Original Article

Relationship between Illness Perception, Treatment Adherence and Clinical Outcomes among Patients on Maintenance Hemodialysis

Hend Gaber Mohamed Hamada[1] Zizi Fakery Mohamed Abd-Elrasol [2] Saada Elsayed Rady[3] Zaghloul Elsafy Ibrahim Gouda [4]

1. Demonstrator at Medical Surgical Nursing, Faculty of Nursing, Damanhour University. Egypt
2. Professor of Medical Surgical, Faculty of Nursing, Damanhour University. Egypt
3. Assistant Professor of Medical Surgical Nursing, Faculty of Nursing, Damanhour University. Egypt
4. Lecturer of Nephrology, National Medical Institute, Damanhour. Egypt

*Corresponding author: Hend Gaber Hamada, Demonstrator at Medical Surgical Nursing, Faculty of Nursing, Damanhour University. Egypt, Hend Gaber@nur.dmu.edu.eg

Abstract:

Background: In haemodialysis patients; illness perception play a role in influencing a person's behavior, especially in terms of adherence to therapeutic regimen, this means patient perception directly or indirectly influences treatment adherence and clinical outcomes . **Aim of this study to** determine the relationship between illness perceptions, treatment adherence and clinical outcomes among patients on maintenance hemodialysis. **Research design**: A descriptive correlational research design was used to conduct this study. **Settings:** This study was conducted at the hemodialysis unit of the Damanhour general hospital, Elbeheira Governorate. **Subjects:** A convenience sample of 130 patients on maintenance hemodialysis admitted in previously mentioned sitting**Tools:** four tools were used : tool I: Socio-demographic and clinical data structured interview; tool Π: Clinical Dialysis Outcomes Assessment; tool III: The Illness Perception Questionnaire-Revised (IPQ-R) interview and tool IV: End Stage Renal Disease – Adherence Questionnaire (ESRD-AQ) interview **Results**: the present study revealed that, more than three quarters (80.0%) of studied patients had moderate illness perception and less than one fifth (19.2%) had high illness perception , more than half (53.1 %) of studied patients had overall good adherence , there was statistical significant relation between mean of systolic blood pressure pre- post dialysis and levels of overall illness perception, and a highly significant negative correlation between overall adherence to the therapeutic regimen and clinical outcomes. **Conclusion:** more than three quarters of studied patients had moderate illness perception and more than half of studied patients had overall good adherence. **Recommendations:** Illustrated booklets, handouts, and audiovisual materials regarding therapeutic regimen instructions and replicating of the study using a larger sample size to ensure generalizability of results.

Key words: Illness Perception, treatment adherence, clinical outcomes ,hemodialysis.

Introduction:

Patients with End Stage Renal Disease (ESRD) have two options to sustain their life; lifelong peritoneal or hemodialysis or kidney transplantation. Most patients with ESRD are treated with hemodialysis and several factors play a role in influencing a person's behavior, especially in terms of adherence to therapeutic regimen of hemodialysis patients. [1,2] These factors are perceptions of the disease. So long-term HD patients are considered partially responsible for the accomplishment of their therapy by recognizing belief regarding their condition to cope with their medical condition, these belief systems known as illness perceptions. [3] Illness perception plays a principal role in the study of patients' perceptions of their illness and substantially influences treatment adherence. Individuals are more inspired to adhere to their treatment regimen when they hold the belief that their medicines are successful and that their illness is well-controlled, this means patient perception directly or incidentally impacts therapeutic regimen adherence. [4]

Adherence is a energetic, relatively multifaceted and multi-dimensional thought and in HD it means expecting patients to restrict interdialytic fluid consumption, obey to diet commendations, use medication frequently and to go for dialysis at regular times .[5] Therapeutic adherence in HD patients improved health outcomes, prevent complications, and maintain their overall well-being. Non adherence to treatment negatively affects patient clinical outcomes contributing to excess morbidity , hospitalizations, complications, poor quality of life in HD patients and increases healthcare expenses. Not only patients themselves are affected, but also non-adherence action impacts the regular work-load of the hemodialysis unit. [6]

Adherence can be affected by numerous elements. These elements can be enablers or confines to adherence and generally categorized as either perceptual or practical. Perceptual factors denote to factors which occur primarily from internal cognitive processes, such as inspiration, passions, or patient perceptions and views of the illness and treatment, while practical factors refer primarily to external environmental aspects concerning to the individual, treatment, or community which can disturb behavior such as how easy it is to access the medication, and the construction of the healthcare scheme. These perceptual and practical factors can lead to deliberate or un non deliberate adherence. [7] In HD patients, nonadherence to dialysis schedule, fluid boundaries lead to extreme weight gain between sessions and dietary commendations (e.g, limitations in sodium, potassium and phosphorus intake) is combined with elevated risk of both hospital admission and death. Also , low adherence to medications has been found to be a substantial mortality risk issue in this contributors.[8]

In order to advance patient adherence, a multilevel program should be occupied that categorizes definite individual factors for each patient and tailors intrusions to improve health outcomes and prevent deteriorations in several parts, such as blood pressure, electrolyte levels, resulting in compact cardiovascular mortality and other complications .[9,10] Nurses play an important role in HD units to improve treatment adherence and patient's clinical out come as they accountable for providing full care, including psychological provision and instructions about adherence to diet, fluids, medication, as well as set the HD machine, scrutiny

for arteriovenous fistula -graft complications, and observe the whole HD process in emergency circumstances.[11]

Significance of the study:

Despite the important effect of adherence on prognosis and clinical outcomes in general patients and specifically in HD patients, there is a lacking number of reviews that handled this subject at the local and provincial level in Arab residents. Therefore, disease progress may vary corresponding to the patient's illness perception and their level of therapeutic adherence. However, no single study performs to have been established to detect clinical outcomes in the HD populace as a function of both patients' illness perceptions and their degree of therapeutic adherence. [12,13] Because of the high incidence and prevalence of ESRD around the world in general and particularly in developing nations that is likely to cause major problems for both healthcare and the economy in the future year due to cardiovascular disease and other serious complications. These complications occur due to low illness perception and treatment adherence of hemodialysis patients which in turn lead to significant effect on patients' activity of daily living and the patients quality of life as the general.[14] So that this correlational study was conducted to determine the relationship between illness perception ,treatment adherence and clinical outcomes among patients on maintenance hemodialysis.

Aim of the study:

This study aimed to determine the relationship between illness perceptions, treatment adherence and clinical outcomes among patients on maintenance hemodialysis.

Research Question:

What is the relationship between illness perception, treatment adherence and clinical outcomes among patients on maintenance hemodialysis?

Operational definition of clinical outcomes

Clinical parameters which including:

Physiological parameters as a mean of pre and post-dialysis blood pressure, inter-dialytic weight gain, frequency of hospitalizations due to hemodialysis access problems as (clotting or infection…etc).

Biochemical markers as serum urea, serum creatinine and albumin.

II. Materials and Method

Research design:

A descriptive correlational research design was used to conduct this study.

