Normal and Therapeutic Diets in Khartoum State Teaching Hospitals: Case Study Ibn Sina Teaching Hospital

By

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Dedication

To the reader, students and through them to the common man and his family in developing countries - everywhere

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Abstract

There is hardly any information regarding this subject, little approach had been put to meet the nutritional care of inpatients in this country. There fore this study was conducted to assess the adequacy of the hospital diets, offered and intake with respect to individual needs in Khartoum state teaching hospitals .as well as to assess dietary services, sanitation and implementation of therapeutic diets.

Data were obtained from Ibn Sina Teaching Hospital, 49 adult female and 51 adult male who were admitted for a minimum period of 5 days .The mean age of the sample was 47± 16 years. Patients receiving entral or parenteral feeding admitted for surgical treatment or endoscopy were excluded.

Average food offered and intake of the patients was calculated over 3 days using the weighing method, then checked against BLS (1999) Nutri Survey (www.nutrisurvey.de) and Passmore and Eastwood (1986) recommendations

Results of the study showed that nutritional status of the patients was normal, further categorization showed that 36% were normal,35% were underweight, 17% overweight and 12% were obese. The hospital offered normal diet (38%) in addition to six therapeutic diets (62%), which were modified only by (8%) , often incorrectly planned and formulated. The intake of 95% patients could not meet their requirements due to illness, poor appetite and modification of the diets, anorexia, or lack of selective menu. A higher intake of protein, sodium, vitamins A and C were noticed, other micro nutrient were deficient.

Energy, carbohydrate, protein, fat and salt intake differed significantly ($p>0.05$), ($p>0.005$) and ($p>0.0005$) in most types of diets.

The gap between what was offered and the intake of the patients resulted in a range of wastage in total energy (33–89 %). Dietary services and sanitation were inadequate to meet the international pattern recommended for nutrition care in hospitals. Most of physicians (83%) and dietitians (43%) were not satisfied with therapeutic diets served in hospitals.

It appears that in-service training program as well as refreshing courses for dietitians could result in marked improvement in planning and formulation of therapeutic diet. In addition to a dietary manual accompanied by guidelines could result in an improved use of therapeutic diets within hospitals.

Chapter One

INTRODUCTION

1.1.Background:

Diet therapy is considered a relatively new science although people have been practicing it in one way or another for centuries. This practice was based on general knowledge and experience rather than on sound scientific facts. Many foods have been used as treating agents for years but only recently this traditional ingredients have been identified and utilized by modern medicine.

Diet is a major part of the services which hospitals provide for inpatients especially therapeutic diets which are an important measure in the treatment of many diseases. It forms the main stay in hospitals and can influence both the enhancement of recovery and duration of hospitalization

The nutritional value of hospital diets depends upon the amounts and types of foods included in the menus, the way in which the food is prepared, cooked and served, however, actual value of the diet ultimately depends on how much the patients consume which in turn is a reflection of food preference, frequency of meals and appetite.

On the other hand, nutritionists view nutrition as an important part of the basic care for inpatients but physicians and other medical staff rarely take responsibility for the nutrition part of the patient's care particularly if the patient does not have clear signs and symptoms of malnutrition..

Diet therapy sarted in the Ministry of Health in (1973) following a guideline report (Bagchi and Zummrawi,1973). Qualified Nurse- sisters were

taught diet therapy to supervise the cooks in Khartoum teaching hospital. In 1980 the first graduates (Bsc. Human nutrition and dietetics) from Home Science Department University of Khartoum to work in hospitals as dietitians.

Food offered is usually over cooked in this country, a problem facing dietary standards in addition to improper formulation of therapeutic diets which does little to stimulate patients food intake. Even when feeding was improved in quality and services in some private hospitals, it was only hotel standard diets rather than therapeutic.

Realizing these unsatisfactory conditions in the dietetic services in hospitals and the recent awareness of the importance of therapeutic diets, this research was undertaken to study the current status of therapeutic diets in Ibn Sina Teaching Hospital as a case study for teaching hospitals in Khartoum State.

1.2.Historical background of therapeutic diets:

Musaiger (1997) gave a brief historic background on therapeutic diets which will be briefly reviewed.

Man was well initiated and interested in nutrition and food science a long time ago as food was at the center of his interest for which he exerted efforts to obtain it. Ancient Egyptians had indicated the importance of nutrition and explained that food intake in excess quantities caused diseases and as such they used to prescribe certain kinds of food as a treatment for some diseases i.e. bull's liver to treat night blindness. Furthermore, the Greek

physician Hippocrates (377-460 B.C.) emphasized the need of the human body for nutrition.

In the Arab-Islamic era, a lot about food, the negative impact about its excess intake and interest in certain kinds of it was reported. Prophet Mohamed (Peace be upon him) advised against satiety and taking excessive amounts of food when he said “The son of Adam hasn’t filled a vessel worse than his stomach, it is sufficient for the son of Adam to have some morsels in order to straighten his crookedness”. (Ibn Hanbul).

It had been reflected in some of the prophetic traditions that excess intake of some types of foods (meat, dates, honey, milk) was a causative factor for headaches. During the Islamic era much interest was focused on deficiencies of certain foods that cause illnesses. Moreover, certain foods were prescribed to treat particular diseases according to the prophetic traditions “The stomach is an abode of diseases but abstention is the cure”. (Takrrory and Massary, 1989).

Diseases were treated through the nutritional system (therapeutic feeding) which was the most essential basis for medical therapy during the Umayed and Abbassid Khaliphates. Nutrition was specified in some books of the Islamic physicians such as Al-Razi (850-932 A.D..) and Ibn Sina (980-1037 A.D.). If we consider “The Law in Medicine” by Ibn Sina, the

characteristics, uses and benefits in the treatment of different diseases were

mentioned in different types of foods. Ibn Sina summarized "The Law in Medicine" in his collection "Urjouza in Medicine" in which there is a wide range of foods and their uses in therapy.

1.3.Statement of the problem:

Nutrition in health and disease is one of the most lacking health problems in Sudan. This study evaluates the use of therapeutic diets in hospitals in Khartoum State according to diagnostic diseases.

The study emphasizes the promotion of patients' health and upgrading therapeutic diets services in Khartoum State hospitals as well as to improve patients' awareness regarding quality and quantity of therapeutic diets.

1.4.Hypothesis:

- Generally in Ibn Sina Teeaching Hospital therapeutic diets are not formulated according to the prescription of the physician.

1.5. Objectives of the study:

Main objective:

To evaluate therapeutic diets (adequacy and intake) at Ibn Sina Teaching Hospital as a model for hospitals in Khartoum State and to suggest recommendations and guidelines for improvement of the current situation if need arises.

Parameters examined:

- Extent of use of therapeutic diets

- Formulations according to diagnosis.
- Food offered and food intake and reasons for poor intake (if any)
- Nutritional status of inpatients
- Management of dietary services in hospitals

Minor objectives:

- To identify areas in which nutrition and food services are inadequate
- To increase the understanding of how to modify a normal hospital diet according to inpatient's diagnosis

Chapter Two

LITERATURE REVIEW

This chapter focuses on the review of literature related to four areas, which are:

1- Nutrition in hospitals e.g. hospitals diet prescription and nutrients needs of patients.

2- Modification of the normal hospital diets and types of all therapeutic diets.

3- Role of nutrition in relation to different diseases integrated to various organ systems.

4- Role of physician and dietitian in therapeutic diets.

2.1.NUTRITION CARE OF HOSPITALIZED PATIENTS:

Nutrition care for hospitalized patients is fundamental both as a support for medical treatment as well as in aiding primary therapy. The applicability will depend upon comprehensive nutritional assessment and appropriate nutritional therapy based on the availability of information regarding food habits and lifestyle of the patient (Mahan, Escott and Stump, 1996; Williams, 1981).

The basic methods of clinical nutritional assessment can be categorized into four groups. These are a) anthropometric measurements, b) biochemical tests, c) clinical observations and d) dietary evaluation including nutrient-drug interactions. These methods have been referred to as ABCD (Williams, 1981).

Thus nutritional care involves more complex processes and is more than providing food three times per day. It should include an assessment of the adequacy of nutritional intake, manipulation of the diet when necessary, provision of enteral or parenteral support when appropriate and intervention of counseling or education when needed.

All hospitals and institutions have some specific basic routine diets designed for uniformity and convenience of services. These standard diets based on the foundations of adequate dietary pattern are derived from the recommended dietary allowances (RDA) and should be as flexible as possible in order to meet the nutritional needs of hospitalized individuals (Mahan, Escott and Stump, 1996)

2.1.1.Types of hospital diets:

Generally, four types of diets are served in hospitals.

2.1.1.1.Normal or general hospital diets:

These are used routinely for patients not requiring special diet modifications according to general patient's needs and tolerance. This diet provide 1600-2200 kcal, 60-80g. protein, 80-100g. fat and 180-300g. carbohydrates (CHO) according to Mahan, Escott and Stump (1996) and Passmore and Eastwood (1986).

2.1.1.2.Soft diet:

It is used as a transitional diet, is an adequate diet moderately low in cellulose, connective tissues and residues. It is planned for the condition when mechanical ease in eating or digestion is desired (Elseed, 1997; Mahan, Escott and Stump, 1996; Williams, 1981). It is considered a palliative diet (Fleck, 1976) directed to foster liberal intake with regards to vegetables and whole grain cereals according to patient's tolerance.

The diet provides 1800-2000 kcal with protein and CHO intake adjusted to individual needs and any specific demands caused by the disease (Mahan, Escott and Stump, 1996).

2.1.1.3.Full liquid diets:

These are ordered for post-operative patients (Elseed, 1997) and are made up of foods that are liquid or become liquid at body temperature. These can also be planned to meet the needs of patients with any other disorders (Mahan, Escott and Stump, 1996).

The diet can be adequate for maintenance requirements except for fibre. It provides 1300-1500 kcal, 45g. protein, 65g. fat and 150g. CHO. However, specific changes in protein and calories are necessary when the diet continues for an indefinite period.

2.1.1.4.Clear liquid diets:

These are served to pre-operative (Elseed, 1997) and post-operative patients to furnish fluids, some electrolytes and small amounts of energy before functioning of the gastro-intestinal tract begins (Mahan, Escott and Stump, 1996; Sukker, 1983). It is also served for weak patients when meal eating becomes a

physical effort e.g. in fevers, inflammation of gastro-intestinal tract (Sukker, 1983).

The diet is inadequate composed mainly of water and CHO hence used for a very short time. It provides 400-500 kcal, 5-10g protein, 100-120g. CHO and is almost devoid of vitamins and minerals. It is served at frequent intervals (Mahan, Escott and Stump, 1996).

2.1.2.Therapeutic diets:

2.1.2.1.Definition:

The therapeutic diet is a modification of the normal diet (Fleck, 1976) ordered by a physician as part of a treatment for a disease or a clinical condition to eliminate, decrease or increase specific nutrient(s) in the diet. It should vary from the individual's normal diet as little as possible unless inadequacies i.e. requirements for special nutrients be met as generally the disease condition permits (Mahan, Escott and Stump, 1996; cdph 2001).

The modified diet is basically a nutritious diet that emphasizes a variety of foods tailored to meet a particular client's needs which may involve adjusting the consistency, amounts of nutrients, energy or fluid, altering number or eliminating certain foods (Whitney *et al*, 1994). The modification may take any or combination(s) of the followings:

- Changes in the consistency of food e.g. liquid, soft, low/high fiber diet.
- Increase or decrease in energy value e.g. weight reduction, high energy diet.
- Increase or decrease in type of nutrient e.g. sodium (Na) restricted, lactose restricted.
- Omission of a specific food e.g. allergy diet.

- Adjustment in the ratio or balance of protein, fat and CHO e.g. diabetic diet, renal diet.
- Rearrangement in the number and frequency of meals i.e. diabetic diet.
- Changes in the delivery of nutrients e.g. enteral or parenteral nutrition.

(Elseed, 1997; Mahan, Escott and Stump, 1996; Whitney *et al*, 1994; Sukker, 1983; Williams, 1981; Coubrough, 1978; Fleck, 1976).

2.1.2.2.Diet prescription:

The diet prescription in nutrition designates the type, amount and frequency of feeding based on the individual's disease process and disease management goals. It may specify energy level based on present body weight and normal activity plus the amount and forms of needed protein, fat, CHO, vitamins, minerals and other substances e.g. fiber, fluid, consistency (Mahan, Escott and Stump, 1996).

2.1.2.2.1.Energy allowance:

It is frequently necessary to calculate the individual's energy needs whenever necessary by either:

- Determination of the ideal body weight based on sex, weight and height, then calculating the basal metabolic rate (BMR) and increases in BMR according to activity of the patient. However, desirable body weight is not used in the case of very malnourished patients.
- Measureing BMR using a spirometer i.e. Benedict Roth spirometer used in many hospitals, then add additional energy needed depending on the activity.

- A rapid and adequate method is by calculating energy contribution from the diet e.g. 8-18% from proteins (40-90g.), 25-35% from fat (60-120g.) and 50-65% from CHO (150-300g) – Mahan, Escott and Stump (1996).
- Stress factor is added if the patient is under stress.

2.1.2.2.2.Protein allowance:

The WHO-RDA (1989) for protein is 0.8 g/kg body weight/day for an adult. This is considered adequate for previously well-nourished individuals who are ambulatory or who require long periods of hospitalization.

In case of malabsorption or protein loss from ascities or renal disease, an increase in protein allowance is often determined on the basis of energy-nitrogen (kcal:N) ratio of 100-200kcal/g. nitrogen intake.

2.1.2.2.3.Carbohydrates and fat allowances:

These are the major energy contributors whose amounts are altered according to the specific disease state. Generally, 50-60% of the energy from CHO and 25-30% from fat with no more than 10% from saturated fatty acids.

2.1.2.2.4.Vitamins and minerals allowances:

Levels of vitamins and minerals are difficult to determine for stress individuals as these nutrients might be countered with mobilization of body stores, decreased body losses, increased absorption or improved utilization. In addition, individual response vary and deficiencies with clinical signs and symptoms may take time to develop.

To arrive at appropriate vitamins and minerals levels of intake, the following should be considered: a) requirement for a healthy individual, b) nature of the disease or injury, c) normal and abnormal losses through the skin, urine and intestinal tract, and d) interaction with drugs.

2.1.2.2.5.Fluids:

A normal healthy adult at rest needs 1800-2500 ml/day of water (1ml/kcal consumed) to provide for urinary excretion and replace losses. Additional fluids must be added to replace water loss from excessive sweating, vomiting, diarrhea, tube drainage etc.

If sufficient water is not obtained through fluid intake and food, it must be supplied parenterally with electrolytes (Mahan, Escott and Stump, 1996).

2.2.DIET MODIFICATION ACCORDING TO CONTENTS:

2.2.1.Energy:

The diet can provide low or high energy.

2.2.1.1.Low energy diet:

This diet is suitable for weight reduction and obesity. Energy requirement is adjusted to meet the individual's weight reduction program. The diet should include appropriate macro and micro-nutrients and can be followed for months without specific supplementation. However, the nutrients most likely to be deficient are pyridoxine, folate, iron and zinc ((Pi-sunyer, 1985).

The protein should be of high biological value providing 240kcals (60g.) contributing to about 25% of the total energy, at least 20% of the rest from fat and 20% of the diet from CHO thus ensuring availability of fat soluble vitamins and essential fatty acids from fat and fiber and anti-ketogenic agent from CHO. The energy deficit should not exceed 500-1000kcal/day and should not be below 800kcal/day unless the individual is under tight medical surveillance (Pi-sunyer, 1994). Others suggested 1000-1100kcal/day or less (Mahan, Escott and Stump, 1996; Williams, 1981; Zummrawi and Bagchi, 1973). However, Elseed (1997) recommended 1400-1800kcals/day for normal active males and 1000-1500kcal for normal active females.

Since these individuals need to be on the diet for a long time it is crucial the diet should be acceptable to suit the tastes and habits of the individual and flexible enough for eating at home as well as outside it (Pi-sunyer, 1994).

The effectiveness of the low energy diet in weight reduction is well documented in people with cardiovascular disease, hypertension, hyperlipidaemia, diabetes mellitus and gall bladder (Elseed, 1997; Mahan, Escott and Stump, 1996; Pi-sunyer, 1994; Williams, 1981; Zummrawi and Bagchi, 1973).

2.2.1.2.High energy diet:

The diet is described for underweight and malnourished individuals. It should be of high energy density containing high protein of high biological value and adequate micronutrients (Elseed, 1997; Torun and Chew, 1994), hence must contain sufficient CHO and fat to spare protein for vital tissue synthesis which may require 3000-4000kcal/day or more depending on the degree of malnutrition (Williams, 1981).

Elseed (1997) suggested that the energy should be calculated according to individual needs plus an additional 500-1000kcal/day and the protein level at 1-1.5g/kgBW/day.

Energy and protein intake should be gradually increase. Initial intake should provide average energy and protein requirements followed by gradual increases of the requirements (1.5x energy + 3-4x protein). By the seventh day, the patient's response to the diet will either be no change in weight or a decrease caused by loss of odema. By the 15^{th} day there will be a rapid weight gain (Torun and Chew, 1994).

2.2.2.Fat:

Two types, a restricted fat diet and a low fat low cholesterol diet.

2.2.2.1.Restricted fat diet:

The diet is suitable for liver diseases, gall bladder disease and pancreatic diseases (Elseed, 1997; Mahan, Escott and Stump, 1996; Williams 1981). Fat is restricted to less than 25g./day while protein and CHO according to recommended dietary allowances of healthy individual (El Seed,1997,Williams, 1981).

2.2.2.2.Low fat low cholesterol diet:

This diet is suitable for the treatment of hypercholesterolemia, arteriosclerosis and coronary heart diseases. It provides 1800kcal, 80g. protein and 30g. fat (Elseed, 1997; Zummrawi and Bagchi, 1973).

The National Cholesterol Education Programme-NCEP, (1993), specified two-steps diet, step1 and step 2 diets, the modifications consist of recommendations for lowering total fat, saturated fatty acids and cholesterol and adjusting energy intake to achieve appropriate weight for patients who need it. As for those who do not need to loose weight, CHO foods can be substituted for fat.

Step 1 diet contains less than 30% of the total energy from fat, 8-10% from saturated fatty acids (SFA) and less than 300mg./day cholesterol. Step 2 diet contains the same energy contribution from fat but SFA are reduced to less than 7% and cholesterol to less than 200mg./day.

Serum cholesterol is lowered by 3-14% on step 1 diet and should be measured after 6 weeks on the diet and again after 3 months. If blood lipid goals are not achieved after this period the patient progresses to step 2 diet which may lower serum cholesterol another 3-7%. Diet therapy for compliant patients should be tried for a minimum of 6 months before drug therapy is started.

2.2.3.Carbohydrates:

2.2.3.1.Restricted CHO:

The diet is for post operated patients with dumping syndrome (El Seed, 1997; Mahan, Escott and Stump, 1996).

2.2.3.2.Lactose free diet:

Diet advised for lactose intolerant patients.

2.2.3.3.Dietary fiber diet:

Dietary fiber is defined as plant cell wall polysaccharides (excluding starch) and legnin that resist digestion by enzymes of the human intestine (David *et al*, 1985).

2.2.3.3.1.Fiber restricted diet:

The diet contains minimum amount of indigestible CHO (5-10%g/day) and is recommended for preoperative patient, intestinal operation, endoscopy, duodenal ulcers, chronic gastritis, chronic diarrhoea and haemorrhoids.

It is used to reduce fecal output and also as a transition from a minimal residue diet to a general diet (Elseed, 1997; Mahan, Escott and Stump, 1996; Shils, *et al*., 1994; Zummrawi and Bagchi, 1973).

2.2.3.3.2.Minimal fiber diet:

In this diet foods of moderate and high fiber contents as well as milk and meat with connective tissues are excluded. The diet is nutritionally inadequate so should be used for a short time period. It is advised during acute irritable bowel syndrome or partial obstruction (Mahan, Escott and Stump, 1996).

It is usually inadequate in some vitamins i.e. folate and minerals i.e. calcium (Rosenberg and Mason, 1994).

2.2.3.3.3.High fiber diet:

The goal is a daily intake of at least 25-39g. of dietary fiber. This is achieved by the intake of wheat or other cereal bran e.g. ¼ to ½ cup/day (Mahan, Escott and Stump, 1996).

It is useful for constipation, hyperlipidemia, hyperglycemia in different states of diabetes mellitus (Elseed, 1997).

2.2.4.Protein:

There are five types of protein diets modified according to contents.

2.2.4.1.High protein:

Served in cases of liver conditions, regenerative stage nephrotic syndromes, rehabilitation after malnutrition, burns and wound healing, pregnancy and lactation (Elseed, 1997).

2.2.4.2.Restricted protein:

Described for edema associated with hepatic failure, renal failure and acute nephritis. It provides daily about 1400kcal, 218g. CHO, 40g. protein, 50g. fat and 380mg.Na (Elseed, 1997; Zummrawi and Bagchi, 1973).

2.2.4.3.Protein free:

The diet is suitable for hepatic coma and provides 900kcal, 2g. protein, 215g. CHO and 1-2g. fat. It is served in the form of a barley drink or orange juice every two hours (Zummrawi and Bagchi, 1973).

2.2.4.4.Restricted phenylalanine:

Restricted to patients with phenylketonuria who suffer from the absence of phenyalanine hydroxylase that converts phenylalanine to tyrosine (Thiele, 1980).

2.2.4.5.Restricted purine:

Diet recommended for those with hyperuricemia of gout disease. The diet provides 1600kcal, 40g. protein, 40g. fat and 240g. CHO (Elseed, 1997; Zummrawi and Bagchi, 1973).

2.2.5.Protein, fat and carbohydrates:

The diet aims at restricting CHO intake while meeting normal needs of protein and providing just sufficient energy to maintain normal weight in adults and to allow for normal growth in children. It is restricted in fat but rich in dietary fiber (Passmore and Eastwood, 1986; Elseed, 1997).

2.2.6.High protein high energy:

Diet described for protein malnutrition, chronic liver diseases, fevers, burns, fractures. It provides 1.5g. protein/kg BW/day for an adult (100-120g. protein). Diet must contain supplemental calories (25-40 kcal/g. protein) to allow assimilation of protein into the body. In severely burned patients 4000kcal plus 180g. protein/day might be needed. In chronic liver diseases the diet improves protein turnover and survival (David *et al,* 1985).

2.2.7.Minerals:

2.2.7.1.Sodium:

These are high sodium diet and restricted sodium diets. The high sodium diet is served for patients with hypoadrenalism (Elseed, 1997).

The restricted sodium diets are for oedema, cardiac failure, renal failure, hypertension, eclampsia (Elseed, 1997; Zummrawi and Bagchi, 1973). These include sodium free as less than 5mg./serving. Low sodium with 40mg or less/serving and very low sodium with 35mg. or less/serving. Also reduced sodium i.e. 24% or less/serving than reference food (The Nutrition Labeling and Education Act – NLEA – 1990).

2.2.7.2.Other minerals:

High potassium diet for patients on potassium loosing diuretic and potassium restricted diet for acute renal failure.

High calcium, high phosphorous diet for patients suffering from rickets, osteomalacia and tetany. Calcium and phosphorous restricted diet for patients with urinary tract stones. Iron rich diets for those suffering from iron deficiency anaemia (Elseed, 1997).

2.3.NUTRITION CARE IN DISEASES:

2.3.1.Diseases of esophagus:

Disorders of the esophagus are caused by obstruction, inflammation (esophagitis) or difficulty in swallowing (dysphagia). The objective of nutrition care is to prevent both the irritation of inflamed esophageal mucosa (esophageal reflux) and decrease the irritating capacity of gastric juice.

The diet must be lower in fat, alcohol and carminated foods and orange juice and other citrus and tomato products can be irritating while use of spices is limited. Timing of the evening meal is specially important as it should be 3 hours before bed time (Mahan, Escott and Stump, 1996).

In the acute phase or partial obstruction, ingestion of adequate amounts of complete liquid diet or formulas is often beneficial in preventing malnutrition and is less abrasive to the esophagous.

