Nutritional Assessment of Patients under Hemodialysis in King Faisal Hospital in Makkah, Saudi Arabia

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Abstract: Background: The most common problem in chronic renal failure patients is malnutrition which can be secondary to poor nutrients intake, increase losses or increase in protein catabolism. **Objectives:** to assess the nutritional status of a sample of hemodialysis patients (HDP) attending King Faisal Hospital in Makkah, Saudi Arabia. **Subjects and methods:** A cross-sectional study was conducted included 40 hemodialysis patients (24 females, 16 males), attending the hemodialysis center in King Faisal Hospital. A pretested interview questionnaire was used to collect demographic, medical, and dietary histories. Anthropometric indices were recorded for each patient. Serum phosphorus, calcium, total proteins, albumin, cholesterol, and creatinine were obtained from patients' files. **Results:** Among the studied patients 40% were males and 60% were females. Dietary assessment showed that, patient' daily intake of all macro and micronutrients (except vitamin A) was <90% of the average nutritional requirements. Regarding percentiles of anthropometric measurements as indicators of malnutrition ; 35%, 20%, 32.5%, 32.5% of the patients had a weight for age, triceps skinfold thickness **(**TSF), mid-arm muscle circumference **(**MAMC), and mid-upper arm muscle area **(**MAMA) less than the 5th percentile respectively. Biochemical assessment among the studied patients shows that, all patients were anemic,22.5% of patients had serum phosphorus of >1.94 mmol/L, 20.0% had serum total protein <64 g/L, 75.0% with serum calcium of ≤ 2.37,100% with BUN >28.5 mmol/L, 72.5% with albumin <40 g/L, and 55.0% with serum creatinine of < 884 µmol/L.**Conclusion:** malnutrition is common in (HDP), rendering them at high risk of mortality and morbidity .Improvement of nutritional status of patients on maintenance hemodialysis is needed. Every patient needs an intensive nutritional counseling based on an individualized plan of care to maintain adequate nutrients intake.

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Key words: Nutritional assessment- Hemodialysis- Nutrients intake – Malnutrition.

1. Introduction

Chronic kidney disease (CKD) is commonly related to malnutrition, affecting approximately one-third of patients with advanced renal failure (RF). Chronic kidney disease is a syndrome characterized by fast deterioration of the renal function, resulting in hydro-electrolytic imbalance and accumulation of nitrogen catabolism products, such as urea and creatinine (Fernanda *et al.*, 2008).

Protein-energy malnutrition (PEM) is a relatively common problem, especially among adult patients with chronic renal disease who undergoing hemodialysis (HDP). As the presence of PEM is one of the strongest predictors of morbidity and mortality in HDP (Alharbi, 2010).

Malnutrition is prevalent among patients undergoing hemodialysis. Differences in socioeconomic, demographic, clinical, and general characteristics can be used to identify patients who require more attention due to the risk of malnutrition, particularly in the elderly, retirees, and those with depression and low socioeconomic status (Oliveira *et al.*, 2012) .

Dietary therapy is an integral component of medical care required for the patient with progressive or end stage renal disease and its goal is to minimize uremic toxicity and other metabolic disorders of renal failure, possibly slowing the rate of progression of chronic renal failure while maintaining body protein store (Sweta, 2006). Malnutrition in dialysis patient is associated with poor survival. The survival rate of patients with renal failure has not changed in last the 20 years despite intensive treatment. One of the main determinants of mortality and morbidity in HD is nutritional status of the patients (Teixeira *et al.*, 2008).

The information available about nutritional status of dialysis patients in developing countries, including Saudi Arabia, is very little compared to USA and Europe. Therefore this study was carried out to assess the nutritional status of a sample of hemodialysis patients attending King Faisal Hospital in Makkah, Saudi Arabia.

2. Subjects and Methods

2.1 *Design*

A cross-sectional study was conducted from September 2011 to January 2012

2.2 *Settings*

The study was conducted at HD unit of King Faisal Hospital in Makkah, Saudi Arabia. This unit is affiliated to the Ministry of Health. It accommodated 55 patients at a time. This unit had two shifts, five hours for each, starting from 8 AM to 12 PM. Dialyzed patients are grouped into two groups; one was dialyzed on Saturday, Monday, and Wednesday, while the other was dialyzed on Sunday, Tuesday, and Thursday. It provided services for both Saudi and non-Saudi patients.

2.3 *Ethical consideration*

The approval of study by the ethics committee of the hospital was obtained. All patients were informed about the nature and the purpose of the study. They were also informed that their participation in this study is voluntary and they have the right to withdraw at any time without any penalization and their refusal to participate and withdraw will not affect their treatment at the hospital.

2.4 *Subjects*

A convenience sample of 40 patients was recruited for the study. A total number of 55 medical records were analyzed, 15 were excluded yielding a total number of 40 subjects included in the study

Inclusion criteria:

1. Receiving HD three times per week.
2. Anuric
3. Patients with no acute illness, such as pneumonia, acute myocardial infraction or septicemia.
4. Had not been diagnosed with clinical depression.
5. Had undergone hemodialysis for at least 3 months.
6. Both sexes.
7. Not receiving enteral or parenteral feeding.
8. No communication barrier (e.g., hearing deficit, mental disability)

2.5 Methods

2.5.1 Interview questionnaire

A pretested, structured interview questionnaire was used. It consisted of the following parts:

- Part 1: socio-demographic characteristics of the study sample: gender, age, marital status, level of education, and family size, etc.
- Part 2: medical history; patients were asked about the present medical conditions, and symptoms at the time of onset. In addition the medical history included data collected from patients' files about the onset of ESRD and HD, the primary cause of the disease e.g. diabetes mellitus (DM), hypertension (HTN), coronary heart disease (CHD), and the duration of HD, etc.

