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Nutritional Status of Haemodialysis Patients

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SUMMARY

Malnutrition is common in chronic renal failure patients; to assess its prevalence we conducted a prospective hospital based study at haemodialysis unit of Shaikh Zayed Hospital, Lahore. All patients on regular haemodialysis were included in the study. Nutritional status was checked by symptoms, anthropometrics measurements [height, dry weight, body mass index (BMI), Mid arm circumference (MAC), triceps skin fold thickness (TSF), mid arm muscles circumference (MAMC)] and laboratory data (hemoglobin, hematocrit, blood urea nitrogen, serum albumin, total protein, and lipid profile).

Total number of patients was fifty-one. Twenty-four patients were male and twenty-seven were female. Mean±SD age was forty-three years. Majority of the patients 27 (53%) were between twenty one to fifty years. Major cause of end stage renal disease was chronic glomerulonephritis in 19(35%) patients followed by diabetic nephropathy 14(27%) and hypertensive nephropathy in 11(21%). Hemoglobin and hematocrit was normal only in seven patients and rest of the forty-four patients were anemic. Mean serum albumin was 3.64±0.59 gm/dl, total protein 7±0.86 gm/dl, serum cholesterol 170±43.56 mg/dl, LDL 96.94±40.76 mg/dl, HDL 45.7±19.61 gm/dl, serum triglyceride 176.8±99 gm/dl. Adequacy of dialysis, Urea Reduction Ratio (URR) was adequate only in 16(31%) and rest of the patients 35(69%) were getting inadequate amount of dialysis. On, anthropometric measurements, majority of the patients were malnourished and they were in moderate to severe category of malnutrition. Symptoms of uremia (nausea, vomiting, body aches & pain and pulmonary oedema) were more in patients who were getting inadequate dialysis (p value<0.05).

Majority of patients are anaemic, undernourished and factors responsible were economical, late referral to nephrologist, inappropriate dietary restrictions and inadequate dialysis.

Key words. Haemodialysis, under nutrition, anthropometric measurement.

INTRODUCTION

As kidney function deteriorates and patients go for the maintenance haemodialysis, protein and calorie intake fall on average below the recommended requirement[1-2] which leads to malnutrition. Malnutrition is an important recognized predictor of morbidity and mortality[3-4] and very common in haemodialysis patients[5-6]. The etiology of malnutrition in haemodialysis patient is multi factorial including inadequate nutrition intake, catabolic stimuli, direct effect of the haemodialysis and socioeconomic status. It is know that patients with a lower serum albumin level at the start of dialysis therapy have greater mortality and morbidity rates[7, 8, 9] Except malnutrition, other factors responsible for increased morbidity include old age, male sex, white race, diabetes mellitus, non-renal medical co morbidities, and modifiable risk factors like lower dose of dialysis and lower hematocrit level[10] Adequate amount of haemodialysis and adequate protein intake are closely interlinked.

Aim of the study

To assess the nutritional status of haemodialysis patients and factors responsible for malnourished patients.

PATIFNTS AND METHODS

This study was conducted at haemodialysis unit of Shaikh Zayed Hospital, Lahore. Patients who were on regular haemodialysis for more than three months were included in study. Symptoms of uremia were recorded and physical examination done. Nutritional status was checked by anthropometric measurements[11] including height, dry weight, body mass index (BMI Kg/msq), Mid arm circumference (MAC) on the side without vascular access with a tape with the arm hanging and relaxed, Triceps skin fold thickness (TSF mm) and mid arm muscles circumference (MAMC cm). Triceps skin fold thickness was measured with the help of vernier caliper. Mid arm muscles circumference was derived from mid arm circumference and triceps skin fold thickness using following formula:

$$MAMC\ (cm) = MAC\ cm - (0.314 \times TSF\ mm)$$

Mid week pre dialysis blood was drawn for measuring hemoglobin, hematocrit, mean corpuscular volume, blood urea nitrogen, serum albumin, total protein, and lipid profile. Two blood samples were drawn during dialysis (pre-dialysis, post-dialysis) to assess the adequacy of dialysis. Following formula was used for checking adequacy of dialysis:

Urea Reduction Ratio[12].
URR = 1- Post dialysis urea/Pre dialysis urea.

RESULTS

Total number of patients were fifty-one. Twenty-four patients were male and twenty-seven were female. Mean age was 43 years with range of 11-73 years. Majority of the patients 27 (53%) were between 21-50 years. Major cause of end stage renal disease was chronic glomerulonephritis in 19(35%) patients followed by diabetic nephropathy 14(27%) and hypertensive nephropathy in 11 (21%). Mean duration on dialysis was 19 ± 35.5 months. Twenty-six patients (51%) were on twice weekly and twenty-five (49%) were on thrice-weekly dialysis. Bio chemical and anthropometrics measurement are shown in Table 1.

