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Dietary intake of female patients with renal failure in Al-Hassa Province, East of Kingdom of Saudi Arabia

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ABSTRACT

The aim of this study was to assess the dietary intake of female patients with renal failure in Al-Hassa Province, east of Saudi Arabia, and to study the effect of some variables on dietary intake of the patients. The study included 85 volunteers female with renal failure, from three Hemodialysis (HD) centers during seven- months period study from May to November, 2013. The data was analyzed by SPSS, ver. 17 Program. The results showed that daily dietary intake of most nutrients were low specially energy (932.2±345.2kcal), protein (36±14.8g), fat (28.8±15.2g), calcium (290.8±206.7mg), phosphorus (558.3±301.8mg), vitamins A (252.6±188.7mg), C (19.5±22.9mg), B1 (0.6±1.0mg) B2 (0.7±0.6mg) respectively, and fiber (5.5±3.1g). Dietary intake of some nutrients were significantly affected by some variables (like age, educational level, nutritional knowledge, BMI, number of HD and family income level), whereas some variables did not have an effect on dietary intake (like social status, Place of residence and onset of HD). The results also showed that the age of 76.5% of patients were ≥ 40 years , 32.9% were overweight and 35.3% obese, all of

patients are sedentary and light active, 62.4% were illiterate and the level of nutritional knowledge of 30.6% of the patients were low. The onset of HD for 65% of female patients with renal failure was ≤ 3 years, and 91.8% of the patients undergoing HD three times weekly. Based on these results, the study recommends hospitals` administration to organize continuous classes in order to educate patients with chronic renal failure who need hemodialysis about correct nutrition, in addition periodic nutrition consultations with dietician and provision of a detailed diet plan for each patient is very helpful.

Keywords: Renal failure, Dietary intake, Hemodialysis, Female, Saudi Arabia.

1. INTRODUCTION

The basic functional unit of kidney is the nephron; each human kidney is made up of approximately one million nephrons, all of which are independently capable of forming urine. Several disease conditions may interfere with the normal functioning of nephrons, resulting in kidney disease (Mahan and Escott-Stump, 2008; Nix, 2009). Malnutrition is a common and serious complication of chronic kidney disease (CKD), and is associated with increased morbidity and mortality (Foster and Leonard, 2004). Contributing factors to this malnutrition include poor appetite, various co-morbidities, dietary restrictions, inflammation, infection, metabolic acidosis and oxidative stress (Morais *et al.*, 2005).

There are many risk factors causing CKD such as advanced age, high protein intake, high consumption of some drinks (like carbonated beverages, sugary drinks, and coffee), low consumption of water, some diseases (like diabetes mellitus, atherosclerosis and hypertension), hot climate, low level of income and education, chemical and environmental hazards (lead) and another reasons (Tanner and Tanner, 2001; Tofovic *et al.*, 2002; Jacob, 2003; Knowlton *et al.*, 2006; Saldana *et al.*, 2007; Lou *et al.*, 2007; Bakris and Ritz, 2009; Al-Saran *et al.*, 2009; Judia Harriet Sumathy, 2014; Rysz *et al.*, 2017).

Rysz *et al.,* (2017) revealed that a healthy diet comprising many fruit and vegetables, fish, legumes, whole grains and fibers, and also reducing red meat, sodium and refined sugar intake associate with lower mortality in people with kidney diseases, this indicates to the importance of balanced nutrition.

Kidney disease wasting (KDW) in chronic dialysis patients affects approximately one-third of Hemodialysis (HD) patients. Serum levels of inflammatory markers are increased and numerous causes of chronic inflammation may be present (Kaysen, 2001; Punam Yadav *et al*. 2014).

Protein catabolic rates of less than 1 g/kg/day are indicative of protein malnutrition and should lead to institution of corrective steps (Goldstein *et al.*, 2002). Two methods of obtaining dietary information may be used; prospectively, by means of a three-day diary, or retrospectively, by interview with recall of intake over the previous 24h (Foster and Leonard, 2004).