2.5.2 Dietary assessment

1) Dietary history : this was further divided into three parts

- Dietary habits, including how many times the patient had breakfast per week, number of daily meals, and preferable methods of cooking, etc.
- Dietary record

- A three days dietary record (2 working days and 1 weekend day) was completed by the patients. Patients were instructed on the recording method by using the house hold measurements. Each patient was instructed to fill the dietary record by himself if he was educated otherwise filled by educated one of his household members. Dietary records were then reviewed with patients to check the reliability.
- The dietary record was analyzed using the national nutrient database of United States Department of Agriculture (USDA) for Standard Reference, Release 23. This 2010 database is the major source of food composition data in the United States and is updated by the USDA from time to time (USDA Research Service, 2010).
- Nutrients intake was classified as follows: 90—110% of the requirement (adequate), >110% (over-intake) and <90% (under-intake) (McClave *et al.*, 1998).

- Food frequency questionnaire (FFQ): The Food Frequency Questionnaire (FFQ) is a checklist of foods and beverages with a frequency response section for subjects to report how often each items was consumed over a specified periods of time. The FFQ included frequency response formats to recall each patient diet. The food intake frequencies were classified into four categories: not preferable, 1time per week, 2-5 times per week, and daily. It contained the most important items that are rich in electrolytes such as calcium (ca), phosphorus (p), potassium (k). Seven categories were included: dairy products, meat groups, vegetables, fruits, cereals, fast food, and miscellaneous.

2) Nutritional requirements estimation

Nutritional requirements for hemodialysis patients were based on (National Kidney Foundation, 2000).

2.5.3 Anthropometric measurements

- **Weight**

Dry weight in dialyzed patient is the weight at the end of dialysis treatment. Weighing scale was used to obtain the weight. The scale was placed on a hard-floor surface. Participants are asked to remove their heavy outer garments. Weight was measured for all participants and taken to the nearest 0.1 kg. The scale was calibrated at the beginning and end of each examining day. The scale is checked using the standardized weights and calibration is corrected if

the error is greater than 0.1 kg.(Steiber *et al.*, 2004, and Abu-Al Makarem, 2004).

- **Height**

Height was measured with the patients bare footed and head upright. The height is measured with the measuring rod attached to the balanced beam scale. The height was reported to the nearest 0.5 cm (Tayyem and Mrayyanm, 2007).

- **Body mass index (BMI)**

The body mass index was calculated according to the patients post dialysis weight in kilogram (Kg) divided by height in meter square (m^2). Patients were categorized according their BMI according to the WHO criteria (underweight: < 18.5, desirable weight: 18.5 to 24.9, overweight: 25 to 29.9, obese: ≥ 30) (Gee *et al.*, 2008).

- **Mid-upper arm circumference (MAC)**

MAC was measured by using a Ross Inser-Tape fiberglass tape. At the dry weight, patient's right or non-access arm was bent at the elbow at $90C^0$ angle; palm up, to locate the arm's midpoint on posterior side of the arm. With the same arm hanging loosely by side, the tape was positioned at previously marked midpoint of upper arm and the circumference was obtained (National Kidney Foundation, 2000).

- **Waist circumference and hip circumference**

Waist circumference and hip circumference were measured by using a Ross Inser-Tape fiberglass tape at the dry weight. Waist circumference was measured in centimeters at the midpoint between the button of the ribs and the top of iliac crest. Hip circumference was measured at the largest posterior extension of the buttocks. Waist hip ratio was calculated by dividing these two values with each other and categorized as (for males, normal: ≤ 0.9, obese: > 0.9 and for females normal: ≤ 0.8, obese: > 0.8) (Yalcin *et al.*, 2004).

- **Triceps skinfold thickness (TSF)**

Ross Adipometer[tm] skinfold caliper was used to measure TSF to the nearest 1mm. Three readings were taken and mean was calculated (National Kidney Foundation, 2000).

- **Mid-arm muscle circumference (MAMC)**

MAMC was calculated as follows: MAMC = MAC – (TSF X 0.314) (Frisancho, 1990)

- **Mid-upper arm muscle area (MAMA)**

MAMA was calculated as follows: MAMA = $(MAMC)^2$ / 12.56) (Frisancho, 1990)

Percentiles of weight for age, TSF, MAMC, and MAMA for every patient were determined based on the tables developed by the National Health and Examination Survey (NHANS) I and II (Wiggins, 2004)

2.5.4 Biochemical measurements

Biochemical measurements including serum phosphorus, calcium, total protein, albumin, cholesterol, and Creatinine were collected from patients' files if available, otherwise the urologist was consulted to request them.

2.6 *Statistical analysis*

Statistical analysis was performed using the Statistical Package of Social Science (SPSS) version 16 (SPSS Inc., Chicago, IL, USA.). The responses of subjects were expressed in frequency and percentage For the quantitative variables, compliance with the normal distribution was assessed using the Kolmogorov-Smirnoff test, as appropriate. In case of continuous variables, T test was chosen for independent groups if the distribution was normal, and paired T test for the same group before and after dialysis ,otherwise a non-parametric tests were used (Mann-Whitney test or Wilcoxon signed-rank test). Pearson's Chi square (x^2) test or Fisher's Exact test were used for categorical variables. A two-sided *p*-value < 0.05 was considered statistically significant.

