55yrs Wt= (KHx1.24) + (MACx2.97) - 82.48. Accuracy = ±11.98kg

60-80yrs Wt= (KHx1.50) + (MACx2.58) - 84.22. Accuracy = ±14.52kg

Males

6-18yrs Wt= (KHx0.59) + (MACx2.73) – 48.32. Accuracy = ± 7.50kg

19-55yrs Wt= (KHx1.09) + (MACx3.14) – 83.72. Accuracy = ± 11.30kg

60-80yrs Wt= (KHx0.44) + (MACx2.86) – 39.21. Accuracy = ± 7.04kg

Where: KH= knee height; MAC= mid arm circumference

Estimates of Height/recumbent length for the various groups

Age	Equation	Error
Black females		
>60	S=58.72+(1.96KH)	8.26cm
19-60	S=68.19+(1.86KH)	7.60cm
6-18	S=46.59+(2.02KH)	8.78cm
Black males		
>60	S=95.79+(1.37KH)	8.44cm
19-60	S=73.42+(1.79KH)	7.20cm
6-18	S=39.60+(2.18KH)	9.16cm

Source: Nutritional Assessment

3.5 Method of Data Analysis

The data was analysed using simple frequencies, simple percentages and frequency tables.

IV. Results

The results of the study conducted on a sample of twenty patients on enteral nutrition in the University of Nigeria Teaching Hospital, Enugu, Nigeria, over a period of one month are noted in tables as follows:

Table I: Patients' Information

	Frequency	**Percentage**	**Cumulative frequency**	**Cumulative percentage**
Age (yrs)				
0-10	3	15	3	15
11-20	1	5	4	20
21-30	2	10	6	30
31-40	-	-	6	30
41-50	3	15	9	45
Above 50	11	55	20	100
Total	**20**	**100**		
Sex			12	60
Male	12	60	20	10
Female	8	40		
Total	**20**	**100**		
Date ofadmission(Month)				
April	1	5	1	5
May	3	15	4	20
June	6	30	10	50
July	10	50	20	100
Total	**20**	**100**		

Table 1 showed that 55% of the patients were above 50 years of age while 15% were between the ages of 0-10years. 60% of the patients were male while 40% were females. About 50% of the patients were admitted in July and 30% in June.

Table II: Anthropometric Measurement

	f	%
Height (m)		
0.01-0.50	**1**	**5**
0.51-1.00	**2**	**10**
1.01-1.50	**2**	**10**
1.51-2.00	**15**	**75**
Total	**20**	**100**
Current Weight(kg)		
1-10	3	15
11-20	-	-
21-30	-	-
31-40	3	15
41-50	10	50
51-60	3	15
Above 60	1	5
Total	**20**	**100**
Usual Weight (kg)		
1-10	3	15
11-20	-	-
21-30	-	-
31-40	-	-
41-50	6	30
51-60	9	45
Above	2	10
Total	**20**	**100**
DesirableBody Weight(kg)		
1-10	1	5
11-20	2	10
21-30	-	-
31-40	-	-
41-50	2	10
51-60	5	25
Above 60	10	50
Total	**20**	**100**
Body Mass Index(kg/m^2)		
< 18.5	12	60
18.5-24.9	7	35
25-29.9	1	5
Total	**20**	**100**
Percentage Desirable Body Weight (%)		
<50	1	5
51-60	2	10
61-70	-	-
71-80	11	55
81-90	5	25
91-100	-	-
Above 100	1	5
Percentage Body Weight Loss(%)		
1-5	-	-
6-10	10	50
11-15	7	35
16-20	2	10
21-25	-	-
Above 25	1	5
Total	**20**	**100**

Table II revealed that 75% of the patients' height fall between 1.51-2.00 metres, 50% of the patients' have a current weight between 41-50kg, 45% of the patients had a usual weight of 51-60kg and 30% and 30% had a usual weight of 45-50kg. It was also showed that the desirable weight of 50% of the patients was above 60kg while 25% had a desirable weight between 51-60kg. 60% of the patients had a body mass index less than 18.5(i.e. underweight) whereas only 35% had a body mass index between 18.5-24.9(normal), and only one patient (about 5%) had a body mass index between 25-29.9(overweight). About 55% of the patients had a percentage desirable body weight of 71-80% while 25% had a percentage desirable body weight of 81-90%. Half of the patients (50%) had a percentage weight loss of 6-10% while about 35% had a percentage weight loss of 11-15%.