In Australia a study of Fassett *et al.,* (2007) aimed to determine the dietary intake of patients with chronic kidney disease before and after filtering for suspected under reporters and to investigate the impact of underreporting on the interpretation of diet data, the results showed that body mass index was 28.6±6.0 kg/m^2, and serum Creatinine 223.4±110.0 mmol/L, the daily protein intake was higher than recommended, but energy intake was lower than recommended, also mean calcium, zinc and dietary fiber intakes were all below recommendations. A study of Lou *et al.,* (2007) aimed to analyze their nutrients intake in stable hemodialysis patients; the results showed that caloric rather than protein undernutrition was the major abnormality. About mineral content, intake of sodium, potassium and phosphorus are reasonable and insufficient for calcium. In Saudi Arabia a study of Al-Saran *et al.,* (2009) aimed to examine interventions used to manage malnutrition and obesity and to share experiences, concerns and solutions to these problems for management of nutritional disorders in Saudi patients with end stage renal disease (ESRD), the results showed that mean of BMI was 25.2±5.5 kg/m^2, 47% of female patients was overweight and obesity, the mean duration of dialysis was 1.9 years, the nutritional assessment classified patients into normal (68%), mild to moderately malnourished (24%) and severe malnutrition (8%), the level of calcium, phosphorus and albumin were 2.25±0.6 mmol/L, 1.5±0.4 mmol/L and 34±4.4 g/L respectively. In Italy a study of Cupisti *et al.,* (2010) aimed to evaluate change of actual dietary nutrient intake in stable hemodialysis patients in respect to normal subjects and guideline recommendations, and to assess the prevalence of signs of malnutrition, the results showed that hemodialysis patients had lower energy and protein intake in respect to normal subjects, the results also showed that in hemodialysis patients abnormalities of nutritional parameters were less prevalent than expected by analysis of dietary food intake. In Nigeria a study of Odufuwa and Fadupin (2011) aimed to examine the nutritional status of hemodialysis patients, the results showed that the mean intake of energy, protein and fat were 1051.2 kcal, 23.6g and 30.4g respectively, and the intake of calcium, iron and phosphorus were 159.5 mg, 1.74mg and 470.8mg respectively, the results also showed that 40% of patients had under weight. In Iran a study of Espahbodi *et al.,* (2014) aimed to evaluate the nutritional status of patients with end stage renal disease (ESRD)

undergoing hemodialysis using subjective global assessment (SGA), also assessed probable association between biochemical parameters and malnutrition in this population, the results showed that 0.0% of female and 3.81% of male healthy, 40% of female and 53.33% of male had mild to moderate malnutrition, 2.86% of female and 0.0% of male had severe malnutrition. There is a significant association between patient`s sex and the SGA score, but no significant association was seen between age and duration of hemodialysis with SGA score.

The aim of this study is to assess the nutritional status in female on regular hemodialysis (HD), compare the intake with the recommended dietary allowances (RDA) and to correlate the dietary intake with certain variables.

2. PATIENTS AND METHODS

The study included 85 female volunteers with renal failure on regular HD aged (< 21- > 40) years. , and being followed-up at three Nephrology and Transplantation Center, in Al-Hassa Province, east of Saudi Arabia, during seven- months period from May to November, 2013.

For all patients:

Full history was taken, including:

- Demographic data, HD duration and co-morbidities.
- The dietary intake was assessed using one day 24-hours Food recall method. The household measures (teaspoon, tablespoon, cup and plate) were used to help subjects to estimate the portion intakes, which were then converted to metric measurements (g). The Nutritional Health Balance Program software was used to analyze the dietary intake (Energy, protein, Carbohydrate, fat, fiber, Fe, Ca, P and vitamins A, C, B1 and B2) as well as percentage of protein, carbohydrate and fat of total energy. Calorie, protein and fat intake were calculated and expressed as a percentage of the recommended dietary allowance of protein, fat and calories for CKD.

Development of a nutritional knowledge questionnaire: Some items of the questionnaire were taken from existing questionnaires while others were generated from the literature (Mahan and Escott-Stump, 2008; Nix, 2009) with expert advice from dieticians where necessary. The content validity of the questionnaire was carried out by a panel of four specialist and four dieticians, to select the best in terms of clarity of the questions, accuracy of the dietary knowledge being tapped, and interpretability. This process reduced the number of items to 14 in which 85% of the panel agreed on. The preliminary instrument was then ready for piloting in a general population sample (n=30). The nutritional knowledge divides to 3 levels: low or poor (≤ 14 degrees or ≤ 50 %), medium or good (15–20 degrees or > 50 – < 75%) and high or excellent (≥ 21 degrees or ≥75%) . None of the patients were on tube feeding or parenteral nutrition.