3. Results

3.1 Socio-demographic characteristics

The demographic profile of the studied chronic renal failure patients is presented in table (1); (50%) of patients were below 45 years of age , while elderly patients represented 15% of the studied sample, out of the 40 subject, 40% were males and 60% were females. Moreover, (37.5%) of the patients were illiterate, and (62.5%) didn't work, 45 % had a family income of 2000-5000 Saudi Riyal (SR) per month, with a large family size of more than 8 members in (40%) of the cases.

3.2 Medical history

Table (2) shows the clinical characteristics of HD patients. It was observed that the most common cause of chronic renal failure among patients was chronic glomerulonephrities (37.5%) followed by D.M (30.0%) followed by HTN (25%).

Regarding the symptoms of kidney disease at the time of onset, it was found that among the 40 patients studied , edema and breathlessness were the most common symptoms (92.5 %) and (87.5%) respectively, followed by Oliguria, nausea, and headache in the same percentage (75%). (62.5 %) were suffering from anorexia. Frequent urination and vomiting were prevailing in more than half of the patients, followed by (35.0 %) for both convulsions and loss of consciousness. Few subjects suffered from hematuria (12.5%).

Regarding the clinical signs at the time of investigation; pallor of eyes and nails was common in nearly all the patients undergoing dialysis (95.0%), followed by edema (70.0%), and excoriation due to pursuits and swollen joints had the same percentage (52.5%).

3.3 Dietary assessment

Table (3) shows the food and nutrition habits of hemodialysis patients. It was found that the highest percentages of the patients (65.0%) were having breakfast from 6-7 times /week, while

(17.5) either had breakfast less than three times / week or did not had breakfast at all .

Most of dialytic patients (55.0 %) reported that they take three meals /day and (35.0%) preferred boiled method of cooking. Moreover, among the 40 patients interviewed, (47.5%) were on special diet.

Table (4) shows some daily macro and micro nutrients intake of dialytic patients. The results showed that there was no significant difference (P>0.05) between males and females daily intake of the tested parameters. However, patients' intake of all macro and micronutrients (except vitamin A) was <90% of the average nutritional requirements.

Results of food frequency questionnaire (table 5) revealed that both male and female patients were comparable regarding the frequency of consumption of the different food categories (p > 0.05), however low consumption of dairy product was found. The same tendency was found regarding the consumption of fried beef, fish canned tuna, fried shrimp, and lentils with relatively higher consumption of eggs Also, low consumption of fruits was reported among the studied sample with lower frequency among males than females. On the contrary consumption of green vegetables was relatively frequent and was more among females than males. In the view of the reported consumption of cereals; consumption of whole wheat bread, and rice 2-5 times per day or daily was reported by more than half of cases while the consumption of pasta and white bread was low**.**

Table (6) shows that, the frequency of consumption of all the studied fast foods was low among both male, and female patients (p > 0.05), and that the consumption of tea, coffee and cola was also low among the studied sample (p> 0.05).

3.4 Anthropometric assessment

Table (7) represents the BMI and WHR of the studied sample**;** the majority of dialytic males had normal or overweight BMI categories (37.5% in each), followed by obesity I (12.5%). Regarding female patients; (41.6%) had normal weight and there were similar percentage of females falling in the under and overweight categories (20.8%).

With respect to waist to hip ratio, most of the dialytic males were obese (62.5%), while (37.5%) were in the normal group, on the contrary, in case of dialytic females; (41.7%) belong to obese category and had abdominal obesity while (58.3%) were falling in normal category.

Regarding percentiles of anthropometric measurements as indicators of malnutrition Table (8) shows that 35%, 20%, 32.5%, 32.5% of the patients have a weight for age, TSF, MAMC, and MAMA less than the 5th percentile, respectively. Moreover according to percentiles of weight for age, TSF, and MAMC nearly half the patients had sever depletion while 52.5%, 47.5%, 35%,and 35% had TSF, MAMC, and MAMA less than the 25th percentile

3.5 Biochemical assessment

Biochemical measurements of dialytic patients before and after undergoing dialysis are displayed in table (9). The obtained results indicated that all measured parameters were reduced after dialysis (P<0.05), while calcium level was increased (P<0.05).In addition , biochemical indicators of malnutrition among the studied patients (table 10) shows that all patients were anemic , 22.5% of the patients had serum phosphorus of >1.94 mmol/L, 20.0% serum total protein <64 g/L, 75.0% with serum calcium of ≤ 2.37,100% with BUN >28.5 mmol/L, 72.5% with albumin <40 g/L, and 55.0% with serum creatinine of < 884 µmol/L.

Table (11) reflects the classification of chronic renal failure subjects based on their lipid profile. High percentage of subjects had desired levels of total cholesterol, TG, and LDL-C (75.0%, 70.0%, and 62.5% respectively).

On the other hand, (57.5%) of the patients were classified in borderline category for HDL-C and (25.0%) were falling in desired category, while (17.5%) were falling in the risk category.

Table (1): Socio-demographic characteristics of the studied patients in KFH.

