Assessment of Nutritional status of Haemodialysis Patients

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Abstract:

Malnutrition is very common in patients on hemodialysis. Assessing the malnutrition status of haemodialysis patients is important for treatment and better health of the patients. Anthropometric measurements, both parts of anthropometry are used to assess the nutritional status.

Objective:

To assess the nutritional status of hemodialysis patients.

Methods:

A cross-sectional study was conducted at Bahria International Hospitals, Lahore and completed within 9 months using the convenient sampling technique. The data were collected through pre-tested questionnaire from 385 dialysis patients. Data were analyzed in the form of mean, frequencies, percentage and standard deviation with the help of SPSS version 22.0.

Results:

50.5 % of the patients had normal body mass index (BMI) and 9.2% had BMI less than 18 which were underweight according to the WHO criteria. The mean and standard deviation of mid upper arm circumference (MUAC), mid arm muscle circumference(MAMC) and skin fold thickness (SFT) were 13.22±6.16, 20.40±4.67 and 1.67±0.54. Biochemical data showed mean and standard deviation of urea, creatinine and albumin were 104.37±38.63, 3.46±7.2716 and 3.46±0.72. Dietary intake included average energy intake i.e. 612.16±243.95, protein intake i.e. 30.61±10.98, fluid i.e. 738.11±223.06, sodium intake i.e. 949.60±578.96 and potassium intake i.e. 918.77±359.52.

Conclusions:

Most of the patients on haemodialysis were malnourished. These patients need dietary advice, care and monthly routine checkup of biochemical and anthropometric data to prevent from further complications.

Keywords:

HaemodialysisNutrional Assessment, Malnutrition, Dietary Intake.

Introduction:

Chronic kidney disease is a major issue in Pakistan. Chronic kidney disease is a slow progressive and irreversible loss of kidney functions. Dialysis treatment should be used when the kidneys are unable to functions properly.[1] Punjab has the highest percentage (19%) of among all the provinces of Pakistan in 2013.[2] Hemodialysis not only lengthen the life of patients with chronic kidney disease but also results in series of metabolic and nutritional changes with acute and chronic complications. Poor nutritional status of these patients is associated with increased hospitalization and mortality rate. Nutritional assessment of these patients is a challenging and critical task for providing health and dietary advice to the patients. [3] There are different methods to assess the nutritional status of haemodialysis patients. The nutritional parameters include anthropometric measurements, clinical sign and symptoms, biochemical data, diet history, food habits and frequency.[2] There are also different tools to assess the malnutrition status of these patients. These forms are subjective global assessment form, mini nutritional assessment form, and malnutrition inflammation score.[4]

Different causes of malnutrition includes hormonal and metabolic changes, inadequate food intake, dietary restrictions, drug nutrient interaction, gastrointestinal disorders, and nutrient absorption, insufficient dialysis and other co morbidities.[2,3]

Kenyar K *et al*., studied evaluation of nutritional parameters of haemodialysis patients and concluded that their age seem to be negatively associated with albumin. The mean and standard deviation of creatinine and heamoglobin were 8.4±1.8 and 11.2±1.0. Body mass index BMI and MAMC were 23±4 and 22±3. Researcher found significant positive correlation between age of patients and C reactive proteins, mid arm muscle circumference and LDL cholesterol, body mass index, albumin and hemoglobin whereas negative correlation was found between age, albumin, creatinine, parathyroid hormone and dialysis vintage versus MAMC.[5] Lou LM *et al*., concluded that improper intake of nutrient is one of the important cause of malnutrition. They examined more than 62 years old 28 Haemdialysis patient's diet and compared nutrients intake with recommended haemodialysis intake and contrast food groups consumption with the theoretical ideal based on Mediterranean diet. They stated that improper caloric intake cause nitrogen imbalance. They observed that their eating habits are healthy and natural, but there is a deficit in slowly absorbed carbohydrates and olive oil intake, and large intake of red and processed meats. The change in their dietary patterns could reduce the saturated fats and increase the energy intake, obtaining a balanced diet integrated into our geographic region and culture.[6] In another study the mean intake of energy was lower than the recommended intake i.e 19.4±6.8kcal/day. The mean dietary protein was 0.8±0.4g/kg/day. Serum albumin levels were 3.37±6.5gdL^{-1}and heamoglobin concentration was 11.4gdl^{-1}.[7]In a study on screening of malnutrition 75% patients were underweight; BMI, MAMC and MUAC were 16.6±3.09, 21.5±4.50 and 19.7±8.86. He concluded that nutritional parameters clearly depicted the presence of protein energy malnutrition in haemodialysis patients which is attributed to low caloric intake.[8]In a study on nutritional parameters and mortality incidents of hemodialysis patients, the serum creatinine was 8.9±3.6 , BMI was 3.9±4.3, MAMC was 90.6±14.0, SFT was 8.1±52.6, energy intake was 26.2 ±8.6 and protein intake was 0.99±0.37.[9]In a study, the age was 42.56 ± 16.32, BMI was 19.15±2.45, SFT was 0.85±4.33, MUAC 20.63±2.47, MAMC 17.23±2.26, serum albumin and creatinie was 4.10±0.60, 9.95± 2.41.[10]55% patients had normal BMI, 17% had low BMI and 13% had BMI more than 30. Serum albumin, creatinine and urea were also elevated.[11] In a study on Chinese population the mean and standard deviation of age, albumin, BMI, SFT, MUAC and MAMC were 62.70±14.21, 39.01±5.01, 21.6±3.1, 10.7±6.5, 25.78±2.09 and 22.43 ±3.26.[12]In a study on biochemical parameters of malnutrition, the mean and standard deviation of age, albumin, urea and creatinine were 38.11±11.6, 3.1±0.33, 134±20 and 11.32±3.33.[13] Bibi H *et al*., explained the BMI classification. 73.4% patients had low BMI, 12.1% had normal BMI and 12.1% had high BMI.[14]Georges concluded that improper dietary intake may increase the risk of cardiovascular diseases and dietary guidelines are helpful tool in reducing this risk factor.[15]Amel *et al.,* studied the evaluation of nutritional assessment. The average age was 46.7 years and the gender ratio was 1.18. Mid upper arm circumference was 27.2 ±5.6cm, average BMI was 24.4 kg/m^2, average serum albumin was 33.6g/dl and the average energy intake was 1.02±0.44.[16]

