A Comparison of the Nutritional Status of Diabetic and Non-Diabetic Hemodialysis Patients

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Abstract: ***Background**: In hemodialysis patients, malnutrition is a leading cause of morbidity and mortality. Diabetes patients on hemodialysis have a shorter life expectancy if their dietary health is inadequate. As a result, this study used anthropometric data, a malnutrition inflammation score, and a body composition monitor to determine the nutritional condition of diabetic and non-diabetic hemodialysis patients. **Methods**: Nutritional status was determined in 70 patients. Among these, 35 were diabetic hemodialysis patients and another 35 were non-diabetic hemodialysis patients. Anthropometric parameters, body composition analyzer, and malnutrition information score were used to assess the malnutrition status of hemodialysis patients. **Results**: Malnutrition is more common in diabetic individuals receiving hemodialysis than in non-diabetic patients receiving hemodialysis. There was a significant difference in muscle wasting between diabetics and non-diabetics (p<.05), as well as a significant difference in blood albumin between diabetics and non-diabetics (p<.001). A lower phase angle denotes a poor state of health, while a higher phase angle suggests a good state of health. When comparing diabetics to non-diabetics, there was a significant difference in phase angle (p0<.05). **Conclusion**: Diabetic nephropathy patients have worse outcomes than non-diabetic patients, with a statistically significant difference (p<005). Nutritional status in hemodialysis patients should be assessed on a regular basis, and early discovery of malnutrition can help to improve this condition.*

Keywords: Hemodialysis, Malnutrition Inflammation Score, Body Composition Monitor

1. Introduction

Diabetic nephropathy is now the leading cause of ESRD, affecting 33% of all individuals diagnosed with renal failure. Nephropathy can be caused by both Type 1 and Type 2 Diabetes Mellitus. The global prevalence of diabetes has risen rapidly in recent years, with over 552 million cases expected by 2030 [1.]

Malnutrition in renal failure is complicated, although low nutritional intake is regularly reported as a key contributing factor in surveys.2 Mild to moderate malnutrition affects about one-third of patients, while severe malnutrition affects 60-80 percent.

In diabetic hemodialysis patients, malnutrition is a severe problem. Malnutrition in diabetic nephropathy is caused by a variety of factors. Diabetic nephropathy is now the most common cause of ESRD, accounting for 33% of all cases.

Restrictive meal recommendations, a lack of desire, and drug-related variables all contribute to malnutrition in hemodialysis patients. However, in order to avoid protein wasting and the detrimental health effects of malnutrition, people with end stage renal disease must have their nutritional status assessed on a regular basis.3Many factors can contribute to this decline in nutritional status, including increased resting energy expenditure (REE), insulin deprivation (the anabolic effects of insulin on protein homeostasis appear to be impaired in patients with type 1 diabetes mellitus), and increased muscle protein breakdown (as reported in patients with type 2 diabetes mellitus undergoing hemodialysis.4As a result, the goal of this study was to determine the nutritional health of diabetic and non-diabetic patients. The nutritional condition of dialysis patients is a significant component in determining whether or not they are malnourished.

The main objectives of this study were (1) to compare the nutritional status of diabetic and non-diabetic hemodialysis patients, (2) to assess the anthropometric measurement profile of diabetic and non-diabetic patients, and (3) to assess the malnutrition inflammation score of selected samples.

2. Materials and Methods

The study was conducted to assess the nutritional status of diabetic and non-diabetic hemodialysis patients at the dialysis unit of tertiary hospital in Chennai.70 patients were selected by simple random sampling. The samples were then divided into groups. Group-1: 35 diabetic dialysis patients; Group-2: 35 non-dialysis patients. The research protocol of the present study was approved by the Institutional Ethical Committee of Madras Medical Mission, Mogappair, Chennai (ECR/140/Ins/TN/2013/RR-16) In this research, a self-administered questionnaire, which was designed according to the objectives of the research, was constructed and it was used to compare the nutritional status of diabetic hemodialysis patients and non-diabetic hemodialysis patients. The format of the questionnaire is enclosed with three parts, namely, anthropometric measurements, Body composition monitor, and Malnutrition inflammation score. Male and female participants between the ages of 30 and 85 were involved in the study. The study did not include children or teenagers. Patients on peritoneal dialysis were also eliminated.

