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RESEARCH ARTICLE

Health Status and Normalized Protein Catabolic Rate for Hepatitis Versus Non-hepatitis Patients Undergoing Hemodialysis: A Comparative Study

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ABSTRACT

Health status of hemodialysis patients is a complex and multifaceted issue that requires continuous monitoring and evaluation to ensure the effectiveness of their treatment plan. Complications include viral hepatitis and protein-energy loss, with inflammation and malnutrition being leading causes of death. The main objective of the study is to compare the health status and normalized protein catabolic rate between hepatitis and non-hepatitis patients undergoing hemodialysis. A descriptive A-non-probability (purposive sample) of 205 male and female hemodialysis patients in AL-Diwaniyah City with end-stage renal disease and undergoing hemodialysis. All patients included in the sample were diagnosed with ESRD > one year ago and on a maintenance hemodialysis program. The patient's overall health status was found to be low, with a mean score of 19.82. The assessment was conducted in eight domains, with 99.0% of patients having low health status, and 78.0% having low nPCR, and 15.1% having high nPCR. End-stage renal disease patients undergoing hemodialysis face physical, mental, emotional, and social challenges, including fatigue, muscle weakness, mobility difficulties, anxiety, depression, and social isolation. Addressing these issues is crucial for improving patient outcomes and health status. Low nPCR levels indicate inadequate protein intake or malnutrition. Regular monitoring of health indicators like nPCR levels, protein intake, and muscle wasting, providing psychological support, and supervised exercise programs are crucial for early identification of deficiencies and issues, as well as addressing anxiety, depression, and social isolation in patients.

INTRODUCTION

Chronic kidney disease is a progressive, irreversible condition where the kidneys fail to manage body metabolism, fluid, and electrolyte balance, leading to uremia and the need for dialysis or kidney transplantation[(1) (2)]. End-stage kidney disease (ESRD) is a severe condition that restricts physical and psychosocial health, affecting patients' ability to lead a typical life[(3) (4)]. Hemodialysis is a long-term treatment for ESRD, aiming to manage and alleviate symptoms like exhaustion, cramping, anxiety, and discomfort[(5) (6)]. ESRD and CKD are becoming significant public health concerns globally, with ESRD affecting over 500,000 people in the US[(7)]. The onset of chronic renal failure contributes to lower life expectancy and early death[(8)]. Hemodialysis patients' health status is a complex issue[(9)]. The health state of individuals receiving hemodialysis is a crucial aspect in their general well-being.

It is essential to regularly evaluate the health status of patients receiving hemodialysis in order to monitor progress and make any required modifications to their treatment plan [10]. These illnesses place a large financial burden on the health care system and increase the risk of mortality and morbidity in patients [11]. The patient's health status is significantly impacted by the progressive loss of kidney functions [12]. Patients' social, physical, and psychological well-being might be impacted by hemodialysis. Compared to healthy individuals, hemodialysis patients have fewer functional capacities, which are linked to less physical activity in daily life and may have an impact on their quality of life [13]. Patients with end-stage renal disease (ESRD) who are undergoing hemodialysis treatment and have multiple comorbidities, such as cardiovascular disorder, renal bone diseases, and anemia, often experience a reduced quality of life and heightened depression. This is primarily due to the significant physical symptoms and mental health issues they face. Physical inactivity, a significant factor in the decline of physical function in patients on hemodialysis, has been associated with adverse clinical results such as increased morbidity and death rates [14]. The two main risks for complications after hemodialysis are inflammation and protein-energy loss. Given that inflammation and malnutrition are two of the leading causes of death in hemodialysis patients [15].The normalized protein catabolic rate (nPCR) is a measure used to assess daily dietary protein intake and nutritional status in patients on hemodialysis. It is calculated by counting the urea excreted during a procedure and comparing it to the protein taken in. This helps medical professionals assess a patient's protein consumption and adjust their diet or dialysis regimen if necessary [16].nPCR is an important marker of health status in patients on hemodialysis [17]. Viral infections, such as HIV, viral hepatitis B (HBV), and viral hepatitis C (HCV), are more common in patients receiving hemodialysis. The viral infections hepatitis B and hepatitis c contribute significantly to mortality as well as morbidity in patients on hemodialysis and present management challenges in dialysis units because patients with chronic renal failure are unable to effectively clear viral infections [18]. Hemodialysis (HD) patients have a higher prevalence of viral hepatitis than people in general. End-stage renal disease (ESRD) and viral hepatitis both negatively affect HRQOL, mortality, and morbidity, according to a number of studies [19].

