Republic of Iraq

Ministry of Higher Education

& Scientific Research

University of Babylon

College of Nursing

Adherence of Hemodialysis Patients toward their Therapeutic Regimen in Al-Hilla Teaching Hospitals

A Thesis Submitted by

Salah Hadi Ali

To the Council of the College of Nursing, University of Babylon in Partial Fulfillment of the Requirements for the Degree of Master in Nursing Sciences

Supervised by

Prof. Dr. Fakhria Jaber Muhaibes

2022 A.D **1444 A.H**

بسم الله الرحمن الرحيم

﴿ قَالُوا سُبْحَانَكَ لَا عِلْمَ لَنَا إِلَّا مَا

عَلَّمْتَنَا إِنَّكَ أَنْتَ الْعَلِيمُ الْحَكِيمُ ﴾

صدق الله العلي العظيم

سُورةُ البقرة

الآية (٣٢)

Dedication

To whom his birth brightened the sun of knowledge, our prophet Mohammed "Blessing upon him".

To my ideal in life, who I carry his name proudly…… dear father.

To the fountain of giving …… my lovely mother.

To my brothers and sisters.

Acknowledgements

Praise to the Almighty Allah, the Glorious Creator of the universe, for His kindness and mercy, and blessing upon Mohammad the Prophet, our first Master.

I would like to express my sincere thanks to **Prof. Dr. Ameen A. Yasir**, Dean of the College of Nursing, University of Babylon for his support.

It is a pleasure to express my deep appreciation to my supervisor, **Prof. Dr. Fakhria Jaber Muhaibes,** for her valuable guidance, assistance, cooperation, and motivation throughout the course of preparing my thesis.

I gratefully acknowledge the endless generosity of the **experts** who kept me on the right track for their time and expertise in reviewing and evaluating the study instrument.

Furthermore, I would like to thank all members of the College of Nursing, University of Babylon, for their aid and to all the people who helped me in my work.

Finally, thanks are also extended to the participants of this study, who helped me in making this thesis possible to be accomplished. Each of you has contributed to my success in completing this thesis.

Abstract

End-stage kidney disease is a worldwide health problem that has led to an increase in the number of patients using hemodialysis as their first renal replacement therapy. Adherence to dietary guidelines, fluid restriction, prescription medicines, and hemodialysis (HD) sessions is essential for optimal and successful therapy. Nonadherence is linked to a variety of unfavorable clinical outcomes and decreasing the quality of life of patients.

The objectives of the study are to assess the adherence of hemodialysis patients toward their therapeutic regimen and to investigate the statistical differences in hemodialysis patients' adherence to the therapeutic regimen and their sociodemographic characteristics and clinical data.

A descriptive cross-sectional study was started from the 19th of September, 2021, to the 6th of July, 2022. The study was carried out in two artificial kidney centers at Al-Hilla Teaching Hospitals. A non-probability purposive sample consisted of 100 patients with ESRD who received hemodialysis treatment. The data was collected using a constructed and adopted questionnaire, then these data were electronically analyzed using SPSS Version 26.

The findings revealed that 90% of hemodialysis patients expressed a moderate level of adherence to the therapeutic regimen. Hemodialysis patients' adherence to therapeutic regimen is significantly associated with their age (p=0.000), marital status (p=0.037), educational level (p=0.000), economic status (p=0.000), and duration of hemodialysis (p=0.016).

Majority of hemodialysis patients demonstrated a moderate level of adherence to the therapeutic regimen. To promote adherence among hemodialysis patients, it is necessary to educate patients with family

involvement about the significance of adherence to hemodialysis treatment attendance, medication adherence, and dietary and fluid restrictions.

Table of Contents

List	Subjects	Page No.
1	Abstract	I- II
2	Table of Contents	III-V
3	List of Figures	V-VI
4	List of Tables	VI- VII
5	List of Abbreviations	VIII- IX
6	List of Statistical Symbols	IX
7	List of Appendices	X
	Chapter One: Introduction	1-11
1.1	Background	2- 6
1.2	Importance of the Study	6- 9
1.3	Statement of the Problem	9- 10
1.4	Objectives of the Study	10
1.5	Definitions of Terms	10- 11
	Chapter Two: Literature Review	12- 50
2.1	Kidney Functions	13- 14
2.2	Kidney Failure	14
2.2.1	Acute Kidney Failure	14-15
2.2.2	Chronic Renal Failure	15
2.2.2.1	Causes of Chronic Kidney Disease	15
2.2.2.2	Classification System for CKD	16
2.3	End-stage Kidney Disease	16- 17
2.3.1	Pathophysiology of End-stage Renal Disease	17-18
2.3.2	Clinical Manifestations of ESKD	18- 19
2.3.3	Diagnostic Tests OF ESRD	19- 20
2.4	Kidney Replacement Therapy (Transplantation, Dialysis)	20
2.4.1	Kidney Transplant	21
2.4.2	Dialysis	21
2.4.2. a	Peritoneal Dialysis	21
2.4.2. b	Hemodialysis	22
2.5	Hemodialysis Historical Overview	22- 27
2.6	Complications of Hemodialysis	28- 30