Anthropometric measurements

Height and BMI were used to calculate pre-dialysis body mass. The thickness of the skin folds is a useful metric for determining adiposity and assessing body fat composition. A skin fold caliper was used to measure the thickness of the skin folds. Hand grip strength has long been recognized as a key health indicator. This influences the degree of weakness and impairment, as well as musculoskeletal function. Hand grip reference values differ depending on age and gender. Squeezing the handgrip dynamometer with either their dominant or non-dominant hand was the task.

Body Composition Monitor

The body composition monitor allows you to measure each body component separately and provides you with results. A clear picture of the sufferers' health BCM identifies the presence of malnutrition and alerts the user.5 Establish a link between malnutrition and biological indicators on a regular basis. In HD patients, they are used as indicators of nutritional status. In addition, it delivers a lot of information. Fat, protein, phase angle, and total body water are all measured. The investigator assessed the body composition of all of the chosen samples.

Malnutrition Inflammation Score

The malnutrition inflammation score is one of the valid tools to assess mortality risk and health-related conditions among dialysis patients.6 MIS is considered the CKD-specific nutritional scoring system, which helps to assess malnutrition and inflammation in renal patients. MIS contains 10 questions, which include: dry weight, dietary intake, GI symptoms, functional capacity, co-morbidities, and decreased fat stores, signs of muscle wasting, BMI, serum albumin, and serum total iron binding capacity.7Each MIS component has four levels of severity, from 0 (normal) to 3 (very severe). The sum of all 10 components results in an overall score ranging from 0 (normal) to 30 (severely malnourished). A higher score reflects a more severe degree of malnutrition and inflammation.8

3. Results and Discussion

Table 1: Anthropometric Parameters

Particular	Group	Mean	Level of significance
Skin fold thickness	Diabetic	5.22mm	NS
	Non –diabetic	6.01	
Mid Arm circumference	Diabetic	32.20	NS
	Non –diabetic	31.5	
Hand grip measurements	Diabetic	47.31	P<0.01
	Non –diabetic	35.06	

Anthropometric parameters such as skin fold thickness, mid-arm circumference, and hand grip were measured. The mean skin fold thickness in diabetic samples was 5.22 mm, whereas in non-diabetic samples it was 6.01 mm. The mean mid arm circumference in diabetic samples was 32.20 and 31.5 in non-diabetic samples. It was found that there was no significant difference in skinfold thickness and mid arm circumference between diabetic and non-diabetic samples. Hand grip measurements

Table 2: Description of Body Composition

Particular	Group	Mean± SD	T value	Level of significance
Protein	Diabetic	11.01±10.25	1.29	NS
	Non-diabetic	8.72±2.14		
Fat	Diabetic	24.09±10.20	0.81	NS
	Non-diabetic	22.09±10.20		
Fluids	Diabetic	35.30±9.60	0.72	NS
	Non-diabetic	33.77±7.94		
Phase Angle	Diabetic	5.69±3.38	2.53	P<0.05
	Non-diabetic	4.18±0.92		

The protein distribution was split into two groups, with group 1 (diabetes) having a mean and standard deviation of 11.01±10.25and group 2 (non-diabetic) having a mean and standard deviation of 8.72±146. Between diabetics and non-diabetics, there is no substantial difference in protein distribution. The mean and standard deviation of the group 1 (diabetic) was 24.09±10.20 and group 2 (non-diabetic) was 22.09±10.20. There is no significant difference in fat distribution between diabetic and non-diabetic group.