Variables	(No=40)	%
Age (year)		
-30	10	25.0
-45	10	25.0
-60	14	35.0
-> 60	6	15.0
Gender		
Male	16	40.0
Female	24	60.0
Education level		
Illiterate	15	37.5
Primary	8	20.0
Intermediate	8	20.0
Secondary	2	5.0
University	7	17.5
Occupation		
None	25	62.5
Student	3	7.5
Public employee	8	17.5
Private employee	4	5.0
Family number		
< 3	5	12.5
3 - 5	11	27.5
6 - 8	8	20.0
> 8	16	40.0
Income(SR /month)		
<2000	12	30.0
2000 – 5000	18	45.0
>5000	10	25.0

Table (2): Clinical characteristics of hemodialysis patients

Variables	Dialytics (n=40)	
	No	%
Commencement of dialysis (months)		
3-24	2	5.0
24-48	8	20.0
48-72	17	42.5
>72	13	32.5
Number of visits to ER over a year		
<3	8	20.0
3-6	22	55.0
>6	10	25.0
Etiology of renal failure		
Hypertension	10	25.0
Diabetes Mellitus	12	30.0
Chronic glomerulonephritis	15	37.5
Chronic tubule-interstitial nephritis	-	-
Chronic pyelonephritis	3	7.5
Symptoms at the time of onset		
Anorexia	25	62.5
Breathlessness	35	87.5
Convulsions	14	35.0
Frequent urination	21	52.5
Headache	30	75.0
Hematuria	5	12.5
Loss of consciousness	14	35.0
Nausea	30	75.0
Nocturia	20	50.0
Oliguria	30	75.0
Edema	37	92.5
Vomiting	21	52.5
Others*	10	25.0
Signs at time of investigation		
Pallor of eyes	38	95.0
Excoriation due to pursuits	21	52.5
Pallor of nails	38	95.0
Swollen joints	21	52.5
Edema	28	70.0

* Fever, acidity, abdominal pain, giddiness, sleep disturbances, dark colored urine, pain in right side of chest, blood in cough, burning micturation, pain while breathing

Table (3): Food and nutrition habits of hemodialysis patients

Variable	Dialytics (n=40)	
	No	%
Frequency of breakfast / week		
Less than 3times	6	15.0
3-5 times	7	17.5
6-7 times	26	65.0
Don't eat breakfast	1	2.5
Number of meals / day		
One meal	2	5.0
Two meals	10	25.0
Three meals	22	55.0
More than 3 meals	6	15.0
Favorite meal		
Home made	36	90.0
Fast food	1	2.5
Canned food	2	5.0
Other	1	2.5
Eat away from home / week		
Once	30	75.0
2 times	4	10.0
3-4 times	3	7.5
More than 4 times	3	7.5
Favorite method of cooking		
Fried	10	25.0
Grill	11	27.5
Boil	14	35.0
Other	5	12.5
On special diet		
Yes	19	47.5
No	21	52.5
Who described special diet		
Dietitian	3	7.5
Physician	13	32.5
Nurse or dialysis unit	1	2.5
From my reading	2	5.0
Follow the special diet		
Always	8	20.0
Sometimes	10	25.0
Not follow	1	2.5
Appetite		
Good	18	45.0
Moderate	6	50.0
Bad	16	40.0

Table (4): Classification of the patients based on daily intake of some macro and micro nutrients.

Nutrients	Dialytics			*P*	Average nutritional requirement*	% of average requirements
	Male (n=16)	Female(n=24)	Total (40)			
Energy (kcal/kg)	15.1±4.9	16.5±5.5	15.9±5.3	0.44	1950 (kcal)	<90%
Protein (g/kg)	0.6±0.2	0.6±0.2	0.6±0.2	0.43	78 (gm)	<90%
Sodium (mg)	1010.2±275.7	961.2±205.9	981.2±234.1	0.56	2000 (mg)	<90%
Potassium (mg)	834.1±128.1	850.3±122.9	844.2±123.6	0.70	2000 (mg)	<90%
Calcium (mg)	556.1±88.4	511.4±131.1	529.3±116.8	0.20	1000 (mg)	<90%
Phosphorus(mg)	615.4±224.3	697.3±193.1	665.4±207.3	0.24	800 (mg)	<90%
Vitamin A(ug)	832.2±142.8	816.4±198.4	823.3±176.1	0.77	800 (µg)	95-105

*American dietetic association (2004)

Table (5) Distribution of the studied patients according to frequency of consumption of different food