Setting:

The present study was conducted at the hemodialysis units of Damanhour general hospital, Elbeheira governorate, Egypt. The unit consists of two floors, the first floor includes: a large room that contains 7 beds for acute hemodialysis patients using 7 machines and works for 24 hours. The second floor consists of 4 rooms, the first room contains 13 machines, the second room contains 10 machines, the third room contains 9 machines, and the fourth room contains 5 machines for chronic hemodialysis patients using a total of 37 machines.

Subjects:

A purposive sample consisted of 130 patients with chronic renal failure on maintenance hemodialysis admitted to the above-mentioned setting was included in the study.

The Subjects were selected based on the following criteria:

 Inclusion criteria: -

 - Adult patients, aged from 18 to less than 60 years old.

 - Independent with self-care activities

 - Able to communicate verbally.

Epi info was used to estimate the sample size using the following parameters:

 • Population size is 215 patients per year (According to the above-mentioned settings records in 2021).

 • Minimum sample size 115

 • Prevalence of the problem 50%

 • Confidence level 95%

 • Margin of error 5%

Tools for data collection

Four tools were used to conduct the present study.

<u>Tool one: -" Socio-demographic and clinical data structured interview":-</u>

This tool was developed by the researcher after reviewing recent literature[15,16,17] and it was included two parts:

 Part 1:- Socio-demographic data include; age, sex , level of education, occupation , marital status, area of residence , average monthly income, type of transportation used to the dialysis center and persons accompanies patient to the dialysis center.

Part 2:- Clinical data include; Causes of kidney failure, history of peritoneal dialysis treatment and a kidney transplantation, associated diseases, HD duration per years ,number of hours in hemodialysis session, convenience to dialysis schedule and main reasons for shortening dialysis treatment.

Tool two:- "Clinical Dialysis Outcomes Assessment " ;-

This tool was developed by the researcher after reviewing the recent literature .[4,18 -20] It was included **inter dialytic weight gain** which was measured by the researcher through the mean of inter dialytic weight gain for the 12 hemodialysis sessions through a month by calculating the difference between the patient's weight obtained at the onset of current dialysis session and the weight at the end of the previous dialysis session. Additionally **mean of pre and post blood pressure** was measured for the 12 hemodialysis sessions before and after HD sessions, the **frequency of hospitalizations due to hemodialysis access problems** as clotting, Infiltration, Phlebitis or infection and latest **biochemical markers** which were blood urea, creatinine, and serum albumin from medical record.

Tool three : The Illness Perception Questionnaire-Revised (IPQ-R) interview:

This tool was developed by Moss M et al. 2002. [21] It was used to identify patients' perception of illness. It comprised seven dimensions with 38 questions ,These seven dimensions were timeline-acute/chronic, it included (6)statements, time line cyclical, it included(4)statements , consequences of disease, it included (6) statements , personal control, it included (6) statements, treatment control, it included (5) statements, illness coherence, it included (5) statements ,and emotional representations, it included (6)statements.

Scoring System:

- A five- points Likert scale was used and ranged from strongly disagree (1), disagree (2), don't know (3), agree (4) and strongly agree (5) was used.

- Accordingly, the maximum total score for patient's perception was equal to190 and minimum total score was equal to 38 .

- The raw score was transformed to percentage as the following:
  - Less than 33.3% means low perception
  - 33.3% to 66.3% means moderate perception
  - More than 66.3% means high perception

Tool four: End Stage Renal Disease – Adherence Questionnaire (ESRD-AQ) structured interview

- This tool was developed by Kim, et al., 2010. [22] The final version of the ESRD-AQ was adapted by the researcher after reviewing recent related literatures .[23,24]. It was used to assess therapeutic adherence in four sections: **HD schedule , prescribed medications, fluid limitations,** and **diet restraints suggestions**. ESRD-AQ contain 46 questions/items segregated into five segments. **general data regarding patients' ESRD and Renal Replacement Therapy correlated history** (5 question). **Adherence to HD attendance** (14 question) **Adherence to prescribed medications** (9 question) **Adherence to fluid limitations** (10 question) **Adherence to diet limitations instructions** (8question)

Scoring System:

- Responses to the ESRD-AQ utilize integration between multiple choices and "yes/no" answer format.

- Adherence category were classified as the following:

- low patient's adherence less than 700
- moderate patient's adherence from 700 to 999
- good patient's adherence from 1000 to 1200

- The raw score will be transformed to percentage as the following:
  - less than 50% means low patient's adherence
  - 50% to less than 75% means moderate patient's adherence
  - more than 75% means good patient's adherence

Method

1. Permission to conduct the study was taken from the Dean of the Faculty of Nursing at Damanhour University to the responsible authorities in the study setting. The goal of this study was clearly explained to the relevant authorities in the previously mentioned setting.

2. Tool (I), (II)were developed, tool IV was adapted and the tools were translated into Arabic by the researcher.

3. The four study tools were submitted to a jury of five professionals in the field of Medical Surgical Nursing Sector in Faculty of Nursing, Damanhur University and Nephrology field in Damanhour Medical National Institute for examination content cogency, comprehensiveness, and clearness of items. Remarks and recommendations from jury were taken in considerations , and the tools were revised accordingly.

4. An experimental study had been performed on (10%) of total sample (n=13) in order to ensure the clearness of questions, feasibility, applicability of the tool and to recognize potential difficulties that could be occurred throughout gathering of data . Pilot study had been omitted from the study sample; Considering the results of an experimental study , the essential changes were ensured.

5. The steadfastness of tools were confirmed using Cronbach's Alpha test which revealed that, the reliability of the tool III was (0.80), reliability of tool IV was (0.90) which indicate good reliability.

6. Every HD patient was interviewed individually according to their dialysis schedule in morning and evening shift to collect sociodemographic and clinical data using tool I, then the researcher collected tool II through reviewing medical record for biochemical marker and for physiological parameters the researcher measured the mean of pre and post-dialysis blood pressure, inter-dialytic weight gain for 12 HD sessions.

7. After that the researcher interviewed each patient individually to assess their illness perception and treatment adherence using tools III and IV. The interview took about 20 to 30 min with each patient.

8. Data collection lasted five months, from April 2023 to August 2023.

7. **Statistical analysis:**

The f Data were fed to the computer and analyzed using IBM SPSS software package version 20. Quantitative data were described using range (minimum and maximum), mean, standard deviation. Implication of the attained results was adjudicated at the 5% level.

Following statistical measures were applied:

- The used tests were:

Chi-square test For definite variables to equivalence between diverse categories, Monte Carlo correction; modification for chi-square when more than 20% of the cells have probable count less than 5 , F-test (ANOVA) For normally distributed quantitative variables to compare between more than two classes , Kruskal Wallis test For unusually dispersed calculable variables to compare between more than two calculated categories and Pearson coefficient to relate between two normally scattered calculable variables.