The purpose of study was to find out the Nutritional Assessment, if found malnutrition then tried to create the awareness for its prevention.

Methods:

A cross sectional study was conducted in Bahria International Hospital, Lahore. Data were collected form 382 patients of maintenance

hemodialysis. The anthropometric assessments were recorded using weight with weight ma chine and height with measuring device for height to calculate BMI, skin fold thickness, mid upper arm circumference and mid arm muscle circumference wererecorded from m easuring tape and skin fold caliper. The BMI, MUAC, MAMC and SFT were evaluated with the references values of world health organization (WHO). The references ranges of BMI was 18.5-24.5, MUAC was Male=26-29cm, Female=26-28.5cm, MAMC was M=23-25cm, F=20-23cm and SFT was M=11-12.5, F=15-16.5 respectively.[17] Biochemical data were taken from the laboratory reports and evaluated with the normal ranges of urea 18-50mg/dl, uric acid 0.5-1.5mg/dl, creatinine M=4-7 and F= 3-6, albumin 3,5-5.5g/dl, calcium 8.2-10.5mg/dl, potassium 3.5-1.5 mmol/L, sodium 135-145mmol/L, phosphate 0.8-1.5 mmol/L, phosphorous 2.7-4.5mg/dl, red blood cells M=5-7, F=4-6, hemoglobin M=13-17, F=12-15 and mean corpuscular volume 77-99 f/l.[18]The serving and portion size were evaluated using Pakistani standard servings and their calories and nutrients were counted using the standard formulas. The data were analyzed using the SPSS version 22.0. The results were computed in the form of frequency, percentages, mean and standard deviation.

Results:

Total number of patients in study was 382 out of which 197 were males and 185 were females with the mean age of 42.37±11.573. 33.5% patients were on dialysis from the past 6 months, 52.4% patients were on dialysis from 1-2 years and 14.1% were on dialysis for more than 3 years, as shown in Table 1.

Sr #	Duration of dialysis	Frequency	Percentage
1.	Past 6 months	128	33.5
2.	1-2 years	200	52.4
3.	More than 3 years	54	14.1
4.	Total	382	100.0

Table 1: Duration of dialysis

According to Table 2,the mean height of the patients was 163.26±10.48, mean weight was 64.91±12.71, mean ideal body weight was 57.43±9.20, mean usual body weight was 65.99±15.92, mean body mass index was 24.13±5.56, mean mid upper arm circumference was 13.22±6.16, mean mid arm muscle circumference was 20.40±4.67 and mean skin foldthickness was 1.67±0.54. Mid upper arm circumference, mid arm muscle circumference and skin fold measurements showed difference from the normal ranges due to poor intake.

Variables	Ranges	Mean ±SD
Height (cm)	135-190	163.26±10.48
Weight (Kg)	34-125	64.91±16.71
Ideal body weight(Kg)	40-86	57.43±9.20
Usual body weight (Kg)	35-100	65.99±15.92
Body mass index (Kg/m^2)	13-45.92	24.13±5.56
Mid upper arm circumference (cm)	11-31	13.22±6.16
Mid arm muscle circumference (cm)	18-28.73	20.40±4.67
Skin fold thickness (mm)	12.7-101.6	1.67±0.54

Table 2: Anthropometric characteristics of patients undergoinghaemodialysis

According to table 3,9.2% patients were underweight, 50.5%were having normal weight, 19.1% were overweight, 18.1% were obese with the category of I, and 0.8% and 2.4% were in the categories of II and III respectively according to WHO ranges.