Table III: Biochemical Assessment

	f	%
Haemoglobin ($\times 10^9$/l)		
Less than 5.0	3	15
5.0-10.0	15	75
Greater than 10.0	2	10
Total	**20**	**100**
Fasting BloodSugar (mg/dl)		
Less than 80	-	-
80-120	10	50
120 above	5	25
None	5	25
Total	**20**	**100**
Total Cholesterol(mmol/dl)		
Less than 3.6	3	15
3.6-6.2	11	55
Greater than 6.2	1	5
None	5	25
Total	**20**	**100**
Low Density Lipoprotein (mmol/dl)		
Less than 1.9	2	10
1.9- 3.6	11	55
Greater than 3.6	2	10
None	5	25
Total	**20**	**100**
Very Low DensityLipoprotein (mmol/dl)		
Less than 0.4		
0.4 – 1.3	2	10
Greater than 1.3	10	50
None	3	15
Total	**20**	**100**
Triglyceride(mmol/dl)		
Less than 0.5	4	20
0.5- 1.0	7	35
Greater 1.0	4	20
None	5	25
Total	**20**	**100**

In table III, 75% of the patients had haemoglobin values of 5.0-10.0x10^9, while about 15% had less than 5.0x10^9/l. the fasting blood sugar of 50% of the patients was within 80-120mg/dl, 25% of the patients had more than 120mg/dl while none had less than 80mg/dl. The FBS of 25% of the patients were not recorded. 55% of the patients had total cholesterol value of 3.6-6.2mmol/dl while that of 25% of the patients was not recorded. The low density lipoprotein of 55% of the patients was within 1.9-3.6mmol/dl while that of 25% of the patients was not recorded. 50% of the patients had a very low density lipoprotein of within 0.4-1.3 whereas that of 25% of the patients was not recorded. The triglyceride level of 35% of the patients fall within 0.5-1.0mmol/dl, while 20% had a value greater than 1.0mmol/dl and value of 25%of the patients were not recorded.

Table IV Clinical Assessment

	f	%
PALE		
Present	5	25
Absent	15	75
Total	**20**	**100**
ANGULAR STOMATITIS		
Present	3	15
Absent	17	85
Total	**20**	**100**
ODEMA		
Present	8	40
Absent	12	60
Total	**20**	**100**
MUSCLE WASTING		
Present	7	35
Absent	13	65
Total	**20**	**100**

In table IV, the clinical assessments showed that 25% of the Patients were pale while 75% were not, 15% had angular stomatitis while 85% had not, Oedema was present in 40% of the patients but not in the other 60%, 35% were wasted while 65% were not.

Table V Dietary Assessment

	f	%
1) NUMBER OF MEALS EATEN EACH DAY PRIOR TO ADMISSION		
2 times	5	25
3 times	11	55
4 times	2	10
More than 4 times	2	10
Total	**20**	**100**
2) NUMBER OF SNACKS TAKEN EACH DAY PRIOR TO ADMISSION		
1	9	45
2	8	40
3	2	10
More than 3	1	5
Total	**20**	**100**
3) FRUITS TAKEN EACH DAY PRIOR TO ADMISSION		
1	7	35
2	8	40
3	3	15
More than 3	2	10
Total	**20**	**100**
4) FRUIT JUICES TAKEN EACH DAY PRIOR TO ADMISSION		
1 glass cup	9	45
2 glass cup	8	40
3 glass cup	3	15
More than 3 cups	-	-
Total	**20**	**100**
5) METHOD OF FEEDING		
Nasogastric	11	55
Gastrostomy	2	10
Oral	7	35
Total	**20**	**100**
6) WHY WAS FEEDING TYPE INTRODUCED		
Loss of appetite	7	35
Chewing or swallowing difficulty	13	65
Greater than 3 days Nil Per Oral -		
Greater than 3 days on dextrose and Or clear liquids only (post-surgery) -		-
Total	**20**	**100**
7) CURRENT DIET REGIMEN		
High protein fluid diet	15	75
Low protein fluid diet	1	5
Low fat fluid diet	3	15
Oral Hemix	1	5
Total	**20**	**100**
8) VOLUME OF FEED CONSUMED (LITRES)		
0.5-1	2	10
1.5-2	16	80
2.5-3	2	10
Total	**20**	**100**
9) STRENGTH OF FEED		
Half	2	10
Full	18	90
Total	**20**	**100**
10) FEED GIVEN BY		
Nurses	13	65
Relatives	7	35
Doctors	-	-
Dietitians	-	-
Total	**20**	**100**
11) FEEDING TIME INTERVAL		
2	2	10
3	8	40
4	6	30
6	4	20
Total	**20**	**100**
12) COMPLIANCE TO FEEDING TIME		
Always	10	50
Often	5	25
Seldomly	3	15
Never	2	10
Total	**20**	**100**
13) CONSUMPTION RATE		