Laboratory investigations:

Patients` blood parameters were obtained from their medical records (serum albumin, creatinine, hemoglobin, serum calcium, phosphorus, sodium, potassium, predialysis blood urea nitrogen).

Anthropometric measurements: Body weight was measured in light clothing, without shoes to the nearest 0.1 kg and height was measured to nearest 0.1 cm by using digital weighting scale (Detecot, USA). The balance was placed on hard flat surface, checked for zero reading before each measurement and subjects were asked to stand unassisted in center of platform and looking straight ahead during the measurement. Body Mass Index (BMI) was calculated as weight (kg) / height^2 (m^2) , and the BMI was classified to 4 categories: Underweight (<18.5 kg/m^2) , Normal (18.5 -< 25 kg/m^2), Over weight (25 -< 30 kg/m^2) and Obese (> 30 kg/ m^2) (Insel *et al*., 2006; WHO, 2004).

Statistical Analysis:

The data was analyzed using SPSS, ver. 17, ANOVA was used to study the effect of some variables dietary intake. The results are presented as frequencies, percentages and means.

3. RESULTS AND DISCUSSION

1-Patients` demographic and lifestyle variables:

The female patients` demographic and lifestyle variables in Table (1) showed that the age of 87% of patients were ≥35 years, 76.8% with light brown skin, 62.4% were illiterate (does not read or write), 97.6% were house wives and all of them were sedentary and light active.

Table 1 Patients` demographic and lifestyle variables

Variables		Frequency	Percentage (%)
The Age	< 21 years	2	1.2
	> 21 – 25 years	4	4.7
	> 25 – 30 years	2	1.2
	> 30 – 35 years	5	5.9
	> 35 – 40 years	9	10.5
	≥ 40 years	65	76.5
	Total	85	100
The color of skin	White	15	17.6
	Light brown	67	76.8
	Black	3	3.6
	Total	85	100
Educational level	Illiterate (does not read or write)	53	62.4
	Primary–Middle School	24	28.2
	Secondary School – Institution	8	9.4
	University	0	0
	Total	85	100
The type of work	House wife	83	97.6
	Employee	0	0
	Retired	2	2.4
	Total	85	100
Patients` social status	Single	8	9.4
	Married	77	90.6
	Total	85	100
The level of daily activity	Sedentary	51	60
	Light	34	40
	Medium	0	0
	heavy	0	0
	Total	85	100
Family income level (SR / month)	≤ 3000	45	53
	>3000 - <6000	16	18.8
	6000 - <10000	16	18.8
	>10000	8	9.4
	Total	85	100
Place of residence	City	49	57.6
	Village	36	42.4
	Total	85	100

The results also showed that more than half of patients lives in cities and the income of 53% of family`s patient was low (≤ 3000 SR / monthly). The results agreed with the reasons mentioned by Kabantar-Zadeh (2011), whereas there are many risk factors incident CKD such as low levels of income, education and advanced age.

2-Pateints` anthropometric measurements:

The patients` anthropometric measurements in table (2) showed that the mean of patients` weight was 67.7±18.2 kg, mean of height was 155.9± 6.2cm and mean of BMI was 27.7±7.1 kg/m^2.

Table 2 Patients` anthropometric measurements

Variables	Mean ± S.D**
Weight (kg)	67.7 ± 18.2
Height (cm)	155.9 ± 6.2
Body mass index (kg / m^2)	27.7 ± 7.1

***SD= Standard deviation.*

The result of study agreed with a study of Fassett *et al.,* (2007) which mentioned that CKD patients` BMI were 28.6±6.0kg/m^2 (over weigh), also a study of Al-Saran *et al.,* (2009) which mentioned that BMI of patients with ESRD were 25.2±5.5kg/m^2 (over weigh), but the result of current study disagreed with a study of Cupisti *et al.,* (2010), which mentioned that BMI of female patients with ESRD were 23.6±5.3kg/m^2 (normal).

Table (3) showed that only 22.4% of patients had normal weight (their body mass index ranged from 18.5 to<25 kg/m^2), while 32.9% of patients were overweight (25 - < 30 kg/m^2) and 35.3% were obese (≥ 30 kg/m^2).