In radiation and chemotherapy treatments, oral or tube feeding is often inadequate to meet the needs of the patient due to nausea, pain or their combination. In such instances, preoperative parenteral feeding is indicated to improve the nutritional status.

The patient who had undergone esophagectomy needs a diet that provides frequent small meals to overcome easy satiety e.g. high intake of CHO with adequate protein and fat. In case of steatorrhea, partial substitution of long chain fatty acids by medium chain one can be tested (Warren, 1994).

Post operative stricture may occur which requires dilation. The patient may temporarily requires oral or tube feeding formulas to assure adequate intake until the stricture is overcomed (Shils, *et al.,* 1994).

2.3.2.Cardiovascular diseases:

2.3.2.1.Coronary heart diseases:

The main goal is to achieve and maintain normal body weight and benefit from regular exercise. The general principle of diet therapy is a fat controlled diet where animal fat is substituted by plant fat so that polyunsaturated fat energy contributes about 50% of the total fat energy (Mahan, Escott and Stump, 1996;

MacNamara, 1994; Williams, 1981). Saturated fat increases serum cholesterol while polyunsaturated fats decrease it with a neutral effect from monounsaturated ones (Thiele, 1980). Cholesterol is one of the predictors of coronary heart diseases (CHD) in addition to triglycerides and phospholipids and their lipoproteins' carriers.

The Council on Food and Nutrition of the American Medical Association (1981) suggested three fat controlled diets based on the contribution of fat to the total energy. Each diet is on three energy levels with the ratio of polyunsaturated fatty acids to saturated ones ranging from 1:1 to 1.5:1 to serve as a guideline for dietary planning. These diets include modified fat (40%), moderate fat restricted (25%) and severe fat restricted (10%).

In congestive heart failure, a sodium restricted diet is used to control edema. The degree of restriction depends on the severity of the case (Mahan, Escott and Stump, 1996; Williams, 1981).

The basic therapeutic objective in the treatment of acute or chronic heart failure is cardiac rest. Small intake of food during the first few days after the attack is advisable to decrease metabolic activity. Williams (1981) recommended Karell's diet based on 4 glasses of milk/day in the first days then progress to more food as the patient improves. At recovery stage, a diet soft in nature, small in portions and frequently served that provides 800-1200kcal is advised. If the patient is obese, this diet may continue for a longer period to affect desired weight loss (Mahan, Escott and Stump, 1996; Williams, 1981).

For undernourished patients with severe congestive heart failure, energy needs are increased to 30-50% above basal level due to increased energy expenditure of the heart and lungs. Thus patients with cardiac cachexia may require further increases in resting energy expenditure (x1.6-1.8) for malnutrition repletion. Protein requirements are also adjusted e.g. 0.8-1.0g/kgBW/day if intake is oral or 1.5g/kg if given parenterally. The amount of CHO in the diet is determined by the arterial pCO^2 and presence of hyperglycaemia.

During hospitalization fluids are restricted to 500 – 2000 ml/day and foods with high fluid contents are limited.

2.3.2.2.Hypertension:

An initial target in the nutritional management of hypertension is to achieve weight loss of at least 4.5kg. This modest loss will not only lower blood pressure but often normalize blood lipids and glucose (Kotchen and Kotchen 1994; Steven *et al*, 1993).

Moderate salt restriction is recommended for treatment of hypertension (100mE or 2400mg.Na/day) by Mahan, Escott and Stump,(1996), Kotchen *et al* (1994) and Williams (1981). In stage 1 hypertension this level of salt restriction may be sufficient to normalize blood pressure (Mahan, Escott and Stump, 1996).

Dietary potassium and blood pressure are inversely related, higher intake is associated with lower blood pressure (Mahan, Escott and Stump, 1996; Svetkey and Itman, 1990; Veterans Administration Cooperative, 1987).

2.3.3.Stomach diseases:

2.3.3.1.Peptic ulcer:

The current clinical practice for peptic ulcer diet is based on liberal individual approach rather than acid neutralization treatment of the past (Elseed, 1997; Mahan, Escott and Stump, 1996; Meyer, 1994; Williams, 1981; Grossman, 1976; Mendeloff, 1974). The focus of the treatment is the individual who must give a careful initial history about daily dietary programme.

The activity of the patient's ulcer will influence dietary management; during acute periods of active ulceration more vigorous treatment is necessary to control acidity and initiate healing. When pain disappears feeding should be liberalized according to individual tolerance and desire (Elseed, 1997; Williams, 1981).

2.3.3.2.Acute and chronic gastritis:

It often precedes the development of organic gastric lesions e.g. ulcer, tuberculosis, myocardial infarction, nephritis and cancer. In the acute phase, stomach rest for 24-48 hours or longer depends on the presence of bleeding in which case nasogastric lavage with ice water brings homeostatis in most patients. Fluids are given intervenously following the fasting period, then a clear liquid diet is added followed by a soft diet as tolerated. The amounts of food and number of feeding are increased according to the patient's tolerance until full diet is achieved. Spices should be temporarily avoided (Thiele, 1980).

In chronic phase, the nutrition care should be directed towards individual treatment based on avoidance of foods that cause discomfort. The diet should be adequate in energy and nutrients, soft in consistency and eaten at regular intervals. Drinking of excess amounts of water or liquids with meals tends to cause discomfort (Elseed, 1997; Mahan, Escott and Stump, 1996).

2.3.4.Gall bladder diseases:

A diet plan based on low fat regimen usually meets the needs of the patient with gall bladder diseases. In an acute attack, oral feeding must be discontinued and when resumed, a low fat diet is recommended restricted to 20 - 30g.fat/day (Elseed, 1997; Williams, 1981) but for those who can tolerate it up to 40 – 45g is allowed (Mahan, Escott and Stump, 1996). The diet should provide daily 30-40g. protein i.e. skim milk and 200-300g. CHO i.e. sweet juices (Elseed, 1997).

The chronic phase may require a long term fat diet in which the fat provides 25-30% of the total energy (Mahan, Escott and Stump, 1996; Williams, 1981).

Restriction of foods containing cholesterol and food labeled gas ferments i.e. chocolate, has no valid rationalization (Williams, 1981). The degree of food tolerance is highly individualistic with foods that cause flatulence and bloaching (Mahan, Escott and Stump, 1996; Korsten and Lieber, 1994).

2.3.5.Liver diseases:

2.3.5.1.Cirrhosis:

Moderate to severe malnutrition is common among patients with advanced liver diseases (Mc Cullough and Tavill, 1991; Di Cecco *et al,* 1989). Numerous coexisting factors are involved in the development of malnutrition e.g. inadequate oral intake caused by anorexia, dyspepsia, early satiety, nausea, vomiting and drugs used to treat it (Munoz, 1991; Hasse, 1989; Porayko *et al*, 1991). Other factors include dietary restrictions, unpalatable hospital diets, maldigestion and malabsorption. Therefore, food served should be attractive and appetizing, so smaller more frequent feedings are better tolerated although adequate nutritional intake is difficult to achieve. This also improves nitrogen balance and prevent hypoglycemia (Mahan, Escott and Stump, 1996).

Studies showed positive outcomes with enteral and parenteral nutrition in malnourished cirrhosis including improvement in clinical complications such as ascities, encephalopathy, infection and decreased mortality (Kondrup *et al,* 1992; Cabre *et al*, 1990).

2.3.5.1.1.Energy:

The energy requirements are increased to promote gradual repletion. The general estimation is 25-35kcal/kgBW/day (Shronts and Fish, 1993; Mc Cullough and Tavil, 1991), the upper range is needed for patients with high stress levels i.e. infections (Mahan, Escott and Stump, 1996).

2.3.5.1.2.Carbohydrates:

Determining carbohydrates needs in liver failure is often challenging because of its primary role in CHO metabolism. Glycogen synthesis and storage are decreased switching to fat. Therefore, CHO should provide most of the non-protein energy and must be balanced appropriately with fat to offset the consequence of altered glucose tolerance (Mahan, Escott and Stump, 1996).

Specific provision of energy in the form of complex CHO is effective in reducing insulin requirements and protect the patient from developing diabetes (Korsten and Lieber, 1994).

2.3.5.1.3.Fat:

Cirrhosis is marked by impaired fat metabolism, long chain triglycerides are incompletely metabolized in liver failure which result in decreased availability of ketones for fuel (Mahan, Escott and Stump, 1996; Mc Cullough and Tavilll, 1991).

A range of 25-40% of the energy as fat is generally recommended but if significant steatorhea is present, replacement of some of the long chain triglycerides with medium chain ones may be useful. A low fat diet (≤ 40g./day) may also be necessary for controlling malabsorption. In any case 10% of the fat energy should be as linoleic acid to prevent essential fatty acid deficiency.

Restricting fat is difficult because it decreases palatability of the diet and prevent adequate energy intake (Mahan, Escott and Stump, 1996). Overfeeding regardless of energy source should be avoided because excess calories contribute to fat synthesis and accumulation in the liver (Shronts, 1987).

2.3.5.1.4.Protein:

It is the most complex nutrient in liver failure. Cirrhotic patients do appear to have an increase in protein requirements due to increased degradation to supply energy (Shronts, 1987).

Protein kinetic studies have demonstrated increased nitrogen losses in patients with hepatic failure or decompensate diseases but not with stable cirrhosis (Mc Cullough and Tavill, 1991). Therefore, in uncomplicated hepatitis or cirrhosis without encephalopathy, protein requirements range 0.8-1.0g./kg/day to achieve nitrogen balance (Mahan, Escott and Stump, 1996, Korsten and Lieber, 1994). To promote positive balance, at least 1.2g/kg/day is needed (Kondrup *et al*, 1992). Protein restriction (<50g/day) may only worsen body protein losses and therefore must be avoided.

In the cases of stress such as alcoholic hepatitis or decompensate diseases e.g. infection, gastro-intestinal bleeding, severe ascites, at least 0.5g

protein/kg/day should be provided. Patients with encephalopathy often do not receive adequate protein (Mahan, Escott and Stump, 1996; Korsten and Lieber, 1994).

2.3.5.1.5.Vitamins and minerals:

Vitamins supplementations are needed in all patients with end stage liver disease (ESLD) because of the vital role of liver in their transport, storage, metabolism, in addition to side effects of drugs (Shronts and Fish, 1993).

Levels of zinc, magnesium and calcium are low in liver diseases, therefore, standard doses of these minerals should be provided (Mahan, Escott and Stump, 1996).

2.3.5.1.6.Fluids and electrolytes:

Fluid retention is common and ascites results as a serious consequence of liver diseases, therefore, treatment includes sodium and fluids restriction in addition to sparing diuretic therapy. Fluid intake is usually restricted to 1-1.5l/day and sodium to 2g./day (low Na diet) and more severe limitation may be imposed. Fluid status is monitored closely by regular measurements of body weight (Mahan, Escott and Stump, 1996).

2.3.5.2.Hepatitis:

High energy (2500-3000 kcal/day) is needed to furnish energy demands of tissue regeneration to compensate for losses due to fever and to renew strength and recuperative power. Carbohydrates must be provided in sufficient amounts (300-400g./day) to protect glycogen reserves and meet energy demands. Daily intake of 3000-3500ml. Fluids guards against dehydration and gives a sense of well being and improved appetite.

Meals may need to be in liquid form for patients who can not tolerate solid food at first, then frequent feeding in concentrating form followed by solid food as the patient becomes better and able to tolerate it (Williams, 1981).

2.3.6.Portal systemic encephallopathy (PSE):

General treatment is towards reducing ammonia. Dietary manipulation of vegetable proteins and casein have shown a promise in reducing encephalopathy (Mahan, Escott and Stump, 1996; Urible, 1982; Greenberger *et al*, 1977). Vegetable proteins are low in methionine and ammonogenic amino acids as well as in BCAAs. Initially, then dairy and vegetable proteins should gradually substitute animal proteins to meet calculated energy needs. Protein restriction should be employed as a last resort in case of clinical symptoms. The higher fiber content of vegetables play a role in the excretion of nitrogenous compounds (Mahan, Escott and Stump, 1996; Minco, 1985).

Williams (1981) recommended 1500-2000kcal to prevent tissue catabolism, CHO and fat just sufficient for energy needs and 15-50g. protein depending on symptoms. Vitamin K and other vitamins parenteraly taken.

2.3.7.Pancreas:

2.3.7.1.Pancreatitis:

Nutritional care is provided to minimize the stimulation of the enzymes amylase or lipase thus reducing pain. During acute attack, oral feeding is withheld and hydration is maintained intervenously (Mahan, Escott and Stump, 1996; Korsten and Lieber, 1994). In less severe attack, a clear liquid diet with negligible fat may be given for four days during which the patient is monitored for any symptoms of pain, nausea or vomiting. The diet then progresses as tolerated to easily digestible food with low fat content, then advance as tolerated, divided into 6 small meals/day.

The patient usually demonstrates negative nitrogen balance due to increased rate of protein catabolism and hypercatabolic state hence weight loss. Attention should be given to maintain a positive protein balance (Mahan, Escott and Stump, 1996; Korsten and Lieber, 1994).

In life threatening cases, fat and amino acids are increased at the expense of CHO which serves the severely ill patient who looses 15g./day of nitrogen in the urine. Thus increasing the overall percentage of amino acids as well as a relative amount of BCAAs will prevent the break down of visceral proteins and promote repletion of lean body mass (Korsten and Lieber, 1994).

2.3.7.2.Chronic pancreatitis:

It is associated with diarrhoea, vomiting, nausea, therefore it makes it difficult to maintain good nutritional status and weight loss may result. Large meals with fatty foods and alcohol should be avoided.

When pancreatic function is diminished by 10%, enzymes production and secretions are insufficient, malabsorption of proteins and fat thus become a problem (Holt, 1993). At this time, pancreatic enzymes replacement is mandatory. A low fat diet or substitution of some dietary fat with MCT is advised to further improve absorption and weight gain after surgical pancreatic carcinoma. Nutritional care is similar for chronic pancreatitis (Mahan, Escott and Stump, 1996; Korsten and Lieber, 1994).

In chronic cases with extensive pancreatic destruction, diabetes mellitus may develop so treatment with insulin and diabetic diet is then required (Mahan, Escott and Stump, 1996).

2.3.7.3.Diabetes mellitus:

The primary nutritional goal for patients with diabetes mellitus (DM) is to achieve and maintain normal blood glucose and lipid levels.

Energy restriction and moderate weight loss have been shown to improve glucose intake, increase insulin sensitivity and normalize glucose production. Energy specifications are based on a desirable body weight (DBW) with allowances for physical activity or added stress such as growth (Shils, *et al.*, 1994; Williams, 1981). Energy restriction and moderate weight loss (4.5-9.0kg) have

been shown to improve DM control even if DBW was not achieved (Watts et al, 1990; Wing et al, 1987).

Intake of generous amounts of complex CHO and fiber and restriction of fat and cholesterol is appropriate for diabetic patients (Mahan, Escott and Stump, 1996; Shils, *et al.*, 1994; Anderson and Geil, 1988). Carbohydrates should provide 55-60% of the total energy (generous CHO diet) but upto 70% (high CHO diet) is well tolerated. Complex CHO should provide 2/3 of total CHO (Shills, 1994; Williams, 1981). Consuming a high CHO diet increases the number of insulin receptors and also enhances intracellular glucose metabolism (Anderson and Geil, 1988).

ADA (1987) suggested modest amounts of sucrose and other refined sugars depending on the individual's metabolic control and body weight. Nutritive sweeteners such as fructose and sorbitol probably poses no risk to diabetic individuals as long as their energy contribution is counted in the meal plan (Talbot, 1978; Shils, *et al.*, 1994). Studies indicated that diabetic individuals can consume moderate amounts of fructose with reasonable safety (Mahan, Escott and Stump, 1996; Shils, *et al.*, 1994).

Dietary fiber has a beneficial effect in most diabetic individuals with automatic neuropathy. It is capable of inhibiting glucose absorption from the small intestine (Anderson *et al*, 1990; Shils, *et al.*, 1994), however, the clinical significance of the effect of fiber in lowering glucose level is probably insignificant (American Diabetes Association – ADA, 1995). Mahan, Escott and Stump (1996) and Shils, *et al.*, (1994) recommended an intake of 20-35g./day while ADA (1987) suggested 40g./day or 15-25g./1000kcal. A high CHO diet provides about 70g. dietary fiber while a generous CHO diet 50g. (Shils, *et al.*, 1994).

The recommendation for protein intake is 0.89g./kg/day (Mahan, Escott and Stump, 1996; ADA, 1995), however, high protein intake may contribute to

nephropathy (Zeller *et al*, 1990; Wiseman *et al*, 1987). At present scientific evidence does not support either a high or a low protein intake (ADA, 1990).

The contribution of dietary fat to total energy depends on the desired glucose, lipid levels and weight outcome. If obesity and net weight loss are primary concerns, then reduced dietary fat intake should be considered. If low density lipoproteins cholesterol (LDL) is primary concern, dietary guidelines should be implemented to reduce it and if triglycerides and very low density lipoproteins cholesterol (VLDL) is the primary concern one approach is a moderate increase in monounsaturated fat intake. The advice is a moderate CHO intake and fat intake of less than 20-35% of total energy with saturated fat not exceeding 10% and 200-300mg. cholesterol/day. Polyunsaturated fat should not be less than 10% and the remaining fat as mono -unsaturated (ADA, 1995; Shils, *et al.*, 1994).

2.3.8.Intestinal diseases:

Symptoms of intestinal diseases may be presented in the familiar form e.g. constipation, diarrhoea and malabsorption (Turtel and Shike, 1994).

2.3.8.1.Constipation:

An essential part for its treatment is provision of a normal diet that is high in both soluble and insoluble fiber. The daily diet should contain 25g. fiber i.e. wheat bran is particularly used for bulk formation and relieving constipation. It is used in moderate amounts then gradually increased (1 table spoon to 4-6/day) accompanied by extra intake of water (Mahan, Escott and Stump, 1996).

2.3.8.2.Diarrhea:

Food is withheld for 12 to 24 hours and fluids and electrolytes are given to prevent dehydration. As the stools are formed, small amounts of food may be gradually introduced. Raw apple or liberal amounts of unsweetened apple sauce may be given 2-4 hours as tolerated to hasten the development of formed stools.

Gradual foods low in residue i.e. refined starch, and build up to a normal diet as conditions improves (Mahan, Escott and Stump, 1996; Rosenberg and Mason, 1994). Fat should be encouraged not limited (Mahan, Escott and Stump, 1996).

In chronic diarrhea heavy losses of electrolytes, vitamins and protein occur which should be replaced (Mahan, Escott and Stump, 1996; Williams, 1981).

2.3.8.3.Steatorrhea:

A condition in which as much as 60g. fat/day may be excreted in the stool as a result of malabsorption. Management include increased energy intake as tolerated e.g. addition of protein, CHO and fat. Supplementary therapy with calcium, zinc, magnesium and iron is needed (Mahan, Escott and Stump, 1996).

2.3.8.4.Inflammatory bowel disease (IBD):

Refers mainly to chronic alcerative colitis and Crohn's disease. Many patients suffer cramping and diarrhea so decrease in dietary fiber intake is beneficial while those who suffer steatorrhea fat reduction may improve the diarrhea. The diet must be rich in foods that provide sufficient energy, protein, vitamins and minerals to restore and maintain DBW and nutritional status to facilitate healing of the inflamed bowel (Mahan, Escott and Stump, 1996; Rosenberg and Mason, 1994; Williams, 1981).

Hospitalization of IBD patients is based on bowel rest program with reduction or elimination of oral intake, or a switch to a liquid formula diet that contains no residue (Rosenberg and Mason, 1994). Energy and protein requirements should be high (40-50kcal and 1-1.5g. protein/kg IBW/day) divided into frequent feedings (Mahan, Escott and Stump, 1996). The diet for uncomplicated IBD should provide 100-150g. protein/day and at least 3000kcal/day with supplementation with vitamins, potassium and calcium (Williams, 1981).

2.3.8.5.Coelliac disease:

It is known as gluten sensitive enteropathy or non-tropical sprue. A gliadin restricted diet high in energy and protein (6-8g./kg BW) with vitamins and minerals supplementation to correct nutritional deficiency states resulting from impaired absorption. Wheat which contains gluten is replaced by foods i.e. corn, rice, sorghum, potato etc that do not contain it i.e. restriction of gluten is permanent (Cannon, 1994; Thiele, 1980).

2.3.8.6.Lactose intolerance:

An adult who is intolerant to a moderate amount of milk can ultimately adopt and tolerate 12g. or more of lactose when gradually increasing the amount over 6-12 weeks (Johnson *et al,* 1993). Milk products e.g. cheese and yoghurt, are well tolerated (Mahan, Escott and Stump, 1996).

2.3.8.7.Wilson's disease:

It is a disorder of abnormal copper metabolism in which urinary copper excretion is high, serum level is low and an excess of copper in various organs causes severe damage. A vegetarian diet may be useful because copper is less available (Brewer, 1993).

2.3.9.Large intestine diseases:

2.3.9.1.Irritable bowel syndrome:

Individuals are frequently underweight due to diarrhea alternating with constipation. Stimulants include dairy products, chocolate, eggs and wheat products. Treatment involves exclusion of the offending agents and a high dietary fiber intake (20-30g.) which acts as a bulk laxative (Mahan, Escott and Stump, 1996; Francis and Whorwell, 1994).

2.3.9.2.Diverticular disease:

Diverticula are small sacs that protrude through weak spots in the muscle of the colon. A high dietary fiber diet promotes soft stool that pass more easily and result in low inter-colonic pressure. To patients with acute diverticulitis, a low fiber diet is appropriate followed gradually to a high one (Mahan, Escott and Stump, 1996) Lupton et al (1993) suggested two tea spoons of bran/day. A low fat diet is reasonable for these patients to avoid colonic muscle contraction (Snape, 1994).

2.3.10.Renal diseases:

2.3.10.1.Acute glomerulonephritis:

An inflammation of the glomeruli in which treatment depends on sufficient energy supplied by CHO and fat to spare protein and reduce breakdown of endogenous protein. Sodium intake is restricted to 500-1000mg/day in presence of edema and high blood pressure, and fluid intake reduced to 500-700ml when there is oliguria (less urine volume) as stated by Mahan, Escott and Stump (1996) and Williams (1981).

Protein restriction is indicated only when there is nitrogen-retention. High quality protein (15-20g/day) is initially allowed e.g. milk, egg, but as condition improves, protein intake is gradually increased until a normal allowance is taken.

In chronic glomerulonehpritis, normal protein intake of 0.9-1.0g/kg BW is sufficient to maintain nitrogen balance (Thiele, 1980).

2.3.10.2.Nephrotic syndrome:

The primary objective in its management is the replacement of albumin and other proteins lost from the plasma into the urine. The diet should provide sufficient energy and CHO to ensure efficient utilization of protein (Mahan and Escot, 1996; Kaysen, 1986; Taguma *et al*, 1985; Williams, 1981).

Daily protein intake upto 1.5g/kg BW (3/4 of high biological value) and energy intake of 35-50kcal/kg for adult and 100-150kcal/kg for children (Mahan,

Escott and Stump, 1996). Sodium is restricted to only 500 mg/day (Williams, 1981).

2.3.10.3.Acute renal failure:

Dietary management in acute renal failure includes a) restriction of fluid intake to a volume equivalent to urine output plus extra-renal losses including an allowance of 600ml/day for insensible water loss, b) sodium restriction (500mg/day) to improve edema and hypertension, c) potassium restriction because of limited ability to excrete potassium, d) restriction of protein to 20g.day to reduce urea nitrogen retention and e) provision of sufficient energy (1800kcal or more) to prevent breakdown of body tissues. Protein should be of high biological value e.g. egg or milk (Thiele, 1980).

In the early stage the patient is unable to eat so total parenteral nutrition and easy dialysis have a positive impact on patient's survival (Cierra, 1987; Bartlett, 1986). Parenteral administration of glucose and essential amino acids to reduce protein catabolism and minimize urea production until patient tolerate oral feeding (Feinstein and Massary, 1988). Brenner and Lazarus (1988) advocated 0.5-1.5g. protein/kg BW. At the stable period, it is generally agreed that 0.8g/kgIBW/day should be given.