High	8	40
Low	10	50
Refuses	2	10
Total	**20**	**100**
14) FEELINGS AFTER CONSUMPTION		
Satisfied	13	65
Hungry	3	15
Calm	4	20
Total	**20**	**100**
15) REACTIONS AFTER FEEDING		
Vomiting	1	5
Uneasy	-	1
Diarrhea	1	5
None	18	90
Total	**20**	**100**
16) RECOMMENDED BY		
Dietician	20	100
Doctor	-	-
Nurse	-	-
Self	-	-
Total	**20**	**100**
17) DATE COMMENCED		
On admission	-	
Few days after admission	2	10
A week after admission	7	35
Two weeks after admission	8	40
More than two weeks	3	15
Total	**20**	**100**

It can be seen in Table V that 55% of the patients ate meals 3 times daily and 25% 2 times daily prior to admission 45% of the patients took 1 snack daily while 40% of the patients usually consumed 2 fruits daily and 35% took 1 fruit daily prior to admission. Also, 45% of the patients took 1 glass of fruit juice daily prior to admission. On admission, 55% of the patients were placed on nasogastric fluid diet while 35% were on oral fluid diet and only about 10% were on gastrostomy fluid diet. The feed method was introduced because 35% of the patients had loss of appetite while 65% of the patients had chewing or swallowing difficulty. 75% of the patients were on high protein diet fluid diet, 15% on low fat fluid diet and 5% on low protein fluid diet and Oral Hemix each. About 80% of the patients consumed between 0.5-1or 2.5-3.0 litres. 90% of the patients were fed on full strength while each 10% were on half strength. Majority of the patients about 65% were fed by nurses while 35% were fed by their relatives. 40% of patients were fed 3hourly, 30% 4hourly, 20% 6hourly and 10% 2 hourly. It was observed that feeding time was always adhered to by 50% of the patients while 10% never adhere to the feeding time. About 40% of the patients consumed high amount of the feed while 50% consumed low amount and only 1 patient about 10% refused to feed. 65% of the patients felt satisfied after feed intake, 15% still felt hungry and 20% just remained calm. It was noted that 10% of the patients reacted after feeding that is, vomiting-5%, diarrhoea-5%, whereas 90% showed no reaction to feed. All feeds were recommended by dieticians (100%). About 40% of the patients commenced feeding two weeks after admission, 35% a week after admission, 15% more than two weeks after admission and 10% few days after admission. No patient was commenced fluid diet on the day of admission.

Table VI: Nutritional Related Problem/Diagnosis

	f	**%**
Malnutrition	2	10
Pressure ulcer	-	-
Sepsis	3	15
Aids	-	-
Dysphagia	7	35
Renal Disease	3	15
Hepatic Disease	1	5
Unconsciousness	2	10
Surgery	2	10
Total	**20**	**100**

Table VIshowed that 35% of the patients had dysphagia, 15% had renal disease another 15% had sepsis, 10% were malnourished, 10% were unconscious, 10% had surgery and 5% had hepatic disease. There was no patient with peptic ulcer or AIDS.

V. Discussion

In table 1, it was shown that majority of patients on enteral nutrition were males (60%) whereas only 40% were females. It was also shown that the elderly of ages above 50 years (55%) and children of ages between 0-10years (15%) were mostly affected. The research which was conducted in July 2013 showed that majority of the patients were admitted in the July (50%) and June (30%).

5.1. Anthropometry Measurements

Anthropometric measurements showed that the body mass index of 35% of the patients fall within the normal range (18.5-24.9), while 60% of the patient's about 5% was overweight (25-29.9). It was also shown that 15% of the patients had 60% and below of their desirable weight while only about 5% had more than 100% of the desirable body weight. It was reported that 80% of the patients had percentage weight loss of 6-10%, 35% had percentage weight loss of 11-15%, 10% had percentage weight loss above 25%. The data showed that most of the study carried out by Kelly, *et al*.(2000) who assigned likelihood of malnutrition scores based on serum folate and vitamin C level, anthropometric measurements, lymphocyte count, and hematocyte levels in 134 patient at a Teaching Hospital, Kelly,*et al*.(2000) also found that among 219 patients in an academic inner city hospital in the United Kingdom in 1998, 13% were malnourished based on body mass index and weight loss and only these patients were referred to the Dietetic Department. In a recent British study of 2, 283 patients, malnutrition was determined by weight loss, poor intake, wounds and infections.