2.7	Hemodialysis Vascular Access	31
2.7.1	Arteriovenous Vistula	31- 32
2.7.2	Arteriovenous Graft	32
2.7.3	Central Venous Catheter	32- 33
2.8	Nursing Care for Patient Undergoing Hemodialysis	35
2.8.1	Nursing Care Pre-hemodialysis Session	35- 37
2.8.2	Nursing Considerations during Hemodialysis	37
2.8.3	Ending Hemodialysis	38
2.9	Therapeutic Regimen of Hemodialysis Patients	38- 43
2.10	Theoretical Framework	43- 44
2.11	Education to Enhance Self-management in Patient Undergoing Hemodialysis	44- 46
2.12	Previous Studies	46- 50
	Chapter Three: Methodology	51- 60
3. 1	Design of the Study	52
3.2	Administrative Arrangements	52
3.3	The Setting of Study	53
3.4	The Study Sample	54
3.5	The Instrument of Study	54- 55
3.6	Rating and Scoring	55- 56
3.7	The Study Instrument's Validity	56
3.8	Pilot Study	57
3.9	Reliability of the Study Instrument	57- 58
3.10	Collection of the Data	58
3.11	Methods of Statistical Data Analysis	58
3.11.1	Descriptive approach	58- 59
3.11.2	Inferential approach	59- 60
	Chapter Four: Results of the Study	61- 79
	Chapter Five: Discussion	80- 95
5.1	Hemodialysis Patients' Sociodemographic Characteristics	81- 84
5.2	Clinical Data of Hemodialysis Patients	84- 86

5.3	Adherence of Hemodialysis patients toward their Therapeutic Regimen	86
5.3.1	Hemodialysis patients' adherence to dietary restrictions	86- 87
5.3.2	Hemodialysis Patients' Adherence to Fluid Consumption	87- 88
5.3.3	Hemodialysis Patients' Adherence to Hemodialysis Sessions	88-89
5.3.4	Hemodialysis Patients' Adherence to Prescribed Medications	89- 90
5.3.5	Overall Adherence of Hemodialysis Patients toward their Therapeutic Regimen	90- 91
5.4	The Relationship Between Hemodialysis Patients' Adherence to Therapeutic Regimen and their Socio-demographic Characteristics.	91- 95
	Chapter Six: Conclusions and Recommendations	96- 98
6.1	Conclusions	97
6.2	Recommendations	98
	References	99- 118

List of Figures

List	Figures	Page No.
2.1	The KDIGO classification of chronic kidney disease and prognostic risk	16
2.2	Graham’s osmometer	23
2.3	The Vividiffusion machine	24
2.4	Dr. Georg Haas and his assistant demonstrate the cabin dialysis system.	25
2.5	Artificial kidney machine (Kolff–Brigham), France, 1955	26
2.6	Externalized Quinton-Dillard-Scribner Arteriovenous shunt made of Teflon	27
2.7	Current hemodialysis access routes	35
2.8	The health belief model	44
4.1	Adherence of Hemodialysis Patients to Dietary Restrictions	65

4.2	Adherence of Hemodialysis Patients to Fluid Consumption	67
4.3	Adherence of Hemodialysis Patients to Hemodialysis Sessions	69
4.4	Adherence of Hemodialysis Patients to Prescribed Medications	71
4.5	Adherence of Therapeutic Regimen among Hemodialysis Patients	72
4.6	Adherence of Therapeutic Regimen according to Age Groups	73
4.7	Adherence of Therapeutic Regimen according to Education Level	75
4.8	Adherence of Therapeutic Regimen According to Marital Status	76
4.9	Adherence of Therapeutic Regimen According to Economic Status	78
4.10	Adherence to Therapeutic Regimen according to Duration of Hemodialysis	79