Ethical considerations:

- The research agreement was gained from the ethical team at the Faculty of Nursing-Damanhour University, before beginning of the study, then an informed approve was obtained from the study participants after justification of the aim of the study and the participants were ensured that collected data will be used merely for the research reason. Confidentiality and right to trash to take part or renounce from the study at any period was confirmed during the study .They were informed that, their withdrawal will not affect the care they receive at the hospital. Namelessness was preserved by using code number rather than names. Confidentiality of the study subjects during collected data was assured.

Results

   Table (1) Distribution of the studied hemodialysis patients according to their sociodemographic characteristics

   Regarding sex, more than half (58.5%) of the studied patients were males, and, more than two fifth (43.8%) of HD patient were in the age from 30 to less than 40 years old . Regarding marital status , two thirds (60.8%) of the studied patients were married. Regarding level of education, about one third (32.3%) of the studied patients had Secondary education , while only 9.2 % had high education . Concerning occupation, it was noticed that, more than one fifth (30.0%) of studied patients were housewives, followed by 28.5% were employed and more than half (53.1%) of the studied patients lived in rural areas . Regarding average of monthly income ,more than half(56.9%) of the studied patients had not enough income. As for means of transportation to the dialysis center, 61.5% of studied patients used buses, while 38.5% utilized personal transportation , the table also showed that, 60% of studied patients went to dialysis center alone.

Table (1): Distribution of the studied hemodialysis patients regarding their sociodemographic characteristics

Socio-demographic characteristics	n=130	
	No	**%**
Sex		
•Male	76	58.5
•Female	54	41.5
Age		
• 20 < 30 years	34	26.2
•30 < 40 years	57	43.8
•40 < 50 years	7	5.4
•50- 60 years	32	24.6
Marital status		
•Single	31	23.8
•Divorced	10	7.7
•Married	79	60.8
•Widowed	10	7.7
Level of education		
•Illiterate	41	31.5
•primary education	35	27.0
•Secondary education	42	32.3
•Higher education	12	9.2
Occupation		
•Employed	37	28.5
• Manual	30	23.0
•Housewife	39	30.0
•Retired	14	10.8

• Not working	10	7.7
Residence area		
•Urban	61	46.9
•Rural	69	53.1
Average monthly income "from patient point of view"		
•Enough	56	43.1
•Not enough	74	56.9
Means of transportation to the dialysis center		
•Personal transportation	50	38.5
•Bus	80	61.5
Person accompanies patient to the dialysis center		
•Alone	78	60.0
•Son/daughter	17	13.0
•Parent	7	5.4
•Spouse (husband or wife)	28	21.6

Table (2): Distribution of the studied hemodialysis patients according to their clinical data:

In relation to causes of kidney failure ,the most reported causes of kidney failure were hypertension and diabetes mellitus (47.7% and 34.6%), respectively. Regarding history of peritoneal dialysis treatment and kidney transplantation most of the studied patients (93.1% and 96.2 %) were had not neither peritoneal dialysis treatment nor kidney transplantation respectively. Also, more than one third (37.0%) of studied patients had been on HD for less than one year. Concerning duration of HD sessions per hours, the findings found that, more than two fifth (47.7%) of studied HD patients having sessions lasting for four hours, followed by 40.8% had sessions lasting between three to less than four hours. Regarding associated diseases more than half (53.8%)of studied patients were having hypertension, followed by 42.3% were having diabetes mellitus. As regarding convenience of the dialysis schedule ,the majority of studied patients (90.8%)

reported that HD schedule was convenient, while only (9.2%) did not, and the reasons mentioned for not convenience were having to come to the dialysis center too early or too late (75.0% and 25.0%) respectively

.

Clinical data	n=130	
	No.	%
Causes of Kidney Failure? #		
•Hypertension	62	47.7
•Diabetes mellitus	45	34.6
•Glomerulonephritis	17	13.1
•Congenital kidney anomalies	6	4.6
•Polycystic kidney	9	6.9
•Accident	5	3.8
•Kidney stones	3	2.3
•Medical mistake	3	2.3
•Unknown	12	9.2
Pervious peritoneal dialysis treatment		
•Yes	9	6.9
•No	121	93.1
Pervious kidney transplantation		
•Yes	5	3.8
•No	125	96.2
Hemodialysis duration per years		
•Less than 1 year	48	37.0
•1<3 years	41	31.5

•3<5 years	41	31.5
Hemodialysis session duration per hours		
•3hours	10	7.7
•3<4 Hours	53	40.8
•4 Hours	62	47.7
•More than 4 hours	5	3.8
Associated diseases #		
•Diabetes Mellitus	55	42.3
•Hypertension	70	53.8
•Heart diseases	11	8.5
•Liver disease	12	9.2
•Rheumatoid arthritis	5	3.8
Dialysis schedule convenient for patient		
• Yes	118	90.8
• No	12	9.2
If no because of	**(n = 12)**	
• I've to come to the dialysis center too early	9	75.0
• I have to come to the dialysis center too late	3	25.0

Table (2): Distribution of the studied hemodialysis patients according to their clinical data

Table (3):   Distribution of the studied hemodialysis patients regarding their clinical outcomes concerning means of (blood pressure and interdialytic weight gain) (n = 130)

In relation to blood pressure, the table revealed that , the mean systolic blood pressure pre-dialysis was 134.5 ± 15.70 mmHg ,while the mean systolic blood pressure post-dialysis was 124.6 ± 16.58 mmHg. For mean diastolic blood pressure pre-dialysis was 85.52 ± 9.74 mmHg, and post-dialysis was 77.72 ± 9.33mmHg. Concerning mean of interdialytic weight gain, the mean interdialytic weight gain which calculated in pervious 12HD sessions was 2.05 ± 1.12kg.

Table (3): Distribution of the studied hemodialysis patients regarding their clinical outcomes concerning means of (blood pressure and interdialytic weight gain) (n = 130)

Table (3B): Distribution of the studied hemodialysis patients regarding clinical outcomes concerning frequency of hospitalizations in preceding one month

This table showed that , the majority of studied patients didn't have complications from dialysis to be hospitalized as coma and infection were represented in (98.5 %and 94.6%) respectively , followed by

Clinical outcomes	Min. – Max.	Mean ± SD.
Blood Pressure **Mean Systolic** • Pre-dialysis • Post-dialysis	101.7– 194.2 100.0 – 180.0	134.5 ± 15.70 124.6 ± 16.58
Mean Diastolic • Pre-dialysis • Post-dialysis	66.67 – 106.7 64.17 – 99.17	85.52 ± 9.74 77.72 ± 9.33
Mean of interdialytic weight gain(Kg)	0.0 – 4.04	2.05 ± 1.12

infiltration (89.2%) ,clotting (86.1%)and phlebitis (80.0%) .

