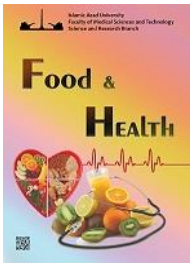

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Association of depression with malnutrition in hemodialysis patients

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ABSTRACT

Chronic renal failure (CKD) is a progressive and irreversible disease that in the final stages (ESRD), the person forever needs kidney replacement therapy such as hemodialysis. Protein-energy malnutrition is very common among hemodialysis patients and depression is also very common in these patients. This study was designed to determine the relationship between depression and malnutrition in patients undergoing hemodialysis. In this study, the Depression, Anxiety and Stress Scale- 21 Items (DASS-21) questionnaire was used to determine depression and Subjective Global Assessment (SGA), Malnutrition Inflammation Score (MIS), and Dialysis Malnutrition Score (DMS) questionnaires were used to determine malnutrition. Demographic, anthropometric, biochemical, and clinical indicators were also examined. The study involved 100 patients (59 men and 41 women). The mean age of participants was 62.12 ± 13.22. According to the DASS-21 questionnaire, 59% of patients had depression. Also, 23%, 25%, and 23% of patients were malnourished based on the results of SGA, MIS, and DMS questionnaires. There was no statistically significant relationship between depression and malnutrition. Also, the relation between depression and most demographic, anthropometric, biochemical, and clinical variables was not significant. But there was a significant relationship between depression and the duration of hemodialysis in men (r =-0.29, p=0.02) and serum level of TIBC in all participants (r =-0.21, p=0.03). In this study, depression was not associated with malnutrition. Further studies are needed to determine this relationship.

1. Introduction

Hemodialysis (HD) is the most common alternative treatment for ESRD (1). More than two million people worldwide live on hemodialysis (1). In Iran, at the end of 2016, the prevalence of patients requiring dialysis was 369 per million (2). Hemodialysis can gradually cause various complications for the patient. Restriction of certain food groups, anorexia, loss of water-soluble nutrients during hemodialysis, and high catabolism due to increased inflammatory cytokines can lead to poor nutritional status and malnutrition in hemodialysis patients (1-4). Malnutrition is a common problem among hemodialysis patients (5). The diagnosis of protein-energy wasting (PEW) malnutrition has been proposed by the International Society for Nutrition and Renal Metabolism (ISRNM) (6). Malnutrition in hemodialysis patients is associated with an increased risk of death (7). On the other hand, depression is common among patients with chronic renal failure and is associated with worsening of these patients (8). In a meta-analysis of observational studies, the prevalence of depression was 22.8% in dialysis patients and 21.4% in pre-dialysis patients (9). Malnutrition and depression tend to occur simultaneously in patients with a final diagnosis of chronic kidney disease and can even lead to worse conditions such as death (7). A case study reporting the condition of a hemodialysis patient with severe organ failure noted the importance of micronutrient loss during hemodialysis, and its association with malnutrition and depression. According to the report, early detection of both disorders (malnutrition and depression) and their treatment help the patient survive and reduce the risk of death (10). Also, limited studies on the relationship between depression and malnutrition in hemodialysis patients have shown the simultaneous presence of these two physical and psychological

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disorders, which indicates the possible relationship between these two disorders (11, 12). The aim of this study was to determine the relationship between depression and malnutrition in dialysis patients of Chamran Hospital in Tehran.

2. Materials and methods

This cross-sectional study was performed on patients over 18 years of age undergoing hemodialysis at Shahid Chamran Hospital in Tehran. In the beginning, the objectives of the study were explained for patients and the participants signed an informed consent form. In addition, blood sampling was performed simultaneously with periodic monitoring of patients to minimize invasive intervention. People whose blood test was positive for hepatitis and AIDS were excluded. Information on age, gender, level of education, marital status, consumption of dietary supplements, duration of hemodialysis treatment, number of dialysis sessions per week, and duration of dialysis were recorded in a demographic questionnaire by interviewing patients. In this study, the Depression, Anxiety and Stress Scale- 21 Items (DASS-21) questionnaire was used to determine the patient's depression status. Subjective Global Assessment (SGA), Malnutrition Inflammation Score (MIS), and Dialysis Malnutrition Score (DMS) questionnaires were used to assess the status of malnutrition in the study population. Weight was measured with minimal cover and without shoes using a standing scale (Seca, Germany) with an accuracy of 100 g (0.1 kg) before and after hemodialysis. Height was measured using a wall-mounted Seca stadiometer without shoes while the shoulders were in normal condition with accuracy of 0.5 cm. Body mass index was calculated by dividing weight after dialysis into kilograms by height squared in meters. Edema was also evaluated by a physician based on clinical instructions (13). Serum albumin and total iron-bound capacity (TIBC) were recorded from their periodic checkup. All analyzes were performed by SPSS.21 software (SPSS, Chicago, IL, USA) [24] and the significance level was considered to be 0.05. All quantitative variables were expressed as mean ± SD, and qualitative variables as number (%). The *chi-square test was used to compare qualitative variables.* An Independent t-test was also used to compare the means of quantitative variables between men and women. Pearson test was used to show correlation between depression and malnutrition scores, as well as other quantitative variables.