METHODS AND MATERIALS

A quantitative descriptive cross-sectional design was used to assess the health status and normalized protein catabolic rate among end-stage renal disease patients undergoing hemodialysis (hepatitis and non-hepatitis). The study was conducted at AL-Diwaniyah City /AL- Diwaniyah Health Department /AL-Diwaniyah Teaching Hospital / Fatima Al-Zahraa Dialysis Center. A nonprobability (purposive) sample of (205) patients was selected from those who visited the Hemodialysis Center in AL-Diwaniyah City. An assessment instrument used to assess health status and measure normalized protein catabolic rate among end stage renal disease patients, the instrument included three parts :Part I : Patient's Socio-Demographic Characteristics :The characteristics of the subjects under study included (age, sex, marital states, level of education ,socio-economic status ,Residence). Part II: The Clinical Characteristics of Patients: Body mass index (BMI), Normalized protein catabolic rate (nPCR), Bio-chemical parameters, Fatigue. Part III : Health status scale : The SF-36 assesses eight dimensions: physical function (PF), roles physical (RP), pain in the body (BP), general well-being (GH), energy (VT), social interaction (SF), the roles emotions (RE), and mental well-being (MH). The SF-36 measures two separate concepts: a physical dimension, which is represented by the Physically Components Summary (PCS), and the mental dimension, which is represented by the Mental Components Summary (MCS) [22]. The procedures to calculate scores were in accordance with the recommendations of the creators of SF-36. Every item on the scale has a value between 0 and 100; a higher score indicates a higher quality of life. The patient was asked to complete the answers on their own. a higher health-related quality of life is indicated by an average score above 50 in any domain. utilizing Microsoft Excel for manual scoring. The statistical software SPSS was used to assess health status. The normalized protein catabolic rate was calculation by predialysis and postdialysis

blood urea nitrogen by using the formula: - nPCR = 0.22 + (0.36 × intradialytic rise in BUN×24 / intradialytic interval). In represents the natural logarithm; intradialytic rise in BUN is the difference of pre-dialysis to post-dialysis BUN; intradialytic interval is the length between the end of one dialysis session and just prior to start of the next dialysis session in hours. After the validity and reliability of the study instrument are ensured, the researcher uses a self-report questionnaire to collect the data regarding demographic data and the Short Form Health Survey (SF-36) questionnaire. The study's selection criteria were (patients who have been on hemodialysis for at least one year, who are medically stable, who agreed to participate in the study, the age of all participants is between 20 and older years, and Alert patients; free of any change in level of consciousness, both sexes, and free of any psychiatric illness).The instrument used for the study was to collect the data are The data collection process has taken one month, starting from January 1st, 2024, to February 1st, 2024. utilizing Microsoft Excel for manual scoring. The statistical software SPSS was used to assess health status.

RESULT

Table (1): Summary statistics for Patients' Health status domains

Domains	Categories	Statistics	Type of Hepatitis				Total
			Type C	Type B	Both B and C	Negative	
Physical functioning	Low	F	20	6	7	56	89
		%	36.4%	37.5%	53.8%	46.3%	43.4 %
	Moderate	F	34	10	6	65	115
		%	61.8%	62.5%	46.2%	53.7%	56.1 %
	High	F	1	0	0	0	1
		%	1.8%	0.0%	0.0%	0.0%	0.5%
Mean			**32.27**	**32.50**	**31.92**	**32.69**	**32.35**
Role limitations due to Physical health	Low	F	54	13	7	117	194
		%	100.0%	81.3%	67.2%	97.5%	95.1 %
	Moderate	F	0	3	4	4	11
		%	0.0%	18.8%	30.8%	2.8%	5.2%
Mean			5.64	**16.25**	**27.31**	**18.95**	**17.09**
Role limitations due to emotio	Low	F	55	16	13	121	205
		%	100.0%	100.0%	100.0%	100.0%	100.0 %