2.3.10.4.Chronic renal failure:

The variables of treatment are primarily protein, sodium, potassium and water. The level of each nutrient to be adjusted according to the progression of illness (Mahan, Escott and Stump, 1996; Zeller *et al*, 1991; Ihle *et al*, 1989; Walser, 1975).

Protein is closely controlled ranging 30-70g./day, of high biological value (Williams, 1981), but Kopple (1994) recommended a low protein diet 0.28g./kg BW/day. Sodium and potassium as 400-2000mg/day and 1500mg.day. Water volume as 800-1000ml/day with careful records of total fluid intake and output (Williams, 1981).

The diet should provide daily non-protein energy in the range 2000-2500kcal e.g. 300-400g. CHO and 75-90g. fat.

2.3.10.5.Nephrolithiasis (renal stones):

Many authors e.g. Wilkens(1996) and Williams (1981) suggested the analysis to identify the type of stone then the treatment to reduce or restrict certain nutrients. Stones are generally composed of calcium, uric acid and cystine. In all cases large volume of fluid intake (1.5-2.0 l/day) to produce at least 2l/day of urine is an essential component of the prophylactic treatment.

Most contain calcium as a component. A low calcium diet is prescribed preferably acidic that decreases precipitation of calcium salts. If it also contains oxalate (calcium oxalate) then food with high oxalate content to be avoided.

Uric acid stones represent a small percentage to which are prescribed low purine diets, as for the cystine stones these are a result of an inborn error of metabolism for which drugs are best.

2.3.10.6.Nephropathy:

The first renal functional changes in diabetes mellitus are increased albumin excretion and elevated glomerular filtration rate, but when the glycemic control is adequate renal function can return to normal.

Protein intake of 0.8g/kg BW (ca.10% of daily energy) is recommended. Ihle(1989) suggested that it was wise to restrict protein to 0.6g/kg BW. CHO need careful clinical monitoring to provide at least 50% of energy intake and saturated fat and cholesterol intake should be restricted (Kopple, 1994). Sodium should not exceed 2000mg/day in hypertensive or edematous patients. Smoking should be discouraged and regular activity encouraged (ADA, 1994).

2.3.11. Cancer:

2.3.11.1.General:

The basic objectives of nutrition therapy in cancer are to meet the increased metabolic demands of the disease and prevent catabolism as much as possible to alleviate symptoms from the disease and its treatment by surgery, radiotherapy and chemotherapy (Mahan, Escott and Stump, 1996; Shils, *et al.,* 1994; Williams, 1981).

The usual regulation of food intake obviously fails in this syndrome (Shills, 1994). Warren (1994) noted that cancer cachexia (wasting of body tissues) is associated with carcinoma of various primary sites e.g. stomach (45%), breast (33%), large bowel (22%) while the least prevalent were bladder and prostate cancers.

In surgical treatment, gastro-intestinal tract (GI) therapy poses special problems for normal ingestion, digestion and absorption of food nutrients. Food intake is greatly affected and a variety of food forms and textures must be devised (Fleming *et al*, 1977). Williams (1981) suggested ingestion of small low CHO diets.

Radiotherapy produces a loss of taste with increasing anorexia, nausea and consequent decrease in eating hence food appearance and aroma must be developed to meet these (Shills, 1994; Williams, 1981).

In chemotherapy, the major nutritional problems are related to GI symptoms due to general systemic toxicity e.g. stomatitis, nausea, diarrhea, malabsorption and anemia that contribute to many food intolerances (Williams, 1981).

Guidelines put by Williams (1981) for intake of nutrients by cancer patients were:

- Total energy of the diet must be increased with sufficient amounts of CHO and fat to spare protein for vital tissue synthesis. Adult patients with good nutrition require 2000kcal/day while malnourished ones

require 3000-4000kcal or more depending on the degree of malnutrition and body trauma

- Adult patients require 80-100g. protein/day while malnourished ones 100-200g.
- Vitamins and minerals are needed to control the efficiency of protein and amino acid metabolism, at least at the RDA level and frequently augmented by supplementation
- Fluids are increased to counteract losses due to infection and fever and to help the kidney get rid of catabolites.

2.3.11.2.Oral cavity:

The patient suffers nutritional problems and difficulties caused by the trauma obstruction and oral infection. Nutritional support is provided via tube feeding if oral feeding is impossible. General dietary recommendations would include liquid, soft diets or moist food for easy mastication and swallowing. Thus small frequent meals of relatively high energy density are prescribed. In presence of steatorrhea the use of medium chain triglycerides in the formula may be necessary and the use of complex sugars with frequent consumption of fluids and oral hygiene (Mahan, Escott and Stump, 1996).

2.3.11.3.Stomach:

The goal of the diet therapy is to maintain the patient in an optimal nutritional state while permitting the individual to choose food he/she enjoys. Correction of anemia and control of fluid and electrolytes imbalances are important (Mahan, Escott and Stump, 1996; Shils, *et al.,* 1994).

Epidemiological data (1973-1999) support the association between high fruit and vegetable intake and reduced risk of cancer of the GI tract (Riboli, 2001).

Surgical treatment for gastric cancer involves either a radical subtotal gastroctomy or total gastroctomy – the nutritional problems with these patients depend on the response of the patient. Various signs and symptoms which have been termed dumping syndrome can occur. Nutritional support minimize it by provision and adherence to anti-dumping diet which is high in protein, adequate in fat, low in soluble CHO, restricted in fluid at meal time and served 6 times/day. The use of pectin derivatives has been reported to prolong gastric emptying, decrease dumping, serum insulin and to minimize the fall in blood sugars (Leeds *et al*, 1981). Steatorrhea is reduced by progressive replacement of long chain triglycerides with medium chain ones as tolerated. Iron and vitamin C should be adequately supplied with monthly injections of vitamin B_{12}. Drinking milk in small amounts frequently over the day or use of yoghurt helps to obtain adequate calcium and to overcome milk intolerance (Shils, 1994).

2.4.ROLE OF DIETITIAN AND PHYSICIAN:

2.4.1.Definition:

A dietitian is defined by ICDAs (2002) as a person with legally recognized qualification in nutrition and dietetics who applies the science of nutrition to the feeding and education of people or individuals in health and disease. To have a better overview of the profession, three more definitions that are comprehensive were made by the working group.

An **administrative dietitian** is one with an education in nutrition and dietetics focused on food service management with responsibilities for the feeding of groups in health and disease in an institution or community.

A **clinical dietitian** is the one with an education focused on clinical nutrition and dietetics with responsibilities for dietary treatment of groups and individuals in an institution or a community.

A **general dietitian** is the one with a basic education but not a specialization in clinical nutrition, dietetics and food service management with overall responsibilities for these aspects in an institution or a community.

2.4.2.Implementation of therapeutic diets:

The dietitian works closely with the medical staff in the treatment of essential palliative and prophylactic diets (Mahan, Escott and Stump, 1996; Passmore and Eastwood, 1986; Williams, 1981; Courbrough, 1978). This needs:

- Interviewing the patient to record personal and socioeconomic information.
- Carry out anthropometric measurements
- Translation of the diet described by the physician into type of foods and exact amounts in a specific way
- Modification of the normal hospital diet
- Help the patient in the selection of foods which will produce or maintain a psychological adjustment from the problems he/she faces in food consumption.
- Participation in ward rounds and discussions of problems that may arise with the medical staff.
- Adjustment between body measures, eating habits, to recommend amounts for consumption and explore the patient's personality e.g. likes, dislikes, allergy.
- Serving the tray must be in an attractive manner to encourage the patient's appetite e.g. hot meals served hot and *vice versa* for cold ones.

- Make sure the patient is in a comfortable position for dietary intake i.e. can reach everything in the tray

2.4.3.Advisory role and supervision:

This can be summarized as follows:

- Dietitian needs to cooperate closely with catering manager, catering office and store in the purchase of the exact quantity and quality of the different food items that will be delivered to the kitchen
- Planning of menus to ensure that nutritionally balanced meals are available to all the patients and most diets can be selected from the range of available food
- Hygienic handling of food
- Advice and supervision of cooks on methods of food preparations and cooking to ensure retention of nutrients
- Supervision of smooth handling of food service which can be centralized or decentralized
- Oversee the transport of diets from kitchen to wards by caterers, distribution in wards by nurses and make sure as far as possible the patients get their designated diets.

Thus dietitians share the responsibility for patients' diets with doctors, nurses, caterers and cooks (Whitney *et al*, 1994; Passmore and Eastwood, 1986; Courbrough, 1978).

2.5.STUDIES ON DIETARY INTAKE BY INPATIENTS:

Barton *et al* (2000) investigated the cause of continuing weight loss in hospitalized patients by determining whether the hospital menus were able to meet the patient's requirement and the proportion of food wasted. The results showed that the hospital menu provided over 2000kcal/day and could meet the patients' requirements. However, there was high wastage (40%) and protein intake was less than 80% of recommendations.

Mureil *et al* (1998) measured the intake of inpatients for 3 days. They ate freely from standard hospital menu provided on medical recommendations. The findings demonstrated that the catering provisions did not meet their requirements. Deficit in energy was 1432±256kj/day and in protein 22.8±2.9g./day compared to the control group.

Incalazi *et al* (1996) conducted a study to assess the adequacy of nutritional intake to meet individual needs, the effect of hospitalization on nutritional status and to identify the reasons for inadequate energy intake (if any) of the inpatients. The study showed deficient energy intake as the patients consumed 40% of the prescribed diets, complained of anorexia and masticatory inefficiency and were not satisfied with the quality and timing of the meals.

Begum *et al* (1994) assessed the prevalence of diets provided to different types of patients in five hospitals in Dhaka, Bangladesh. Hospital diets were imbalanced to meet therapeutic needs of patients e.g. energy content of foods supplied to the patients was about 50% of that mentioned on the diet menus. The patients intake of hospital food was very low and the majority were not satisfied with the foods offered.

In a South African survey by Gouns *et al* (1989) to determine the actual nutrients' intake of a group of older inpatients (mean ages 70±9 years for men and 74±10 for women), it was found that the hospital diets served did not meet 100% of the RDAs for energy, magnesium, zinc and folic acid. The percentage mean intake of RDA for energy was 67% and that energy contribution was 16% protein,

34% fat and 50% CHO. The snacks received from family and friends did not contribute significantly to the nutrient intake of the inpatients.

A survey (1983 1) was carried out by Turnland *et al* in the largest hospitals of six Middle Eastern countries (Bahrain, Jordan, Kuwait, Lebanon, Saudi Arabia and Syria) to evaluate the nutritional adequacy of normal hospital diets and to determine the extent and use of therapeutic diets. Hospital diets were evaluated according to the four food groups. The findings revealed adequacy of diets in 7 out of 16 hospitals where there was lacking of servings of milk, meat and/or fruit and vegetable food groups. Diets were frequently augmented by food brought by visitors. Therapeutic diets were used extensively and often incorrectly planned and prescribed without trained dietitians while physicians lacked adequate understanding and use of dietary treatment. Sanitary conditions were very serious problem in nearly all hospitals. In Lebanon Turnland *et al* (1983 II) -Survey reported that the house diet was served to about 79% of all patients and the modified diet to 21%; only two therapeutic diets were served – a low salt diet to both cardiovascular diseases and liver diseases patients and a diabetic diet which meant sugar was not added. In Saudi Arabia, the situation was considered adequate in 2 out of 4 hospitals due to the presence of trained and registered dietitians from the United Kingdom and United States of America. In one of the two hospitals, food was flown frozen from the U.S.A. In the III-Survey by Turnland *et al* (1983 III) in Bangladesh it was found that hospital food was supplemented by additional food items brought to patients from their homes and few therapeutic diets were used e.g. diabetics (80%) or a low energy diet (18%). The diets provided inadequate servings from milk group, citrus fruits and dark green leafy vegetables. Most servings were in small and limited amounts.

The study by Pasricha *et al* (1985) for the evaluation of the nutritive value of the general diet in Indian hospitals suggested that they provided enough protein, calcium, thiamin and iron but fell short of the RDA for sedentary male in case of energy, vitamin A and vitamin B_2.

In Sudan, Bashir (1996) studied the dietary management and compliance of ESRE patients and found that patients on maintenance hemodialysis therapy in Khartoum Teaching Hospital were malnourished or wasted and that dietary deficiency was prevalent throughout their stay. In addition, fluid overload resulted in anorexia, nausea and decreased food intake.

Another study was undertaken by Abbasher (1998) in Khartoum hospitals to evaluate the feeding arrangements and nutritive value of meals using observed weighed method. Average plate waste was 39.1% in the three main hospitals whether in private or general wards – it was 38.2% at breakfast, 39.0% at lunch and 40.6% at supper in all general or private wards. In the private wards, intake of thiamin, riboflavin and calcium was adequate but that of retinal, niacin, vitamin C and iron was inadequate.

Ibrahim (1999) conducted a study in Khartoum State about feeding patterns and practices of diabetic patients. Most of the patients (70.0%) had 3 meals/day but their mean intakes were estimated as follows: energy as 2318.9±115.9 kcal/day, protein as 90.2±4.9g/day, carbohydrates as 281.7±16 g/day and fat as 56.1±5.3g/day.

2.6.PHYSICIANS' VIEW ON DIETITIANS:

Rosen *et al* (1991) conducted a survey on a selected group of physicians (133) to determine their opinion regarding appropriate activities and educational background of hospital dietitians.

Most of the physicians viewed dietitians as contributing members of the health care team, however, they believed that physicians should be responsible for ordering therapeutic diets. Most (98.0%) agreed that one of the most important duties of the dietitian is to assure patient's satisfaction with the food served.

Information to hospital personnel is an important activity. The survey showed the importance of including the physician in the educational background

of the dietitian. A high proportion of physicians (60.0%) indicated that it is important for the dietitians to understand blood and urine values.

The study showed that the perceived status of hospital dietitians by physicians has improved since earlier studies.

Chapter Three

MATERIALS AND METHODS

3.1.Location of the study:

3.1.1. Ibn Sina Teaching Hospital:

The study was conducted at Ibn Sina Teaching Hospital, located 4.5 km south- east from the center of Khartoum. It is one of the leading teaching hospitals for the training of medical staff in Sudan, and is a referral hospital specializing in endoscopy and advanced surgery to whom people from all the regions are referred to for medical treatment.

The hospital was established in 1985 with three departments for admission: gastro- intestinal (GI); urology with a dialysis sub-unit and an ear nose and throat (ENT) in addition to an out- patient clinic. A consultant physician heads each department assisted by physicians, registrars and sisters.

During this study two national centers were under establishment, a National Center for Kidney Diseases and Surgery and a National Center for Gastro-intestinal Tract.

The hospital has a capacity of 120 beds, 40 beds in each department. Each of the GI and urology departments has an intensive care room provided with 2 beds. The range of admission period is 3 days up to 4 months.

3.1.2. Dietetic Department:

The dietetic department (area 90 sq .m.) has only one general kitchen with a small storeroom attached. Its staff consisted of six qualified dietitians, headed by the most senior. A chief cook managed the kitchen with four assistants.

Meals distributed were based on a central system serving usually four types of diets a normal diet, a low fat diet, a low protein low salt diet and the diabetic diet (low CHO). In addition, special diets were prepared for patients who suffered from other disease as well. Two male maids distributed the meals .The department is also responsible for provision of meals for the staff who are on-duty.

3.2. Design of the questionnaire:

The questionnaire designed for this study was divided into three sections: patient's, physician's and dietitian's sections.

3.2.1 Patients' section:

The patient's section (Appendix 1a) was for the collection of the following data personal, socio-economic, anthropometric, diagnostic, type of diet taken by the patient, reaction of the diet on bowel habits, appetite, the reaction of the patient towards the diet and recording of actual food intake of the patient over three days covering the main meals as well as any hospital or inpatients' extras.

The questionnaire was designed in multiple choice and short answer format. It was pretested by 20 in-patients. The questions were easily under stood and answers recorded thus its suitability for the study was ensured.

3.2.2.Dietitians' section:

This section (Appendix 1b) was also completed by other dietitians working in other teaching hospitals eg Omdurman, Khartoum ,Soba ,Military and Albulk beside those in Ibn Sina. It discussed their qualifications and duration of

experience, the system of the dietetic departments in their hospitals regarding diet planning, supervision and preparation of therapeutic diets, diets menu, distribution and delivery of the food.

It also included attendance of doctors' round, the in-service training offered to them and job satisfaction i.e. the therapeutic diets offered in the hospital. .

3.2.3 Physicians' section:

The physicians' section (Appendix 1c) was intended to assess the role of physicians in the implementation of the therapeutic diets regarding recommendation, level of co-operation between the physician and dietitian and their consideration for drug-nutrients interaction. .

3.3.Questionnaire completion:

3.3.3.Initial steps:

Prior to the study, a request letter attached with the proposed study was sent to the hospital administrative committee for permission. After the approval was given, a meeting was held with the director of the administration and the head of the dietetic department to discuss the procedures for conducting the study.

In the preparation for the implementation of the study, the investigator visited the hospital twice a week on Sundays and Tuesdays during the period 1-31/10/2000**.**

Major rounds were attended by the author in the gastro-intestinal tract and urology departments. During this period information on the prevalence of chronic diseases was collected..

The dietetic department was also visited several times to check kitchen and equipment sanitation by the observation method.

3.3.2.Inpatients:

The study started on 1/ 11/2001 on a daily basis (8.30 am - 10.30 pm) in Ibn Sina Teaching Hospital for a duration of 6 months. However, the study was twice interrupted, first due to the discharge of most of the inpatients and secondly to the postponement of admission for two weeks (one week vacation each for Eid al-Fitr and Eid al-Atha).

Data collection for patients was based on questionnaire completed by researcher. Interview, anthropometric measurements and food weighing.

The study sample was selected from patients newly admitted to the gastro-intestinal tract (GI) and urology departments during the period 1/11/ 2001 to 15/4/2001, whose diets were prescribed according to their diagnoses and whose hospitalization was for a minimum period of 5 days. Patients receiving enteral or parenteral feeding admitted for surgical treatment or for endoscopy, were excluded from the sample.

Patients were interviewed in the wards. The purpose of this study was explained clearly to the patients or co-patient and were asked to co-operate. On admission the inpatient was interviewed and her/his weight and height were measured. Two dietitian assisted the author in anthropometric and dietary measurements. The diagnosis and prescription were recorded from patients' file in the nursing room. Dietary intake was measured for three successive days using the weighing method.

About six patients were studied weekly depending on the availability of the required number. In the interview the personal data was completed e.g. name, age, sex residential area, education, occupation, sleeping hrs /day, number of meals /day, and activity. Questions regarding the patient's reaction to hospital diet e.g. appetite bowel movement before and after admission, like and dislike of the diet were collected after the third day of

dietary measurements. The activity of each patient was estimated by the author using the observation method according to patient's movements in the hospital (in-bed /light)to calculate energy requirement. A total of 120 patients were covered - 20 questionnaires were not completed due to discharge, surgery or death hence only 100 patients from Gastro-intestinal and Gastroenterology departments were considered in the analysis of data.

3.3.3 Physicians and dietitians:

Questionnaires (60) were distributed to physicians and dietitians who worked at the teaching hospitals in Khartoum State in addition to those at Ibn Sina Teaching Hospital, to assess their implementation of the therapeutic diets. The information gathered from 30 physician and 30 dieticians was discussed and evaluated against the international pattern recommended for nutrition care in hospitals.

3.4.Anthropometric measurements:

The basic anthropometric measurements used in this study were weight (kg) and height (cm) carried out in the nursing room before breakfast time.

Weight was measured to the nearest 0.1kg using the regular clinical beam- balance. The scale was checked and the patients were asked to remove their shoes before taking their weights.

Height was measured to the nearest 0.1cm using the standard measuring wood – board. The patients were measured without shoes, standing erect with their heels against the measuring board, then the statiometer lowered to rest flat on top of the head.

Height and weight were used for the calculation of the body mass index (BMI) for the assessment of the nutritional status of the inpatients.

$$\textbf{BMI = weight (kg) / height (cm}^2\textbf{)}$$

BMI was classified according to the WHO (1997) as follows:

Underweight → <18.5 : normal → 18.5-24.9 : over weight →25.-29.9 : obese >30

3.5.Food intake measurements:

The dietetic department had a standard weight for each food item offered to the inpatients. However, this was implemented by the use of household measures and not balances.

In this study food intake was measured by actual weighing of food items but since only one electronic balance (0.1 g scale divisions) was available for use and to save time the following standard weighing procedure was adopted for all types of dishes.

A small plate was placed on the balance, then the scale was adjusted to zero. The food item was removed from the tray by means of a spoon, placed on the plate and its weight recorded. Similarly, the food item was returned to the tray and the plate and spoon cleaned and dried by tissue paper. This procedure was repeated for all the food items in the tray Three measurements were recorded for every food item on the different trays of the same type of diet and the average weight recorded. This was carried out for the three-meal served/day for the seven types of diets studied for the seven days cyclic menu of the hospital diets. These were normal, low fat, low protein low salt (low protein/salt), low protein low salt low carbohydrates (low protein/salt/CHO), low carbohydrates (low CHO), high carbohydrates (high CHO) and high protein diets. Any additional diets served i.e. extras were treated likewise.

Weight of fruits and bread were recorded as an average for three different sizes e.g. small, medium and large. Different averages of weight was calculated for the different parts of chicken (leg, chest) whether fried , roasted or boiled. Cups (250 ml.) were used for soap and milk measurements and 160 ml. cups for tea. Averages measurements (every three meals/tray) as standard measurements of the food items offered by the hospital.

Inpatients were asked to keep their trays beside them after eating and to leave any food leftover or any inedible part of the food (bones, seeds or a skin of a fruit) in the tray . These were weighed after the patients finished their food intake (ca 45-60 minutes after the meal distribution) and subtracted from the original weight of each food item to give actual food intake.

Food items taken by the inpatient as hospital extras and inpatients extras were adopted from the dietitian file and were directly weighed from the tray. Hospital extras were offered on the patients request or when prescribed by the physician while inpatient extras were offered on the patient request and permission of the dietitian to bring it from home. Request for the later extras rarely occurred. Food offered as hospital extras were liquid and soft diets. The investigator asked each inpatient after every meal if she/he had any inpatients' extras between the three meals.

There was regular follow up of these inpatients to monitor both food offered and food leftover to record actual food intake by the investigator.

The mean food intake in grams by the patients assigned to a specific diet i.e. normal diet was calculated and was used for the specific diet irrespective of sex and age . This procedure was carried out for the seven diets. (Appendix 2).

3.6.Conversion of food intake into nutrients' intake:

The German Nutrition Data Base Software Program (BLS, 1999) was used to convert food intake into nutrients' intake. This program is based on German national and international food composition tables. The use of this software

(www.nutrisurvey.de) is now standard procedure in German research institutions i.e. Institute of Nutrition, Giessen University.

The data base lacked few dishes e.g. tahnia, pspusa, pigeon soup, porridge – these were referred to the Egyptian and Kenyan data bases (www.nutrisurvey.de).The software calculate individual energy reguirement according to sex ,age, BMI and activity .

For specific types of diet i.e. low protein/salt diet, the recipe was changed for certain food items according to the actual food offered by the hospital, this was done by deleting the table salt from the recipe.

The mean food intake (g.) by the patients per type of diet was converted into macronutrients (energy, protein, carbodydrates, fat), vitamins (thiamin, riboflavin, pyridoxine, folic acid, ascorbic acid and vitamin A) and some minerals (sodium, potassium, calcium, magnesium, phosphorous, iron and zinc). Quantifications were carried out using the computer software mentioned above. (Appendix 2).

3.7.Recommended Dietary Allowances:

No standardized or internationally recommended dietary allowances (RDA) are yet available to cater for the different diseases.

In this study therefore, Data Base Software Program (BLS, 1999) although meant for healthy people was used as one reference, and Eastwood and Passmore (1986) recommendations for specific diseases was used as the second reference.