In terms of fluid distribution, group 1 (diabetes) had a mean and standard deviation of 35.50±9.60, while group 2 (non-diabetic) had a mean and standard deviation of 33.77±7.94. Between diabetics and non-diabetics, there is no substantial difference in fluid distribution. The mean and standard deviation of the phase angle between two groups were 5.69±3.38 for group 1 (diabetes) and 4.18. ±0.92 for group 2 (non-diabetic).

When comparing diabetics to non-diabetics, there is a significant difference in phase angle (p<0.05). previous studies showed that a lower phase angle indicates a poor status of health and a higher angle phase indicates a good health status[9].

Table 3: Description of Malnutrition Inflammation Score

Weight Changes	Diabetic		Non-Diabetic		Significance
	N	%	N	%	
No decreases in dry weight or weight loss< 0.5 kg	21	60	29	82.9	NS
Minor weight loss	10	28.6	4	11.4	
Weight loss more than 1 kg	4	11.4	2	5.7	
DIETARY INTAKE					
Good appetite and no deteriorate of diet intake	29	82.9	33	94.3	NS
Solid diet intake	6	17.1	1	2.9	

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Full liquid diet	0	0.0	1	2.9	
GI SYMPTOMS					
Good appetite	17	48.6	29	82.9	P< 0.01
Poor appetite	18	51.4	6	17.1	
FUNCTIONAL CAPACITY					
Normal functional capacity	30	85.7	34	97.1	NS
Occasional difficulty	4	11.4	0	0.0	
Difficulty with independent activities	1	2.9	1	2.9	
NUMBER OF YEARS ON DIALYSIS					
On dialysis less than one year	4	11.4	13	37.1	NS
Dialyzed for 1-4 years	22	62.9	20	57.1	
Dialyzed > 4 years	9	25.7	2	5.7	
DISTRIBUTION OF DECREASED FAT STORES					
Normal	22	62.9	33	94.3	P<0.01
Mild	13	37.1	2	5.7	
SIGNS OF MUSCLE WASTING					
Normal	26	74.3	32	91.4	P<0.05
Mild	9	25.7	2	5.7	
Moderate	0	0.0	1	2.9	
BODY MASS INDEX					
BMI: >20kg/ht²m	28	80.0	32	91.4	NS
BMI: 18-19kg/ht²m	6	17.1	2	5.7	
BMI: 16-17.9kg/ht²m	1	2.9	1	2.9	
SERUM ALBUMIN					
Albumin ≥4.0g/ dl	9	25.7	14	40.0	P<0.001
Albumin 3.5-3.9 g/dl	11	31.4	20	57.1	
Albumin 3.0-3.4g/dl	13	37.1	1	2.9	
Albumin ≤3.0 g/dl	2	5.7	0	0.0	
Total Iron Binding Capacity					
Normal	6	17.1	19	54.3	P<0.01
Mild	15	42.9	11	31.4	
Moderate	12	34.3	5	14.3	
Severe	2	5.7	0	0.0	

In terms of changes in end-dialysis dry weight, 60 percent of diabetic patients lost less than 0.5 kg, 28.6% lost a little more than 0.5 kg, and 11.4 percent lost more than 1 kg. In the non-diabetic group, 82.9 percent of patients lost 0.5 kg, 11.4 percent lost a moderate amount of weight, and 5.7 percent lost more than 1 kg.

In terms of nutritional intake, 82.9 percent of diabetic patients had a healthy appetite and no change in their dietary consumption pattern, 17.1% had a solid diet intake, and 0.0 percent had a full liquid diet. In the non-diabetic group, 94.3 percent had a good appetite, 2.9 percent ate a solid diet, and 2.9 percent drank only water. The difference in dietary intake between diabetics and non-diabetics is not significant.

Regarding gastrointestinal symptoms, in the diabetic group, 48.6% of patients had a good appetite and 51.4% had poor symptoms. Whereas in the non-diabetic group, 82.9% had a good appetite and 17.1% had a poor appetite. There is a significant difference in the GI symptoms in diabetics when compared with non-diabetics (P < 0.01).