List of Tables

List	Tables	Page No.
2.1	Advantages and disadvantages of each type of vascular access	33- 34
3.1	The Rating Scales and Scoring	56
3.2	Questionnaire Reliability	58
4.1.1	Distribution of the study sample according to their socio-demographic Variables (SDVs)	62
4.1.2	Distribution of the study sample according to their clinical data	63
4.2.1	Hemodialysis Patients' Adherence to Dietary Restrictions	64
4.2.2	Overall Hemodialysis Patients' Adherence to Dietary Restrictions	65
4.2.3	Hemodialysis Patients' Adherence to Fluid Consumption	66
4.2.4	Overall Hemodialysis Patients' Adherence to Fluid Consumption	67

4.2.5	Hemodialysis Patients' Adherence to Hemodialysis Sessions	68
4.2.6	Overall Hemodialysis Patients' Adherence to Hemodialysis Sessions	69
4.2.7	Hemodialysis Patients' Adherence to Prescribed Medications	70
4.2.8	Overall Hemodialysis Patients' Adherence to Prescribed Medications	71
4.2.9	Overall Adherence toward Therapeutic Regimen among Hemodialysis Patients	72
4.3.1	Statistical Differences Adherence to Therapeutic Regimen among Hemodialysis Patients with regard to their Age	73
4.3.2	Statistical Differences Adherence to Therapeutic Regimen in Hemodialysis Patients with regard to their gender	74
4.3.3	Statistical Differences Adherence of Therapeutic Regimen among Hemodialysis Patients with regard to their Education	75
4.3.4	Statistical Differences Adherence to Therapeutic Regimen in Hemodialysis Patients with regard to their marital status	76
4.3.5	Statistical Differences Adherence of Therapeutic Regimen among Hemodialysis Patients with regard to their Occupational Status	77
4.3.6	Statistical Differences Adherence to Therapeutic Regimen in Hemodialysis Patients with regard to their economic status	77
4.3.7	Statistical Differences Adherence to the Therapeutic Regimen in Hemodialysis Patients with regards to their residence	78
4.3.8	Statistical Differences Adherence to the Therapeutic Regimen in Hemodialysis Patients with regard to their Duration of Hemodialysis	79

List of Abbreviations

Abbreviations	Meaning
AKI	Acute Kidney Injury
ANOVA	Analysis of Variance
ARF	Acute Renal Failure
AV	Arteriovenous
AVF	Arteriovenous Fistula
AVG	Arteriovenous Graft
BMI	Body Mass Index
BUN	Blood Urea Nitrogen
CDC	Centers for Disease Control and Prevention
CKD	Chronic Kidney Disease
CRF	Chronic Renal Failure
CT	Computed Tomography
CVC	Central Venous Catheter
CVD	Cardiovascular Disease
D.M	Diabetes Mellitus
DDS	Dialysis Disequilibrium Syndrome
DF	Degree of Freedom
ESKD	End Stage kidney Disease
ESRD	End Stage Renal Disease
ESRD-AQ	End-Stage Renal Disease Adherence Questionnaire
F	Frequency
GFR	Glomerular Filtration Rate
HBM	Health Belief Model
HBV	Hepatitis B Virus
HCPs	Health Care Providers
HCV	Hepatitis C Virus
HD	Hemodialysis
HDL	High-density Lipoprotein
HIV	Human Immunodeficiency Virus
IDWG	Interdialytic Weight Gain
IgE	Immunoglobulin E
IV	Intravenous
KDIGO	Kidney Disease Improving Global Outcomes
KRT	Kidney Replacement Therapy
M	Mean
M. S	Mean of Scores
Max	Maximum

MDRD	Modification of Diet in Renal Disease
Min	Minimum
mOsm	Milliosmoles
MRA	Magnetic Resonance Angiography
N	Number
NKF	National Kidney Foundation
No.	Number
NS	Non-Significant
P	Probability
PH	Potential of Hydrogen
PO4	Phosphate
PTFE	Polytetrafluoroethylene
RBCs	Red Blood Cells
ROD	Renal Osteodystrophy
RRT	Renal Replacement Therapy
S	Scores
SD	Standard Deviation
SDVs	Socio-Demographic Variables
Sig	Significant
SPSS	Statistical Package of Social Sciences
VA	Vascular Access
WHO	World Health Organization

List of Statistical Symbols

Symbols	**Meanings**
%	Percentage
<	Less than
>	More than
≤	Equal or less than
∑	Summation of
X	The value in the data set
$\tilde{\chi}$	Mean of all values in the data set.

List of Appendices

List	Appendices
A	Administrative Arrangements
B	Questionnaire
C	Panel of Experts
D	Linguistic Approval

Chapter One:

Introduction

Chapter One

Introduction

1.1. Background

Chronic renal disease is an irreversible and gradual disorder that refers to a three-months or longer decrease in Glomerular Filtration Rate (GFR) or nephritic damage. The National Kidney Foundation (NKF) has classified it into five stages, from stage one (glomerular filtration rate greater than 90 milliliters /minute/1.73 m^2) to stage five (GFR fewer than 15 milliliters /minute/1.73 m^2), which is called End Stage Renal Disease (ESRD) (Baqer *et al.*, 2018).