nal problems							
Mean			**0.00**	**2.08**	**10.25**	**7.98**	**5.08**
Energy/ fatigue	**Low**	F	44	14	9	50	117
		%	80.0%	87.5%	69.2%	41.7%	57.4 %
	Moderate	F	11	2	4	67	84
		%	20.0%	12.5%	30.8%	55.8%	41.2 %
	High	F	0	0	0	3	3
		%	0.0%	0.0%	0.0%	2.5%	1.5%
Mean			**22.91**	**20.94**	**24.23**	**36.04**	**26.03**
Emotional wellbeing	**Low**	F	52	12	8	82	154
		%	94.5%	75.0%	61.5%	67.8%	75.1 %
	Moderate	F	3	4	5	39	51
		%	5.5%	25.0%	38.5%	32.2%	24.9 %
Mean			**16.22**	**26.00**	**32.62**	**29.69**	**26.13**
Social functioning	**Low**	F	46	10	1	62	119
		%	83.6%	62.5%	7.7%	51.2%	58.0 %
	Moderate	F	9	6	11	53	79
		%	16.4%	37.5%	84.6%	43.8%	38.5 %
	High	F	0	0	1	6	7
		%	0.0%	0.0%	7.7%	5.0%	3.4%
Mean			**17.27**	**26.56**	**49.04**	**30.37**	**30.81**
Pain	**Low**	F	52	15	11	95	173
		%	94.5%	93.8%	84.6%	78.5%	84.4 %
	Moderate	F	3	1	2	26	32

		%	5.5%	6.3%	15.4%	21.5%	15.6 %
Mean			**15.14**	**14.38**	**20.58**	**24.19**	**18.57**
General health	**Low**	F	55	13	9	118	195
		%	100.0%	81.3%	69.2%	97.5%	95.1 %
	Moderate	F	0	3	4	3	10
		%	0.0%	18.8%	30.8%	2.5%	4.9%
Mean			**5.64**	**16.25**	**27.31**	**18.97**	**17.04**
Mean of Health Status			13.68	17.33	24.49	22.49	19.82

33.3 an. d less = Low, 33.34-66.67 = moderate, 66.68 and more = High

Table (1) demonstration that the patients' responses to the scale of health status Rand -36 items as domain items are low at all most all items in positive and negative viral hepatitis hemodialysis patients.

Table (2): Summary statistics of Overall Assessment for Hemodialysis Patients' Health Status

Questions	**Categories**	**Statistics**	**Type of Hepatitis**				**Total**
			Type C	**Type B**	**Both B and C**	**Negative**	
Mean of Health Status	**Low**	F	55	16	12	119	202
		%	100.0%	100.0%	92.3%	99.2%	99.0%
	Moderate	F	0	0	1	1	2
		%	0.0%	0.0%	7.7%	0.8%	1.0%
Total			55	16	13	120	204
Mean + SD		**19.82**	**6.58**	**Low Health Status**			

33.3 an. d less = Low, 33.34-66.67 = moderate, 66.68 and more = High

Table (3) reveals that the overall assessment of the patients' responses to the health domain items are low at all most all items in positive and negative viral hepatitis hemodialysis patients.