Eastwood and Passmore (1986) mostly specified energy, protein, fat and salt (when restricted) so gaps e.g. vitamins and minerals, were completed using the(BLS, 1999) However, Eastwood and Passmore (1986) did not include the low protein/salt/CHO diet so American Diabetes Association (ADA 1994a) recommendation was used.

3.8.Adequacy of diets offered and intake :

Mean macro and micro-nutrients' offered and intakes were compared with BLS (1999), Eastwood and Passmore (1986) and (ADA 1994) as mentioned above.

For nutrients' contribution to the total energy intake, BLS (1999) recommendations of 12% from protein, 30% from fat and 58% from carbohydrates were used which are within the recommended range (10-15%, 25-35% and 55-65% respectively).(WHO, 1989)

Results were expressed as percentages' fulfillment's of the recommendations of the above references.

3.9.Statistical analysis:

Statistical analysis of data was performed using Microsoft Excel 2000 program descriptive statistical methods mainly mean, median and standard deviation.

Data was shown in tables and histograms. Student's t-test was used to compare macro-nutrients' and salt intake of the different types of diets.

3.9.Problems encountered during the study:

1. The cooks do not follow the standard measurements of foods recommended to the patients according to the diagnosis of the disease. This was overcome by measuring every item in the tray.

2. The co-patients used to eat with the patient in every meal but the investigator convinced them that the food was provided to the inpatients and that the study depended on the measurements of the food intake of the patients.
3. Each tray was identified by the patient's name and the investigator and assistants waited inside the ward to weigh the food leftovers, to avoid some of the co-patients took the trays outside the ward before the measurements were carried out.
4. As some patients took their dinner late in the evening, the investigator and assistants were compelled to stay late till 11pm.
5. Diet prescription was missing in some patients' files.
6. Using one electronic balance for all the measurements in addition to item 4 – work was time-consuming.

Chapter Four

RESULTS

The results part starts with a background information on the patients then proceeds to the main topic of the thesis, therapeutic diets served at Ibn Sina Teaching Hospital with an in-depth analysis of the macronutrients and sadium intake and ends with the assessment of implementation of therapeutic diets. Regarding tables see (Appendix 3)

4.1.BACKGROUND INORMATION ON PATIENTS:

4.1.1.Sex and age:

The sample consisted of 51 males and 49 females with a mean age of 47±16 years old (Fig 1). The range aged 25-65 years old (78% and 66% respectively). They were mostly from Khartoum (47), Gezira (22), western Sudan (16) and few from northern and eastern parts (7 and 8 respectively)(Fig 2).

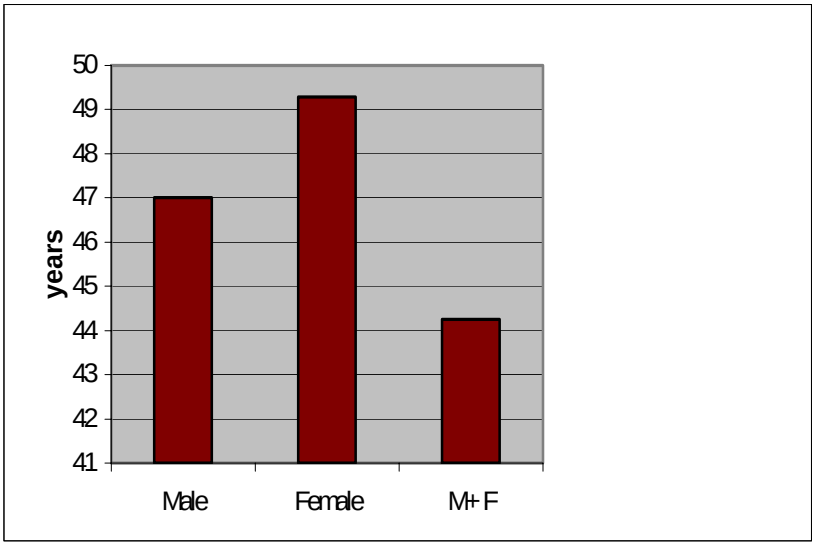


Fig. 1: 1Mean age of the patients (years)

Most of the males (76.0%) were in the 25-65 age group with a lower percentage (68.0%) for the females . In the 15-24 age group, there were more females compared to males (22.0% vs 6.0% respectively), and most of those in the 19-24 group were females (72%).Fig 3.

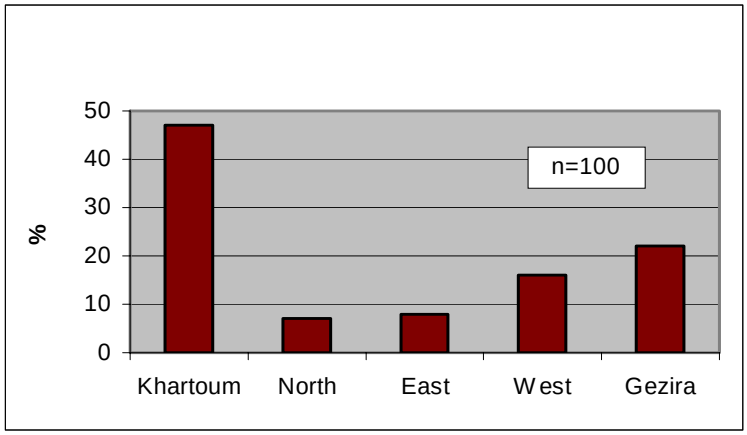


Fig. 2: Residential areas of the patients.

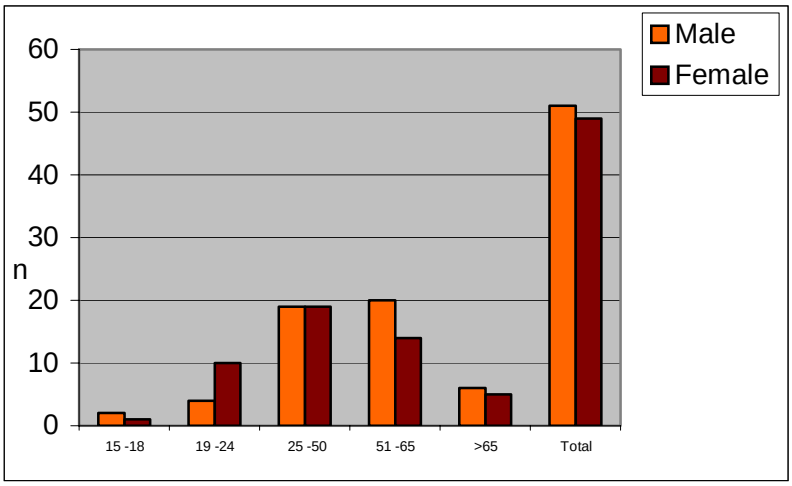
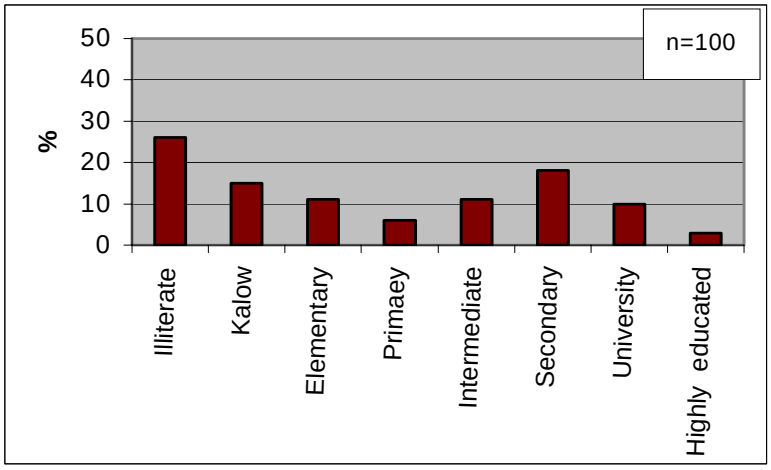


Fig. 3: Distribution of the patients in the different age groups.

4.1.2.Education:

The percentages of regular schooling were 46% of the sample (primary, intermediate and secondary) whereas 15% had informal education kalwa. The illiteracy was high among the sample (26%) and only 13% were graduates and post graduates (Fig 4).

Of the illiterate patients 69.2% were females More females had primary/intermediate (57.1%) and secondary (55.5%) education but less



attained university or postgraduate levels (23.0%). Only 13.3% had an informal education (Khalwa). (Fig 5)

Fig. 4: level of education of the patients

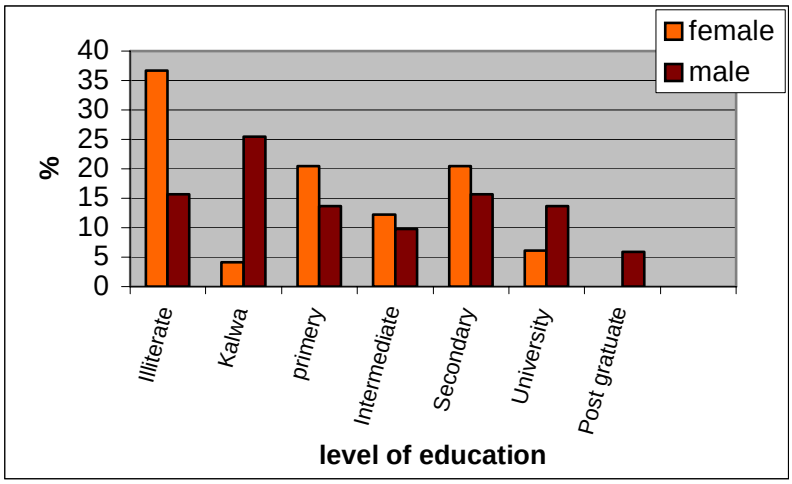


Fig. 5: level of education according to sex.

4.1.3.Occupation:

The majority of the females inpatients were housewives (40%), 26% were unemployed, 15% were laborers and only 12% of the sample were governmental employees, the rest (7%) were self-employed (Fig 6).

The majority (94.1%) of those employed were males (Fig7). Only 4.0% of the females had a formal employment (employees) and 14.3% were unemployed. However, 81.6% of the females were housewives, an employment not officially recognized.

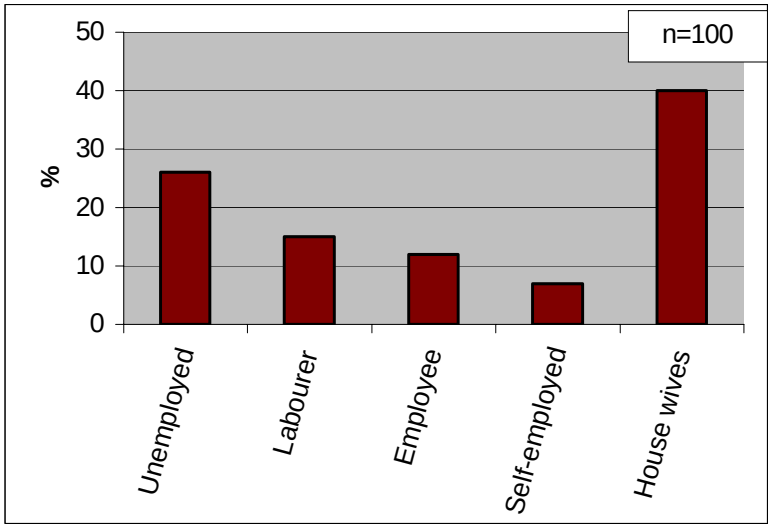


Fig 6: Occupation of inpatients

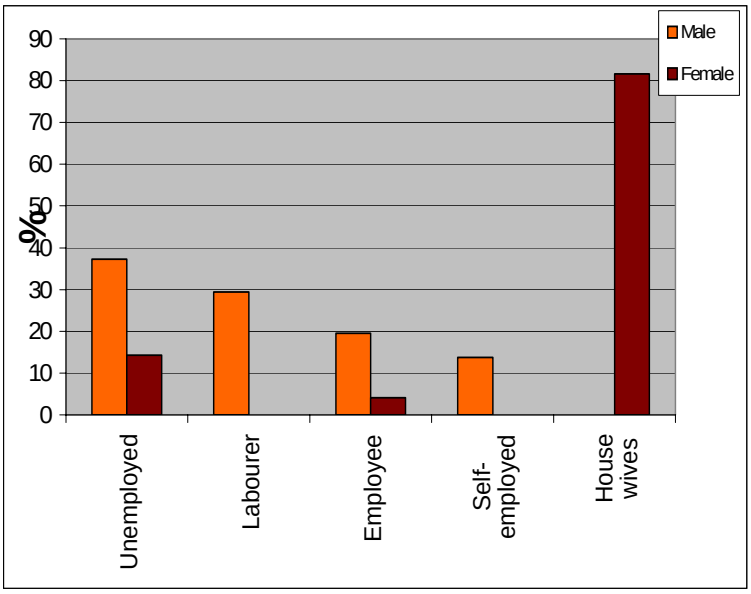
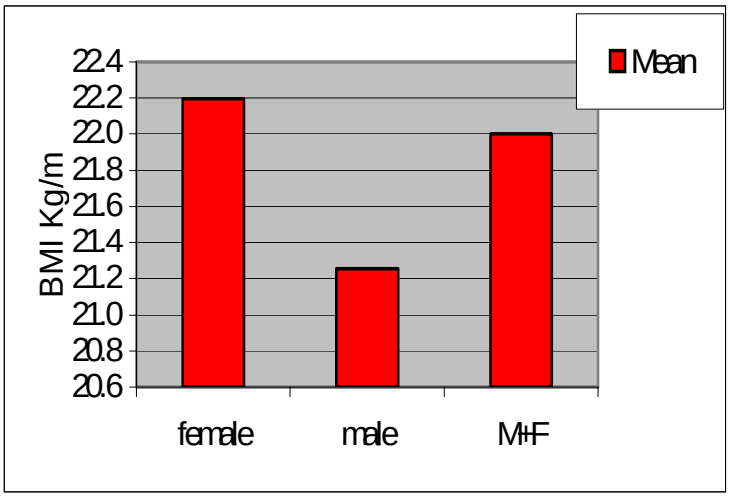


Fig .7 Employment status according to sex

4.1.4.Nutritional status:

The nutritional status of the patients was assessed using BMI. Mean BMI for all patients was 22 ± 6; 21.3 ± 4.9 for males and 22.2 ± 6.3 for females (Fig8.). Further categorization showed that 35% were underweight (<18.5) and 12% were obese (>30). 36% had normal status (18.5-24.9) and 17% were overweight (25-29.9). Fig. 9

The malnourished patients (47%) were classified in different degrees of malnutrition, (34%) suffered from severe thinness their BMI was <16., while 11% had moderate thinness 16 – 16.9. and 30% were on mild thinness their BMI corresponded to 17-18.4. 25% of the malnourished inpatients are in different stages of obesity (Fig 10).



(Fig:8)Mean BMI of the patients kg/m^2

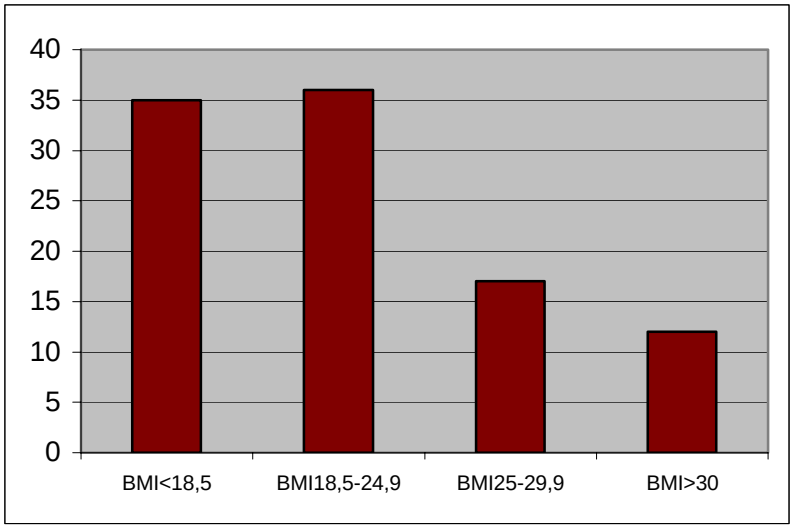


Fig. 9: Classification of the patients according to BMI [kg/m²]

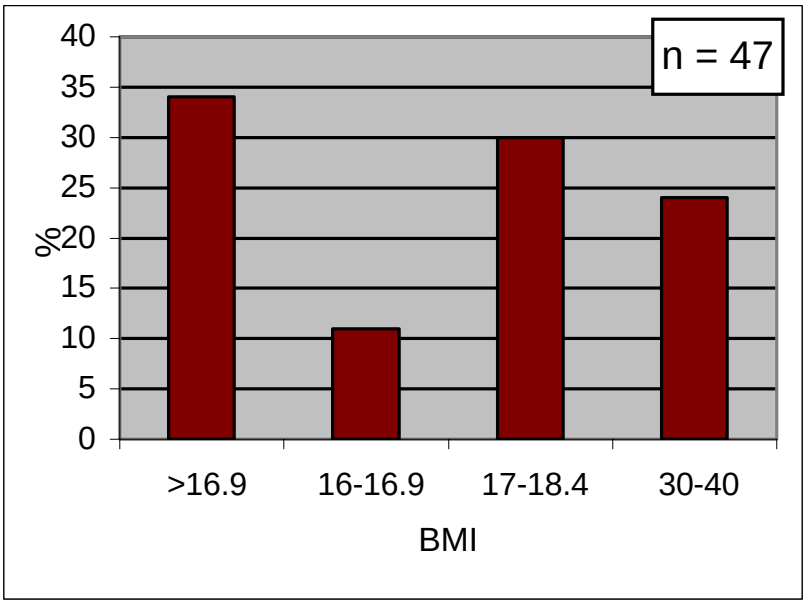


Fig. 10: Classification of the malnourished inpatients according to degrees of malnutrition

4 .1.5 Diagnosis of the patients

33% of the patients suffered from liver disease and 30% were diagnostic with kidney diseases.

The percentages of patients with cancer, stomach and pancreas diseases were not high (16, 12 and10%) respectively (Fig11).

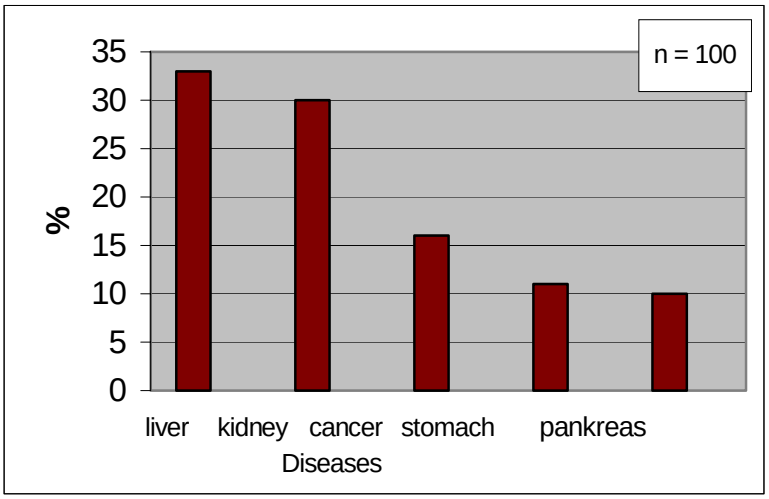


Fig.11: Classification of inpatients according to their diagnostic condition

4.1.6. Diets served in hospital:

The hospital served a normal diet and six other therapeutic diets for the inpatients. The major diets served (73%) were normal (38%), low protein/salt (23%) and the low fat (12%) diets.(Fig.12) .

Three meals / day were taken by the majority of inpatients (89 %), 4 meals were offered to 10 % of the patients and only 1% offered 2 meals/day. (Fig.13)

Most of the diets were offered in solid consistency (92%).Clear and full liquid diets had a similar percentages (3%), while 2% of the inpatients were offered soft diet.(Fig.14)

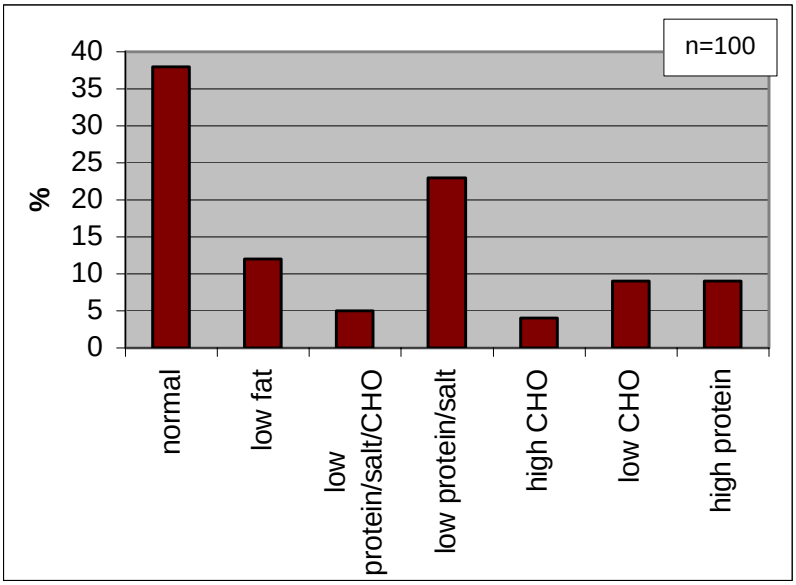


Fig. 12: Distribution of the patients according to diets

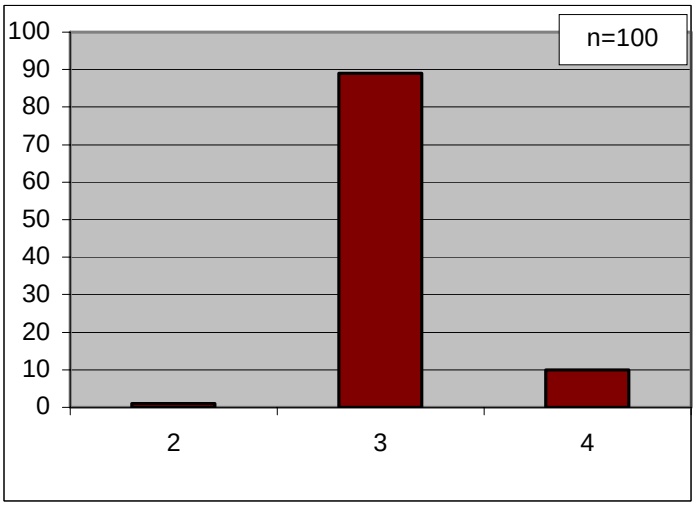


Fig. 13: Frequency of meals /day

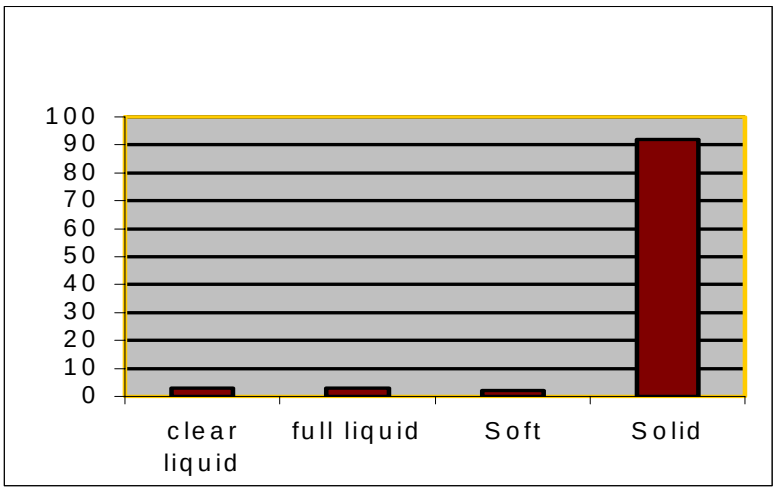


Fig .14: Consistency of the diet

4.1.7.Bowl habits:

No indicative results were obtained (Fig 15). There was a positive change for the <once/day and twice/day (+5 and +4) respectively and a negative change for the once/day (-7) and for the three/day and >three/day (table 20 & 3, Appendix 3).