Table 3 Patients` body mass index category

Body mass index category	Frequency	Percentage (%)
Under weight	8	9.4
Normal	19	22.4
Over weight	28	32.9
Obese	30	35.3
Total	85	100

The results mentioned that the most of patients (68.2%) had over weight and obesity, this result agreed with some literatures such as a study of Al-Saran *et al.,* (2009) which showed that patients` body mass index category were under weight (0.5%), normal (20%) and overweight and obesity (47%). But a study of Odufuwa and Fadupin (2011) showed that patients` body mass index category was under weight (40%) and normal (60%), this result did not match the current study.

3-Patients` health status:

Table (4) showed the health status of the patients, the results indicated that 9.2% of patients with renal failure had no symptoms, but 77.6% had more than one symptom. The results also indicated that patients had one or more comorbidities , a disease or condition that exists alongside another disease (essential and secondary hypertension 7% and 11.8% respectively), 60% of patients had more than one diseases specially hypertension and diabetes mellitus.

Table 4 Patients` health status

Variables		Frequency	Percentage (%)
The symptoms	No symptoms	8	9.3
	Constipation	4	4.7
	Retention of body fluids	2	2.4
	Other symptoms	5	6
	More than one symptom	66	77.6
	Total	85	100
co-morbidities	Essential Hypertension	6	7
	Secondary Hypertension	10	11.8
	Other diseases	18	21.2

	More than one disease	51	60
	Total	85	100
The beginning (start-onset) of hemodialysis	≤ 3 years	65	76.5
	> 3 – 9 years	15	17.6
	> 9 years	5	5.9
	Total	85	100
Number of hemodialysis / week	2 times	5	5.9
	3 times	78	91.8
	> 3 times	2	2.3
	Total	85	100
Presence of patient with renal failure in the family	Yes	31	36.5
	No	54	63.5
	Total	85	100
The relationship	Father or mother	10	32.3
	Brother or sister	9	29
	Uncles or aunts	3	9.7
	Other relationships	9	29
	Total	31	100

The results also showed the beginning of hemodialysis from ≤ 3 years for 76.5% of patients, the number of hemodialysis for 91.8% of patients was 3 times /week, there was presence of patient with renal failure in the family for 36.5% (32.3% and 29% of patients had father or mother and brother or sister with renal failure respectively) (Table 4).

A study of Lou *et al.,* (2007) showed that the causes of chronic renal failure among patients were nephroangosclerosis (35.7%), diabetic nephropathy (28.6%), glomerulonephritis (21.4%) and other diseases. Also a study of Al-Saran *et al.,* (2009) showed that the causes of chronic renal failure in patients were some diseases such as diabetic nephropathy (20%) and hypertension (6%), and the incidence of comorbid diseases associated with maintenance hemodialysis patients were cardiovascular disease (13%), central nervous system disorders (8%), gastrointestinal tract diseases (3.5%) and other diseases. Another study of Odufuwa and Fadupin (2011) showed that the causes of chronic renal failure among hemodialysis patients were hypertensive nephrosclerosis (35%), diabetic nephropathy (20%) and other diseases, and the main symptoms were nausea (90%), vomiting (100%), diarrhea (60%), dizziness (100%) and oedema (75%). A study of Cupisti *et al.,* (2010) showed that a good nutritional status in hemodialysis patients who were in stable condition, free from sever co-morbidities or complications or acute events, the results did not match the current study.

Also some results of this current study disagreed with some literatures such as a study of Lou *et al.,* (2007) which showed that the mean stay of CKD patients on hemodialysis was 2.67 years , also a study of Cupisti *et al.,* (2010) showed that the time on dialysis was 11.67 years for CKD patients, but a study of Al-Saran *et al.,* (2009) showed that the mean duration of dialysis of patients with ESRD was 1.9 years. also a study of Espahbodi *et al.,* (2014) showed that hemodialysis for less than 12 months was most frequent (30.04%).

The results in Table (5) showed patients` blood parameters, the mean of urea was 21.7 ± 8.3 mmol /L, the mean of creatinine was 746.7±256.8 umol/L, the mean of albumin was 35.8±7.9g /dl, the mean of hemoglobin was 10.3±1.8g /dl. The results also showed the level of some nutrients in patients` blood such as potassium, phosphorus, sodium and calcium, the mean of K was 4.9±1.1 mmol / L, the mean of P was 1.6±0.6 mmol/L, the mean of Na was 136.7±7.2 mmol/L and the mean of Ca was 2.3±0.5 mmol/L.