Table (3): Distribution of the observed frequencies and percent of normalized Protein Catabolic Rate (nPCR) for Study Sample

Variable	**Categories**	**Statistics**	**Type of Hepatitis**				**Total**
			Type C	**Type B**	**Both B and C**	**Negative**	
nPCR	**Low**	F	54	13	10	83	160
		%	98.2%	81.3%	76.9%	68.6%	78.0%
	Normal	F	0	0	2	12	14

		%	0.0%	0.0%	15.4%	9.9%	6.8%
	High	F	1	3	1	26	31
		%	1.8%	18.8%	7.7%	21.5%	15.1%
Total		F	55	16	13	121	205

Table (3) presented that 205 patients included shows the distribution of nPCR levels in positive and negative viral hepatitis hemodialysis participants (55 Total number of HCV participants ,16 HBV,13 both B and C coinfection,121 negative viral hepatitis participants). Type C hepatitis: 54 individuals (98.2% of the total) have low nPCR levels, Type B Hepatitis: 13 individuals (81.3% of the total), have low nPCR levels, Both Type B and C hepatitis coinfection: 10 individuals (76.9% of the total), have low nPCR levels. Negative viral hepatitis hemodialysis patients 83 (68.6% of the total), have low nPCR levels, From this data, we can see the majority of participant have low nPCR levels.

Table (4): Summary statistics for Correlation between the nPCR and Hemodialysis Patients' Health status Domains

Variables/Domains	Statistics	nPCR
Physical functioning	Correlation Coefficient	0.049
	Sig. (2-tailed)	0.476
Energy/fatigue	Correlation Coefficient	0.089
	Sig. (2-tailed)	0.191
Emotional wellbeing	Correlation Coefficient	0.026
	Sig. (2-tailed)	0.709
Social functioning	Correlation Coefficient	0.003
	Sig. (2-tailed)	0.969
Pain	Correlation Coefficient	0.061
	Sig. (2-tailed)	0.373
General health	Correlation Coefficient	-0.015
	Sig. (2-tailed)	0.829
Health Status	Correlation Coefficient	0.074
	Sig. (2-tailed)	0.279

Table (4) reveals that there is no statistically significant correlation between the nPCR and hemodialysis patients' health status domains. Although patients who have poor health status themselves have a low normalized protein catabolic rate, there is no statistical significance.

Table (5): Relationship between Overall patients' Health Status and Types and Hepatitis

Variables/domains	df	F	Sig.
Energy/fatigue	3	15.000	0.000
Emotional wellbeing	3	22.915	0.000
Social functioning	3	11.389	0.000
Pain	3	7.225	0.000
General health	3	49.123	0.000
Physical functioning	3	0.027	0.994
Role limitations due to emotional problems	3	6.776	0.000
Health Status	3	39.915	0.000

Table (5) reveals that there is a highly significant relationship between the patients' health status and types of hepatitis, Except physical function, which does not show a statistically significant relat3621ionship.

Table (6): Correlation between the nPCR and types of hepatitis

Variables/Domains	Statistics	Type of Hepatitis
nPCR	**Pearson Correlation**	.282**
	Sig. (2-tailed)	0.000

Table (6) shows that there is a highly significant correlation between the patients' nPCR and types of hepatitis.

DISCUSSION

Health status is best described as an individual's overall well-being, including physical, mental, emotional, and social aspects. It reflects the presence or absence of illness, disease, or injury, as well as factors such as lifestyle, environment, and genetics that can impact a person's health [23]. Patients undergoing hemodialysis often experience physical symptoms such as fatigue, weakness, and decreased mobility, which can impact their daily activities and quality of life. Additionally, the stress and lifestyle changes associated with managing a chronic illness like kidney failure can affect mental health, leading to anxiety, depression, and social withdrawal. Overall, hemodialysis can have a significant impact on multiple aspects of a patient's health and well-being [24]. Eight subscales measure different areas of health-related aspects of life on the SF-36 questionnaire: a person's mental state, energy/fatigue, pain, role constraints due to physical or emotional issues, social and physical functioning, and general health perceptions [25]. The physical components summary (PCS) as well as the mental components summary (MCS) scores are two summary components that can be further combined from these subscales. Higher scores on the SF- 36 scores indicate a higher quality of life; values vary between 0 to 100 [26]. Current study results reveal that the patients' responses in health status domains are low at all items. This result is in line with [27] study, which indicates that patients' responses in the health status domain are generally low. The role limitations due to emotional problems dominance in the SF-36 questionnaire have been shown to have a majority low mean score (5.08) and have been most impaired in patients with ESKD in this investigation. The physical role (17.09) and general health (17.04) had the lowest mean scores, indicating that the illness had the