Table (3B): Distribution of the studied hemodialysis patients regarding clinical outcomes concerning(frequency of hospitalizations for dialysis complications in preceding one month) (n = 130)

Clinical outcomes	No		Yes			
			Once		Twice	
	No.	%	No.	%	No.	%
Frequency of hospitalizations for dialysis complications in preceding one month						
▪ **Clotting**	112	86.1	14	10.8	4	3.1
▪ **Infection**	123	94.6	7	5.4	0	0.0
▪ **Infiltration**	116	89.2	14	10.8	0	0.0
▪ **Phlebitis**	104	80.0	24	18.5	2	1.5
▪ **Coma (Hypertensive Encephalopathy)**	128	98.5	2	1.5	0	0.0

Table (3C): Distribution of the studied hemodialysis patients according to their clinical outcomes concerning (biochemical markers)

The results of this table illustrated that, more than two thirds, (68.5%) of the studied patients had normal values of blood urea ,comparing to 64.6% of studied HD patients had normal creatinine level. In terms of albumin level, 56.9% of studied patients had normal level, on the other hand, 43.1% of studied patients had decreasing albumin level.

Table (3C):   Distribution of the studied hemodialysis patients according to their clinical outcomes concerning (biochemical markers) (n = 130)

Clinical outcomes	No.	%
Biochemical Marker		
Blood urea		
▪ Normal	89	68.5
▪ Elevated	41	31.5
▪ Decreased	0	0.0
Creatinine		
▪ Normal	84	64.6
▪ Elevated	46	35.4
▪ Decreased	0	0.0
Albumin		
▪ Normal	74	56.9
▪ Elevated	0	0.0
▪ Decreased	56	43.1

Figure (4): Distribution of the studied hemodialysis patients according to their overall illness perception levels

This figure showed that, more than three quarters (80.0%) of studied patients had moderate illness perception and less than one fifth (19.2%) had high illness perception .
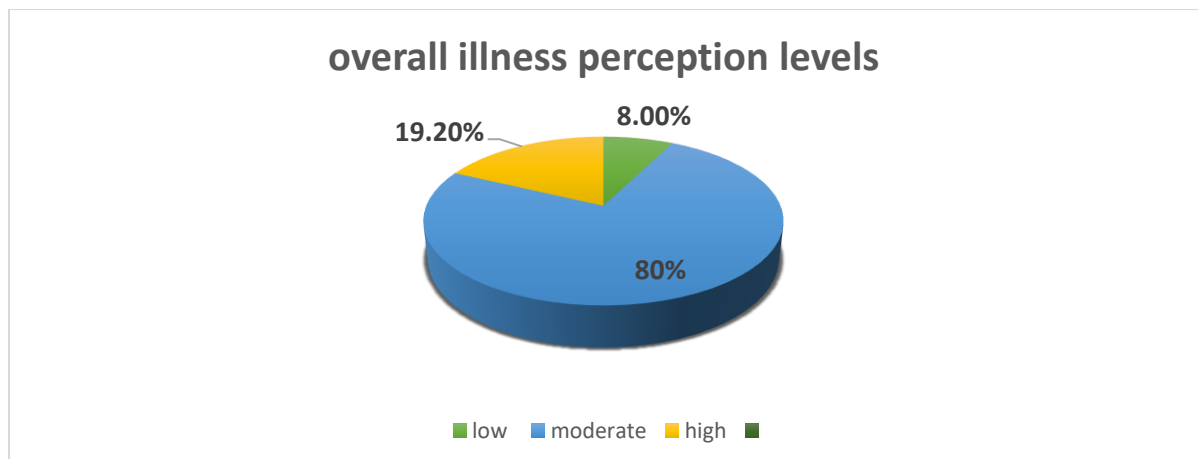

overall illness perception levels

8.00%

19.20%

80%

low moderate high

Figure (4): Distribution of the studied hemodialysis patients regarding their overall illness perception levels

Table (5): D**istribution of the studied hemodialysis patients regarding their levels of adherence score to therapeutic regimen (hemodialysis schedule, prescribed medications, fluid restrictions and dietary recommendations) and overall adherence**

In terms of adherence to the hemodialysis schedule, the table showed that more than four fifth (89.2%) of studied patients had good adherence and the mean score for hemodialysis schedule adherence was 385.8 ± 157.3 In terms of adherence to prescribed medications, more than two thirds (70.8%) had good adherence ,with the mean score was 163.1 ± 51.5. In terms of fluid restrictions ,more than half (60.8%) of studied patients had good adherence ,with mean score 137.3 ± 43.3. Regarding adherence to dietary recommendations, 49.2% had good adherence and the mean score was 121.9 ± 61.6. Regarding overall adherence to the therapeutic regimen more than half (53.1 %) of studied patients had good adherence and the mean score for overall adherence was 808.1 ± 274.6.

Table (5): Distribution of the studied hemodialysis patients regarding their levels of adherence to therapeutic regimen (hemodialysis schedule, prescribed medications, fluid restrictions and dietary recommendations and overall adherence

Dimensions of therapeutic regimen	n=130					
	Levels of adherence					
	Low		Moderate		Good	
	No.	%	No.	%	No.	%
▪ Hemodialysis schedule	4	3.1	10	7.7	116	89.2
▪ Prescribed medications	9	6.9	29	22.3	92	70.8
▪ Fluid restrictions	9	6.9	42	32.3	79	60.8
▪ Dietary recommendations	43	33.1	23	17.7	64	49.2
▪ Overall Adherence	30	23.1	31	23.8	69	53.1

Table (6): Showed relation between levels of illness perception and clinical outcomes (blood pressure and mean of interdialytic weight gain)

In terms of blood pressure there was statistical significant correlation between mean of systolic blood pressure pre-dialysis and levels of overall illness perception, where p value=0.033 , also a highly significant relation was found post dialysis p value=0.008.Regarding diastolic pressures blood pressure there was statistical significant relation between mean of diastolic blood pressure pre-dialysis and levels of overall

illness perception, where p value=0.015. Regarding mean systolic blood pressure pre-dialysis among patients with moderate illness perception was 138.72 ± 18.10mmHg,while mean post dialysis was132.08 ± 21.76 mmHg. Regarding mean diastolic blood pressure pre-dialysis among patients with moderate illness perception was 89.58 ± 9.21mmHg.

Table (6): Relation between levels of illness perception and clinical outcomes (mean of blood pressure and mean of interdialytic weight gain)

Clinical outcomes	Levels of illness perception			Test of Sig.	p
	n=130				
	Low (n = 1)	Moderate (n = 104)	High (n = 25)		
▪ **Systolic blood Pressure**					
Pre-dialysis					
Mean ± SD.	166.67	138.72 ± 18.10	133.18 ± 14.70	χ^2= 3.499*	0.033*
Post-dialysis					
Mean ± SD.	152.50	132.08 ± 21.76	122.57± 14.45	F= 5.039*	0.008*
Diastolic blood Pressure					
Pre-dialysis					
Mean ± SD.	100.83	89.58 ± 9.21	84.40 ± 9.57	F= 4.311*	0.015*
Post-dialysis					
Mean ± SD.	88.33	79.35 ± 9.83	77.23 ± 9.19	F= 1.178	0.311
▪ **Mean of IDWG**					
Mean ± SD.	3.75	2.05 ± 1.10	1.99 ± 1.22		0.245

				H= 2.812

χ^2: Chi square test   F: F for One way ANOVA test   H: H for Kruskal Wallis test

p: p value for comparing between categories   *: Statistically significant at $p \leq 0.05$

Table (7): Displayed correlation between clinical outcomes, overall illness perception and overall adherence to therapeutic regimen .