5.2. Biochemical Assessment

The biochemical assessment which is an indicator for assessing the level of depletion of important nutrients or the accumulation of toxic wastes in the body showed that 75% of the patients' haemoglobin level greater than 10.0×10^9/l. The fasting blood sugar indicated hyperglycemia in 25% of the patients while 50% about half the number of the patients had normal fasting blood sugar. The fasting blood sugar for 25% of the patients was recorded. About 55% of the patients had adequate total cholesterol less than 3.6. The low density lipoproteins were normal in 55% of the patients while each of 10% of patients had lowered and raised low density lipoproteins of less than 1.9 and greater than 3.6 respectively. Half of the patients about 50% were reported to have normal levels of very low density lipoproteins (0.4-1.3mmol/l) while 15% had more than 1.3mmol/l and 10% had less than 0.4mmol/dl of very low density lipoproteins. The triglyceride levels were normal in 35% of the patients (0.5-1.0mmol/dl), low in 20% of the patients (greater than 1.0mmol/dl).

The total cholesterol, low density lipoproteins (LDL), very low density lipoproteins (VLDL) and triglyceride (TG) are indices for total fat store in the body. The indices show that about 15% of the patients had depleted fat store while about 13% of the patients had an excess of fat store in the body. The lipid profile of 25% of the population was not recorded.

5.3. Clinical Assessment

Clinical assessment is techniques used to detect physical signs associated with nutrient deficiency, toxicity, and imbalance or even non-nutrition conditions. The clinical assessment showed that one- quarter of the patients about 25% were pale, 15% had angular stomatitis, there was oedema(retention of fluid in the body tissues) in 40% of the patients and 35% of them were wasted(depletion of the body tissues or muscles). These signs are good indicators of malnutrition.

5.4. Dietary Assessment

This assessment emphasizes the patients' dietary pattern. It was shown that prior to admission, 55% of the patients ate 3 meals a day while 25% ate 2 meals daily. About 45% of the patients took one snack daily while 40% took 2 snacks. 4% of the patients ate 2 fruits a day while 35% ate 1 fruit daily. It was also reported that 45% of the patients took one glass of fruit juice daily, 40% took two glasses of fruit juice and the remaining 15% took about three glass of fruit juice daily. On fluid diet, 10% were on gastrostomy fluid diet and 35% on oral fluid diet. The feeding method was introduced when 35% of the patients showed loss of appetite for food and 65% had difficulty in chewing or swallowing solid food. These conditions are among the criteria for which enteral nutrition can be administered. Carr, *et al*. (1996) opined that enteral nutrition is the preferred route for nutritional support; the gut barrier and immune functions are preserved and systemic infections and other complications are reduced. It was reported that 75% of the patients were on a high protein fluid diet, and 15% on low fat fluid diet. Majority of the patients (80%) were fed between 1.5 to 2 litres of feed daily and 90% of the patients were on a full strength feed. 65% of the patients were fed by the nurses while 35% were fed by their relatives. The feeding time interval was 3 hourly for 40% of the patients, 4 hourly for 30% of the patients, 6 hourly for 20% of the patients and 2 hourly for 10% of the patients. 50% of the patients reported that feeding time were always adhered to; 25% were often adhered to; 15% were seldomly complied with; 10% reported that it was never adhered to;and 10% reported non-compliance. Non-compliance to feeding reported was largely due

to negligence on the part of the nurses or patients' refusal to eat. According to Saeed,*et al*.(2005), one potential cause of worsening nutritional status may be inadequate medical staff awareness about the importance of nutrition in hospitalized patient. 40% of the patients consumed high amount of the feed, 50% consumed low amount of fed while 10% of the patients refused the feed. This is in support of Kondrup, *et al*. (2002) who stated that patients' appetite usually decreases during illness due to pain, nausea, weakness and altered mood or mental status, and they can become dissatisfied with repetitive menu cycles, dietary restriction, and the food which may not be the type prefer. It can be seen from this study that 65% of the patients felt satisfied after feeding, 155 still felt hungry while 20% just remained calm. All the feeds were recommended by a Dietician. No patient commenced feeding on the days of admission, 10% of the patients commenced feeding few days after admission, 405 commenced feeding two weeks after admission and 15% of the patients commenced feeding more than two weeks after admission. The delay in commencing feeding on patients was most times due to physical insensitivity to patients' nutritional status and delay in referring patients to a Dietician. Deborah (2005) revealed that lack of attention to functional impairment by physicians to patients upon admission and adverse drug effects are the most common causes of Iatrogenesis. Kritina (2008) opined that the nutritional status of patients is known to worsen during hospital stay which is partly due to poor recognition by the medical staff and adverse clinical routine.