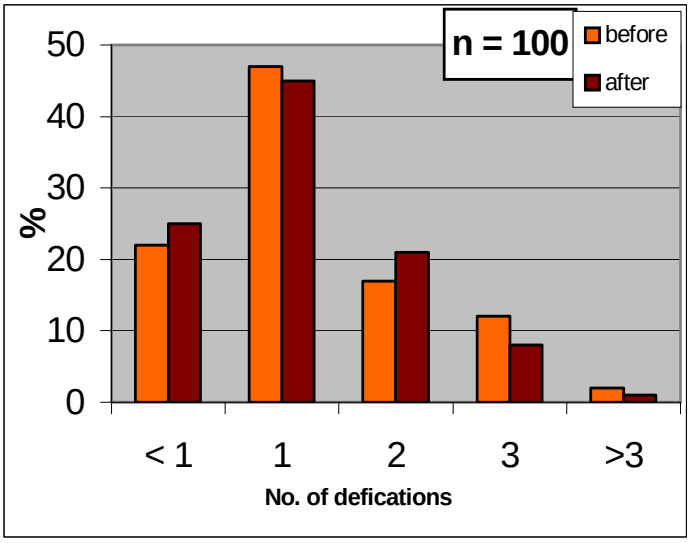


Fig.15: Bowel habits before and after admission.

4.1.8.Intake of hospital meals:

Appetite before hospital admission was rated by 54% as poor. On hospital admission this was reduced to 50% which was not significant. Also there was an increase on percentages of inpatients towards a better appetite (8 - 10% and 30 - 40% respectively) (Fig16).

The response of the patients towards the hospital diets after admission was further investigated (Fig 17). The diets were liked by 66% but 34% didn't.

75 % of inpatients who disliked the hospital diet mentioned two reasons for disliking them, taste and composition whereas 24% hated it because of their illness (Fig18).

Patients were asked to register their complaints regarding the hospital diets served to them. 43% did not mention any complaint. The rest (57%) complained of different symptoms whereas nausea came on top by (27%), other symptoms ranged between 11 - 4%.

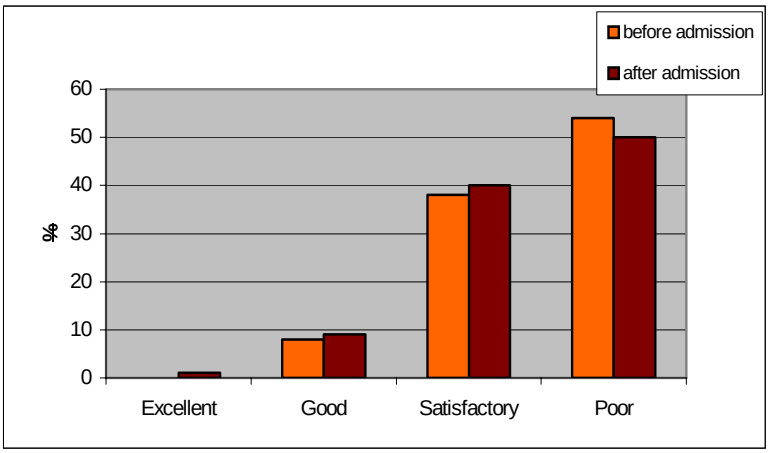


Fig.16: Appetite before and after admission.

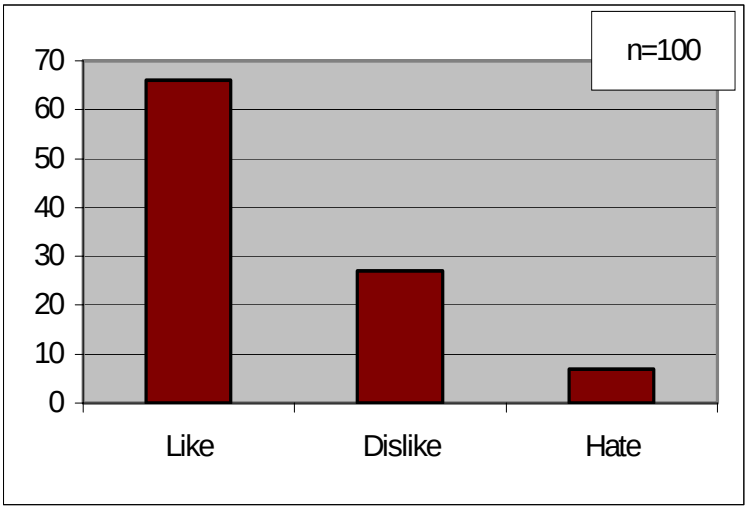


Fig. 17 : Response of the patients towards the hospital diets .

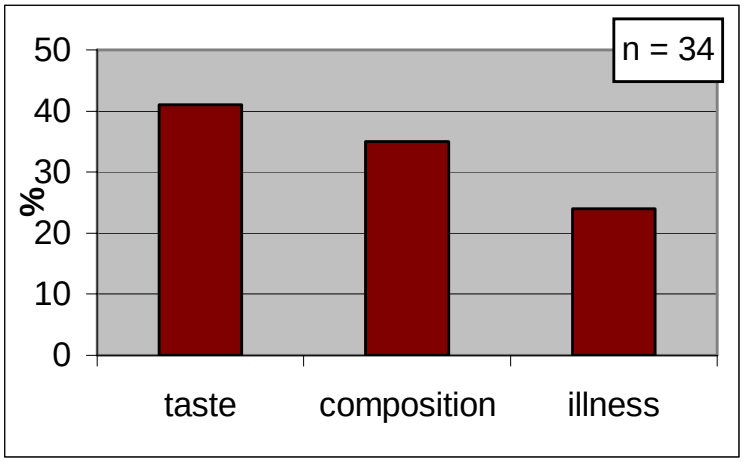


Fig. 18:Reasons for dislike the hospital diets.

Fig. 19: Patients complaints

4.1.9 In-depth study on background information:

4.1.9.1.Distribution of diet by age/sex:

More males were fed the normal and low protein/salt/CHO diets (58% and 80% respectively) and more females were fed the low fat diet (83%) and the high protein diet (66.6%).

No appreciable sex differences were noted in the other diets (Table1).

4.1.9.2.Distribution of diet by residence:

A large proportion of the normal diet was served to inpatients from Khartoum (52.6%), followed by those from Gezira (21.0%) and to a lesser extent those from western part (15.8%). The same applied to the low protein/salt diet as 65.2% was served to those from Khartoum. Distribution of the rest of the diets according to residential areas was similar.(Table.2)

4.1.9.3.Distriubtion of diet by Education and occupation:

Illiteracy was high among females patients fed low fat diet (58%),while in other diets it rangd between (33- 16%) (Table 3) .A similar trend was noticed in the distribution of diets according to occupation (Table. 4). The low fat diet was

mostly served to housewives (75%) . The low protein/salt diet was mainly served to those with no official income e.g. 28.9% unemployed and 43.4% housewives

4.1.9.4.Distribution of diet by nutritional status:

The BMI of patients served the different diets is shown in Table 5. Only those served the high CHO diet suffered underweight (<18.5). However, those served the normal diet although had a normal BMI, their median value was 18.2 which implies that at least 19 of the patients suffered underweight.

4.1.9.5 Diets according to diagnosis:

Table 6 shows the type of diets offered to the inpatients suffering from the different diseases (15 types).

Two diets were solely served to specific diseases, the low fat diet to those suffering from gall bladder and the low protein/salt/CHO diet to those suffering from diabetic nephropathy.

Some diets although not solely assigned to specific diseases yet were the only diets served to certain diseases e.g. normal diet for spleen, bladder and renal stone diseases, high protein for nophritic syndrome, diabetes mellitus/portal hypertension (DM/PHT) and anaemia.

The low protein/salt diet was mostly fed (83%) to those suffering from renal failure.

The majority (85.7%) of those suffering from gall bladder were fed the low fat diet and a similar percentage of those suffering from stomach ailment were given the normal diet.

As for liver diseases, depending on other complications, a wider range of diets were served: normal and low protein/salt (36% each), high protein (18%) and high CHO (9%) diets.

A majority of cancer patients (61.5%) were served the normal diet and 23.0% the low CHO diet.

Renal failure patients were mostly (95%) fed the low protein/salt diet – only one patient was fed the high protein diet. All those suffering from bladder or renal stones were fed the normal diet, those suffering from nephrotic syndrome the high protein diet and those suffering from diabetic nephropathy the low protein/salt/CHO diets.

The majority of patients (85%) diagnosed with portal hypertension (PHT) were fed the normal diet while all those with DM/PHT were fed the low CHO diet. It should be noted that the normal diet was served in varying percentages to two-thirds of the diseases.

4.1.8.6 Consistency of diets and frequency of meals:

Diets served were mostly solid in consistency (92.0) served 3 times/day (89.0%) (Table 8).

The non-solid diets were served to eight inpatients:

-3 clear liquid diets: one normal, one high CHO and one high protein

-3 full liquid diets: one low protein/salt, one high CHO and one low CHO

-2 soft diets: one high protein and one low protein/salt/CHO

One patient had 2 meals/day (low protein/salt/CHO) and 10 others had 4 meals/day varying between 1-3/diet except the low protein/salt/CHO which was taken by none.(Table 7)

Concerning the appetite no noticable imrovement was recorded, only slightly for patients fed low protein /salt/CHO and low CHO diets (Tables 11&12).

50% of the patients had poor appetite.Those were consuming the high protein (66.6%), low fat (58.3%), normal (55.2%), low protein/salt and high CHO (43.4% each) and low CHO (33.3%) diets. However, none of the patients consuming the low protein/salt/CHO diet rated it as poor (Table12).

Hospitals diets were liked by the majority of the patients who cosumed the normal (74%) and low fat (75%) diets (Table 13), while those who cosumed the high protein, low protein /salt/CHO and low protein /salt diets disliked them due to the taste .(Table 14).

Nausea was the major complaint against low fat (42%) and low CHO (44%) diets (Table15). Nausea, vomiting and the combination of both was also a major complaint for all diets except the high CHO and low protein/salt/CHO diets. Comparing the complaints among the different diets, incidences of vomiting, diarrhea and nausea were highest among consumers of the normal diet (85.7%, 45.4% and 33.3% respectively). The sample was small for other complaints i.e. constipation.(Table 15)

The low CHO diet was the one that faced the highest complaints (77.8%) followed by the high protein (66.7%), with similar complaints about the normal and low fat diets (*ca*. 58%). Complaints from the remaining diets was ≤50%.

4.1.8.7. Bowl habits:

The positive change in bowel habits after admission was recorded for patients fed low fat and low protein/ salt diets, while the negative change was for the normal and high protein diets .(Tables 9 &10)

Table 1: Distribution of diets by age and sex

	Normal diet				**< fat diet**			
Age group	**male**		**Female**		**Male**		**female**	
	NO	%	NO.	%	NO.	%	NO	%
15 –18	1	3	0	0	0	0	0	0
19 –24	4	11	4	11	0	0	0	0
25 – 50	9	24	6	16	0	0	3	25
51 – 65	8	21	3	8	1	8	6	50
> 65	3	8	0	0	1	8	1	8
Total	25	66	13	34	2	16	10	83
	< (protein +salt) diet				> CHO diet			
Age group	**male**		**Female**		**male**		**Female**	
	NO	%	NO.	%	NO	%	NO.	%
15 –18	0	0	1	4	1	25	0	0
19 –24	0	0	5	22	0	0	1	25
25 – 50	4	17	3	13	1	25	1	25
51 – 65	5	22	1	4	0	0	0	0
> 65	1	4	3	13	0	0	0	0
Total	10	43	13	57	2	50	2	50
	< CHO diet				> protein diet			
Age group	**male**		**Female**		**male**		**Female**	
	NO	%	NO.	%	NO	%	NO.	%
15 –18	0	0	0	0	0	0	0	0
19 –24	0	0	0	0	0	0	0	0
25 – 50	1	11.1	3	33.3	3	33.3	3	33.3
51 – 65	3	33.3	0	0	0	0	3	33.3
> 65	1	11.1	1	11.1	0	0	0	0
Total	5	55.6	4	44.4	3	33.3	6	66.6
< (proteim+salt+CHO) diet								

Age group	**male**		**Female**	
	NO	%	NO.	%
15 –18	0	0	0	0
19 –24	0	0	0	0
25 – 50	1	20	0	
51 – 65	3	60	1	20
> 65	0	0	0	0

Total	4	80	1	20	

Table 2: Distribution of diets by residency

Areas

	normal		< fat		< (protein+ salt)		> CHO		< CHO		> protein		<(p + s+c)		total
	No.	%	No.	%	No.	%	No	%	No.	%	No.	%	No.%		NO%
Khartoum	20	53	6	50	15	65	1	25	2	22	1	11	2	40	47
North	2	5	0	0	4	17	0	0	0	0	1	11	0	0	7
East	2	5	0	0	2	9	0	0	1	12	2	22	1	20	8
West	6	16	4	33	0	0	1	25	2	22	2	22	1	20	16
Gezira	8	21	2	17	2	9	2	50	4	44	3	34	1	20	22
Total	38	100	12	100	23	100	4	100	9	100	9	100	5	100	100

Table 3: Distribution of diets by education

Education	**normal**		**< fat**		**< (protein+salt)**		**> CHO**		**< CHO**		**> protein**		**<(p+ s+c)**		**total**
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	NO.%
Illiterate	6	16	7	58.3	5	22	1	25	3	33	3	33	1	20	26
Kalwa	8	21	0	0	2	9	0	0	1	11	1	11	3	60	15
Primary	4	11	1	8	7	30	1	25	2	22	2	22	0	0	17
Intermediate	6	16	1	8	3	13	0	0	1	11	0	0	0	0	11
Secondary	7	18	2	17	4	17	1	25	1	11	3	33	0	0	18
high edu.	7	18	1	8	2	9	1	25	1	11	0	0	1	20	13
Total	38	100	12	100.0	23	100.0	4	100	9	100	9	100	5	100	100

Table 4: Distribution of diets by occupatuion

Occupation	**normal**		**< fat**		**< (protein+salt)**		**> CHO**		**< CHO**		**> protein**		**<(p+ s+c)**		**total**
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	NO%
Unemployed	11	29	0	0	8	38	1	25	3	33	0	0	3	60	26
Labouror	7	18	1	8	3	13	0	0	0	0	3	33	1	20	15
Employed	7	18	2	17	2	9	1	25	0	0	0	0	0	0	12
Self-employed	5	13	0	0	0	0	0	0	2	22	0	0	0	0	7
house-wife	8	22	9	75	10	43	2	50	4	45	6	67	1	20	40
Total	38	100	12	100	23	100	4	100	9	100	9	100	5	100	100

Table 5: Distribution of diets by BMI

	BMI kg/m²]				
Diets	**Mean**	**median**	**classification**	**NO.**	**%**
Normal diet	19.7± 5.5	18.2	normal	38	38
< fat diet	24.7± 6.7	24	normal	12	12
< (protein + salt)	23.4± 5.3	22.9	normal	23	23
> CHO	18.0± 3.5	17.5	under weight	4	4
< CHO	23.1± 6.4	21.9	normal	9	9
> protein	21.5± 4.3	21.5	normal	9	9
<(protein+salt+CHO)	23.6± 2.3	24.1	normal	5	5
Total				100	100

Table 6 Distribution of diets according to Diagnosis

normal			**< fat**		**< protein+ salt**		**> CHO**		**< CHO**		**> protein**		**<(p+s+c)**	
Diseases	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Gall bladder	1	3	12	100	0	0	0	0	1	11	0	0	0	0
Stomach	6	16	0	0	0	0	1	25	0	0	0	0	0	0
Liver	4	11	0	0	4	17	1	25	0	0	2	22	0	0
Spleen	3	8	0	0	0	0	0	0	0	0	0	0	0	0
Pancreas	1	3	0	0	0	0	0	0	2	22	0	0	0	0
Oesophagus	1	3	0	0	0	0	1	25	0	0	1	11	0	0
Cancer	8	21	0	0	0	0	1	25	3	.33.3	1	11	0	0
Renal failure	0	0	0	0	19	83	0	0	0	0	1	11	0	0
Bladder	2	5	0	0	0	0	0	0	0	0	0	0	0	0
Renal stone	6	16	0	0	0	0	0	0	0	0	0	0	0	0
Nephrotic	0	0	0	0	0	0	0	0	0	0	2	22	0	0
Nephropathy	0	0	0	0	0	0	0	0	0	0	0	0	5	100
Portal HAT	6	16	0	0	0	0	0	0	0	0	1	11	0	0
DM+PHT	0	0	0	0	0	0	0	0	3	33	0	0	0	0
Anaemia	0	0	0	0	0	0	0	0	0	0	1	11	0	0
Total	38	100	12	100	23	100	4	100	9	100	9	99	5	100

Table 7 Distribution of diets by Freguency of meals per day .

normal			< fat		< (protein +salt		> CHO		< CHO		> protein		< (p+s+c)		total
Frequency	No.	%	No	%	No.	%	No.	%	No.	%	No.	%	No.	%	NO.%
2	0	0	0	0	0	0	0	0	0		0	0	1	20	1
3	36	95	11	92	22	96	2	50	8	89	6	67	4	80	89
4	2	5	1	8	1	4	2	50	1	11	3	33	0	0	10
total	38	100	12	100	23	100	4	100	9	100	9	100	5	100	100

Table 8 Distribution of diets by Consistency

	normal		< fat		< (protein +salt)		> CHO		< CHO		> protein		<(p+ s+c)		total
consistency	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	NO.%
clear liquid	1	3	0	0	1	4	1	25	0	0	0	0	0	0	3
full liquid	0	0	0	0	0	0	1	25	1	11.1	1	11	0	0	3
soft	0	0	0	0	0	0	0	0	0	0	1	11	1	20	2
solid	37	97	12	100	22	96	2	50	8	89	7	78	4	80	92
total	**38**	**100**	**12**	**100**	**23**	**100**	**4**	**100**	**9**	**100**	**9**	**100**	**5**	**100**	**100**

Table 9 Distribution of diets by Bowel habits before admission

Normal			< fat		< (protein +salt)		> CHO		< CHO		> protein		<(p + s+C)		total
Movement	No.	%	No.	%	No.	%	No	%	No.	%	No.	%	No.	%	NO.%
<1/day	10	26	4	33	3	13	2	50	1	11	1	11	1	20	22
1/day	20	53	3	25	11	48	1	25	5	56	4	44	3	60	47
2/day	2	5	3	25	5	22	0	0	2	22	4	44	1	20	17
3/day	5	13	1	8	4	17	1	25	1	11	0	0	0	0	12
>3/ day	1	3	1	8	0	0	0	0	0	0	0	0	0	0	2
total	38	100	12	100	23	100	4	100	9	100	9	100	5	100	100

Table 10 Distribution of diets Bowel habits after admission.

	Normal		< fat		< (protein +salt)		> CHO		< CHO		> protein		<(p + s+C)		total
Movement	No.	%	No	%	No.	%	No. %		No.	%	No.	%	No.	%	NO.%
<1/day	11	29	4	33	5	22	2	50	1	11	1	11.1	1	20	27
1/day	20	53	4	33	8	35	1	25	5	56	4	44.4	3	60	40
2/day	4	11	4	33	7	30	0	0	2	22	3	33.3	1	20	21
3/day	3	8	0	0	3	13	1	25	1	11	0	0.0	0	0	11
>3/ day	0	0	0	0	0	0	0	0	0	0	1	11.1	0	0	1
total	38	100	12	100	23	100	4	100	9	100	9	99.9	5	100	100

Table 11 Distribution of diets by Appetite before admission.

	normal		< fat		< protein +salt		> CHO		< CHO		> protein		< (p+s+C)		total
Appetite	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	NO.%
good	4	11	1	8	2	9	1	25	0	0	0	0	0	0	8
satisfactory	13	34	5	42	10	43	0	0	3	33	4	44	3	60	38
poor	21	55	6	50	11	48	3	75	6	67	5	56	2	40	54
total	38	100	12	100	23	100	4	100	9	100	9	100	5	100	100

Table 12: Distribution of diets by Appetite after admission.

	normal		< fat		< (protein +salt)		> CHO		< CHO		> protein		<(p + s+C)		Total
Appetite	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	NO%
good	3	8	1	8	1	4.3	1	25	2	22	0	0	2	40	10
satisfactory	14	37	4	33	12	52.2	0	0	4	44	3	33	3	60	40
poor	21	55	7	58	10	43.5	3	75	3	33	6	67	0	0	50
total	38	100	12	100	23	100	4	100	9	100	9	100	5	100	100

Table 13 Distribution of diets by Reactions.

normal			< fat		< (protein +salt)		> CHO		< CHO		> protein		<(p+ s+C)		total
Reactions towards the diet.	No	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	NO%
like	28	74	9	75	14	61	2	50	6	67	4	44	3	60	66
dislike	7	18	2	17	9	39	0	0	3	33	4	44	2	40	27
hate	3	8	1	8	0	0	2	50	0	0	1	11	0	0	7
total	38	100	12	100	23	100	4	100	9	100	9	100	5	100	100

Table 14: Distribution of diets by Reasons for dislike

	normal		< fat		< (protein+ salt)		> CHO		< CHO		> protein		<(p + s+C)		total
Reasons	No.	%	No.	%	No.	%	No.	%	No.	%		No.	%	No.	%	NO%
contents	6	60	2	67	2	22	0	0	1	33	1	25	0	0	35
taste	2	20	0	0	5	56	0	0	2	67	3	75	2	100	41
illness	2	20	1	33	2	22	2	100	0	0	1	25	0	0	24
total	10	100	3	100	9	100	2	100	3	100	4	100	2	100	100

Table 15: Distribution of diets by Patients' complaints

	Normal		< fat		< protein+ salt		> CHO		< CHO		> protein		<(protein+ salt+CHO)	
Complaints	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
nausea	9	24	5	42	6	26	1	25	4	44	2	22	0	0
vomiting	6	16	0	0	1	4	0	0	0	0	0	0	0	0
na+vom.	1	3	0	0	2	9	0	0	0	0	2	22	1	20
anorexia	0	0	1	8	1	4	1	25	1	11	0	0	0	
diarrhea	5	13	1	8	1	4	0	0	2	22	1	11	1	20
constipation	1	3	0	0	0	0	0	0	0	0	1	11	0	0
no complaints	16	42	5	42	12	52	2	50	2	22	3	33	3	60
Total	38	100	12	100	23	100	4	100	9	100	9	100	5	100

4.2.HOSPITAL DIETS SERVED TO PATIENTS:

4.2.1.Nutrients' composition:

The nutrients' contents/day of the different hospital diets served to the patients is shown in Appendix 4. table 5. Energy and protein were in all cases offered in excess of the amounts recommended .

The ratio of the polyunsaturated fatty acids (PUFAs) to total fatty acids ranged between 14.5-24.9% in all cases lower than the suggested figure of 30%. Except for the low protein/salt diet, cholesterol content was higher than the suggested amount of 300mg/day.

Dietary fiber suggested amount of 25g/day was higher than what was offered in the low fat, low protein/salt/CHO, low protein/salt and low CHO diets (18.1g, 118.6g, 17.2g, and 20.5g. respectively).

The normal, high CHO and high protein diets provided very high amounts of vitamin A (retinol equivalents) compared to the other diets –17096, 17098 and 26562 respectively.

Thiamin was low in the low fat, the low protein/salt/CHO, low protein/salt and low CHO diets while pyridoxine was low in all diets except the normal, high CHO and high protein diets. Only the high protein diet had adequate folate content.

In all the diets vitamin C was supplied in excess of the amounts recommended.

Sodium was provided in excess of the 2400mg suggested in all the diets especially for the two low sodium diets (3932mg and 3554mg) where the recommendation is 920mg Na/day or 40mmol.

Potassium content of the diets was much less than that of sodium contrary to the suggestion of 2400mgNa to 3500mgK.