The results indicate that there is a highly significant negative correlation between overall adherence to the therapeutic regimen and clinical outcomes. A systolic blood pressure pre dialysis had a stronger negative correlation with adherence to the therapeutic regimen where (r = -0.616 and p<0.001),also systolic blood pressure post dialysis(r = -0.645 and p<0.001) . For diastolic blood pressure pre dialysis , also had a stronger negative correlation with adherence to the therapeutic regimen where (r = -0.615 and p<0.001) and diastolic blood pressure post dialysis (r = -0.684 and p <0.001). Concerning mean of IDWG (r = -0.693 and p <0.001). Additionally, the frequency of hospitalizations in the preceding one month due to clotting, phlebitis, and infiltration showed significant negative correlations with adherence to the therapeutic regimen where (r = -0.272 and p= 0.002, r = -0.305 and p <0.001, r = -0.180 and p= 0.040) consequently . Regarding the biochemical markers, blood urea, creatinine, and albumin, all demonstrated significant negative correlations with adherence to the therapeutic regimen where(r=-0.317and p<0.001, r= -0.251 and p =0.004, r= - 0.501 p<0.001) consequently .

Table (7): Correlation between clinical outcomes , overall illness perception and overall adherence to therapeutic regimen (n = 130)

Clinical Outcomes	Overall illness perception		Overall adherence to therapeutic regimen	
	r	p	r	P
Blood Pressure				
(Mean) Systolic				
▪ Pre-dialysis	0.000	1.000	-0.616*	<0.001*
▪ Post-dialysis	0.083	0.348	-0.645*	<0.001*
(Mean) Diastolic				
▪ Pre-dialysis	0.050	0.571	-0.615*	<0.001*
▪ Post-dialysis	0.073	0.408	-0.684*	<0.001*
Mean of IDWG	0.032	0.719	-0.693*	<0.001*
Frequency of hospitalizations in preceding one month due to :				

▪ **Clotting**	-0.051	0.567	-0.272*	0.002*
▪ **Infection**	0.014	0.873	-0.153	0.081
▪ **Phlebitis**	-0.211	0.016	-0.305*	<0.001*
▪ **Infiltration**	0.158	0.072	-0.180*	0.040*
▪ **Coma**	0.072	0.418	-0.027	0.764
Biochemical Markers				
▪ **Blood urea**	0.026	0.771	-0.317*	<0.001*
▪ **Creatinine**	0.009	0.919	-0.251*	0.004*
▪ **Albumin**	-0.022	0.802	-0.501*	<0.001*

r: Pearson coefficient   ***: Statistically significant at $p \le 0.05$**

Discussion

End Stage Renal Disease often influences daily lives and autonomy of the patients in an undesirable way. Low perception of illness causes psychological troubles such as sandiness and misery more vigorously. HD patients see themselves as reliant and their conditions as hopeless because of illness chronicity and limiting treatment methods. Feeling of hopelessness involves negative hope for the future and it is linked with depression and suicidal ideation . Despite that, high perception of disease by HD patients positively influenced self-confidence and independence as the sequence of disease was found to be better in individuals who had a high perception of personal control [25]

However, HD is complex in that it necessitates adherence in many elements. Nonadherence to certain portions of HD regimen is a major apprehension that influences HD patient outcomes , including survival. In general, HD regimen adherence is estimated in four dimensions: joining HD sessions, limiting fluids, following dietary instructions, and taking medication frequently. Clinical outcomes directly rely on patients' adherence to a defined treatment schedule. Low adherence to treatment regimen is a public problem of great clinical significance among HD patients . Missed or shortened HD treatments decreases the ordered dialysis dose and thus the competence of dialysis. In such circumstances, hospital admissions and death risk are stated to rise. [26]

As regarding socio-demographic characteristics**,** Concerning gender, the findings of the present study revealed that more than half of studied patients were males . This may be attributed to higher prevalence of unhealthy habits like smoking or stress. These lifestyle choices can increase the risk factors for conditions like high blood pressure and diabetes, which are the leading triggers of ESRD .This result was consistent with **Shankar and Satheesh .(2024)[27]** who found that more than half of the study contributors were male, also in agreement with **Aini et al.(2022) [28]** showed that more than half of studied patients were male . But

this study was contradicted with **Sadra et al.(2022)[29]** conveyed that more than half of studied populations were female.

Concerning educational status , about one third of the deliberate patients had Secondary education , while only less than one fifth of them had high education .It can be explained by the fact that more than half of the studied patients had not enough income and low socioeconomic status ; this could be what makes them ignore completing their education and satisfied with secondary education. This was congruent with **Hamza et al.(2022)[30]** who found that more than one third of the studied patients had Secondary education. But, this finding weren't in agreement with the study done by **Javed et al.(2019)[31]**, revealed that more than half of studied patients had high education level.

Regarding average of monthly income ,more than one third the studied patients had not enough income. These findings may be interpreted by , more than half of included participants   were housewives , had manual working , more than half of them were male , married and responsible for their families and saplings especially because they were lived in rural area where the husband responsible for all family member . This result was consistent with **Kim and Cho. (2021)** [32] who illustrated that , more than one third of studied patients had not enough income.

Regarding means of transportation to the dialysis unit and persons escorts patients to the dialysis unit; more than one third   of studied patients used buses and went to dialysis center alone. These findings may be attributable to more than half of them had low degree of monthly income and more than two fifth of them were in the age between 30 to 40 years old and able to went to dialysis unit alone. This result was consistent with **Sultan et al.(2022)[33]** who found that more than half of studied patients used public transportation and also more than half of them went to dialysis center alone.

Regarding clinical data the present study revealed that ,the most reported causes of kidney failure were hypertension and diabetes mellitus. These findings may be interpreted by low educational and income level that hinder patients to make periodic check up especially because hypertension known as a silent killer ,also salty diet in rural area considered as important factor in disease progress . This result was consistent with **Iorfa et al.(2024)[34]** who found that ,more than two fifth of studied patient had hypertension and diabetes mellitus. This result was in agreement with **Al-qahtani et al.(2024)[35]** who revealed that more than two fifth of studied patient had hypertension and diabetes mellitus. But this study was contradicted with **Tung et al.(2023)[36]** who found that more than half of studied patients had calcium containing stones .