Table 1: Biochemical and Anthropometric Measurements

Parameters	**Mean ± SD**
Hemoglobin (gm/dl)	7.97 ± 1.44
Hematocrit (%)	25.53 ± 5.06
Mean Corpuscular Volume (fl)	86.85 ± 10.95
Mean Corpuscular Hb Conc. (%)	33.25 ± 9.19
Mean Corpuscular Hb (picograms)	28.33 ± 2.37
Serum Albumin (gm/dl)	3.64 ± 0.59
Serum Total Protein (gm/dl)	7.012 ± 0.86
S. Cholesterol (mg/dl)	170 ± 43.56
LDL (mg/dl)	96.94 ± 40.74
HDL (mg/dl)	45.7 + 19.61
S.Triglyceride (mg/dl)	176± 99
Anthropometric Measurements	**Mean ± SD**
Weight (kg)	56.97± 14.42
Body Mass Index (Kg/msq)	20.70 ± 4.01
Triceps Skin Fold Thickness (mm)	12 ± 2.80
Mid Arm Circumference (cm)	24.9 ± 4.09
Mid Arm Muscle circumference (cm)	21.17 ± 3.77

Hemoglobin and hematocrit were normal only in seven patients and rest of the patients[44] were anemic. Serum albumin and total protein was normal in 30 (60%) patients and rest of the patients 21(44%) were hypoalbuminic. Mid week predialysis blood urea nitrogen was less than 70 mg/dl in fifty percent of the patient. Total Lymphocyte count was adequate (>1500/mm^3) in 30 (60%) patients. Anthropometrics measurement (dry weight for height, mid arm muscle circumference and triceps skin food thickness) were divided into normal, mild, moderate, severe[13]. Majority of the patients were malnourished and they were in moderate to severe category of malnutrition as shown in Table 2. Parameter of adequacy dialysis (URR) was adequate only in 16(31%) and rest of patients 35 (69%) were getting inadequate amount of dialysis. Symptoms of uremia were compared using Z score. Symptoms of uremia (nausea, vomiting, body aches & pain and pulmonary oedema) were more in patients who were getting inadequate dialysis (p value < 0.05).

Table 2: Anthropometric measurements & adequacy of dialysis

Measurements	*p* Value	URR >70%
Weight for Height		
Normal to Mild	> 0.05	12
Moderate to Severe	<0.05	4
MAMC (cm)		
Normal to Mild	>0.05	13
Moderate to Severe	<0.05	3
TSF (mm)		
Normal to Mild	> 0.05	10
Moderate to Severe	<0.05	6

DISCUSSION

As kidney function deteriorates and patients go in to chronic renal failure with glomerular filtration rate (GFR) less than 10 ml/min, their protein intake is reduced. Reduced protein intake is due to inappropriate dietary restrictions, anorexia (inadequate protein or calorie intake), taste alteration, intercurrent illness and frequent hospitalization. Metabolic acidosis (stimulation of amino acids and proteins degradation) and resistance to anabolic hormones due to uremic toxins causes persistent catabolism. As patient goes for maintenance dialysis, loss of proteins, amino acids, nutrients and vitamins occur during the dialysis treatment.

In our study the most common cause of ESRD was chronic glomerulonephritis followed by diabetic and hypertensive nephropathy, which is different from European countries[14] but similar to Korea[15]. Low standards of living and poor socioeconomic status, improper health facilities and illiteracy predisposes to glomerulonephritis causing ESRD. In European countries diabetes mellitus and hypertension are leading causes of ESRD[16].

In this study hemoglobin and hematocrit were normal only in seven (14%) patients and rest of patients were anemic which is entirely different from international literature. Our mean hemoglobin and hematocrit were 7.97±1.44 gm/dl, 25.53±5.60% respectively, which is much less as compared to other studies[17-18] in which mean hemoglobin and hematocrit were 12.1±0.6 gm/dl, 36.3±3.6%. A hematocrit more than 35% was found only in seven (14%) patients but in another study 44% patients had normal hematocrit that had duration of dialysis therapy of less than 6 month and 58% patients with duration of dialysis of more than 6 months[16].