Food categories	Daily				2-5 times				Once				don't like				*P*
	Females		Males		Females		Males		Females		Males		Females		Males		
	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	
Meat																	
Beef	9	56.2	19	79.2	4	25.0	4	16.7	1	6.3	0	0.0	2	12.5	1	4.1	0.33
Egg	6	37.5	6	26.1	2	12.5	4	16.7	4	25.0	10	41.7	4	25.0	3	12.5	0.53
Fish	10	62.5	7	40.4	4	25.5	10	41.7	2	12.5	4	16.7	0	0.0	2	8.3	0.20
Tuna	8	50.0	12	50.0	2	12.5	6	25.0	5	31.3	5	20.8	1	6.3	1	4.1	0.74
Sardine	15	93.8	17	70.8	0	0.0	4	16.7	1	6.3	3	12.5	0	0.0	0	0.0	0.16
Lentils	7	43.8	11	45.8	6	37.5	6	25.0	3	18.8	5	20.8	0	0.0	2	8.3	0.6
Dairy																	
Milk	11	68.7	12	50.0	2	12.5	7	29.1	0	0.0	2	8.3	3	18.8	2	8.3	0.33
Yogurt	6	37.5	14	58.3	0	0.0	4	16.6	6	37.5	1	4.1	4	25.0	4	16.6	0.03
Cheese	9	56.2	10	41.6	0	0.0	5	20.8	4	25.0	4	16.6	3	18.8	4	16.6	0.31
Vegetables																	
Green beans	6	40.0	5	20.8	3	18.8	7	29.2	4	26.7	7	29.2	2	13.5	5	20.8	0.61
Potatoes	2	12.5	4	16.7	1	6.3	10	41.6	7	43.8	6	25.0	6	37.5	4	16.7	0.07
Spinach	9	56.2	12	50.0	6	37.5	4	16.7	1	6.3	7	29.2	0	0.0	1	4.1	0.18
Green vegetables	2	14.3	1	4.3	3	21.4	4	17.4	6	42.9	8	34.8	3	21.4	10	43.5	0.48
Tomatoes	4	25.0	4	16.7	4	25.0	4	16.7	3	18.8	9	37.5	5	31.3	7	29.2	0.61
Fruits																	
Banana	11	68.8	14	60.9	3	18.8	5	21.7	2	12.5	4	17.4	0	0.0	0	0.0	0.87
Date	11	68.8	15	65.2	3	18.8	5	21.7	0	0.0	0	0.0	2	12.5	3	13	0.97
Pear	9	56.2	11	45.8	2	12.5	9	37.5	5	31.2	2	8.3	0	0.0	2	8.3	0.09
Peach	7	43.8	11	45.8	5	31.2	10	41.6	3	18.8	3	12.5	1	6.2	0	0.0	0.57
Apricot	11	68.8	11	45.8	1	6.2	7	29.2	2	12.5	5	20.8	2	12.5	1	4.2	0.2
Raisins	12	75.0	12	50.0	1	6.2	4	16.7	3	18.8	6	25.0	0	0.0	2	8.3	0.34
Cereals																	
Whole bread	7	43.8	6	26.1	1	6.3	2	8.3	0	0.0	6	26.1	8	50.0	9	39.1	0.15
Rice	1	6.2	4	17.4	1	6.3	2	8.3	2	12.5	8	33.3	12	75.0	10	41.7	0.27
Pasta	5	31.2	6	26.1	3	18.8	5	20.8	6	37.5	11	45.9	2	12.5	2	8.3	0.95
White bread	6	37.5	8	34.8	3	18.8	4	17.4	1	6.2	7	30.4	6	37.5	4	17.4	0.24

Males= 16 Females = 24

Table (6): Distribution of the studied groups according to frequency of consumption of fast and miscellaneous food

Food categories	Do not like				Once				2-5 times				Daily				*P*
	Males		females		Males		females		Males		females		Males		Females		
	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	
Fast food																	
Burger Sandwich	12	75.0	17	70.8	2	12.5	5	20.8	2	12.5	2	8.3	0	0.0	0	0.0	0.75
Filet	13	81.2	19	79.2	1	6.3	4	16.6	2	12.5	1	4.2	0	0.0	0	0.0	0.42
Proust	10	56.2	12	50.0	3	18.7	7	29.2	3	18.7	4	16.6	0	0.0	1	4.2	0.71
Egg and cheeses sandwich	8	50.0	15	62.5	5	31.3	4	16.6	3	18.7	5	20.8	0	0.0	0	0.0	0.55
Cheese pizza	10	66.7	16	66.7	4	25.0	5	20.8	0	0.0	3	12.5	1	6.3	0	0.0	0.31
French fries	6	37.5	10	43.5	5	31.3	7	29.2	1	6.3	4	16.6	4	25	2	8.3	0.45
liver sandwich	12	75.0	16	66.7	3	18.7	3	12.5	0	0.0	3	12.5	1	6.3	2	8.3	0.49
Shawarma	9	56.2	12	52.2	3	18.7	5	20.8	3	18.7	3	12.5	1	6.3	3	12.5	0.87
Falafel sandwich	9	56.2	9	37.5	4	25.0	9	37.5	2	12.5	5	20.8	1	6.3	1	4.2	0.64
Miscellaneous																	
Tea	5	31.2	6	25.0	2	12.5	3	12.5	4	25.0	4	16.6	5	31.6	11	45.8	0.81
Coffee	7	43.8	12	50.0	2	12.5	5	20.8	2	12.5	3	12.5	5	31.6	4	16.6	0.71
Cola	14	87.5	19	79.2	1	6.3	1	4.1	0	0.0	4	16.6	1	6.3	0	0.0	0.23
Jam or honey	6	37.5	6	26.1	4	25.0	5	20.8	3	18.8	5	20.8	3	18.8	7	29.1	0.81
Ice cream	11	68.8	16	66.7	4	25.0	6	25.0	0	0.0	1	4.1	1	6.3	1	4.1	0.86

Males= 16 Females = 24

Table (7): Classification of patients based on BMI and WHR

Variables	Males	Females
	No (%)	No (%)
BMI		
Underweight	1 (6.25)	5 (20.8)
Normal	6 (37.5)	10 (41.6)
Over weight	6 (37.5)	5 (20.8)
Obesity I	2 (12.5)	2 (8.3)
Obesity II	1(6.25)	2 (8.3)
WHR		
Normal	6 (37.5)	14 (58.3)
Obese	10 (62.5)	10 (41.7)