Regarding history of kidney transplantation and peritoneal dialysis treatment most of the studied patients were had not neither peritoneal dialysis treatment nor kidney transplantation respectively .These findings of the present study may be due to unavailability of compatible donor to donate to the potential recipient in addition to their overall health , low socioeconomic status of studied participants and according to the Egyptian culture most of the study participants ignore their health   until to deteriorate and the need to

hemodialysis become necessary. This result was in the line with **Hussain et al. (2023),** [37] who found that treatment most of the studied patients were had not neither peritoneal dialysis treatment nor kidney transplantation respectively.

As regarding convenience of the dialysis schedule , the current study reported that, the majority of studied patients reported that HD schedule was convenient. This finding may be interpreted by availability of three shifts in HD unit ; morning ,afternoon and evening which allow the patient to select which shift suitable for attendance . This finding was in line with **Thompson and Wang. (2021)** [38] who found that majority of studied patients reported that HD schedule was convenient . Contrarily, this finding was contradicted by **Athbi. (2019)** [39] who demonstrated that more than two-thirds of studied populations reported that HD schedule was in convenient .

As regards to clinical out comes ;the current study reported that, the mean systolic BP before dialysis was elevated than after dialysis and mean diastolic BP pre-dialysis was elevated than post dialysis ,but these findings not considered as hypertension according to The Kidney Disease Improving Global Outcomes (KDIGO) guidelines 2024 established that hypertension is diagnosed with prior dialysis BP more than 140/90 mmHg or with post dialysis blood pressure more than 130/80 mmHg. [40] This finding may be interpreted in the light of the following ;majority of included participants had high adherence to hemodialysis schedule , more than two thirds of them had good adherence to medications and more than half of them had good adherence to fluid restrictions . This finding was agreed with **Liang(2022)** [41] **and Hirawa** [42] who found that, the mean systolic BP before dialysis was higher than after dialysis and mean diastolic BP prior - dialysis was higher than after dialysis. Moreover **Desta and Derseh (2023)** [43] who found that the mean systolic BP pre dialysis was higher than post dialysis and the mean diastolic BP was elevated pre-dialysis than post dialysis .

Concerning mean of interdialytic weight gain, the current study reported that, the mean interdialytic weight gain was low .This finding may be interpreted by most of patients had good adherence to the hemodialysis schedule , having HD sessions lasting for four hours , and more than half of them had good adherence to fluid restrictions . This finding was agreed with **Hecking et al. (2018)** [44] who revealed that mean of interdialytic weight gain was low in the study participants . Conversely, this finding was contradicted with **Jalalzadeh et al. (2021)** [45] who studied the consequences of interdialytic weight Gain among hemodialysis patients, found that, study participants had high IDWG ≥ 4kg .

The current study illustrated that, more than three quarters of studied patients had moderate level of overall illness perception, this could be justified by limited information about chronic renal failure among those patients, also low educational level of patients affect on their perception and knowledge regarding disease . This result was agreed with **Ngernsrisuk. (2023)** [46] who reported that, most of studied patients had a moderate level of overall illness perception . Moreover, this finding was parallel to **Afriyanti and**

Febri. (2023) [47] who revealed that , more than half of studied patients had a moderate level of overall illness perception. But, this study results contradicted with **Honal et al. (2024)** [48] who reported that, more than two thirds of studied patients had low level of overall illness perception .

In terms of adherence to the hemodialysis schedule **,** it was found that, more than four fifth of studied patients had good adherence to the hemodialysis schedule, more than two thirds had good adherence to prescribed medications, this finding may be due to most of studied patients talked about importance of adherence from medical professional every dialysis treatment, more than two fifth of them having sessions lasting for four hours, more than three quarters of them consider adherence to their hemodialysis schedule and medication were very important, the majority of studied patients didn't have complications from dialysis,also they had moderate perception regarding consequences of the disease on their life and fear from negative consequence of disease progress. This finding was in line with **Luitel and Pandey. (2020)** [49] who found that ,majority of studied patients had good adherence to the hemodialysis schedule and more than two thirds had good adherence to prescribed medications. Contrarily, this finding was contradicted with**. Shrestha (2020)** [50] who found that more than one third of studied patients had poor adherence to the hemodialysis schedule and more than half of them had poor adherence to the prescribed medications.

Regarding overall adherence to the therapeutic regimen more than half of studied patients had good adherence; this finding may be due to a patient's lack of understanding and information about disease and treatment adherence because of low educational level of studied patients that hinder them to have adequate information about disease and adherence to therapeutic regimen ,also presence of comorbidities as hypertension and diabetes mellitus which limit patient's motivation regarding adherence to therapeutic regimen . This result was in line with **Asadizaker et al. (2022)** [51] who found that more than two fifth of studied patient had good adherence to therapeutic regimen. In contrast, this finding was contradicted with **Thapa et al. (2021)** [52] who illustrated that approximately one-third of the studied populations had good adherence to therapeutic treatment.

Concerning the relation between levels of illness perception and clinical outcomes ; concerning blood pressure. The study discovered that there was statistical significant relation among mean of systolic BP pre-dialysis ,post- dialysis and levels of overall illness perception. Regarding diastolic BP pressure there was statistical significant relation between mean of diastolic BP pre-dialysis and levels of overall illness perception. These results suggest that illness perception is significantly associated with systolic blood pressure, both before and after dialysis sessions, as well as with diastolic blood pressure before dialysis. Patients with higher illness perception tend to have decreased blood pressure level , indicating that illness perception might impact BP control, this finding may be interpreted by the role of a positive illness perception in motivating patients to prevent the aggravation of disease symptoms particularly blood pressure . This finding was in consistent with those of **Smith et al. (2019)** [53] who found that there was a significant relationship between illness perception and systolic blood

pressure control in hemodialysis patients, showing that patients with a higher level of illness perception had better blood pressure management.

Concerning correlation between clinical outcomes, overall illness perception and overall adherence to therapeutic regimen , the existing study reported that, there is a highly significant strong negative relationship among overall adherence to the therapeutic regimen and clinical outcomes including mean of blood pressure ,mean of interdialytic weight gain , frequency of hospitalizations in preceding one month and biochemical markers**.** . These results showed that participants who follow their therapeutic regimen have a competent understanding of the probable health risks of non-adherence than those who do not follow therapeutic regimen   . Another feasible justification could be the efficacy of health teaching about adherence of therapeutic regimen by the nephrology nurses who spend longer hours with the patients, encouraging them to adhere to therapeutic regimen. This finding was in consistent with those of **Mohamed et al, (2024)** [54] who found that there was highly significant correlation between overall adherence to the therapeutic regimen and blood pressure both systolic and diastolic ,mean of IDWG and serum urea and serum creatinine. This result was congruent with **Fernandes and Dsouza, (2022)** [55] who revealed that there was a significant correlation between noncompliance behavior and biochemical parameters among the hemodialysis patients.

Conclusion

Based on the findings of the current study, it could be concluded that the more than three quarters of studied patients had moderate illness perception, more than half of studied patients had overall good adherence. In addition, the study findings revealed that there was   significant negative correlation between overall adherence to the therapeutic regimen and clinical outcomes.