3. Results

In the present study, 100 patients (59 men and 41 women) undergoing hemodialysis participated. Table 1 shows demographic characteristics and other measurements in participants by gender. There was no significant relationship between marital status, level of education, supplementation, presence of edema, and status of body mass index with sex. Weight before and after dialysis, height, and TIBC levels were

Table 1. Demographic characteristics of participants by gender.

	Men	Women	All	P-value*
Marital status (%)				
Single	5 (8.5)	2 (4.9)	7 (7)	
Married	52 (88.1)	33 (80.5)	85 (85)	0.11
Divorced	2 (3.4)	6 (14.6)	8 (8)	
Education level (%)				
Literate	1 (1.7)	2 (4.9)	3 (3)	
Less than Diploma	21 (35.6)	17 (41.5)	38 (38)	0.64
Diploma	28 (47.5)	18 (43.9)	46 (46)	
University	9 (15.3)	4 (9.8)	13 (13)	
Supplement consumption (%)				
Yes	46 (78)	35 (85.4)	81 (81)	0.25
No	13 (22)	6 (14.6)	19 (19)	
Edema (%)				
Yes	26 (44.1)	18 (43.9)	44 (44)	0.98
No	33 (55.9)	23 (56.1)	56 (56)	
Body mass index (%)				
Less than 18.5	3 (5.1)	3 (7.3)	6 (6)	
18.5- 24.9	24 (40.7)	18 (43.9)	42 (42)	0.12
25- 29.9	27 (45.8)	11 (26.8)	38 (38)	
More than 30	5 (8.5)	9 (22)	14 (14)	
Age (years)	32.13 ± 16.62	62.04±13.24	62.02±13.242	0.96
Weight before dialysis (kg)	75.93 ± 14.07	67.98 ± 14.87	72.67 ± 14.86	**0.009**
Weight after dialysis(kg)	74.05 ± 13.53	65.97 ± 14.74	70.74 ± 14.53	**0.007**
Height (cm)	170.0 ± 7.3	160.8 ± 7.0	166.2 ± 8.4	**0.001**
BMI (kg/m2)	25.6 ± 4.8	25.5 ± 5.8	25.6 ± 5.2	0.91
Duration of dialysis (years)	3.36 ± 2.94	3 ± 2.55	3.21 ± 2.78	0.51
Hemodialysis(times / week)	2.89 ± 0.40	2.85 ± 0.47	2.88 ± 0.43	0.62
Serum Albumin (g/dl)	4.03 ± 0.41	3.92 ± 0.52	3.99 ± 0.46	0.265
Total Iron Binding Capacity (mcg/dl)	254 ± 35	273 ± 27	265 ± 32	**0.005**

Data are expressed as n (%) or mean ± SD. *$\chi 2$ for qualitative and t-test for quantitative variables.

significantly higher in men than women (p<0.01). There was no significant difference in age, duration of dialysis, frequency of dialysis per week, and albumin level between men and women. Table 2 shows the distribution of malnutrition (based on SGA, MIS, and DMS tests) and depression and scores of malnutrition and depression in participants by gender. Most patients were categorized as normal in terms of malnutrition. No significant differences were observed in the prevalence of malnutrition between men and women. In terms of depression, a higher percentage of men than women were normal, and a higher percentage of women than men were suffering from severe and very severe depression. However, the relationship between depression and gender was not statistically significant. As it is shown, the mean scores of malnutrition according to MIS and DMS were not statistically different between men and women. Depression score in women was marginally higher than in men (p=0.06). Table 3 shows the relationship between depression and qualitative variables. There was no statistically significant relationship between the studied variables and the severity of depression in this study. Table 4 shows the relationship between depression score and quantitative indicators. Duration of dialysis in men and serum TIBC level in all patients showed a statistically significant inverse relationship with depression score (p<0.05). This means that the longer the duration of dialysis in men, the lower the depression score (r=-0.29). Also, higher serum TIBC levels in patients were associated with lower scores of depression (r =-0.21).