Table (8): Weight for age, TSF, MAMC, and MAMA percentiles

Percentile	Weight for age		TSF		MAMC		MAMA	
	No	%	No	%	No	%	No	%
< 5	14	35.0	8	20.0	13	32.5	13	32.5
5	1	2.5	4	10.0	0	0.0	0	0.0
10	3	7.5	7	17.5	1	2.5	1	2.5
15	3	7.5	0	0.0	0	0.0	1	2.5
25	4	10.0	3	7.5	2	5.0	2	5.0
50	7	17.5	6	15.0	4	10.0	6	15.0
75	3	7.5	1	2.5	5	12.5	2	5.0
85	3	7.5	0	0.0	0	0.0	2	5.0
90	1	2.5	6	15.0	4	10.0	1	2.5
95	1	2.5	1	2.5	0	0.0	2	5.0
>95	0	0.0	4	10.0	11	27.5	10	25.0

Table (9): Biochemical profile of dialytic patients before and after dialysis

Parameters	Prior to dialysis	After dialysis	*P*	95% CI
Albumin (g/L)	36.8±9.7	35.4 ± 6.8	0.040	0.06 - 2.67
Total protein(g/L)	71.9±11.7	70.6±12.6	0.026	0.16 - 2.41
Creatinine (µmol/L)	880.9±304.7	457.3±215.4	<0.001	347.66 - 499.70
Urea (mg/dl)	49.6 ±3.3	36.3±3.7	<0.001	12.28 - 14.29
Calcium (mmol/L)	2.2±0.5	3.7±1.016	<0.001	2.20-2.60
Phosphorus(mmol/L)	1.6±0.8	0.7±0.9	<0.001	0.79 - 1.04

Table (10): Biochemical indicators for malnutrition

Indicators	Abnormal renal range*	No=40	%	Mean ±SD
Hemoglobin	< 11g/dL	40	100.0	9± 0.5
Phosphorus	> 1.94 mmol/L	9	22.5	1.6±0.8
Calcium	≤ 2.37mmol/L	30	75.0	2.2±0.5
Albumin	< 40 g/L.	29	72.5	36.8±9.2
Total protein	< 64 g/L	8	20.0	70.6±12.6
BUN	> 28.5 mmol/L	40	100.0	36.3±3.7
Creatinine	< 884 µmol/L	22	55.0	881±305

* McCann, 2002.

Table (11): Classification of patients based on lipid profile

Parameters (mg/dl)	Dialytics (n=40)					
	Desirable		Borderline		Risk	
	No	%	No	%	No	%
Total cholesterol	30	75.0	-	-	10	25.0
LDL-C	25	62.5	10	25.0	5	12.5
HDL-C	10	25.0	23	57.5	7	17.5
TG	28	70.0	12	30.0	-	-

(Anon., 1996)

Lipids	Desirable	Borderline	Risk
Total cholesterol	<200	200-240	>240
LDL-C	<130	130-159	>160
HDL-C	>45	35-45	<35
TG	<150	150-200	>200

4. Discussion

The sequels of malnutrition are numerous and include increased mortality and hospitalization rates, impaired wound healing, increased susceptibility to infection, malaise, fatigue and poor rehabilitation (Thomas *et al.,* 2008 and Daugirdas *et al.,* 2012). The present study was conducted to assess the nutritional status of a sample of hemodialysis patients attending King Faisal Hospital in Makkah, Saudi Arabia.

Chronic Renal Failure (CRF) is irreversible loss of renal function. The etiologies of CRF are many (Gooneratne, 2008). In the present study, chronic glomerulonephritis was the major etiology for CRF in 37.5% subjects of the sample, followed by diabetes mellitus (30%), followed by hypertension (25.0%) and chronic pyelonephritis (7.5%). This result agreed with Sweta (2006)who found that the first etiology of CRF was chronic glomerulonephritis (40%) in both dialytics and predialytics patients , followed by diabetes mellitus (30% in each group) and chronic pyelonephritis (25% in dialytics and 12% in predialytics) .Prakash *et al.* (2004) also reported diabetes mellitus as the main cause of chronic renal failure followed by chronic glomerulonephritis. In another study (Schneeweiss *et al.,* 1990) chronic glomerulonephritis, chronic pyelonephritis, polycystic kidney disease and hemolytic uremic syndrome were found as the etiologies of CRF in 15 patients.

In their study, Rao *et al* (1988) found that 26 % of the NIDDM subjects with persistent proteinuria, as the disease progresses there is lowering in the Glomerular Filtration Rate (GFR) which is matched by a proportionate decline in tubular function and leads to often nonspecific initial symptoms like edema, anorexia, oliguria, frequent urination and nausea with vomiting. Also the results of the current study showed that edema, and breathlessness were the most common symptoms (92.5%) and (87.5%) respectively, followed by oliguria, nausea, and headache with the same percentage (75%), and (62.5%) were suffering anorexia. This result agreed with the study of Sweta in 2006 who found edema (84.44%), followed by breathlessness (82.22%), anorexia (66.66%) and oliguria (73%) were the classic symptoms at the time of onset of the disease, as reported by the CRF subjects. The cause for edema and oliguria may be due to impaired ability to excrete because of defective tubular function resulting in an overt expansion of the plasma and extracellular fluid volumes and edema. Shortness of breath may indicate congestive heart failure, anaemia or metabolic acidosis while, anorexia points to advanced uremia (Sweta, 2006).