Recommendations

Haemodialysis nurse should conduct:

1) Ongoing assessment of patient's level of illness perception and adherence to therapeutic regimen at regular intervals.
2) Develop and apply regular education sessions to newly admitted patients regarding the importance of adherence to therapeutic regimens .

- **Further future research:**

- Investigate the factors contributing to patients' non-adherence to therapeutic regimen.

- Role of positive thinking training in improving patient illness perception and treatment adherence

CONFLICTS OF INTEREST

There is no conflict of interest to disclose.

References

1. Moradpour A, Hadian M, Tavakkoli M. Economic evaluation of End Stage Renal Disease treatments in Iran. Clin Epidemiol Glob Heal [Internet]. 2020;8(1):199–204. Available from: https://doi.org/10.1016/j.cegh.2019.07.001

2. Chen Y, Ou S, Lin C. Influence of Dialysis Membranes on Clinical Outcomes. Membranes (Basel). 2022;12(2):12-152.

3. Meuleman Y, van der Bent Y, Gentenaar L, Caskey F, Bart H, Konijn W, et al. Exploring Patients' Perceptions About Chronic Kidney Disease and Their Treatment. Int J Behav Med [Internet]. 2023;(0123456789). Available from: https://doi.org/10.1007/s12529-023-10178-x

4. Eshete A, Getye B, Aynaddis G, Tilaye B, Mekonnen E, Taye B, et al. Association between illness perception and medication adherence in patients with diabetes mellitus in North Shoa, Zone. Front Public Heal. 2023;11(12) :1–9.

5. Bulantekin Duzalan Ö, Albayrak Cosar A, Sarikaya S. Hemodialysis Patients' Experiences of Diet and Fluid Restriction. Prog Nutr. 2021;23(8):1–11.

6. Fotaraki Z, Gerogianni G, Vasilopoulos G, Polikandrioti M, Giannakopoulou N, Alikari V. Depression, Adherence, and Functionality in Patients Undergoing Hemodialysis. Cureus. 2022;14(2) :1–12.

7. Hai A, Chan Y, Cooper V, Lycett H, Horne R. Practical Barriers to Medication Adherence . Front Pharmacol. 2020;11(5):1–11.

8. Khan I, Khan Z, Sumbal S, Khan K, Khan S, Ahmad A, et al. Outcome of Hemodialysis (Hd) Versus Hemodiafiltration (Hdf) on Mortality in Renal Failure. J Popul Ther Clin Pharmacol. 2023;30(18):2637–45.

9. Nabergoj M, Locatelli I, Kos M. Improved adherence with Medicines Use Review service in Slovenia: a randomized controlled trial. BMC Health Serv Res. 2021;21(1):1–12.

10. Lim J, Kim J, Jeon Y, Kim Y, Kang S, Yang C, et al. The benefit of planned dialysis to early survival on hemodialysis versus peritoneal dialysis: a nationwide prospective multicenter study in Korea. Sci Rep [Internet]. 2023;13(1):1–10. Available from: https://doi.org/10.1038/s41598-023-33216-w

11. Jeong E. Impact on health outcomes of hemodialysis patients based on the experience level of registered nurses in the hemodialysis department: a cross-sectional analysis. Frontiers in health services. 2023 ;3(8): 1-18. Available from:https://doi.org/10.3389/frhs.2023.1154989

12. Shrestha P, Shrestha N, Rana I. Treatment Adherence Among Patients Undergoing Hemodialysis of Selected Hospitals of Rupandehi. J Univers Coll Med Sci. 2020;8(02):68–72.

13. Sultan B, Fouad A, Zaki H. Adherence to hemodialysis and medical regimens among patients with end-stage renal disease during COVID-19 pandemic. BMC Nephrol. 2022;23(1):1–9.

14. Tayebi A, Einollahi B, Rahimi A. The non-adherence with treatment in dialysis patients in iran. Iran J Kidney Dis. 2019;13(4):347–61.

15. Li H, Tai P, Hwang Y, Lin S, Lan L. Causes of Hospitalization among End-Stage Kidney Disease Cohort before and after Hemodialysis. Int J Environ Res Public Health. 2022;19(16) 1-13.

16. Georgianos P, Vaios V, Sgouropoulou V, Eleftheriadis T, Tsalikakis D, Liakopoulos V. Hypertension in Dialysis Patients. Diagnostics. 2022;12(12):1–10.

17. Lai K, Hsieh Y, Chiu P, Lin P. Association of Albumin and Globulin with Mortality Risk in Incident Peritoneal Dialysis Patients. Nutrients. 2022;14(14):1–11.

18. Nakaya I, Goto T, Nakamura Y, Yoshikawa K, Oyama J, Tamayama Y, et al. Temporary central venous catheter at hemodialysis initiation and reasons for use. Ren Replace Ther. 2021;7(1):1–9.

19. Mohazzab A, Khavanin Zadeh M, Dehesh P, Abdolvand N, Rahimi Z, Rahmani S. Investigation of risk factors for tunneled hemodialysis catheters dysfunction. BMC Nephrol [Internet]. 2022;23(1):1–7. Available from: https://doi.org/10.1186/s12882-022-02927-z81. Claure-Del Granado R, Clark WR. Continuous renal replacement therapy principles. Semin Dial. 2021 Claure-Del Granado R, Clark WR. Continuous renal replacement therapy principles. Semin Dial. 2021;34(6):398–405.;34(6):398–405. 85.

20. Packer D, Kaufman J. Catheter First: The Reality of Incident Hemodialysis Patients in the United States. Kidney Med [Internet]. 2020;2(3):242–244. Available from: https://doi.org/10.1016/j.xkme.2020.04.004

21. Moss-Morris R, Weinman J, Petrie K, Horne R, Cameron L, Buick D. The revised Illness Perception Questionnaire (IPQ-R). Psychol Heal. 2002;17(1):1–16.

22. Kim Y, Evangelista L, Phillips L, Pavlish C, Kopple J. The End- Stage Renal Disease Adherence Questionnaire (ESRDAQ): Testing the Psychometric Properties in Patients Receiving In-Center Hemodialysis. Nephrol Nurs J 2010; 37(4):377-93.

23. Ok E, Kutlu Y. The Effect of Motivational Interviewing on Adherence to Treatment and Quality of Life in Chronic Hemodialysis Patients. Clin Nurs Res. 2021;30(3):322–33.

24. Ozen N, Cinar F, Askin D, Dilek M, Turker T. Nonadherence in hemodialysis patients and related factors. J Nurs Res. 2019;27(4):1–11.

25. Cantekin I, Arguvanl I. Illness Perception of Turkish Patients Undergoing Hemodialysis and Peritoneal Dialysis: Similarities and Differences. Clin Exp Heal Sci. 2022;12(1):94–101.

26. Ok E, Kutlu Y. The Effect of Motivational Interviewing on Adherence to Treatment and Quality of Life in Chronic Hemodialysis Patients. Clin Nurs Res. 2021;30(3):322–33.