The low fat, low protein/salt/CHO, low protein/salt and low CHO diets were all deficient in both iron and zinc.

4.2.2. Adequacy of hospital diets:

The seven hospital diets offered to the patients were evaluated to find out whether or not they fulfilled Passmore and Eastwood (PssEast, 1986) and the BLS (1999) recommendations for such type of diets. The intake was also be assessed to find out whether or not it fulfilled the recommendations. In both cases results are expressed as percentage fulfillment.

The micro-nutrients' intake will be assessed according to recommendations of BLS(1999) . ADA (1994 A) will be used for the low protein/salt/CHO diet as it is the only available reference.

4.2.2.1.Normal diet:

The normal diet provided macro-nutrients in amounts exceeding those recommended by both references (Table 16).

However, intakes of energy, fat and CHO were low (61%, 53%, 62% respectively), while that of protein (71%) was adequate according according to PassEast (1986). Comparison with BLS (1999) showed that only protein intake (130%) was high.

Vitamin A intake was very high (321%), that of vitamin C was high (130%) with adequate intake of riboflavin and pyridoxine.

Intakes of sodium, phosphorous and iron were adequate but not the rest of the minerals.

Table 16:Normal diet (ambulatory) offered and intake (%)

	Offered%		Intake%	
Nutrients	**PassEast***	**BLS**	**PassEa**	**BLS**
Energy kcal	135	132	61±36	65±35
Protein g	140	254	71±43	133±83
Fat g	117	117	53±31	53±31
Carbohydr g.	128	128	62±34	62±34
Dietary fiber g		90	52±30	52±30
PUFA g			51±32	51±32
Vit. A ug			321±474	321±474
Vit. B1 mg			54±30	54±30
Vit. B2 mg			95±60	95±60
Vit. B6 mg			74±45	74±45
Folic acid eq. uq.			66±41	66±41
Vit. C mg			130±61	130±61
Sodium mg	247	247	114±79	114±79
Potassium mg			59±18	59±18
Calcium mg			68±33	68±33
Magnesium mg			65±36	65±36
Phosphorus mg			76±39	76±39
Iron mg			80±37	80±37
Zinc mg			61±35	61±35

4.2.2.2.Low fat diet:

The diet was adequate in meeting the recommendations for energy and carbohydrates of both references (Table 17). It offered too much fat (217%) according to Passmore and Eastwood for a low fat diet while the protein was high (181%) for the BLS (1999).

Thus the intake of fat was high (130%) according to Passmore and Eastwood (1986) and that of protein was high (110%) according to the BLS (1999) compared to the in adequate intake of the other macronutrients especially for carbohydrates (34%) with reference to Passmore and Eastwood (1986) for a low fat diet.

* Pass East : Passmore and eastwood

Intakes were high for vitamin A (356%), vitamin C (121%) and adequate for riboflavin. Low intakes were recorded for other vitamins.

Sodium intake met the recommendation but intakes of other minerals did not.

Table 17:Low fat diet offered and intake (%)

Nutrients	Offered%		Intake%	
	PassEast	BLS	PassEast	BLS
Energy Kcals	93	90	54±39	62±36
Protein G	102	181	59±46	110±82
Fat G	217	75	130±101	53±33
Carbohydr. G	89	88	34±15	61±35
Dietary fiber G		60	39±24	39±24
PUFA G			43±.31	43±.31
Vit. A Ug			356±377	356±377
Vit. B1 Mg			47±25	47±25
Vit. B2 Mg			88±53	88±53
Vit. B6 Mg			64±44	64±44
Folic acid eq. Ug			59±37	59±37
Vit. C Mg			121±65	121±65
Sodium Mg	245	245	95±87	95±87
Potassium Mg			50±31	50±31
Calcium Mg			64±34	64±34
Magnesium Mg			57±33	57±33
Phosphorus Mg			66±35	66±35
Iron Mg			63±28	63±28
Zinc Mg			52±34	52±34

4.2.2.3.Low protein/salt/CHO diet:

Passmore and Eastwood (1986) did not have a suggestion for such a diet, so ADA(1994) was used. The diet offered nearly met the suggested energy requirements but the protein content was much higher(195%) than suggested for a low protein/salt diet (Table18)

This was reflected in a high intakes of protein (214%) .Fat intake was inadequate (64%) due to inadequate fat offered in the diet (67%).

Comparing the intake with the BLS (1999), there was an indeguate energy intake (81%), high protein intake (169%) and low fat intake (64%).

Sodium intake was adequate for both references, BLS (1999) and ADA (1994 a) which shows similar recommendations. Intakes of other minerals were adequate.

Vitamin C intake was high (245%) and the intakes met the recommendations for vitamin A, riboflavin and pyridoxine and was adequate for thiamin and folate.

Table 18: Low protein/salt/CHO diet offered and intake (%)

Nutrient	Low(protein + salt +CHO)			
	Offered%	BLS	Intake%	BLS
	PassEast		PassEast	
energy kcals	93	76	95±.53	81±43
protein g	195	163	214±112	169±98
fat g	67	67	64±38	64±37
carbohyd g.	95.5	71	103±62	77±39
dietary fiber g		62	81±38	81±38
PUFA g			62±23	62±23
Vit. A ug			116±90	116±90
Vit. B1 mg			75±40	75±40
Vit. B2 mg			103±75	103±75
Vit. B6 mg			95±45	95±45
folic acid eq ug.			78±46	78±46
Vit. C mg			245±1.66	245±1.66
sodium mg	197	197	94±52	94±52
potassium mg			94±43	94±43
calcium mg			103±63	103±63
magnesium mg			88±49	88±49
phosphorus mg			102±44	102±44
iron mg			104±30	104±30
zinc mg			81±57	81±57

4.2.2.4.Low protein/salt diet:

According to Passmore and Eastwood (1986) and BLS (1999) suggestions, the diet offered low energy (85% and 74% respectively) as a result of low carbohydrates (68%) and fat (56%) contents (Table 18).

The diet provided high amounts of protein according to both references (226% and 188% respectively) and 386% according to Passmore and Eastwood and 177 % to the BLS. Hence the diet offered was neither low in protein nor sodium.

As a consequence, intake covered about 50% of energy recommended, 32% from fat and 54% from carbohydrates.

As mentioned in section 4.2.3.3. for a low salt diet, there was a large difference regarding intakes of sodium to meet recommendations – it covered 182% that of Passmore and Eastwood but only 45% of the BLS. Again a large gap existed between the two recommendations. Intakes of other minerals were much lower than those suggested.

Only the recommendations for vitamins A and C were met by the intake (217% and 114% respectively). Much lower intakes were recorded for the other vitamins.

Table 19: Low protein/salt diet offered and intake (%)

Nutrients	Offered%		Intake%	
	PassEast	BLS	PassEast	BLS
Energy kcals	85	74	52±23	49±23
Protein g	226	188	100±52	85±53
Fat g	56	56	32±18	32±18
Carbohydr.G	68	68	54±27	54±27
Dietary fiber g		57	43±32	43±32
PUFA G			36±24	36±24
Vit. A Ug			217±291	217±291
Vit. B1 Mg			40±21	40±21
Vit. B2 Mg			64±41	64±41
Vit. B6 Mg			52±33	52±33
folic acid eq.Ug			45±37	45±37

Vit. C Mg			114±114	114±114
Sodium mg	386	177	182.±167	45±24
Potassium Mg	395		56±51	45±28
Calcium mg			.50±23	.50±23
Magnesium Mg			.49±27	.49±27
Phosphorus Mg			.51±25	.51±25
Iron mg			57±38	57±38
Zincmg			42±23	42±23

4.2.2.5.High carbohydrates diet:

Passmore and Eastwood (1986) recommendations for the macronutrients were higher than that of the BLS (1999) as shown by the percentages met by the offered diet (Table. 20). Thus the diet offered adequate energy, protein, fat and carbohydrates according to Passmore and Eastwood but higher amounts of these macronutrients according to BLS.

In spite of these, the intake did not fulfill any of the recommendations suggested by both references. It met only 21% of Passmore and Eastwood suggestions for carbohydrates and 37% of the BLS.

Vitamins intake were recorded as very high for vitamin A (411%), high for vitamin C (155%) and adequate for riboflavin. Intakes of other vitamins were much lower especially for thiamin.

Minerals intake was much lower than the recommendations.

Table 20: High carbohydrates diet offered and intake (%)

Nutrient	Offered%		Intake%	
	PassEast	BLS	PassE	BLS
Energy kcals	92	136	24±22	35±31
Protein g	108	270	26±25	61±59
Fat g	88	121	20±22	24±26
Carbohydr. g	87	129	21±26	37±32
Dietary fiber g		91	39±40	39±40
PUFA g			27±29	27±29
Vit. A ug			411±478	411±478
Vit. B1 mg			40±24	40±24
Vit. B2 mg			82±81	82±81
Vit. B6 mg			46±39	46±39
Folic acid eq. ug			60±61	60±61
Vit. C mg			155±49	155±49
Sodium mg	218	218	53±44	53±44
Potassium mg			42±31	42±31
Calcium mg			47±33	47±33
Magnesium mg			44±0.30	44±0.30
Phosphorus mg			43±40	43±40
Iron mg			64±62	64±62
Zinc mg			34±30	34±30

4.2.2.6.Low carbohydrates diet:

The diet offered met 89% of the energy, 200% of the protein, 52% of the fat and 102% of the CHO according to Passmore and Eastwood (Table21). However, its fulfillment was lower for energy, protein and especially CHO but was higher for fat (80%) as regards BLS.

Low energy and high protein intakes were recorded for both references. Fat and CHO intakes were adequate according to Passmore and Eastwood but low as regards BLS.

Apart for thiamin, vitamins intakes was very high for vitamin A, high for vitamin C, met the recommendation for riboflavin and adequate for the rest.

Intake of minerals was adequate except for potassium and magnesium.

Table 21:Low carbohydrates diet offered and intake (%)

Nutrients	Offered%		Intake%	
	PassEast	RDAs	PassEast	RDAs
energy kcals	89	72	62±25	60±27
protein g	200	188	137±55	132±56
fat g	130	80	85±36	56±25
carbohydr. g	102	55	75±31	53±25
dietary fiber g		68	60±34	60±34
PUFA g			46±21	46±21
Vit. A ug			387±393	387±393
Vit. B1 mg			57±22	57±22
Vit. B2 mg			104±54	104±54
Vit. B6 mg			72±27	72±27
folic acid eq ug.			74±37	74±37
Vit. C mg			147±65	147±65
sodium mg	245	245	107±54	107±54
potassium mg			60±23	60±23
calcium mg			77±28	77±28
magnesium mg			66±26	66±26
phosphorus mg			83±39	83±39
iron mg			97±51	97±51
zinc mg			69±28	69±28

4.2.2.7.High protein diet:

The diet offered provided more macronutrients than suggested by both references (Table22). Passmore and Eastwood recommended more protein than the BLS as this is specifically a high protein diet.

However, the intake according to Passmore and Eastwood was very low for all macronutrients including protein (41%). Results were similar for the BLS except for protein (102%).

Vitamins intake was high for vitamin A (270%), met the requirements for vitamin C (104%) and was adequate for riboflavin. Low intake was recorded for the remaining vitamins.

Minerals intake was much lower than both recommendations except for sodium which met 103±22% of that of Passmore and Eastwood but only 70% of the BLS as lower amounts were suggested by the former.

Table 22:High protein diet offered and intake (%)

Nutrient	Offered%		Intake%	
	PassEast	RDAs	PassEast	BLS
energy kcals	127	138	38±12	54±24
protein g	135	296	41±20	102±49
Fat g	134	124	47±14	47±14
carbohydr.g	128	128	52±27	52±27
dietary fiber g		93	36±18	36±18
PUFA g			37±16	37±16
Vit. A ug			270±44	270±44
Vit. B1 mg			43±17	43±17
Vit. B2 mg			74±59	74±59
Vit. B6 mg			55±24	55±24
folic acid eq.Ug			49±40	49±40
Vit. C mg			109±36	109±36
Sodium mg	498	286	103±44	70±30
Potassium mg			43±14	43±14
Calcium mg			55±20	55±20
Magnesium mg			53±17	53±17
Phosphorus mg			60±29	60±29
Iron mg			62±35	62±35
Zinc mg			48±24	48±24

4.3. INDEPTH ANALYSIS OF MACRONUTRIENTS INTAKE:

The different diets served were not totally consumed by the inpatients resulting mostly in lower intakes of macro- and micronutrients (section 4.2.2).

In this section, intakes of the macronutrients will be compared according to the type of diet and only statistical differences using t-test will be commented upon.

Passmore and Eastwood (1986) was used as the reference for all diets except the low protein/salt/CHO diet where ADA (1994 a) was used.

4.3.1.Energy:

The highest energy was offered by the normal diet (135%) followed by the high protein diet (127%). In the rest of the diets it ranged between 85-93% (Fig 20).

The highest intake of energy was from the low protein/salt/CHO diet (95%) and the lowest was from the high CHO diet (24%).

The normal diet's energy intake was higher than that from the high CHO diet ($P<0.05$) and the high protein diet ($P<0.005$) but lower than the low protein/salt/CHO diet by a highly significant margin ($P<0.0005$) – Table 23.

Energy intake from the low CHO diet was higher than that from the high CHO and high protein diets ($P<0.05$) but was lower by a highly significant margin ($P<0.0005$) compared to the low protein/salt/CHO diet.

The intake of energy from the high protein diet was less than the low protein/salt and much less than the low protein/salt/CHO diets ($P<0.05$ and $P<0.0005$ respectively).

The low protein/salt/CHO diet intake supplied more energy compared to the low protein/salt and the low fat diets ($P<0.0005$).

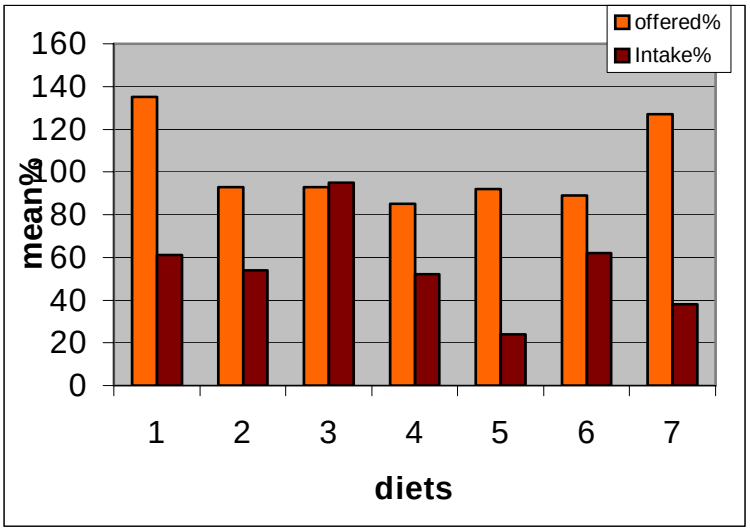


Fig.20: Energy offered and intak in differet types of diets

Key:

1	Normal diet
2	Low Fat diet
3	Low Protein /Salt/ CHO diet
4	Low Protein /Salt diet
5	High CHO diet
6	Low CHO diet
7	High Protein diet

Table 23:Energy intake (%) from the different diets

Diet	Mean ±SD	Normal	< CHO	> CHO	> protein	< prot/salt	< fat	<prot/salt/CHO
Normal	61±36		NS	*	**	NS	NS	***
Low CHO	62±25			*	*	NS	NS	***
High CHO	24±22				NS	NS	NS	NS
High protein	38±12					*	NS	***
Low prot/salt	52±23						NS	***
Low fat	54±39							***
< pr/salt/CHO	95±53							

t-test P values: * = <0.05 ** = <0.005 *** = <0.0005

4.3.2.Protein:

Protein offered nearly met the requirements for the low fat and high CHO diets (102% and 108% respectively). The low protein/salt diet contained the highest amount of protein (226%) The highest mean intake of protein (214%) was

from the low protein/salt/CHO diet and the lowest (26%) from the high CHO diet– (Fig. 21)

The normal diet intake provided more protein than the low fat diet ($P<0.005$) but lower amounts than the low protein/salt and high protein diets ($P<0.005$) and the low protein/salt/CHO diet ($P<0.0005$) – the last being the most highly significant difference.

Concerning low CHO diet, there was less protein intake than the low protein/salt/CHO diet ($P<0.0005$). However, it supplied more protein than high protein diet ($P<0.005$) and high CHO, low fat and low protein/salt/CHO diets ($P<0.0005$) – all were highly significant differences.

Protein intake of high CHO diet was significantly less when compared with the low protein/salt diet ($P<0.005$), while protein intake from the high protein diet was significantly less than that from the low protein/salt and the low protein/salt/CHO diets ($P<0.0005$ and $P<0.005$ respectively).

The low protein/salt diet taken by the patients supplied more protein than the low fat diet ($P<0.05$) but less when compared with the low protein/salt/CHO diet ($P<0.0005$).

However, the low fat diet showed a significant lower protein intake only when compared with the low protein/salt/CHO diet ($P<0.005$).(Table24)

Fig. 21: Protein offered and intake in different types of diets.

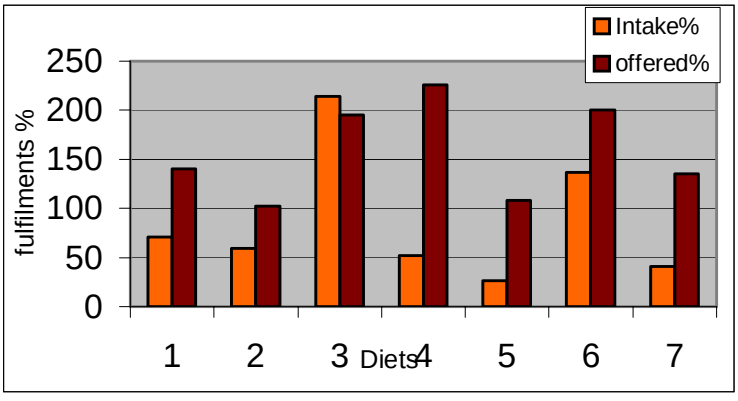


Table 24:Protein intake (%) from the different diets

Diet	Mean ±SD	Normal	< CHO	> CHO	> protein	< prot/salt	< fat	<prot/salt /CHO
Normal	71±43		NS	NS	**	**	**	***
Low CHO	137±55			***	**	NS	***	***
High CHO	26±25				NS	**	NS	NS
High protein	41±20					***	NS	**
Low prot/salt	100±52						*	***
Low fat	59±46							**
< prot/salt/CHO	214±112							

4.3.3.Fat:

The offered low fat diet contained higher amount of fat than the recommendations (217%) but amount offered was lower for the high CHO and low CHO diets (88% and 52% respectively) –

The highest fat intake was from the low fat diet (130%) and the lowest from high CHO diet (20%) followed by the low protein/salt diet (32%) (Fig.22).

Fat intake from the normal diet was more than that from the low protein/salt diet ($P<0.005$) but less when compared to that from the low fat diet ($P<0.0005$) and the low CHO diet ($P<0.0005$) – a more pronounced significance in the last diet.

The low CHO diet intake provided more fat than that from either high CHO or high protein diets ($P<0.0005$). Similarly, the low fat diet intake supplied more fat than the high CHO, high protein, low protein/salt or low protein/salt/CHO diets ($P<0.005$).(Table 25)

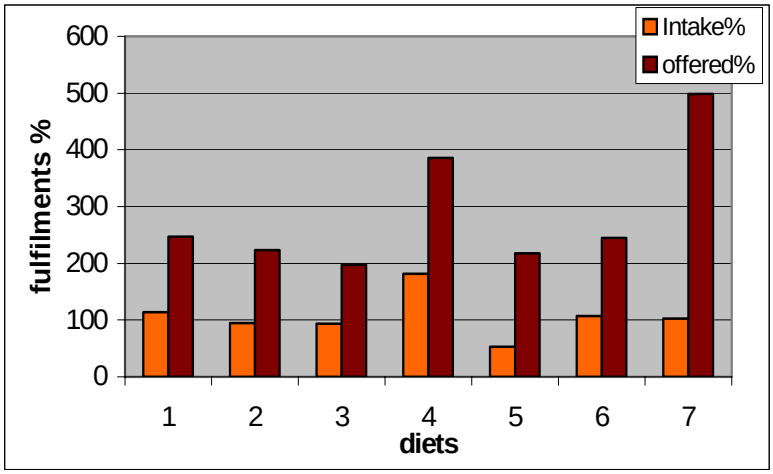


Fig. 22:Fat offered and intake indifferent types of diets .

Table 25:Fat intake (%) from the different diets

Diet	Mean ±SD	Nor-mal	< CHO	> CHO	>protein	<prot /salt	<fat	<prot/salt /CHO
Normal	53±31		***	NS	NS	**	**	NS
Low CHO	85±36			***	***	NS	NS	NS
High CHO	20±22				NS	NS	**	NS
High protein	47±14					NS	**	NS
Low prot/salt	32±18						**	NS
Low fat	130±101							**
< prot/salt/CHO	64±38							

4.3.4.Carbohydrates:

The low CHO diet offered 102% of the CHO recommendation while both the low fat and low protein/salt/CHO diets offered lower amounts (89% and 95.5% respectively) –

Intake of carbohydrates (Table 26) from the normal diet was lower than that from the low CHO diet by a highly significant margin ($P<0.0005$) but was more than that from the low fat diet ($P<0.05$) Fig 23.

The intake was more from the low CHO than the high CHO and low fat diets (P<0.05) and very significantly higher than that from the high protein and low protein/salt diets (P<0.0005).

Intake was less from the low fat diet compared to that from the high protein, low protein/salt and low protein/salt/CHO diets (P<0.05). Table 26.

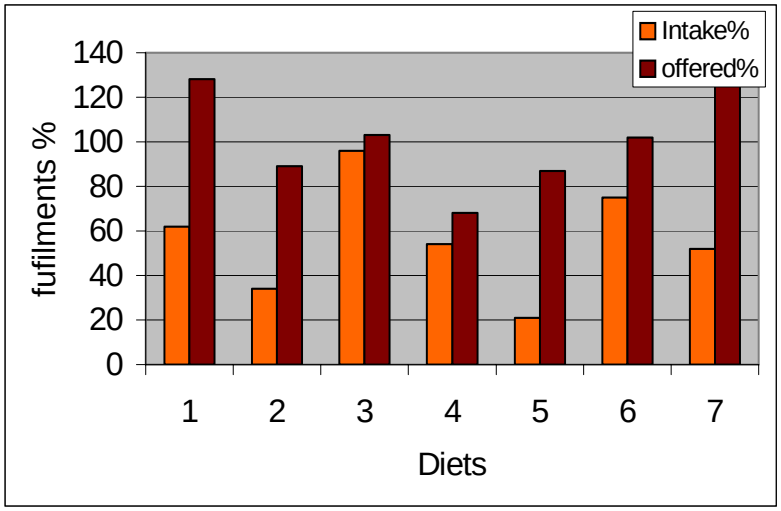


Fig. 23:CHO offered and intake indifferent types of diets

Table 26:Carbohydrates intake (%) from the different diets

Diet	Mean± SD	Normal	< CHO	> CHO	> protein	<prot /salt	< fat	<prot/salt /CHO
Normal	62±34		***	NS	NS	NS	*	NS
Low CHO	75±31			*	***	***	*	NS
High CHO	21±26				NS	NS	NS	NS
High protein	52±27					NS	*	NS
Low prot/salt	54±27						*	NS
Low fat	34±15							*
< prot/salt/CHO	102±62							

4.3.5 Sodium

Salt was offered in very high percentages in the different types of diet when compared to the recommendations whereas the intake from low protein/salt diet was almost higher than the requirement(182±167%) .Other diets, except High

CHO diet, were adequate. High CHO was slightly above 50% of its recommendation. .(Fig.24)

Intake for normal diet showed highly significanat difference (P<0.0005) compared to the intake from high protein and low protein/salt diets, the same result was observed for low CHO and high CHO diets .(Table 27)

Intake of sodium from the high protein diet was similar to that of the low CHO diet , much lower than from the low protein/salt diet, higher than both low fat and low protein /salt /CHO diets, and much higher compared to high CHO diet .