Results revealed that pallor of eyes and nails were seen in nearly all the dialytics (95%). Excoriation due to pruritus was also a striking feature, found among half of the patients causing abrasion of the skin due to itching. This observed symptom is due to inability of the kidney to excrete some unknown substances that accumulate in the body and cause abrasion of the skin due to pruritus (Narita, 2008).

Regarding anthropometric measurements as indicators of malnutrition ,results shows that 35%, 20%, 32.5%, 32.5% of the patients have a weight for age, TSF, MAMC, and MAMA less than the 5^{th} percentile, respectively, while 52.5 47.5%,35%,and 35% had weight for age ,TSF, MAMC, and MAMA less than the 25^{th} percentile, indicating sever depletion in nearly half the patients , this result disagrees with Tayyem and Mrayyanm (2007) who found higher percentage of cases were lower than the 25^{th} percentile.

Although anemia may be diagnosed at any stage of CKD, there is a strong correlation between the prevalence of anemia and the severity of CKD (Thomas et al 2008). Results of the present showed that all patients were having anemia, in accordance with Sweta (2006) who found anemia in all dialysis patients, however , disagrees with (Thomas *et al.,* 2008) who found the overall prevalence of CKD associated anemia is approximately 50%.

The present study reported that the percentage of patients with serum creatinine level of <884µmol/L was 55%. This result is in agreement with Abu-AlMakarem ,2004 who

found that 48.4% of the patients has serum creatinine level of <884 µmol/L .A predialysis or stabilized serum creatinine of less than approximately 884 µmol/L among patients on maintenance hemodialysis could be an indicator of a nutritional deficit (Avram *et al.,* 1995).

Due to high incidence of PEM among heamodialysis patients, it is not surprising to find a high incidence of hypoalbuminemia among these patients. In the present study about three quarters of the patients (72.5%) were having low serum albumin (<40 g/L, with a mean of 36.8±9.2) which is similar to most reported studies (Kalantar-Zadeh *et al.,* 2003, and Abu-AlMakarem, 2004).

Moreover , the mean serum phosphorus was 1.6±0.8mmol/L, which is relatively lower than the upper recommended value (≤ 1.94 mmol/L) for maintenance hemodialysis patients. However, 22.5% of patients showed a serum value of phosphorus >1.94 mmol/L. The result nearly agrees with the finding of Abu-AlMakarem (2004), who found that 32.3% of the dialysis patients had serum phosphorus more than the recommended level.

The dialysate calcium concentration and the volume of ultrafiltrate determine calcium balance during dialysis. A higher dialysate calcium concentration increases diffusion of calcium into the patient. In contrast, the calcium present in the ultrafiltrate is a potentially important source of calcium loss from the patient (Sieniawska *et al.,* 1996). This commentary explains that 75% of the patients in the current study had serum calcium ≤ 2.37mmol/L.

Regarding food intake, the mean calories intake of patients; 15.1±4.9 kcal/kg/day for males and 16.5±5.5 kcal/kg/day for females, was far below the recommended requirements for patients on hemodialysis (30kcal/kg/day recommended for HP), with no difference between male and female groups. Also, the results showed that the mean protein intake of patients was 0.6±0.2 g/kg/day for both males and females, while the protein recommendation for those patients is 1-1.2g/kg/day. This result agreed with Ali and Simpson, (2007) who found that the mean intake of energy was 19.4±6.8 kcal/kg/day, and the mean intake of dietary protein was 0.8±0.4g/kg/day, however this result disagreed with Valenzuela *et al.* (2003) who found that protein input was acceptable (1.3 ± 0.4 g/kg/day). This imbalance should be corrected in the future, because insufficient energy is a factor for under nutrition

Results revealed that the mean intake of calcium and phosphorus was 529.3±116.8 mg/day and 665.1±207.3 mg/day respectively which was substantially less than the recommended intake of those patients. This result agreed with Ali and Simpson (2007) who found that the intake of calcium and, phosphorus was inadequate.

In conclusion, the prevalence of malnutrition is high in HDP in the dialysis center of King Faisal Hospital (KFH), is common, rendering them at high risk of mortality and morbidity. Improvement of nutritional status of patients on maintenance hemodialysis is needed. Every patient needs an intensive nutritional counseling based on an individualized plan of care to maintain adequate nutrients intake.

References

1- **Abu-AlMakarem, Z.S., 2004**, Nutritional Status Assessment of the Hemodialysis Patients in Riyadh Al-Kharj Hospital. Department of Community Health Sciences at the College of Applied Medical Sciences King Saud University. Master Thesis.

2- **Alharbi, K.A., 2010**, Assessment of nutritional status of patients on hemodilaysis: a single center study from Jeddah, Saudi Arabia.. FIU Electronic Theses and Dissertations. Paper 178. http://digitalcommons.fiu.edu/etd/178.

3- **Ali, T.K.I., Simpson, W.,** 2007, Incidence and outcomes in acute kidney injury: a comprehensive population based study. Journal of American Society of Nephrology 18:1292-1298.

4- **Avram, M.M, Mittman, N., Bonomini, L., Chattopadhyay, J., Fein, P.,** 1995, Markers for survival in dialysis: A seven-year prospective study. American Journal Of Kidney Disease 26:209-219.

5- **Daugirdas, J.T., Ing, T., Blake, P**., 2012 ,Causes of kidney disease wasting (KDW) in chronic dialysis patient . Handbook of dialysis 4th Edition .