27. Shankar M, Satheesh G, Reddy G. Gender disparity in maintenance hemodialysis units in South India: a cross-sectional observational study. Front Nephrol. 2024;4(3):1–9.

28. Aini N, Setyowati L, Mashfufa E, Setyawati M, Marta O. Gender Differences in Determinant of Quality of Life Among Patients Undergoing Hemodialysis. Malaysian J Med Heal Sci. 2022;18: (4)89–95.

29. Sadra V, Rahimi M, Najafipour F, Habibi R. Comparison of Male and Female Sexual Dysfunction between Hemodialysis and Peritoneal Dialysis in Patients with End-Stage Renal Disease: An Analytical Cross-Sectional Study Shahryar. J Res Clin Med. 2022;10:(4)1-5.

30. Hamza O, kotb safaa, Hasanen R, El maghawry A. Effect Of Educational Program For Hemodialysis Patients Regarding Their Knowledge And Practice About Self Care Behaviour. Assiut Sci Nurs J. 2022;10(28):10–20.

31. Javed S, Kiani S, Saeed A. Haemodialysis Patients: Depression, Perception of Seriousness of Illness, Adherence to Treatment and Quality of Life. Pak Armed Forces Med J 2019; 69 (4): 876-81.

32. Kim H, Cho M. Factors influencing self-care behavior and treatment adherence in hemodialysis patients. Int J Environ Res Public Health. 2021;18(24):1-13 .

33. Sultan B, Fouad A, Zaki H. Adherence to hemodialysis and medical regimens among patients with end-stage renal disease during COVID-19 pandemic. BMC Nephrol. 2022;23(1):1–9.

34. Iorfa T, Sainabou S, Suntu C, Ebrima S, Safiatu S. Burden of Chronic Kidney Disease among Diabetics and Hypertensives in a Tertiary Hospital in the Gambia.S ci med central.2024;11 (2):11–5.

35. Al-qahtani M, Tawhari I, Alhmare A, Badawi A, Alsalem A, Gazzan M, et al. The Awareness , Prevalence , and Risk Factors of Chronic Kidney Disease Among Diabetes Mellitus and Hypertensive Patients in the Aseer Region , Saudi Arabia. Cureus.2024;16(2):1–11.

36. Tung H, Liu C, Huang H, Lu Z, Liu C. Increased risk of chronic kidney disease in uric acid stone formers with high neutrophil - to - lymphocyte ratio. Sci Rep [Internet]. 2023;12(1):1–9. Available from: https://doi.org/10.1038/s41598-023-45034-1

37. Hussain F, Ashraf S, Arshad M, Rehman M, Khan F, Ahmad M, et al. Knowledge, Adherence, and Perception of Patients on Maintenance Hemodialysis to Treatment Regimens at a Tertiary Care Hospital in Pakistan. Cureus. 2023;15(12):1–12.

38. Thompson P, Wang Y. Convenience of hemodialysis schedule and adherence. BMC Nephrol. 2021;22(1):345-357.

39. Athbi H. Compliance behaviors among patients undergoing hemodialysis therapy in Holy Kerbala / Iraq. Kerbala J Pharm Sci. 2018;(9):78–90.

40. Stevens P, Ahmed S, Carrero J, Foster B, Francis A, Hall R, et al. KDIGO 2024 Clinical Practice Guideline for the Evaluation and Management of Chronic Kidney Disease. Kidney Int. 2024;105(4): 117–314.

41. Liang Y, Gan L, Shen Y, Li W, Zhang D, Li Z. Clinical characteristics and management of hemodialysis patients with pre-dialysis hypertension : a multicenter observational study. Ren Fail [Internet]. 2022;44(1):1811–8. Available from: https://doi.org/10.1080/0886022X.2022.2136527

42. Hirawa N. Blood pressure management in hemodialysis patients. Hypertens Res. 2023;46(7):1807–9.

43. Desta B, Dadi A, Derseh B. Mortality in hemodialysis patients in Ethiopia: a retrospective follow-up study in three centers. BMC Nephrol [Internet]. 2023;24(1):3. Available from: https://bmcnephrol.biomedcentral.com/articles/10.1186/s12882-022-03053-6

44. Hecking M, Moissl U, Genser B, Rayner H, Dasgupta I, Stuard S, et al. Greater fluid overload and lower interdialytic weight gain are independently associated with mortality in a large international hemodialysis population. Nephrol Dial Transplant. 2018;33(10):1832–42.

45. Jalalzadeh M, Mousavinasab S, Villavicencio C, Aameish M, Chaudhari S, Baumstein D. Consequences of Interdialytic Weight Gain Among Hemodialysis Patients. Cureus. 2021;(5):1-10.

46. Ngernsrisuk. Y, Tipaporn W, and Chiraporn T. Illness Representation and Coping with Dying Among Patients with End-stage Renal Disease. Nursing Journal .2022;49 (3): 95-108.

47. Afriyanti E, Febri B, Hafifa C. Perceptions of illness in Hemodialysis Patients in the Reproductive Age Group: A cross-sectional study. J Aisyah J Ilmu Kesehat. 2023;8(4):1800–9.

48. Honal G, Brazzaville T, Mahoungou G, Sinomono T, NgandzaliE, Ntandou S. Chronic Renal Failure : Perception and Knowledge of Patients at the Terminal Stage in Brazzaville. Health Sci and Dis .2024;25(2):86–90.

49. Luitel K, Pandey A, Sah BK, KC T. Therapeutic Adherence among Chronic Kidney Disease Patients under Hemodialysis in Selected Hospitals of Kathmandu Valley. J Heal Allied Sci. 2020;10(2):55–62.

50. Shrestha P, Shrestha N, Rana I. Treatment Adherence Among Patients Undergoing Hemodialysis of Selected Hospitals of Rupandehi. J Univers Coll Med Sci. 2020;8(02):68–72.

51. Asadizaker B, Gheibizadeh M, Ghanbari S, Araban M. Predictors of Adherence to Treatment in Hemodialysis Patients: A Structural Equation Modeling. Med J Islam Repub Iran. 2022;36(1): 36-23.

52. Thapa D, Koirala P, Chaulagain D, Kafle T, Belbase D, Bhagat S. Assessment of Quality of Life and Treatment Adherence in Patients under Maintenance Hemodialysis: A Cross- Sectional Study. Birat J Heal Sci. 2021;6(1):1298–303.

53. Smith J, Brown L, Patel R. (2019). Illness Perception and Blood Pressure Control in Hemodialysis Patients. Journal of Nephrology Studies.2019; 15(4): 234-245.

54. Mohamed A, Abdel K, Gamal L, Mohammad M, Baky A, Tawfek H. Therapeutic Nutrition Adherence among Hemodialysis Patients: Nursing Instructions. Minia Scientific Nursing Journal.2024;15(4):64-72.

55. Fernandes S, Dsouza S. Correlation between Noncompliance Behavior and Biochemical Parameters of Chronic Kidney Disease Patients Undergoing Hemodialysis. J Health Allied Sci. 2022; 31 (12)258–62.