The progression of Chronic Kidney Disease (CKD) begins with acute kidney injury, which is a temporary loss of renal function that occurs within hours to a few days as a result of ischemia or toxic insult to the kidney, leading to the retention of nitrogenous waste. Without treatment, acute renal injury develops into chronic renal disease, an irreversible state marked by persistent albuminuria that gradually develops from mild to severe levels and a sustained decline in predestined glomerular filtration rate (GFR) for at least three months (Geldine *et al.*, 2017).

The most prevalent causes of chronic kidney disease include diabetes, hypertension, chronic glomerulonephritis, chronic pyelonephritis, chronic anti-inflammatory medication use, autoimmune diseases, polycystic kidney disease, Alport disease, congenital defects, and prolonged acute renal disease (Ammirati., 2020).

The severity of CKD signs and symptoms is influenced by the glomerular filtration rate, the age of the patient, and other underlying disorders. This disease affects all body systems, and its symptoms and signs include hypertension, anorexia, nausea, pulmonary edema, pericardial

effusion, fatigue, headache, sleep disturbances, muscular cramps, lethargy, seizures, glucose intolerance, neuropathy, coma, diminished libido, impotence, and amenorrhea. In addition, loss of sodium due to dehydration, pallor, hyperpigmentation, pruritus, ecchymoses, uremic frost, increased bleeding propensity, and anemia, as well as behavioral and personality changes, and changes in cognitive ability (Nettina., 2010).

End stage renal disease is described as an irreversible loss in renal function that, without dialysis or transplantation, is deadly. ESRD is included in stage five of the National Kidney Foundation Kidney Disease Outcomes Quality Initiative classification of chronic renal disease, referring to those having an estimated glomerular filtration rate of less than 15 ml/min/1.73 m^2. Therefore, loss or impairment of kidney function results in a range of maladaptive changes, including fluid retention (excess extracellular volume), anemia, protein-energy malnutrition, abnormal bone mineral metabolism, and dyslipidemia (Abbasi *et al.*, 2010).

Patients with severe kidney disorders who require days to weeks of dialysis (a short time) and those who have dialysis end-stage kidney disease who need permanent renal alternative treatment. Dialysis does not compensate for the loss of metabolic and endocrine activity in the kidneys. More than 90% of patients who need long-term dialysis receive it on a continuous basis. Most dialysis patients receive treatment three times a week in outpatient clinics for an average of three to four hours. Dialysis sessions can be scheduled at home and performed by the patient himself or by home caregivers. They should be adjusted related to time and frequency to match the needs of the patient’s ideal healthcare (Shyaa and Ahmed, 2017).

Dialysis is a form of kidney replacement therapy. Artificial equipment augments the kidney's blood filtration function by removing excess water, solutes, and toxins. Dialysis restores homeostasis (a stable internal environment) to patients who have had a rapid loss of kidney

function, referred to as acute kidney injury (AKI), or a gradual loss of renal function, known as end-stage renal disease. It may be used to hold a sudden decline in renal function until a kidney transplant is performed or to treat individuals who are not transplant candidates permanently. Nevertheless, the three fundamental types of dialysis are hemodialysis, peritoneal dialysis, and hemofiltration (Deif *et al.,* 2015).

Therefore, hemodialysis (HD) is based on the notion of diffusion through a semipermeable membrane. Counter current flow is a diffusion process on which hemodialysis is based, which circulates the dialysate in the opposite direction of blood flow through the extracorporeal circuit. Counter-current movement maintains the largest concentration gradient across the membrane, hence increasing the efficiency of hemodialysis. By applying pressure to the dialysate compartment, it is possible to remove free water and some dissolved solutes (ultrafiltration). The solution used for dialysis is a sterile solution of mineral ions. Also, the diffusion of phosphate, potassium, urea, and other waste substances into the dialysis solution (Mehmood *et al.,* 2016).

Nevertheless, hemodialysis alleviates patients' suffering but cannot totally restore or cure renal function. Additionally, it has an effect on patients' quality of life and may result in significant alterations to their physiology, which may result in impairment. Patients must self-manage their illness and modify their behavior and lifestyle in order to adhere to the hemodialysis treatment regimen, all of which are dependent on compliance with HD sessions, medication, fluid restriction, and dietary restriction. Along with these four components, physical exercise is another critical feature that patients must adhere to. The National Kidney Foundation (NKF) suggested that patients engage in moderate physical exercise for 30 minutes on most days while following a therapy regimen centered on recovery or maintenance of their quality of life (Sulistyaningsih *et al.,* 2020).