Comparing with reference, the level of creatinine was very high, and the level of phosphorus was slightly high, the level of hemoglobin and albumin were low, but the other patients` blood parameters were normal.

Table 5 Patients` blood parameters

Variables	Mean ± SD**	The reference*
Urea (mmol / L)	21.7 ± 8.3	1.7 – 83 (mmol / L)
Creatinine (umol / L)	746.7 ± 256.8	44 – 97 (umol / L)
Albumin (g / dl)	35.8 ± 7.9	38 - 50 (g / dl)

Potassium (mmol / L)	4.9 ± 1.1	3.5 – 5.6 (mmol / L)
Phosphorus (mmol / L)	1.6 ± 0.6	0.87 – 1.45 (mmol / L)
Sodium (mmol / L)	136.7 ± 7.2	133 – 152 (mmol / L)
Calcium (mmol / L)	2.3 ± 0.5	2.0 – 2.6 (mmol / L)
Hemoglobin (g / dl)	10.3 ± 1.8	12 – 16 (g / dl)

** (www.moh.gov.sa), SD**= Standard deviation.*

Some results of this current study disagreed with some literatures and some agreed, such as a study of Fassett *et al.*, (2007) which showed the level of creatinine was 223.4±110 mmol/ L for the patients, a study of Lou *et al.,* (2007) showed that the level of albumin was 3.85±0.5 g/dl, and the level of hemoglobin was 12.2±0.8g/dl for the patients, also a study of Cupisti *et al.,* (2010) showed that the level of albumin was 3.7±0.4 g/ dl, and the level of phosphorus was 4.7±1.3 mg/ dl for the patients, the results disagreed this with current study. But a study of Al-Saran *et al.,* (2009) which showed that the level of calcium, phosphorus and albumin were 2.25±0.6 mmol/L, 1.5±0.4 mmol/L and 34±4.4g/L, also a study of Espahbodi *et al.,* (2014) showed that the level of hemoglobin was under 11g/ dl for patients with end of stage renal disease (73.34%), the results sort of agreed with this current study.

4-Patients` nutritional Knowledge and dietary intake:

The results in Table (6) showed that the level of nutritional knowledge of nearly half patients is medium (51.8%) , and the low level of nutritional knowledge reached 30.6 % of patients, the cause of the result may be due to low educational level of most patients.

Table 6 Patients' nutritional knowledge

The level of nutritional knowledge	Frequency	Percentage (%)
Low (Poor)	26	30.6
Medium (Good)	44	51.8
High (Excellent)	15	17.6
Total	85	100

The patients` dietary intake in Table (7) showed that the patients` intake of nearly all nutrients is low (insufficient) compared with Recommended dietary allowance for CKD (National Kidney Foundation, 2000; www.cdn.intechopen.com).

Daily dietary intake of energy was 932.2±345.2 kcal, of protein was 36±14.8g, of fat was 28.8±15.2g, of calcium was 290.8±206.7mg, of phosphorus was 558.3±301.8mg, of vitamins A, C, B1 and B2 were 252.6±188.7mg, 19.5±22.9mg, 0.6±1.0mg and 0.7±0.6 mg respectively, and daily dietary intake of fiber was 5.5±3.1g, but only daily dietary intake of iron was adequate, because of patients taking iron supplementation.

Table 7 Patients` dietary intake

The item	Mean ± S.D.**	Recommended dietary allowance for CKD[1]
Energy (calorie)	932.2 ± 345.2	35 kcal/kg (2369.5 kcal)[2]
Protein (g)	36.8 ± 14.8	1.2 – 1.4 g/kg (81.24 – 94.78 g)[2]
Fat (g)	28.8 ± 15.2	25 – 35% of total energy (65.8 – 92 g)[3]
Carbohydrate (g)	130.8 ± 50.1	Rest of calories (complex carbohydrate preferred)
Fiber (g)	5.5 ± 3.1	20 – 25
Iron (mg)	10.1± 6.7	10 - 18
Calcium (mg)	290.8 ± 206.7	1000 - 1500