5.5. Nutritional Related Problem/Diagnosis

According to the American Society for Parenteral and Lateral Nutrition (ASPEN, 2002), several disease states and acute events can predispose patients to malnutrition, the degree of which is usually determined by the severity of the illness. The study showed that the nutritional related problems/diagnosis for which patients were placed on enteral Nutrition were, malnutrition 10%, sepsis-15%, dysphagia(inability to swallow)- 35%, Renal disease-15%, hepatic (liver)disease-5%, unconsciousness-10% and surgery-(10%). Majority of the cases where dysphagia. This supports ASPEN (2002) that the most obvious disease states that predispose patients to malnutrition are those that prevent oral food intake such as cancer, tumours or strictures in the oesophagus, stroke and degenerative neurologic disorders that result in dysphagia.

VI. Conclusion

In conclusion, iatrogenic malnutrition in patients was found majorly in males. The elderly and children were the most susceptible. Patients on enteral nutrition seem to be very susceptible to iatrogenic malnutrition due to factors such as non-compliance to feeding time due to negligence on the part of the nurses or patients resistance to feeding, lack of attention to functional impairment by physicians to patients upon admission, nutritional problems such as dysphagia, renal disease, sepsis, hepatic diseases, surgery and certain intrinsic factors which may result in nutrient imbalance hence causing malnutrition. Delay on the part of physicians in referring patients to the dietetics department when they can no longer manage the situation.

In extreme cases, iatrogenic malnutrition can have severe effects in the patients which include, pallor, anemia, edema, angular stomatitis, muscle wasting, nutrient imbalance, worsened health condition, susceptibility to diseases, complication, susceptibility to diseases, and complications even death. According to the British Dietetics Association (2006), malnutrition in hospital causes a reduction in muscle and physiological function which has adverse effects on health. Muscle wasting and weakness decrease mobility and stamina and impair functions of the lungs and heart. Malnutrition is also associated with poor wound healing, impaired immune incidence of post-operative complications, dehydration and presence of ulcers. The circulatory blood volume and the concentration of the serum proteins, haemoglobin and electrolytes may be reduced (Srilakshmi, 2011).

VII. Recommendations

The following recommendations should be put in place in order to address iatrogenic malnutrition especially in patients on enteral nutrition:

1. Early detection of malnutrition by routine screening of vulnerable groups (those with chronic diseases, the elderly and children) can do much to identify those who would benefit from dietary support measures and nutrition intervention.
2. In case of patients who can eat orally, between meal snacks and liquid nutrients supplements can be helpful.
3. Emphasis should be based on frequent dense energy meals like, HEMIX and resolution of underlying causes of malnutrition, poverty, infection and illness.
4. Patients who cannot or will not eat or who are unable to absorb nutrients taken by mouth may be fed intravenously.
5. On time referral of patients by physicians to the Dietetics department would help to ameliorate the effects of iatrogenic malnutrition.

6. It is important that clinicians initiate feeding at low calorie levels while monitoring serum electrolytes, this is because an intracellular shift of potassium, magnesium levels, thus clinicians should monitor at least daily with the onset of feeding and replete electrolytes when necessary.
7. Avoidance of excessive fluid administration is also important especially in patients with cachexia (severely malnourished).
8. Provision of multivitamin or single nutrient supplements or at least thiamine repletion may be necessary.
9. Finally, nutrition education and training of health care professionals should be advocated as this would create awareness in the minds of those professionals thereby enhancing compliance, to nutritional procedures and reducing the incidence to nutritional procedures and reducing the incidence to iatrogenic malnutrition.
10. Obsolete practices relating to nutritional screening assessment and support should be discarded and current practices should be implemented by dieticians and interventions should be timely.
11. According to the American Society for Parenteral and Enteral Nutrition (ASPEN) guidelines (2002), patients who are either unable or expected to be unable to take sufficient oral nutrition for seven to fourteen days are candidates for nutrition support. Enteral nutrition should be used if the gastrointestinal tract is functional and Parenteral nutrition should be used only if the gastrointestinal tract is not functioning or cannot be assessed (Grover *et al*, 2008)

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