greatest impact on the overall health status of hemodialysis patients. One of the most common complaints among ESRD patients whose health status has been seriously compromised is pain [28].Pain has also been found to have a detrimental influence on several aspects of health status, including physical function, social function, daily activities, energy, weariness, and emotional function [29]. The low health status score in the pain domain may be due to medical conditions like kidney disease, discomfort during the hemodialysis process, and multiple comorbid conditions like diabetes, hypertension, or cardiovascular disease. Additionally, emotional factors like stress, anxiety, or depression, common in individuals undergoing hemodialysis, can exacerbate pain and contribute to a lower health status score. Chronic pain during hemodialysis can significantly impact an individual's health status and quality of life [30]. The low social functioning score in hemodialysis patients can be attributed to various factors such as depression, limited social support, and unique psychological conditions play a significant role in impacting the quality of life and social functioning of these patients [31]. Physical function dominance was the most affected in ESKD. The lowest mean scores were for physical functioning, attributable to a variety of factors, such as chronic fatigue and weakness. Nutritional deficiencies and chronic kidney disease can lead to muscle wasting, which can result in decreased strength and physical function [32].ESRD patients getting dialysis therapy had a poorer quality of life than the general population, according to studies. ESRD is often linked to a worse quality of life, poor sleep, decreased physical function, and depression [33].There was no statistically significant correlation between the nPCR and hemodialysis patients' health status domains ($p > 0.5$). A normalized protein catabolic rate (nPCR) level of 0.8 g/kg/day is recommended in hemodialysis patients for optimal nutritional status [34]. Although patients who have poor health status themselves have a low normalized protein catabolic rate, but there is no statistical significance, and the study suggested that the main effect on the health status of patients with ESKD undergoing hemodialysis is due to the hemodialysis factor. There is association between nPCR and health outcomes in this population. Those with a low nPCR are more likely to be weakness and to death than those with an medium nPCR[35]. In patients receiving hemodialysis, there is a correlation between elevated risk for fractures of the bones and both lower and greater nPCR levels [36]. Lower nPCR was associated with poorer nutrition status and increased risk of all-cause mortality [37]. The study's findings indicate a significant relationship between patients' health status and types of hepatitis in both positive and negative viral hepatitis hemodialysis patients. This result is in agreement with [38] findings. Studies show that HCV infection among hemodialysis patients is associated with higher risks of mortality, hospitalization, anemia, and overall worse health status scores, including physical function, pain, vitality, mental health, depression, pruritus, and anorexia [39]. also our study result shows that there is a highly significant correlation between the patients' nPCR and types of hepatitis. Hepatitis in hemodialysis patients can lead to decreased appetite and poor protein intake, which can affect the normalized protein catabolic rate . In patients with hepatitis, the liver's ability to metabolize protein may be impaired, leading to lower nPCR levels. This can result in muscle wasting and malnutrition in hemodialysis patients with hepatitis [40]. There is a strong relationship between health status domain and morbidity and mortality in patients with renal failure. We conclude from our study that health status is reduced in all the health domains of HD patients.

CONCLUSION

End-stage renal disease patients undergoing hemodialysis often have low health status, causing physical, mental, emotional, and social challenges. These issues can lead to fatigue, muscle weakness, mobility difficulties, anxiety, depression, and social isolation. Monitoring and addressing these health status issues is crucial for improving patient outcomes and quality of life. Low nPCR levels may indicate inadequate protein intake, malnutrition, or muscle wasting, resulting in increased morbidity, mortality, and decreased health status. Viral hepatitis can have a significant impact on the health status and normalized protein catabolic rate of hemodialysis patients.

RECOMMENDATION

Regular monitoring of health status indicators such as nPCR levels, protein intake, and muscle wasting is essential to identify any deficiencies or issues early on. Offer psychological support and counseling services to help patients cope with anxiety, depression, and social isolation. supervised exercise program according to patients physical capacity tolerance by rehabilitation and physiotherapy specialists.

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