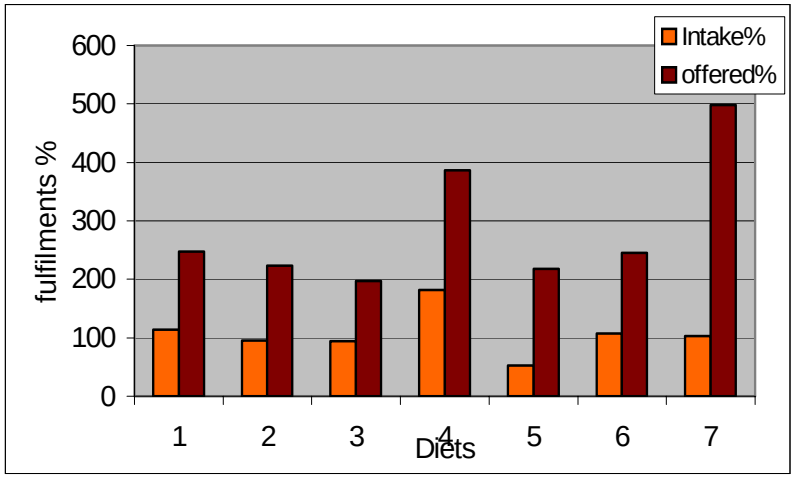


Fig 24:Sodium offered and intake in different types of diets .

Table 27 Sodium intake (%) from different types of diets.

Diets	Means ±SD	< CHO	> CHO	> Protein	< (protein +salt)	< fat	< (protein+salt+CHO)
Normal	114±79	N.S	N.S	* * *	* * *	N.S	N.S
Low CHO	107±54		N.S	* * *	* * *	N.S	N.S
High CHO	53±44			* * *	* * *	N.S	N.S
High protein	103±44				*	* * *	* * *
Low (protein +salt)	182±167					* * *	*
Low fat	95±87						N.S

< prot/salt/CHO	94±52						

4.3.6 Percentages of Waste in energy and macro-nutriets.

As a result of food offered and food intake in different types of diets it is necessary to calculate the waste for energy and macro-nutrients according to Passmore and Escott recommendation . Waste was observed in all diets except low protein /salt /CHO diet.

4.3.6.1 Energy :

A high waste of energy was calculated fo high protein diet (89%) and the normal diet (74%), followed by high CHO diet (58%), other diets were not high .

4.3.6.2 Protein

Low protein /salt diet presented the highest waste (126%) followed by high protein diet (94%), high CHO diet, normal and low CHO diets had nearly similar percentage of waste (82%, 69% and 63% respectively). Low fat diet had the least waste (43%).

4.3.6.3 Fat

The waste in fat ranged (24–87 %), Low protein /salt diet showed the lowest waste, and the low fat diet the highest.Similar waste was recorded for the normal and high CHO diets.

4.3.6.4 Carbohydrate

The high waste in carbohydrate(76%) was recorded for high protein diet (76%), followed by the same wastage (66%) for the normal and high CHO diets. The least wastage was recorded for low protein/salt diet (14%).(Table 28)

Table 28: Percentages of waste in energy and macro-nutrients

Diets						
Nutrients	**Normal**	**< Fat**	**<pro./salt**	**>CHO**	**<CHO**	**>protein**
Energy	74	39	33	58	27	89
Protein	69	43	126	82	63	94
Fat	64	87	24	68	45	77
CHO	66	55	14	66	27	76

4. 4. IMPLEMENTATION OF HOSPITAL DIETS:

4.4.1.Dietitians:

In this study 30 dietitians working in 6 teaching hospitals were included, of whom 29 were qualified professionals and a third of these had post-graduate qualifications (MSc). Table. 29.

A large proportion of the dietitians (57%) had more than 4 years experience with 17% with more than nine years. However, all the dietitians interviewed did not attend any inservice training courses.

To assess the extent to which dietitians are involved in the hospital activities, they were asked about attendance of doctors' rounds and 70% gave a positive answer. However, 50% were consulted by doctors in emergency cases and few (7%) were approached by the ward sisters. Only about one quarter of the dietitians interviewed were involved in on-call duties.

Most of the patients were not followed up by the dietitians after discharge from the hospital (60%).

4.4.2. Level of cooperation in planning of therapeutic diets:

therapeutic diets were planning mostly (80%) in cooperation between dietitians and physicians, and rarely (20%) recommended and planned by physicians. However, a higher proportion (57%) of the dietitians consult the physicians when planning therapeutic diets.

Furthermore, 90% of the dietitians supervised these diets but only 30% used a card system.

The dietitians answered that 97% of the patients received the prescribed diets but only 57% of the dietitians considered these diets as satisfactory.

The hospital meals served were mentioned in section 4.1.5. according to the hospital 7 days protocol (appendex 5). No selective menu(s) was served to the patients but sometimes hospital extras e.g. fruits, drinks, beverages or any soft diet, were served on request of the patients.

Time of meals served was approximately as follows: Morning tea (7.30-8.00); breakfast (9.00-10.00); lunch (13.30-14.30) and supper (18.30-19.30).

4.4.3.Diets distribution:

Two systems of distribution were adopted in the different hospitals. A centralized system (57%) where the rations are fixed in the kitchen and distributed to the patients by trolleys. A ward system (43%) the food was brought in bulk by trolleys to the ward, then rations for patients allotted.

Diets were served to the patients in a compartment stainless steel trays mostly by waiters (70%) in addition to nutrition guides (30%).

4.4.4.Physicians:

Thirty physicians were interviewed working in 6 teaching hospitals. (Table. 29). It is evident that most (83%) were not satisfied with the therapeutic diets served. This is strange as 47% recommended the intake of therapeutic diets for all or most diseases and 37% for certain diseases.

Asked about their cooperation with the dietitians in regard to therapeutic diets, the negative answer was very high – 80% do not consult the dietitians, do

not share in the planning (60%), in the implementation (70%) and 90% in the follow-up.

Most of the physicians do not give much consideration to the drug-nutrient interactions as neither the dietitian (70%) nor the pharmacist (73%) were consulted on this issue.

Table 29.Qualifications of the dietitians

Qualifications	Number	Percentage
Diploma	1	3%
Bsc	19	63%
Post graduate	10	33%
Total	30	100%

Table 30 .Experience of the dietitians

years	Number	Percentage
1-3	13	43%
4-6	4	13%
7-9	8	27%
>9	5	17%
Total	30	100%

Table 31 .Planning of therapeutic diet

By	Number	Percentage
Physician	6	20%
Dietitian	24	80%
Total	30	100%

Table32.Consultation of the physician in planning the therapeutic diet

Answers	Number	Percentage
Yes	17	57%
No	13	43%
Total	30	100%

Table 33 Patients receiving of the prescribed diet

Answers	Number	Percentage
Yes	29	97%
No	1	3%
Total	30	100%

Table 34, Supervision of the therapeutic diet

Answers	Number	Percentage
Dietitian	27	90%
Nutrition quid	3	10%
Total	30	100%

Table 35.Usage of dietetic unit-card

Answers	Number	Percentage
Yes	9	30%
No	21	70%
Total	30	100%

Table36 Systems of diets distribution in the hospital

System	Number	Percentage
Central	17	57%
Ward	13	43%
Total	30	100%

Table 37 Delivery of the diets to the patients

By	Number	Percentage
Nutrition quides	9	30%
Waiters	21	70%
Total	30	100%

Table38.Usage of selective menue

Answers	Number	Percentage
Yes	0	0
No	30	100%
Total	30	100%

Table39.Follow up for the patients after distarge

Answer	Number	Percentage
Yes	12	40%
No	18	60%
Total	30	100%

Table40ffering of trainning coures to dietitians

Answer	Number	Percentage
Yes	0	0
No	30	100%
Total	30	100%

Table41 Dietitians consultation in emergencies

Consultancy	Number	Percentage
Ward sister	2	7%
Physician	15	50%
Others	13	43%
Total	30	100%

Tabl142 Satisfaction with the therapeutic diets

Answer	Number	Percentage
Yes	17	57%
No	13	43%
Total	30	100%

Table 43 Attedant of doctors round

Answer	Number	Percentage
Yes	21	70%
No	9	30%
Total	30	100%

Table 44. Existance of dietitian on call

Answer	Number	Percentage
Yes	8	27%
No	22	73%

Total	30	100%

Table 45. Recommendations of physicians regarding intake of therapeutic diet.

Recommendation	Number	Percentage
certain	11	37
all disease	8	27
some	5	17
most	6	20
Total	30	100

Table 46. Satisfaction of physicians regarding therapeutic diet.

Satisfaction	Number	Percentage
Yes	5	17
No	25	83
Total	30	100

Table 47. Level of cooperation between physician and dietitian regarding therapeutic diet.

Level Of Cooperation	Number	Percentage
consultancy	6	20
planning	12	40
implementation	9	30
follow up	3	10
Total	30	100

Table 48. Consideration of drug- nutrients interaction.

Consideration	Number	Percentage
Yes	9	30
No	21	70
Total	30	100

Table 49. Consultation of pharmacy personnel regarding drug- nutrient interaction.

Consultancy	Number	Percentage
Yes	8	27
No	22	73
Total	30	100

4.4.5.Dietetic department:

Observation method was used.

-The space was about 90m2 .

-Aluminum cooking utensils.

-No hot water available.

-Poor lighting and ventilation .

-water drainage seen.

-Garbage containers open.

-Windows protected by mesh nets but doors left open

-Poor personal hygiene e.g. no aprons or unclean ones, no hair nets.

-No regular physical examination.

Chapter Five
DISCUSSION

5.1.PATEINTS' SOCIAL STATUS:

5.1.1.Sample size, age and gender:

One hundred patients were considered in this study. Sex distribution was 51% males and 49% females (Fig.3).. Within the sample the mean age was 47±16 years old (Fig.3), the females were younger than the males (mean ages 44.2±16.6 and 49.3±16.1). However, most of the percentages were in the middle adulthood age group (45-60 years old), an age group considered at risk for many acute and chronic diseases especially when associated with overweight (Williams, 1981; Mathai, 2000).

5.1.2.Place of residence:

Nearly half the sample (47.0%) were urban from Khartoum State, the rest from different regions in Sudan (Fig.2).

The higher proportion related to Khartoum State was probably a result of the hospital being in the state and was not due to the prevalence of the diseases. In addition it was probably unaffordable to the patients from other regions to meet the cost of public transport and that for the treatment at Ibn Sina Teaching Hospital. Thus the distance as well as the cost were limiting the attendance and compliance at this hospital of patients from outside Khartoum State regions.

5.1.3.Education and occupation:

Level of illiteracy among the total sample (26.0%) was not high although within this category the proportion of illiterate females was higher (69.2%). Ibrahim (1999) attributed the higher rate of illiteracy among females as due to cultural factors as male education started earlier than that of females. However, more females had primary / intermediate (57.1%) and secondary (55.0%) education.

Thus the level of education of the sample makes their nutritional counseling easier as education is an important factor affecting food habits (UNICEF, 1989).

26% of the total patients were unemployed in addition to a majority of females (81.6%) who were housewives (Figs 4& 5) hence depended on others for their life and cost of medical treatment.

Most of the patients (unemployed, employee, workers, self-employed) could be categorized as poor.

5.2.NUTRITION AND FEEDING PATTERN:

5.2.1.Introduction:

The majority of the patients (67.0%) were from the gastrointestinal tract wards (Fig.11) where liver diseases were prevalent, the rest of the patients were from the urology wards in which kidney diseases presented the highest rate (30.0%). This showed that nearly two-thirds of the patients suffered from disorders in these two organs that will have far reaching effects on their nutritional status (Korstein and Lieber, 1994).

5.2.2 Nutritional Status of the patients:

Within the sample population the mean BMI was 22$\pm$6 which is normal (WHO 1997), and within the 20- 25 score suggested by Mahan, Escott and Stump (1996) for the least risk of early death .The state of malnutrition was 47% containing under and over nutrition as suggested by, International Congress of Nutrition (ICN 1998; and Isaksson, 1981).

25% of the total malnourished were obese which increases chances of development of health problems (Bray *et al.*, 1976).

75% of the total malnourished were under-weight which is prevalent among hospitalized patients (Santos *et. al.,* 1981). The loss of 10-20% body weight in association with illness causes significant deterioration in functions which can slow recovery from illness or threatens life (Allison 1992, Hill 1992) . Furthermore , their prolonged stay in hospital make them liable to become severely malnourished ,hence can lead to depression and apathy (Brozek, 1990).

Staff must be trained to identify malnutrition in patients and medical and dietary decision taken to improve their health.

5.2.3.Diets served:

The normal hospital diet was served to 38% of the patients and six therapeutic diets were served to 62% . 8% of the total diets were modified into clear liquid, full liquid and soft diets. In Turnland *et al* (1983 II) -Survey in Lebanon, the general hospital diet was served to 79% and therapeutic diets to 21% but in his III-Survey in Bangladesh (1983 III) only two therapeutic diets were served, a diabetic (80.0%) and a low energy (18%) diets. More therapeutic diets were used in this study .

Most of the diets (92.0%) were served in the solid state as no consideration was given to the ease of the patient's eating regarding age or illness. This was reflected in poor food intake (Tables 16, 17, 19, 20, 21, 22).

Most of the patients (89.0%) received 3 meals/day, a similar finding was reported by Ibrahim (1999), Abasher (1998) and Bashir (1997). This shows that a long time elapses between meals' distribution, bearing in mind that patients were not allowed to have additional home food. Meal distribution in the hospital needs to be adjusted to patients' health and needs. Isaksson (1981) recommended three meals and 2 –3 snacks/day to overcome the problem of poor appetite and to reduce the night fast of ill patients and to normalize bowel habits which could be considered in normal state for patients in this study (Fig.15) according to the definition of constipation where more than 3 days go by without the passing of stool (Mahan, Escott and Stump, 1996). Therefore, the introduction of snacks should be considered in addition to the three meals.

5.2.4.Appetite:

Appetite improved in 4% (Tables 11&12)of the patients after hospitalization probably due to improvement in health condition since appetite decreases during illness and increases during recovery (Passmore and Eastwood, 1986).

Nearly one-quarter of the patients disliked the hospital food (Fig.17) which is not surprising because even when the quantity and presentation of food was optimum some patients were reluctant to eat enough to satisfy their needs. Another probable cause for disliking the hospital diet was that more than half of the patients (53%) were from outside Khartoum State i.e. from other regions, hence their food habits need to be considered when planning the diet. An example was a 51 years old patient who requested the kitchen staff to cook traditional foods (acida, mullah, nasha*), when they complied her appetite improved resulting in a better food intake.

Passmore and Eastwood (1986) demonstrated that wavering appetite may respond best to small servings at first, amount gradually increased between meals.

Therefore, hospital dietitians should do more to stimulate patients' appetite by paying special attention to food habits especially for rural patients and adjust meal distribution to patient's health and needs.

5.3.ADEQUACY OF FOOD OFFERED:

Seven diets were studied. Patients on the high CHO diet (4%) received an adequate diet and nearly half of the patients (47%) on the normal and high protein diets received more than the recommended amounts of nutrients (Tables 16& 22). Other diets (low fat, low CHO, low protein/salt and low protein/salt/CHO diets) contained nutrients in excess or lesser amounts than the recommended levels. This inconsistency was due to improper formulations of the diets in addition to not weighing the food items prior to serving.

The normal hospital diet result (Table 16, Appendix 4) was similar to the recent study by Barton *et al* (2000) but is in disagreement with other studies (Mureil *et al*, 1998; Begum *et al*, 1994; Couws *et al*, 1989) as the normal diet did not meet their recommendations.

* mainly from cereals-

It was found that the food offered in the hospital did not meet any given recommendations either for healthy or sick individuals as no standard recommendation or even food group servings were followed in planning the daily menus.

No food group servings were followed, hence inadequate food group servings were observed in the hospital protocol as in one meal two groups servings (meat and legumes) were commonly served in the same meal (Appendix 5) resulting in higher amounts of protein offered (Tables 16 - 22). Green vegetables were totally ignored.

The diet was planned according to the recommended daily allowances, and poor planning was observed in all diets except for the high CHO diet (Table 20).

The diabetic diet (low CHO) was incorrectly formulated as no attempt was made to calculate the contribution of carbohydrates to the total energy needed according to the type of insulin. Diabetic diet for the hospital meant no addition of sugar or sweaty foods to the regular diet but fat was offered in amounts higher than Passmore and Eastwood recommendation.

In the low fat diet, patients were offered a boiled mixture of chicken, meat and vegetables in the form of soup or stew. Chicken was cooked without removal of the skin and whole milk was also offered to the patients. This resulted in a high fat rather than a low fat diet (Table 17).

Both the low protein/salt and low protein/salt/CHO diets provided high protein (Tables 19 &18) as in both cases only the protein in the meats served during meal was counted and the protein in bread, legumes and milk was ignored. Even the meaty items were not weighed but the weight was visually estimated as containing 40g. protein. This is erroneous as the low protein diet should provide 40g of protein for the whole day (Mahan, Escott and Stump, 1996; Passmore and Eastwood, 1986; Williams, 1981). The protein content of foods offered should be calculated for the whole day and use should be made of legumes as cheap meat substitutes.

No table salt was added to the above two low salt diets and no consideration was given to the salt content of the foods offered. Examples are bread in which table salt is usually added during the fermentation process and some vegetables with known high content of sodium i.e. tomatoes.

It seemed that the hospital gave too much consideration to serve hotel quality diets thus following the common trend in Sudanese dietary habits in the presentation of abundant meat products in addition to legumes and bread.

It can be concluded that the dietitians need more training in nutrition and dietetics to improve their skills in planning and formulating the hospital diets. Calculation of the nutrients' contribution and weighing of food items before serving is a necessity.

5.4. EVALUATION OF THERAPEUTIC DIETS:

5.4.1.Normal diet:

The diet was taken by 38% of the patients who were mainly from Khartoum State. Their BMI was normal (19.7±5.5) but the range (14.2 – 25.3) meant that some of the patients were suffering from different degrees of under-nutrition severity (Table5). The poorly nourished patients of course need special attention even in the short term.

This diet was supplied wrongly to patients suffering from stomach cancer, renal stones, esophagitis and portal hypertension (Table 6). Stomach cancer patients should be offered a high energy diet adequate in iron and vitamin C, soft in texture and served at intervals (Mahan and Escot, 1996; Shils, *et al* 1994; Williams, 1981). Those who were treated with chemotherapy and radiotherapy suffered loss of taste and food intolerance, thus reduction in their food intake (Shils, *et al* 1994; Williams, 1981). For renal stones patients, a diet restricted in the specific mineral(s) of the stone should be provided (Mahan, Escott and Stump, 1996; Williams, 1981). One patient who suffered from esophagitis was offered the normal diet without any modification to which he could not respond. He should have been served a liquid diet which is less abrasive to the esophagus (Mahan, Escott and Stump, 1996). Six patients with portal hypertension were

served the normal diet instead of a restricted salt diet especially if the hypertension was associated with ascitus (Hasse and Matarese, 2000).

The normal diet was not modified in consistency so many patients were too ill to respond to the solid food, therefore, palatable palliative diets can improve their food intake.

The total energy intake was lower than both recommendations (Table 16) which was similar to intakes reported in comparable studies on hospitalized patients on standard diet (Barton *et al*, 2000; Inclazy *et al*, 1996; Begum *et al*, 1994; Evans, 1978). The result was also in agreement with Evans and Stock (1971) who found that pyrexia reduces intake by half of the recommendation.

Vitamin A intake was high due to high intakes of animal products and vitamin C intake was also high due to approximately daily 4 servings of fruits and vegetables. Vitamin C is non-toxic at high levels (Ausman and Mayer, 1999).

The BLS (1999) recommendation for sodium is 2000mg/day, so the intake of sodium can be considered normal (Kotchen, and Kotchen 1991). The low zinc intake (61±35) is of concern since a deficiency can result in poor appetite, an impairment for wound healing and admonished sense of taste and smell (Course *et al*, 1989).

The majority of patients on the normal diet had a poor appetite (Table 12) which affected their food intake. The fact that 74% liked the diet (Table 13) could be a consequence of residency as they were mainly from Khartoum State and their food habits were similar to the food offered in the hospital.

The normal diet patients were at risk to develop undernutrition during long stay hospitalization due to low food intake. Liquid diets are more easily tolerated by anorectic patients as reported by Anderson *et al* (1987) that a 50% increase in energy intake was achieved by inclusion of liquid formula drinks in the general hospital diet for anorexic patients. This was supported by Evans (1978).

To increase the intake of the normal diet it is suggested that diet modification should be made whenever necessary and snacks served between meals.

5.4.2.Low fat diet:

The patients were mainly females diagnosed as having gall bladder stones resulting in jaundice, a disease at risk for females due to gender, pregnancy, age and obesity (Diehl, 1991).

The patients were in normal nutritional state as indicated by their BMI values (Table 5) which was probably attributed to the fact that food consumed by the subjects before hospitalization was optimum.

Macro-nutrients intake of the patients was slightly above half the requirements for energy and protein and one-third for carbohydrates as the patients experienced poor appetite, nausea, anorexia and diarrhea (Table 15).

However, the diet offered high amounts of fat (217% of recommendation) which was reflected in the high fat intake (130% of the recommendation). This could stimulate gall bladder painful contraction (Hasse and Matarese, 2000) resulting in limited oral intake either spontaneously by the patients or as a result of therapeutic treatment (Mahan, Escott and Stump, 1996). The diet offered 48.8g fat/day which is much higher than the suggestion of 25 – 30g fat/day recommended by many authors.

The low food intake resulted in low intakes of most of the vitamins and minerals except for intakes of vitamins A and C and adequate intakes of riboflavin and sodium. (Mahan and Escot, 1996; Shils, *et al* 1994; Williams, 1981).

The diet needs reformulation to reduce the fat content to the recommended level.

5.4.3.Low protein/salt/CHO diet:

The diet was served specifically to nephropathy patients, a complication that develops from diabetes mellitus. The ADA (1994) recommended a diet that can reduce the amount of proteinuria and slow the progression of nephropathy. More males were fed the diet, which correlates with the finding in this study on the low CHO diet. (Table 1)

The BMI of this group was normal (Table 5).

The offered diet was less than the mean consumption (Table 18) so the patients sought hospital extras (fruits, juices, yoghurt) and food left from their neighbours (weighed by the author) in the ward to meet their energy requirements. Therefore, adequate provision of food and supervision of the patients during meal taking is important especially when the majority of these patients (80%) had low educational level (Table3).

Carbohydrates and sodium intake were adequate according to the ADA (1994). Fat consumption although 64% of the recommendation could also be considered adequate as Shils (1994) recommended fat restriction.

Protein intake was 214% of the recommendation. High unlimited protein intake could lead to renal damage in patients with diabetic nephropathy (Anderson and Geil, 1994). Protein offered was 78.0g/day which should be reformulated to meet the 40g/day (0.6g/kg/day), an amount that decreases the progression of chronic renal failure (Marian, 1996; Anderson and Geil, 1994).

The diet offered contained 3932mgNa/day which is much higher than the 2000mg/day suggested by Shils (1994) for healthy individuals or the 920mg (40mmol) Na/day suggest by Passmore and Eastwood (1986) for a low salt diet.

The diet was served in the solid state to the patients except one who consumed full liquid diet twice/day due to her complaints from nausea and vomiting. These patients enjoyed their hospital meal due to their good and satisfactory appetite (Table.12) thus meeting 95% of the recommended total energy.

However, this is a high protein high salt diet which needs reformulation to meet the recommendations for protein and salt.

5.4.4.Low protein/salt diet:

The diet was served to patients diagnosed with chronic renal failure (83%) and those with liver cirrhosis (17%) – (Table 6). The later diseases could lead to nutritional and metabolic disorders that may affect other organs leading to protein energy malnutrition (Korstein and Liber, 1994; Kopple, 1994).