Phosphorus (mg)	558.3 ± 301.8	17 mg/kg (1151 mg)[2]
Vitamin A (mcg)	252.6 ± 188.7	800 - 1000
Vitamin C (mg)	19.5 ± 22.8	30 - 60
Vitamin B1 (mg)	0.6 ± 1.0	1.1 – 1.2
Vitamin B2 (mg)	0.7 ± 0.6	1.1 – 1.3

*S.D.**= Standard deviation, 1-National Kidney Foundation (2000), (www.cdn.intechopen.com), 2- The recommended of energy, protein, phosphorus: RDA of CKD/ kg×mean of patient`s weight, 3- The recommended of fat: total energy×25 –35/100/9*

The causes of low dietary intake of patients may be due to some reasons such as low educational level, low nutritional knowledge level of most patients and low family income of most patients. The results agreed with the reasons mentioned by Kabantar-Zadeh (2011), whereas there are many risk factors incident CKD such as low levels of income, education and advanced age.

A study of Lou *et al.,* (2007) showed that protein daily intake for the patients was adequate (90.8±9g), which represent 1.33±0.2g/kg, this disagreed with current study, but energy daily intake was insufficient (2018.5±104 kcal), which represent 29.5±2.1 kcal/kg, also calcium and phosphorus daily intake were low (754±184 and 1067±193 mg respectively, this results sort of agreed with current study.

A study of Cupisti *et al.,* (2010) showed that energy and protein daily intake for the patients were 1900±586 kcal and 70±22.9g respectively, the intake of energy and protein were insufficient, but high than the intake of patients in this current study. Some studies assessed the nutritional status of patients with chronic renal disease, such as a study of Al-Saran *et al.,* (2009) which showed that the levels of nutritional status of patients were normal (68%), mild to moderately malnourished (24%) and severe malnutrition (8%). Also a study of Cupisti *et al.,* (2010) showed that the nutritional status was good for most of patients. A study of Odufuwa and Fadupin (2011) showed that hemodialysis was observed to significantly reduce the nutritional status of hemodialysis patients. Another study of Espahbodi *et al.,* (2014) showed that 96.19% of patients had various degrees of malnutrition.

The result in Table (8) showed the means percentage contribution of carbohydrate, protein and fat from total energy, the contribution of carbohydrate was 56.7±7.8%, the contribution of protein was 16.2± 4.1% and the contribution of fat was 27.3±7.0 % of total energy.

Table 8 The means percentage contribution of carbohydrate and protein and fat from total energy

Nutrient	Mean ± Std. Deviation
Carbohydrate	56.7 ± 7.8
Protein	16.2 ± 4.1
Fat	27.3 ± 7.0

The result of current study disagreed with a study of Lou *et al.,* (2007), which mentioned that carbohydrate; protein and fat contribute 43.1%, 19% and 37.9% from total energy respectively for hemodialysis patients.

5- The effect of the variables on dietary intake:

The effects of some variables have been studied, these variables are: age, body mass index (BMI), educational level, level of nutritional knowledge, social status, the onset and number of hemodialysis, family income level and place of residence. The results showed that intake of some nutrients were different significantly between patients according to some variables, for example energy, protein and carbohydrate means intake were different significantly between patients depending on age, and the highest intake are for age ≤ 25 years (Table 9).

Table 9 The means of some nutrients intake depend on age

The item	The age						F & (P–values)
	< 21 years	> 21 – 25 years	> 25 – 30 years	> 30 – 35 years	> 35 – 40 years	≥ 40 years	
Energy	1394.7 ±	1337 ±	338 ± 0.0	1064.6 ±	807.5 ±	914.5 ±	2.690

	0.0	332.6		389	188	336.6	(0.027)
Protein	42.6 ± 0.0	56 ± 12.8	16.6 ± 0.0	37 ± 16	30 ± 11	36.8 ± 14.5	2.295 (0.053)
Carbohydrate	217 ± 0.0	170 ± 48.9	51.8 ± 0.0	142 ± 53	104 ± 35.7	131 ± 49	2.313 (0.052)

The mean intake of iron for all female patients with renal failure was low compared to the recommended dietary allowance for CKD except for whom obese (12.6±8.1), and the intake was different significantly between patients depend on body mass index category, and the highest intake was for obese (Table 10).