In terms of functional ability, 85.7 percent of diabetics have normal functional capacity, 11.4 percent have occasional problems, and 2.9 percent have trouble doing independent activities. In contrast, 97.1 percent of non-diabetic adults have normal function capability, 0.0 percent have occasional problems, and 2.9 percent have difficulty with independent tasks.

Regarding the number of years on dialysis, in the diabetic group, 11.4% of the people dialyzed less than one year, 62.9% dialyzed for 1–4 years, and 25.7% dialyzed > 4 years. In the non-diabetic group, 37.1% had less than one year, 57.1% had one to four years, and 5.7% had more than four years. There is a significant difference in the number of years on dialysis in the diabetic group when compared with the non-diabetic group (P < 0.01).

In terms of decreasing fat storage, 62.9 percent of diabetics had normal fat stores, while 37.1 percent had mild fat stores.94.3 percent of non-diabetics had normal fat storage, whereas 5.7 percent had mild fat levels. There is a link between lower income and decreased productivity.

When diabetics are compared to non-diabetics, fat stores are higher (P < 0.01). Fat is excellent for hemodialysis, according to the previousstudy.10Diabetic individuals, on the other hand, had a lower fat store in this study.

In the diabetic group, 74.3 percent of patients had normal muscle wasting signals, 25.7 percent had mild muscle wasting indications, and 0.0 percent had moderate muscle wasting signs. In the non-diabetic group, 91.4 percent of people had normal muscle wasting, 5.7 percent had mild muscle wasting, and 2.9 percent had significant muscle wasting. When diabetics are compared to non-diabetics, there is a considerable difference in muscle wasting (P < 0.05). The nutritional status of diabetic nephropathy patients was low due to muscle wasting, according to a study.1[1] Muscle wasting is a problem for diabetics in this situation.

In terms of BMI distribution, in the diabetes group, 80% of patients had a normal BMI, 17.1% had a BMI of 18-19kg/ht2m, and 2.9 percent had a BMI of 16-17.9kg/ht2m.91.4 percent of non-diabetics had a normal BMI, 5.7 percent had a BMI of 18-19kg/ht2m, and 2.9 percent had a BMI of 16-17.9 kg/ht2m. BMI does not differ between diabetics and non-diabetics.

There is a significant difference in serum albumin in diabetic when compared with non-diabetic group ($p<0.001$). In diabetic group, 25.7% had an albumin level of 4.0g/dl and 31.4% had a range from 3.5-3.9g/l and 5.7%. There is significant difference in TIBC in diabetic when compared with non-diabeticgroup. ($P<0.01$).

4. Conclusion

Nutrition is an important factor in maintaining good health of hemodialysis patients, affecting their morbidity and mortality. Malnutrition is common among patients with end stage renal disease. Tight glycemic control can significantly reduce the development and rate of progression of diabetic nephropathy**.** Both chronic kidney disease and diabetes have been associated with poorer quality of life. Malnutrition Inflammation Score is one of the Chronic Kidney Disease specific nutritional scoring systems that has received a considerable attention in research and clinical practice in the past years and is currently used to findthe nutritional status among two groups. The present study follows a comparative-cross sectional design with quantitative method. A total of 70 samples were selected for the study. Among them 35 belong to diabetic (group-1) and 35 belong to non-diabetic (group-2). Both the groups were selected by simple random sampling.

A self-administered questionnaire, which includes a demographic profile, anthropometric measurements, and body composition monitoring and malnutrition inflammation score, was used.

According to the current study, diabetic hemodialysis patients are at higher risk of malnutrition than non-diabetic hemodialysis patients. Diabetic nephropathy patients have worse outcomes than non-diabetic patients, with a statistically significant difference of p0.005. The use of Malnutrition Inflammation Score, and a body composition monitor is thought to be a good predictor of Hemodialysis patients' nutritional condition. Diabetic dialysis patients require special attention in this area due to many food restrictions that might exacerbate malnutrition in hemodialysis patients. Nutritional status in hemodialysis patients should be assessed on a regular basis, and early detection of malnutrition can help to improve this condition.

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