Both clinical and in vitro studies show that renal failure inhibits erythropoiesis through bone marrow suppression by retained nitrogenous inhibitors of erythropoiesis (19-23). Along with these effects of renal failure other factor like economical condition is an important factor. Cost of haemodialysis is about Rs.2,50,000/year, but the per head income is less than Rs. 25,000/year. With such a gap in income and consumption, people cannot afford even regular hemodialysis. How can they afford expensive treatment for anemia in the form of erythropoitin and iron supplementation? Majority of our patients are getting inadequate amount of dialysis and inadequate dialysis causes anemia. Our mean URR is 63.24±12.64%, which is less (72.7±6.4%) as compared to a study in New York[17]. According to this study, URR less than 70% at both dialysis facility and individual patients' levels restricts the response (low hematocrit) to erythropoitin and that an inverse relationship exits between hematocrit and amount of intravenous iron administered.

Serum albumin level is altered by acute phase response, plasma volume expansion, and albumin redistribution. Because of long half-life of albumin, it does not show acute changes in protein. Due to this reason other proteins like IGF-I may be better indicator of nutritional status because it correlates well with triceps skin fold thickness[24]. Hypoalbuminemia is a major risk factor for morbidity and mortality in haemodialysis patients[7-9]. Factors responsible for hypoalbuminemic in patients may be inadequate dialysis[25], delayed gastric emptying[26], co morbid conditions and underlying inflammation[27], inadequate intake and (2) metabolic acidosis[28].

In our study majority of patients 30 (60%) were normo-albuminemic and mean serum albumin was 3.64±0.59 which is equal to Hemo study[29] 3.65±0.38 gm/dl. This better correlation may be due to multiple factors. Hemodialysis unit of Shaikh Zayed Hospital is tertiary care center and dietitians regularly visit the haemodialysis unit and provide

dietary counseling to the patients. Consultant nephrologist, trained nurses and technicians run our dialysis unit. All these factors influence the outcome of patients on maintenance hemodialysis.

Lipid abnormalities include hypertriglyceridemia, reduced HDL cholesterol fraction and an elevated very low-density lipoprotein VLDL fraction in the setting of normal cholesterol, resembling Frederickson's type 4 hyperlipoproteinemia[30]. Lipid profile of our patients does not correlate with these studies. It may be the part of generalized malnutrition as we have seen in our study.

Anthropometric measurements are cheap and easy to apply but less precise than dual energy X-ray absorptiometry (DEXA)[31]. Subjective global assessment of nutritional statues is a well-validated tool. In our study majority of the patients are in moderate to severe category of malnutrition but serum albumin is normal in 60% patients. Serum albumin may well be normal despite significant anthropometric abnormalities[25,32]. There are many factors responsible for majority of malnourished patients. Amongst these factors financial and social problems are very important. As the annual per capita income is less, patients cannot afford balanced diet, which is required for dialysis patients.

Except financial, our social set up is also responsible for such a high number of malnourished patients. Because of unawareness of the dietary recommendations for dialysis patients, non-medical and medical related personals start restricting protein right from the start of the renal failure. There is common belief among dialysis patients that protein intake leads to increase urea in blood. So they try to treat renal failure with dietary restrictions rather than dialysis. These unnecessary dietary restrictions lead to increased catabolism in body leading to rise in morbidity and mortality amongst dialysis patients. Other aspect of our social setup is that our renal patients are referred to nephrologist by the treating physicians at very late stage, which should be done earlier. There are many studies which show that early referral to nephrologist improves morbidity and mortality. For example, referral to a nephrologist within four months of starting dialysis therapy (late referral) was associated with a greater degree of hypoalbuminemia, anemia, lower GFR at the initiation of dialysis therapy, and decreased likelihood of being administered pre dialysis recombinant erythropoitin compared with patients referred less than four months (early referral) before initiating dialysis therapy[33,34]. Due to the delay in referral, chronic dialysis is started quite late which otherwise should have been started at GFR of 10ml/min[35]. Patients who start dialysis therapy at lower levels of GFR are more likely to have hypoalbuminemia, greater mortality rates[36, 37] and greater hospitalization rates[38].

CONCLUSION

In our study majority of patients were malnourished and anemic. Factors responsible for malnutrition are economical, social, late referral to nephrologist, inadequate dialysis and inappropriate dietary restrictions. Our findings raise several challenges for health care providers. Physicians, nurses and dieticians need to overcome these challenges. The dietitians play a pivotal role in the nutritional care of dialysis patient and patients should be provided with dietary counseling from the start of substitutive treatment in order to meet the recommended nutritional intake. This paper may help in generating awareness amongst treating doctors about the role of malnutrition.

RECOMMENDATION

1. Avalibility of free/subsidized dialysis facilities for poor patients.
2. Early referral to nephrologist.
3. Dietitians should regularly visit the dialysis unit.
4. Adequate amount of dialysis should be delivered and checked regularly.

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