6- **Fernanda, T.N., Gianine, D.C., Sandra, M., Xavier, D. P., Leandro,M., Ka´tia,C., Denise, G., Maria, R.M.,** 2008, Dialysis adequacy and nutritional status of hemodialysis patients. Hemodialysis International . 12:45–51 klo.

7- **Frisancho, A.R., 1990**, Anthropometric standards s for the assessment of growth and nutritional status. Ann Arbor (MI):University of Michigan Press.

8- **Gee, M., Mahan, L.K., Escott-stump, E., 2008**, Nutrition for health and fitness. In Mahan LK & Escott-Stump E, eds. *Krause's food& nutrition and diet therapy*. 12th ed. Philadelphia: USA Saunders ; 532-557.

9- **Gooneratne, I. K., Ranaweera, A. K. P., Liyanarachchi, N. P., Gunawardane N., Lanerolle, R.D., 2008,** Epidemiology of chronic kidney disease in a Sri Lankan population , International Journal of Diabetes Dev Ctries. Apr-Jun; 28(2): 60 – 4.

10- **Kalantar-Zadeh, K., Ikizler, T.A., Block, G., Avram, M.M., Kopple, J.D**., **2003,** Malnutrition-inflammation complex syndrome

in dialysis patients: Causes and consequences. American Journal of Kidney Disease. 42: 864–81.

11- **McClave, S.A., Lowen, C.C., Kleber, M.J., Nicholson, J.F, Jimmerson, S.C., McConnell, J.W., and Jung, L.J .,1998 ,**Are patients fed appropriately according to their caloric requirements? Journal of Parenteral and Enteral Nutrition 22, 375– 81.

12- **Narita, I., Iguchi, S., Omori, K., Gejyo, F.,2008,** Uremic pruritus in chronic hemodialysis patients. Journal of Nephrology . 21(2): 161-5.

13- **National Kidney Foundation, 2000,** KDOQI clinical practice guidelines for nutrition in chronic renal failure. American Journal of Kidney Disease 35 (Suppl 2):1-140.

14- **Oliveira, G.T., Andrade, E.I., Acurcio, F., Cherchiglia, M.L, Correia, M.I., 2012,** Nutritional assessment of patients undergoing hemodialysis at dialysis centers in Belo Horizonte, MG, Brazil. Rev Assoc Med Bras **58** (2):240-7 .

15- **Prakash, S., Pande, D.P., Sharma, S., Sharma, D., Bal, C.S. and Kulkarni, H., 2004,** Randomized, double-blind, placebo-controlled trial to evaluate efficacy of ketodiet in predialytic chronic renal failure. Journal of Renal Nutrition **14**: 89-96.

16- **Rao, K.V.R., Seshaiah, V., and Sehrayan, P., 1988.** ,Observations on compositions in NIDDM. Indian Journal of Public Health 32(3): 142-147.

17- **Schneeweiss, B., Graninger, G., Stockenhuber, W., Druml, F., Ferenci, W. , P., Eichinger, Grimm, S. , Laggner, A.N. , and Lenz, K., 1990**, Energy metabolism in acute and chronic renal failure. American Journal of Clinical. Nutrition. 52: 596-601.

18- **Sieniawska, M., Roszkowska-Blaim, M., Wojciechowska, B.,1996**, The influence of dialysate calcium concentration on the PTH level in children undergoing CAPD. Peritoneal Dialysis International;16 Suppl 1: S567-9 - PMID: 8728272.

19- **Steiber, A., Kalantar, K., Secker, D., McCarthy, M., Sehgal, A., McCann, L. ,2004,** Subjective Global Assessment in Chronic Kidney Disease: A Review. Journal of Renal Nutrition. 14 (4):191-200.

20- **Sweta, S., 2006,** Nutritional Status and Dietary Guidelines of predilytic and hemodilytic patients. Univarsity of agricultural sciences, Dharwad OF - 580 005. . Master Thesis.

21- **Tayyem, R.F., Mrayyan, M.T., 2007,** Malnutrition, anthropometric and biochemical abnormalities in end-stage renal disease patients. Saudi Medical Journal. 28 (10):1575-81.

22- **Teixeira Nunes.F., de Campos, G., Xavier de Paula, S.M., Merhi**, **V.A, Portero-McLellan, K.C, Motta, D.G, Oliveira, M.R., 2008 ,** Dialysis adequacy and nutritional status of hemodialysis patients, Hemodialysis International Journal; 12: 45-51.

23- **Thomas, R. , Kanso, A., Sedor, J. R.**, **2008** , Chronic Kidney Disease and Its Complications .Prim Care Clinical Office Practice; 35, 329–44.

24- **USDA**: U.S. Department of Agriculture, Agricultural Research Service. 2010. USDA National Nutrient Database for Standard Reference, Release 23. Nutrient Data Laboratory Home Page, Available at; http://www.ars.usda.gov/ba/bhnrc/ndl

25- **Valenzuela, R. G. V., Giffoni, A. G., Cuppari, L., Canziani, M. E. F., 2003,**Estado nutricional pacientes com insuficiência renal crônica em hemodiálise no Amazonas. Revista da Associacao Medica Brasileira ;49:72-8.

26- **Wiggins, K.L., 2004**, Renal Care: Resources And Practical Applications 3rd ed. Renal Dietitians Dietetics Practice Group , American Dietetic Association. pp: 23-26

27- **Yalçin, B. M., Sahin, E .M., Yalçin, E., 2004** , Prevalence and epidemiological risk factors of obesity in Turkey. Middle East Journal of Family Medicine; Vol. 6 (6).