WHO BMI ranges	Ranges	Frequency (n=382)	Percentage
Under weight	<18.0	35	9.2%
Normal	18.5-24.9	193	50.5%
Overweight	25.0-29.9	73	19.1%
Obesity grade I	30.0-34.9	69	18.1%
Obesity grade II	35.0-39.9	3	0.8%
Obesity grade III	≥40.0	9	2.4%

Table 3: BMI classifications of patients

As shown in Table 4, the ranges of all biochemical tests which showed great difference with the normal ranges used for references. The renal function

tests, blood electrolyte and hematological aspectswere high with the normal ranges. Levels of red blood cells, hemoglobin and mean corpuscular volume was low due to the blood loss during dialysis and less intake of protein. Urea, uric acid, creatinine, calcium, sodium, potassium and phosphate were high due to poor intake, inflammation and renal failure

Variables	Ranges	Mean ±SD
Urea (mg/dL)	10-99	104.37±38.63
Uric acid (mg/dL)	1.4-9.4	5.94±1.59
Creatinine (mg/dL)	5.81-16.40	3.46±7.2716
Albumin (g/dL)	1.10-7.60	3.46±0.72
Calcium (mg/dL)	6.80-12.40	8.85±1.103
Potassium (mmol/L)	3.70-6.20	5.13±0.64
Sodium (mmol/L)	101.35-193.00	140.24±11.78
Phosphate (mmol/L)	3.4-12.2	7.03±1.99
Phosphourous (mg/dL)	2.10-10.2	5.90±1.85
Red blood cells (mg/dL)	02.35-10.50	3.91±1.09
Hemoglobin (g/dL)	6.20-82.80	11.42±8.3
Mean corpuscular volume (f/L)	1.00-95.60	83.01±12.42

Table 4: Biochemical measurements

According to table 5, the intake of energy, protein, fluid, sodium and potassium in patients was less than the recommended intake with the difference of -1307±339.77,-35.67±13.76, -135.1±227.31, -1529.6±628.1,-1282.0±417.0 respectively. Patients were taking fewer intakes of total calories, proteins, fluids, sodium and potassium than the recommended intake which was the indicator of severe malnutrition, muscle wasting and low BMI. The fewer intakes were because of physiological disease, nausea, vomiting during the procedure of dialysis.

Variable	Actual intake	Recommended intake	Difference
Average energy intake (kcal/day)	612.16±243.95	1920±301.98	-1307±339.77
Average protein intake (g/day)	30.61±10.98	66.28±9.03	-35.67±13.76
Average fluid intake ml/day	738.11±223.06	875.00±0.00	-135.1±227.31
Average sodium intake (mg/day)	949.60±578.96	2473.87±204.71	-1529.6±628.1
Average potassium intakes (mg/day)	918.77±359.52	2196.08±301.97	-1282.0±417.0

Table 5: Intake of protein, energy and fluids

Discussion:

In current study assessment of nutritional status of patients on hemodialysis showed that the prevalence of chronic kidney disease which leads to hemodialysis was higher among malesi.e 51.6 than females which were 48.9%.These findings were similar with the findings of Helle MP *et al.*,[19] and Mandhar D *et al.*,[10].The BMI findings showed that less number of patients had BMI within a normal range. The finding of BMI ranges were more close to the study conducted in Peshawar. According to that 54.5% patients have BMI less than 23kg/m^2 and this study had 48% patients who had BMI less than 23kg/m^2.[14] These findings were also similar with the findings of Sedhain which had 55% normal BMI, 17% had low and 13% had high BMI.[20] The ratio of muscle wasting was said to be higher in hemodialysis patients that's why the study also included MAMC, MUAC and SFTwhich are important indicators of muscle wasting.The study had mean and standard deviation of MAMC 20.4± 4.67; MUAC 13.22±6.16 and SFT were 1.67±0.54. It clearly showed that the patients on hemodialysis were severely malnourished. The mean and standard deviation of study was closely related to the study of Roy LG *et al.*, which had mean and standard deviations of MAMC, MUAC and SFT were 19.7±8.86, 21.5±4.50 and 9.0±5.12 respectively.[8] According to the Amel H *et al.*, study, the diagnosis of protein energy wasting (PEW) can be made using four main diagnostic criteria: 1.Biochemical measures (urea, cretenin, albumin), 2. measures of BMI, 3. measures of muscles mass (MAMC, MUAC SFT), 4. Measures of dietary intake (protein, calories, potassium, sodium).[16] So based on the evidence, mostly patients were suffering from PEW. Mean and standard deviation of urea, creatinine and albumin were 104.37±38.63, 3.46±72716, 3.46±0.72 which was closed to the study of

Amel H *et al*., and Roy LG *et al*., [16, 8] The dietary intake of protein, calorie, potassium, sodium and fluid showed a great difference with the recommended intake. Patients of the study were taking less energy and nutrients than the recommended intake. The caloric and protein intake in a study of Agboton BL *et al*., was 1471±601 kcal/day and 74.3±16.6 g/day[21]. These findings also show the status of malnutrition similar with the findings of Georges K *et al*.,.[15]

Conclusions:

The weight of the patients was not within the normal range because they were getting fewer calories than their bodily requirements. As most of the patients were malnourished it is recommended that they need proper dietary counseling, routine checkups so they will be able to live a better life to prevent further complications. Most of the patients were suffering from protein energy malnutrition because they were taking less protein and the large amount of protein was also depleted during dialysis.

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