Table 10 The means intake of Iron depend on body mass index category

Under weight	Normal	Over weight	Obese	F	P - value
9.2 ± 4.1	7.2 ± 4.9	9.5 ± 6.0	12.6 ± 8.1	2.874	0.041

The intake of fat was different significantly between patients depend on educational level, and the highest intake were for the patients with higher educational level (Secondary school – Institution) (Table 11).

Table 11 The means intake of fat depend on educational level

Illiterate	Primary– Middle School	Secondary school - Institution	F	P - value
27.4 ± 14.4	28 ± 13	42.6 ± 23	3.304	0.042

The mean intake of vitamin A for all patients was low compared to the recommended dietary allowance for CKD, the intake significantly was different between patients depending on nutritional knowledge level, and the highest intake was for the patients with the lowest nutritional knowledge level (Table 12).

Table 12 The means intake of vitamin A depend on nutritional knowledge level

Low	Medium	High	F	P - value
334 ± 176	235.8 ± 201	159.7 ± 107.8	4.809	0.011

The mean intake of vitamin C and B1 for all patients was low compared to the recommended dietary allowance for CKD and the intake were differed significantly between patients depend on number of HD. The highest intake of vitamin C was for patients undergoing HD > 3 times/week, and the highest intake of vitamin B1 was for patients undergoing HD 2 times/week (**Table 13**).

Table 13 The means intake of vitamin C & B1 depend on number of HD (weekly)

Nutrients	2 times	3 times	> 3 times	F	P - value
Vitamin C	6.6 ± 3	19 ± 22	54 ± 46	3.259	0.044
Vitamin B1	2.8 ± 2.8	0.5 ± 0.7	0.2 ± 0.1	11.515	0.000

The mean intake of protein and vitamin C for all patients was low compared to the recommended dietary allowance for CKD and the intake was differed significantly between patients depending on family income level. The highest intake of protein was for patients with family income ranged from 6000 to < 10000 SR/month, and the highest intake of vitamin C are for the patients with family income ranged from 3000 to < 6000 SR /month (low income) (Table 14).

Table 14 The mean intake of protein & vitamin C depend on family income level (SR/monthly)

Nutrients	≤ 3000	>3000 - <6000	6000 - <10000	> 10000	F	P - value
Protein	38.8 ± 16	30 ± 10	42 ± 13.6	28.7 ± 6	2.966	0.037
Vitamin C	12.8 ± 12.5	35.8 ± 38.8	21 ± 21.8	17 ± 15	4.490	0.006

The mean intake of other nutrients were not significantly different (> 0.05) between patients depending on variables (age, educational level, nutritional knowledge, BMI, number of HD and family income level) .Whereas some variables didn't have an effect on dietary intake (social status, place of residence and onset of HD).

Some researchers studied the relationship between dietary intake and some factors (like age, family income level, number of HD, educational level and BMI) such as a study of Al-Saran *et al.,* (2009) which showed that severe malnutrition was significantly correlated with duration of dialysis. A study of Cupisti *et al.,* (2010) showed that age was the only parameter that inversely and significantly correlated with normalized protein intake. Another study of Espahbodi *et al.,* (2014) showed that no significant association between nutritional status and patients` age and duration of hemodialysis.

4. CONCLUSION

The results showed that daily dietary intake of most nutrients were insufficient specially energy, protein, fat, calcium, phosphorus, and vitamins A, C, B1 and B2 , also fiber . Dietary intake of some nutrients were significantly affected by some variables (like age, educational level, nutritional knowledge, BMI, number of HD and family income level), whereas some variables did not have an effect on dietary intake (like social status, place of residence and onset of HD). The results also showed that 32.9 % were overweight and 35.3% obese, all of patients are sedentary and light active, 62.4 % were illiterate and the level of nutritional knowledge of 30.6 % of the patients were low. The onset of HD for 65% of female patients with renal failure was ≤ 3 years, and 91.8 % of the patients undergoing HD three times weekly. Based on these results, the study recommends hospitals` administration to organize continuous classes in order to educate patients with chronic renal failure who need hemodialysis about correct nutrition, in addition periodic nutrition consultations with dietician and provision of a detailed diet plan for each patient is very helpful, the study also recommends to assess patients` nutritional status periodically to follow up the nutritional status of patients and success rate of interventions.

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