Table 2. Frequency of malnutrition based on SGA, MIS, DMS questionnaires, degrees of depression, and mean score of malnutrition and depression in participants by gender.

Malnutrition	Men	Women	All	P-value*
Based on SGA test				
Normal	47 (79.7)	30 (73.2)	77 (77)	0.61
Mild to moderate	10 (16.9)	8 (19.5)	18 (18)	
Sever	2 (3.4)	3 (7.3)	5 (5)	
Based on MIS test				
Normal	45 (76.3)	30 (73.2)	75 (75)	0.67
Mild to moderate	12 (20.3)	8 (19.5)	20 (20)	
Sever	2 (3.4)	3 (7.3)	5 (5)	
Based on DMS test				
Normal	47 (79.7)	30 (73.2)	77 (77)	0.63
Mild to moderate	9 (15.3)	7 (17.1)	16 (16)	
Sever	3 (5.1)	4 (9.8)	7 (7)	
Depression				
Normal	28 (47.5)	13 (31.7)	41 (41)	0.22
Mild	14 (23.7)	9 (22)	23 (23)	
Moderate	10 (16.9)	7 (17.1)	17 (17)	
Sever	3 (5.1)	7 (17.1)	10 (10)	
Very sever	4 (6.8)	5 (12.2)	9 (9)	
Mean MIS score	6.1±5.1	7±6.9	6.4±5.9	0.42
Mean DMS score	12.2±5.3	13.4±6.5	12.7±5.8	0.32
Mean depression score	10.9±9.8	14.7±10.5	12.5±10.2	0.06

Data are expressed as n (%) or mean ± SD.
*$\chi 2$ for qualitative and t-test for quantitative variables.

Table 3. Relationship between depression severity and qualitative variables in participants.

	Depression					P-value*
	Normal	Mild	Moderate	Severe	Very severe	
Sex						
Male	28 (68.3)	14 (60.9)	10 (58.8)	3 (30)	4 (44.4)	0.22
Female	13 (31.7)	9 (39.1)	7 (41.2)	7 (70)	5 (55.6)	
Education level						
Literate	1 (2.4)	0 (0)	0 (0)	2 (20)	0 (0)	
Under diploma	15 (36.6)	6 (26.1)	8 (47.1)	4 (40)	5 (55.6)	0.16
Diploma	18 (43.9)	14 (60.9)	7 (41.2)	4 (40)	3 (33.3)	
University	7 (17.1)	3 (13)	2 (11.8)	0 (0)	1 (11.1)	
Marital status						
Single	5 (12.2)	1 (4.3)	1 (5.9)	0 (0)	0 (0)	0.28
Married	35 (85.4)	20 (87)	13 (76.5)	8 (80)	9 (100)	
Divorced	1 (2.4)	2 (8.7)	3 (17.6)	2 (20)	0 (0)	
Use of supplement						
Yes	34 (82.9)	19 (82.6)	15 (88.2)	7 (70)	6 (66.7)	0.6
No	7 (17.1)	4 (17.4)	2 (11.8)	3 (30)	3 (33.3)	
Edema						
Yes	19 (46.3)	9 (39.1)	10 (58.8)	4 (40)	2 (22.2)	0.46
No	22 (53.7)	14 (60.9)	7 (41.2)	6 (60)	7 (77.8)	
Malnutrition (according to SGA test)						
Normal	33 (42.2)	19 (24.7)	11 (14.3)	9 (11.7)	5 (6.5)	0.09
Mild to moderate	7 (38.9)	1 (5.6)	6 (33.3)	1 (5.6)	3 (16.7)	
Sever	1 (20)	3 (60)	0 (0)	0 (0)	1 (20)	

Data are expressed as n (%) or mean ± SD.
*$\chi 2$ for qualitative and t-test for quantitative variables.