The patients had a normal BMI (23.4±5.3) a finding that disagrees with other authors who reported that patients suffering from these diseases were malnourished (Kopple, 1994; Korstein and Liber, 1994; McClough and Tavill, 1991; Dicecco *et al*, 1989).

Energy intake was half the recommendation which was also reported by Kopple (1994) and Bashir (1996). Carbohyrates intake was also low (54%) due to low amounts offered, the criteria applies also to fat.

The protein intake looked adequate (100% of the recommendation). However, the protein offered was 226% of the recommendation (90.3g protein/day) so if all the diet was consumed, as would be expected, it becomes a high protein diet and not a low protein one since adequate protein intake was due to low food intake as shown by 52% energy intake. It is clear that the protein formulation was wrongly done as before (section 5.5.2) since a low protein diet should provide 40g protein/day which should be followed.

Patients also experienced low intake of water-soluble vitamins so supplements are suggested if low food intake is the normal.

Again as in section 5.5.2. the diet offered provided 3554 mgNa/day which is in excess of any recommendation for a low salt diet.

Phosphorous and potassium were lower (ca.50%) than the daily recommendations for a healthy individual but tended to be in agreement with Kopple's (1994) suggestion that they should be restricted otherwise potassium retention in renal failure may occur leading to fetal hyperkalemia in pregnant women. Intake of magnesium, zinc and calcium (Table 17) was low which is a common feature in these patients (Mahan, Escott and Stump, 1996).

Low energy intake suggests low food intake hence optimum nutritional intake is difficult to be achieved by these patients due to anorexia and nausea (Mahan, Escott and Stump, 1996; Korstein and Liber, 1994). In spite of the diet being not palatable, two-third of the patients said they liked it probably they had food counseling.

In conclusion the diet needs reformulation to meet the recommendations for protein and salt. In addition smaller frequent meals that are well tolerated are suggested to increase their food intake.

5.4.5.High CHO diet:

The small group of patients who consumed this diet were critically ill due to serious diseases (Table. 6) e.g. partial gastrectomy, obstruction in the esophagus, chronic hepatitis and carcinoma of the stomach. Although the patients were classified as mild thin, some patients suffered moderate and severe thinness which could result in leanness with reduction in body subcutaneous tissues and in severe weight loss probably affecting both cardiovascular and gastrointestinal functions (Shils, *et al* 1996). The patients became apathetic and depressed (Brozek, 1990) and might be described as difficult hospital stay which is prolonged by undernutrition (Robinson *et al*, 1987).

The low energy intake (Table. 20) was not surprising since these patients were malnourished suffering from nausea and anorexia in addition to medications whether for the cancer or the other diseases all leading to poor food intake. These patients were also prone to develop severe anaemia due to dietary deficiency of iron and folic acid.

Since the patients faced nutritional problems and eating difficulties, full liquid diet was more suitable and tolerable (Mahan, Escott and Stump, 1996; Shils, *et al* 1994; Passmore and Eastwood, 1986; Williams, 1981). Full liquid diet may be clinically useful by slowing the rate of glucose absorption and additional dietary fiber will be beneficial (Mahan, Escott and Stump, 1996). On the other hand, Allison (1996) showed that such an approach can be counter productive as fluid overload accelerates oxygen consumption and carbon dioxide production resulting in respiratory failure or fatty liver and an increase in fat synthesis without improvement in lean mass.

During convalescence when the patient is physically active and anabolism of lean mass is possible, higher intake may sometimes be beneficial in gradually rebuilding lost tissue mass.

Nutrition support has shown benefit in under nourished patients, so the staff should be trained in the identification of malnutrition and screening those at risk in addition to taking clinical decisions based on appropriate protocol for action.

5.4.6.Low CHO diet:

The diet was provided to 9% of the diabetic patients who suffered from other diseases, as they were not admitted for diabetic treatment (Table.6).

The mean BMI of the patients was normal (23.1±6.4) within the range (20 → 25) suggested by Pisunyer (1994) for non insulin dependent diabetes mellitus (NIDDM) who are advised to maintain their present weight throughout life. Being in this BMI range reduces hyperglycemia, insulin resistance dyslipidemia and hypertension (Mahan, Escott and Stump, 1996).

Although these patients' socio-economic status was similar to those studied by Ibrahim (1997) yet in this study the patients had normal nutritional status while those studied by Ibrahim were mostly malnourished. Furthermore, the daily energy intake recommended by Passmore and Eastwood (1800 kcal/day) and BLS (2197.9 kcal/day) were both lower than the 2328.9 kcal/day reported by Ibrahim for his subjects.

The mean intake of carbohydrates in this study was 134.6g/day (75±31% of recommendation) and that of protein 61.7g/day (137±55) were both lower than the findings of Ibrahim (381.7g and 90.2g respectively) but that of fat 85.1g/day (85±36) was higher in this study than that of Ibrahim (56 g/day).

The intake of dietary fiber (60±34) was lower than the daily requirement of an individual (25-30g/day) but the chemical effect of fiber inhibiting glucose absorption from the small intestine is probably insignificant (ADA, 1995d).

Current guidelines recommend that protein provides 10 – 20% of the total energy, but there is no evidence to increase or decrease the protein with uncomplicated diabetes. Hence, the RDA for a normal individual that recommends the protein to provides 12 – 20% of the total energy is also appropriate for diabetic adults (Mahan, Escott and Stump, 1996; BLS, 1999).

The National Cholesterol Education Program (NCEP. 1993) recommends more than 30% of the total energy from fat with saturated fat restricted to less than 10%, thus more than 55% from carbohydrates.

The later suggestions are derived from the RDAs for healthy individuals as shown in the BLS (Table. 21). As for the source of the carbohydrates, scientific evidence based on at least 12 – 15 studies in which sucrose was substituted for other carbohydrates does not justify sucrose restriction as no adverse effect of sucrose on glycemia was found (Bartle *et al*, 1993). So the first priority is given to the total amount of carbohydrates consumed rather than its source (ADA, 1995d).

The majority (66.6%) liked the hospital diet but those with pacreatitis, cancer or gall bladder complained from nausea, anorexia and/or diarrhea which are common symptoms with the above mentioned disease.

As mentioned earlier no attention was paid to the distribution of meals throughout the day, the number and time of meals were standard for the general hospital diet. Regulation of food intake is an essential successful management of diabetes as persons with IDDM often fare better with smaller meals and snacks, however snacks can not be in addition to the usual meals.

5.4.7.High protein diet:

The patients were in normal nutritional status (mean BMI= 21.5±4.3) suffering from a diversified number of diseases (Table.6)

It was recommended for patients with nephrotic syndrome to increase protein synthesis and prevent malnutrition although current evidence points that a high protein intake may accelerate the progression of renal failure has caused rethinking of dietary protein restriction for nephrotic patients moreover evidence indicates that a low protein or normal intake may decrease urinary protein (Kaysen, 1986).

Two patients were diagnosed with cirrhotic liver of regenerative stage which required an increase in protein intake by 1.2g/kg/day (Kondrup *et al*,1992; Shronts, 1987).

A single patient had nutritional anaemia so heme iron in the meat, fish and poultry (MFP factor) is much better absorbed than the non-heme iron helping in the recovery (Mahan, Escott and Stump, 1996).

Portal hypertension lead to gastrointestinal tract bleeding in one patient hence was put on a high protein diet to avert hemorrhage anaemia. The other two patients were treated with the high protein diet because of surgical medical treatment.

Although the need for protein for all these patients was essential and that the protein offered (142.1g/day) was 135% of the recommendation the protein intake was 41% and the energy intake 38%, the later indicating very low food intake.

The salt provided in the diet was high (5726mg Na/day), however due to their poor food intake their salt intake (70% of recommendation) was adequate to their treatment. It should be noted that Kopple (1994) suggested moderate salt restriction.

The poor food intake will definitely leads to undernutrition in these patients especially if the duration of their stay in the hospital extended for more than two weeks.

Therefore, urgent efforts are needed to overcome their poor dietary intake which might be a result of complications or poor appetite.

5.5.MICRONUTRIENTS' INTAKE:

Micronutrients' intake in all types of diets was less than their recommendation except for vitamins A and C and sodium, which were taken in higher amounts. The deficiencies could be attributed to the patients being under stress due to the diseases that affected their food intake. The inadequacies of these micronutrients could be countered by mobilization of body stores, decreased body losses and increased absorption (Mahan, Escott and Stump, 2000). A deficiency can also arise due to drug-nutrients or drug-drug interaction. Therefore, specific attention should be considered before the signs and symptoms of the deficiency appears.

High percentages of vitamin A intake were noticed in all diets (mean intake 217 $\rightarrow$ 411% of recommendations) except for the low protein/salt/CHO (116%) one due to lower provision of animal foods compared to the rest. Gerald and Combes (2000) reported that persistent large doses of vitamin A over 1000 times the required amount will overcome the capacity of the liver to store the vitamin hence produce intoxication. Therefore it seems that the high intake of this vitamin in this study could not be harmful but could add to the patients' recovery.

Vitamin C intake ranged 114 $\rightarrow$ 155% of the recommendations as a result of more than two servings of green salad/day, other salad dressings, fresh oranges and orange juice. The later served in the

morning and some times during the day is popular among the patients as it is believed to speed up recovery by the Sudanese. Many studies reported no selective advantage for consuming amounts greater than 1000mg/day and Ausman and Mayer (1999) examined the eating habits of a large group of people and concluded that a high intake of the vitamin might reduce the risk of cancer in the digestive system. However, the amounts offered in the studied diets ranged 102.5 → 195.5mg/day, could be considered beneficial.

Sodium offered in the diets ranged 3554 → 5726mg/day which was much higher than the 2000mg/day recommended for healthy individuals by PLS (1999), Shils, *et al.*, (1994). Furthermore, 3554mg/day and 3932mg/day were offered in the two salt restricted diets which is contrary to the 920mgNa/day (40mmol) recommended by Passmore and Eastwood. Intake of sodium is of great concern especially for restricted sodium as excess sodium could lead to edema and hypertension (Mahan, Escott and Stump, 2000; Elseed, 1996; Williams, 1981). Therefore, the dietitians should prepare the sodium restricted diet according to the recommendation of Passmore and Eastwood.

Proteins provided 17 → 23% of the total energy in the different diets when 10 → 15% is recommended for a balanced diet, therefore, the protein foods offered which are rich in sodium content e.g. meat, chicken, eggs, fish etc., should be replaced with those that contain lower amounts e.g. grains and vegetables. The last step will even be cheaper for the food budget.

5.6. FOOD WASTAGE:

From the results of food offered and food intake, wastage was high among the macronutrients. This was 33-89% in energy,43-126% in protein, 24-87% in fat and 14-76% in carbohydrates. The wastage was due to over provision of food and low intake by the patients (Table. 28).

Other authors reported food wastage in hospitals as plate waste. Barton *et al* (2000) reported 40%, Allison (1996) found 60-70% and Abbasher (1998) results showed 39.1%.

It is suggested that more attention should be paid to food preference of patients to reduce waste by ensuring consumption of what is served to them. Menus can be an answer.

5.7.DIETARY SERVICES:

5.7.1.The kitchen:

The flour space available for the kitchen in Ibn Sina Teaching Hospital was 65 m^2 which did not appear to be in conformity with standards recommended by National Nutrition Advisory Committee (NNAC 1970) which was 165 m^2 for a 100-300 bedded hospital (Pasricha *et al*, 1985). This of course affects the efficiency of work in the kitchen e.g. food handling, preparation, cooking, servicing, utensils and dish washing.

The kitchen was poorly equipped, most of the freezers were not working and only cold water was available. Washing was done manually which is time consuming as no dish washer was available. Provision of hot water (82°C) is a must as was recommended to achieve thermal disinfection (Barrie, 1995). Aluminum vessels were used for cooking which could lead to chemical reaction within the food ingredients (Barrie, 1995).

It should be emphasized that there was no special therapeutic kitchen for preparation of therapeutic diets as suggested by Allison (1996). This should be seriously considered by the hospital administration as a top priority objective.

Food and drinks were served in stainless steel and its delivery was generally centralized. Hot and cold meals were placed in compartment trays and delivered in food trolleys to the wards where they were distributed to the site of the patient. The trolleys should maintain meals at the appropriate temperature (Barrie, 1995).

It is suggested that the kitchen needs rehabilitation in equipments including the freezers and introduction of dish washers and hot water. Establishment of a therapeutic kitchen is a must.

5.7.2.Sanitation and hygiene:

Sanitation was far from satisfactory in the kitchen where the following conditions were frequently observed: poor lighting and ventilation, water drainage seen, garbage containers were left open.

The kitchen windows were well protected against pest and flies by mesh net but doors were left open. This needs proper best control and understanding of the importance of general hygiene among the catering staff.

Personal hygiene was generally poor, the cooks and assistants did not wore their aprons continuously and when they did their aprons were not clean. No hair cap was observed on their heads. Therefore, more emphasis on personal hygiene should be considered.

Physical examination of the catering staff was not routine which is in contrary to the General Food Hygiene Regulations (WHO.1989) that stressed regular check up for food handlers in hospitals (every 6 months) to protect food from contamination.

5.7.3.Catering system:

The hospital had six Bsc employed as dietitians with more than five years experience, two of whom had post-graduate qualifications (M Sc.), which was considered adequate by the hospital administration.

The hospital depended on the conventional catering system i.e. cooking on a large scale. The ingredients were brought in, stored, prepared on the same day of use. This central kitchen system should be changed to the ward kitchen system as large scale catering procedures can affect the palatability of food particularly vegetables and often results in the loss of nutrients (Evans, 1978) bearing in mind the Sudanese tendency and habit to over-cook vegetables. Evans and Stock (1971) compared the vitamin C content in diets prepared in the central kitchen with those in the ward kitchen and reported much lower losses in the later. Allison (1998) recommended that cooking in less quantities (for 10-15 patients) will be of benefit.

The catering was carried out by a company awarded a contract to provide meals for the patients, hospital staff and visitors under supervision of the dietitian. The system of contract is believed to result in improved management, value for money, flexibility and greater efficiency in hospitals (Barrie, 1995). However, the author is of the opinion that privatization could lead to poor management of the patients' dietetic needs, a policy that would have a negative impact on the patients nutritional care.

The hospital food was supplied according to the hospital seven days protocol based upon the normal diet and provision of three main meals per day in addition to hospital extras served on request of the patient e.g. fruits, drinks, beverages and/or any soft diet.

Meals were served at 7.30-8.00a.m. (morning tea), 9.00-10.00a.m. (breakfast), 1.30-2.30p.m. (lunch) and 6.30-7.30p.m. (supper). The time-table was not strictly followed but differed from one day to another due to some delay in food preparation. Supper time was early for the patients which is contrary

to the Sudanese habit in taking suppers late in the evenings so the patients usually kept their trays beside their beds which affected the freshness of the food and probably resulted in poor intake. More strict procedures should be followed in the preparation of diets so that the time table for breakfast and lunch should be adhered to, however, it is suggested that supper time should be reviewed.

5.7.4.Dietary Services:

The normal diet was routinely modified into four types of diets (diabetic, low protein/salt, low fat and high protein diets) in addition to other types of diets e.g. high CHO and low protein/salt/CHO diets, served whenever required.

The hospital did not adopt a diet manual, only a sheet containing amounts of some food items was followed. In addition no attempt was made to prepare diet menus or calculate nutrients content of the diets e.g. energy level or carbohydrates consumption according to the type of insulin or even calculate energy requirement according to sex, age and activity. These were reflected in the limited use of food items in hospital diets which were even often incorrectly formulated resulting in high wastage of food. No specific recommendation was followed in meal planning and limited dietary instructions were given by physicians.

No dietary counseling was provided to the patients either during their hospital stay or on discharge. This was provided only on the request of the patient.

From the above it is evident that more efforts should be made by the dietitians to prepare a diet manual using proper formulations, use a variety of foods, prepare menus, calculate nutrients' content to provide requirements *per se*.

5.8.DIETITIANS AND PHYSICIANS:

Most of the dietitians (96%) who worked in Khartoum teaching hospitals were general dietitians according to the International Congress Dietetic Association (ICDA) definition (2000) that a dietitian is an individual who is well trained in the basic education in both clinical nutrition and dietetics food services management.

One-third of the dietitians who took part in this study had post graduate qualifications but in spite of this, dietetics in Sudanese hospitals does not enjoy the rightful position it deserves. Reasons being lack of training operational policies for dietitians and their supporting staff, inadequate physical facilities in managing the kitchen and lack of appreciation on the part of the hospital administration regarding the role

of the dietitian in patient's care. Whoever, in Ibn Sina hospital dietitians qre considered as integral part of the medical team. As a result the position of the dietitian in most hospitals is reduced to the status of kitchen supervision. This is further complicated by the fact that only a minor number of those qualified are being absorbed in hospitals.

On the other hand, dietitians should also be blamed for this bizarre situation as they should participate fully in wards rounds and fight for the need for in service training in nutrition and dietetics in order to improve the quality of diet and food services. In addition limited dietary counseling was given to patients (40%) either during hospitalization or on discharge so nutrition education is important.

Most of the physicians (83.0%) and dietitians (43.0%) were not satisfied with dietetics in hospitals. Similar findings were reported by Turnland *et al* (1983) in the three surveys carried out in developing countries and Pasricha (1985) in Indian hospitals. There is some evidence that the current situation is unsatisfactory as none of the hospitals have a selective menus. Current practice in many hospitals in the developed world is to allow patients to select their choice of dishes from menus distributed usually a day in advance. This should be tried in Sudan at least in the teaching hospitals to test whether or not it will lead to increased food intake.

Physicians were not acquainted with problems that might be related to the diet hence have inadequate understanding and use of dietary treatment which was evident when dietitians (43.0%) were compelled to search the literature during emergencies.

Dietitians were responsible for diet instruction and supervision (80.0%) and limited dietary instructions were given by the physicians (20%) usually by writing up-and-down arrows for the specific nutrients in the medical sheet e.g. carbohydrate or protein diet. However, Rosen *et al* (1991) found that physicians viewed dietitians as contributing members of the health care team but believed that

the physician should be responsible for ordering therapeutic diets and that the dietitian insured patient's satisfaction with food served.

Physicians (70%) did not give consideration to drug nutrient interaction by either consulting the pharmacist on medication or dietitian on nutrition therapy. This should be of particular concern to the physician as adverse or positive effects on nutrients absorption are of special importance to the dietitian e.g. when tetracycline is taken within 2 hours of calcium containing food or supplement, an error in the timing of food intake with drug intake can cause physiochemical interaction (Hanstein, 1985).

Nursing care is also important as good care in the feeding of long stay patients resulted in higher food intake compared with the more active patients awaiting discharge (Evans and Stock, 1971).

In conclusion, the establishment of nutrition support team (NST) suggested by Mahan, Escott and Stump (1996) to cater for nutritional care of the patient can lead to better results. This was developed in many hospitals consisting of physicians, dietitians, nurses and pharmacists who benefit from each other expertise to make interdisciplinary decisions regarding nutritional and medical concerns.

Chapter Six

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

The following conclusions were reached:

1- During this study the hospital served the normal hospital diet to 38.0% of the patients and six therapeutic diets to 62.0%. The therapeutic diets were the low protein/salt (23.0%), low fat (12.0%), low CHO (9.0%), high protein (9.0%), low protein/salt/CHO (5.0%) and high CHO (4.0%) diets.

2- Mean BMI of the total number of patients indicated a normal nutritional status. Further categorization showed that 36.0% were normal, 35.0% underweight, 17.0% overweight and 12.0% obese.

3- The diets were served three times per day mostly in the solid form and only 8% were modified diets.

4- All diets supplied incorrect amounts of nutrients except the high CHO diet in which the nutrients supplied met the requirements. Low protein diets supplied excessive amounts of protein and low salt diets supplied excessive amounts of sodium. All diets except the low protein/salt diet supplied high amounts of vitamins A and C

5- Intakes of normal and therapeutic diets were low for the patients' requirements except for the low protein/salt/CHO diet which met the requirements. This was due to illness, poor appetite, anorexia, multiple drug uses and lack of selective menus. A higher intake of protein, salt,

vitamins A and C was noticed in all diets except the low protein/salt diet. Intake of other micro-nutrients was also deficient.

6- The gap between what was offered and the intake of patients resulted in a wide range of wastage i.e. 33 – 89% in total energy. Intake of carbohydrates, protein, fat and salt differed significantly ($P<0.05 \rightarrow P<0.0005$) in most types of diets.

7- Diets were not modified e.g. soft, full liquid, clear liquid diets, according to the degree of illness, age etc. to increase food intake.

8- Kitchen conditions and sanitation (including personal one) although markedly better than in other hospitals in Khartoum State were not satisfactory. No therapeutic kitchen was found in any of the hospitals visited.

9- The hospital did not have a dietary manual and no reference was followed for diet prescription in planning the diets which resulted in inadequate planning and wrong formulations.

10- Nutritional counseling during hospital stay or after discharge was poor.

11- Dietitians were not offered in-service training to improve their skills whether locally or abroad.

12- Most of the physicians (80.0%) and dietitians (43.0%) were not satisfied with therapeutic diets served in the different hospitals visited during this study and poor coordination between the two professions was noticed.

RECOMMENDATIONS

According to the results of this study the following recommendations are suggested:

1- Modification of the hospital diets e.g. soft, liquid, is an important component of therapy in many conditions especially if higher energy intakes are to be achieved since they are easily tolerated by anorectic patients.

2- To facilitate the intake of these diets it is recommended that four different energy levels according to patients needs based on individual BMR be adopted as suggested by Isaksson (1981). This could ensure patients intake according to tolerance and result in less food wastage.

3- Intake of 3 meals and 2-3 snacks per day is recommended to overcome poor appetite. A daily morning biscuits or piece of cake as snacks can increase food intake while more frequent distribution of milk, a nutritious food, will likely improve the overall energy intake. In addition consideration should be given to Sudanese cultural food habits in diets offered and use of selective menus introduced. For the low fat diet , fat should be removed from meat, skin from chicken and skim milk instead of whole milk .

4- For a low protein diet, fat should be removed from meat, skin from chicken and skimmed milk instead of whole milk. For a low protein diets, all protein intake should be counted eg, bread, legumes, milk et.. For allow sodium diet, the sodium in the food items should also be calculated.

5-

6-

7- Nutritional status of the patients is very important during hospitalization so a screening system to identify patients at risk should be employed and appropriate protocols for action taken. It is stressed that management and prevention of malnutrition requires a climate in which hospital managers have a positive policy towards nutritional care.

8- Kitchen facilities (area, equipment, sanitation etc) should be modernized according to the NNAC suggestions and separate therapeutic kitchens should be established and in the future consideration should be given to ward kitchens.

9- Provision of food to the medical staff and visitors should be separated from the dietetics department, as it is a burden on the dietitians who appeared to please the medical staff more than the patients.

10- Design and implementation of a computerized diet order entry system for the hospitals to solve problems regarding receipt of complete information is recommended.

11- In view of the fact that most o the diets were wrongly planned –dietitians need short term extensive in-service training and refreshing courses locally or abroad are suggested which would result in marked improvement in the use of therapeutic diets, quality of food serviced and sanitation.

12- Dietitians should have the right to be registered in the Federal Ministry of Health as part of the medical and health staff team. This will add to their confidence and overall effort to improve their skills.

13- Establishment of a nutritional support committee (NSC) in every hospital from a member of its administration, a physician, head of dietetics department, ward sister, pharmacist and chief cook to be responsible for provision of appropriate diet and dietary counseling for both in and out patients.

14- General suggestions for upgrading dietary services in Sudan:

1- A national dietary care program should be initiated by the national government through the National Ministry of Health to rehabilitate and upgrade the dietetics departments in the hospitals and improve the skill of the staff.

2- There is a need to build a computerized nutritional data base tailored to the food composition of diets consumed in Sudan which can be of great benefit for dietary planning and when analysis of food intake are undertaken, until then a manual may be more practical.

3- Periodical monitoring should be adopted by the National Ministry of Health in collaboration with the universities as well as follow up studies to evaluate the adequacy of therapeutic diets.

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