4. Discussion

The aim of this study was to determine the relationship between depression and malnutrition in 100 patients undergoing hemodialysis at Shahid Chamran Hospital in Tehran. Three methods of SGA, MIS, and DMS were used for the diagnosis of malnutrition. There was no significant relationship between depression and malnutrition. A positive

Table 4. Correlation between depression score and quantitative variables.

	Depression score					
	Men		Women		All	
	r	P-value*	r	P-value*	r	P-value*
Age	0.1	0.42	0.08	0.6	0.02	0.8
Weight before dialysis	-0.1	0.42	-0.06	0.66	-0.13	0.18
Weight after dialysis	-0.1	0.41	-0.07	0.65	-0.13	0.17
BMI (kg/m^2)	-0.06	0.63	0.03	0.84	-0.02	0.84
Duration of dialysis (years)	-0.29	**0.02**	0.17	0.28	-0.12	0.22
Times of dialysis/week	-0.01	0.94	0.29	0.06	0.11	0.24
Serum albumin (g/dl)	-0.13	0.31	0.05	0.74	-0.06	0.53
Serum TIBC (mcg/dl)	-0.15	0.24	-0.18	0.25	-0.21	**0.03**
MIS score	0.05	0.68	0.02	0.89	0.05	0.6
DMS score	0.17	0.19	-0.12	0.44	0.05	0.6

*Pearson test.

relationship was observed between scores of malnutrition and depression; though it was not significant. Consistent with the present study, in the study by Ibrahim et al., no significant relationship was observed between the MIS score and depression (14). Similar results were reported by Barros et al. (15). In contrast with these results, in a study by Liu et al., the MIS score showed a significant positive relationship with depression in hemodialysis patients (16). In another study conducted in 2011 by Li et al., a significant relationship was observed between MIS score and depression in hemodialysis patients (17). Regarding the relationship of depression with demographic, anthropometric, biochemical, and clinical variables, depression was not significantly associated with other variables except for the duration of dialysis in men and the level of TIBC in all samples, Consistent with the results of this study, in the study by Liu et al., depression did not show a significant relationship with gender, age, education level, marital status, body mass index and duration of dialysis (16). In a study by Teles et al. (18) there was no significant relationship between depression and gender and duration of treatment, while depression was associated with age. In the study by Li et al., there was no significant relationship between depression and gender, marital status, level of education, and body mass index (17). Similarly, in a study by Ekramzadeh et al. (19), no significant relationship was observed between depression and age, sex, duration of dialysis, level of education, marital status, TIBC level, weight, and body mass index. However, in this study, albumin levels showed a significant relationship with depression. In addition, an inverse relationship was observed between TIBC level and duration of dialysis with depression score, which was not statistically significant. Because depression can reduce and sometimes increase appetite, it may have a two-way effect on patients' weight, body mass index, and serum albumin levels, and the relationship between these variables and depression may not be clear (20, 21). It has been suggested that depression is more common in hemodialysis patients in the first year of treatment than in subsequent years (22). Therefore, considering that the average duration of dialysis in this study is estimated to be about 3 years, the lack of a statistically significant relationship between these two variables can be explained. In addition, given that all patients undergo hemodialysis 2 or 3 times a week and the range of this variable is small, lack of a significant relationship between depression and the frequency of hemodialysis per week will not be unexpected. Considering that the mean level of serum albumin in our participants was in the normal range, lack of its relationship with depression could be expected. Albumin is a protein that can be excreted from the blood during hemodialysis. The use of dietary supplements is very common for hemodialysis patients. Therefore, lack of relationship between depression and supplement use was predictable. Similar to the present study, another study found a significant relationship between depression and anemia, and TIBC levels. Increased TIBC levels have been associated with decreased blood flow to the brain and the development of fatigue, irritability, and poor concentration, which are symptoms of depression (23).

5. Conclusion

In this study, depression did not show a significant relationship with malnutrition. Depression was also not associated with demographic, anthropometric, biochemical, and clinical variables other than with dialysis duration and TIBC level. The association between depression and malnutrition in patients undergoing hemodialysis is unclear. Although most of the studies have indicated a significant relationship between these two variables, differences in the questionnaires, sample sizes, and race can be reasons for differences in the results of these studies. The relationship between MIS and DMS scores with DASS-21 was positive in this study, though it was not significant. This was a study with a cross-sectional design. So, a causal relationship cannot be expressed. Prospective studies are suggested to examine the causality. It is also suggested that dietary intake and body composition be assessed along with questionnaires determining malnutrition and depression.

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