Diets for hemodialysis patients should be arranged in such a way that weight gain during dialysis intervals does not exceed 4% of body weight. Patients who are hemodialyzed three times per week should consume 1.2 grams of protein per kilogram of body weight per day, with at least 50% of the protein being of elevated biological value. Because the kidneys are unable to secrete all of the potassium eaten, dialysis patients should limit their potassium intake. The potassium levels in these people should be checked frequently. Additionally, these individuals have an elevated plasma phosphorus level and a decreased plasma calcium level. Hence, it is suggested to minimize phosphorus consumption and increase calcium intake. Sodium consumption should be reduced to 2-3 grams per day for hemodialysis patients. Additionally, these individuals have an increased risk of cardiovascular disease. Additionally, the patients' daily fluid consumption should be limited and they should get an average of 750 to 1000 milliliters per day in addition to the amount of urine output *(*Jampour *et al.,* 2018).

In ESRD patients, non-adherence practices result in noteworthy illness consequences such as heart failure, hypertension, pulmonary edema, trouble breathing, and hypotensive episodes. Additionally, it results in uremic/anemic consequences, disturbances in fluid and electrolyte and acid-base imbalances, recurrent infection episodes, and increased catabolism as a result of poor nutritional adherence. These errors in adherence among ESRD patients receiving hemodialysis have resulted in an increase in the rate of morbidity and mortality (Toroitich *et al.,* 2020).

Therefore, to decrease nonadherence, interventions must target both patient variables and the degree to which relationships with healthcare providers and healthcare system problems impair the patient's ability to follow medications and therapeutic programs. There is still a tendency to focus only on the patient as the source of adherence difficulties, neglecting other factors such as patient-healthcare provider interactions and the health

care system around the patient. The nurse can establish a strong, supportive connection with the patient, identify barriers to adherence, and give patients ways to improve their compliance (Ali, 2013).

Nursing involvement has been widely recognized as significant in improving patients' compliance with dialysis. This involvement, which includes education, training, and behavioral interventions, assists patients to obtain a better understanding of dialysis and create healthy living habits as well as enhance their compliance with this treatment (Wang *et al.*, 2018).

1.2. Importance of the Study

The most commonly used therapy for end-stage chronic renal failure patients around the globe is dialysis, with an estimated 2.989 million dialysis patients by the end of 2016, with 89 percent of them hemodialysis patients. Hemodialysis extends patients' lives, but it also puts them under a lot of limitations and causes a lot of physical, mental, social, and financial issues. The reduction of these problems necessitates extensive patient care (Shahgholian and Yousefi, 2018).

According to a World Health Organization report published in 2018, the number of people died from kidney illness in 2015 was 1.2 million, and in 2010, the number of people with kidney disease in the last stage dying without access to chronic dialysis was 2.3–7.1 million. The death rate has increased by 32% since 2005. According to the same research, 2.1 million people had dialysis therapy in 2010 and that number will jump to 4.2 million by 2030 (Yangoz and Ozer, 2020).

In 2018, approximately 131,600 individuals in the United States began treatment for ESRD. In the United States, almost 786,000 people, or around two people in every 1,000, presently had ESRD: 71% were dialysis patients, and 29% were kidney transplant recipients. For every two women who acquired ESRD, there were three males. According to the Iraqi Renal

Registry, in 2018, about 200,000 adult Iraqi people suffer from various stages of chronic kidney disease (CKD). However, many researchers have claimed that today's silent CKD is an outbreak or epidemic (CDC, 2021; Dhaidan, 2018).

In one of the studies in Iraq, a total of 2,445 patients with ESRD were on a regular hemodialysis program in January 2012, a frequency of 74 per million people. The province of Thiqar had the fewest ESRD patients on regular hemodialysis at 38 (1.55 %), while Baghdad had the most at 593 (24.25 %). However, the greatest prevalence was found in Al-Diwaniya province, with 152 cases per million population, followed by Al-Muthanna and Karbala. Thiqar has the lowest prevalence at 21 per million people, followed by Salah-Elden and Basra. In Babylon province, the number of patients was 121, with a prevalence of 67 per million (Majeed *et al.*, 2018).

The management of stage-five chronic renal disease necessitates a comprehensive treatment regimen that includes hemodialysis and adherence to a stringent medication, diet, and fluid treatment regimen. These four therapeutic facets are inextricably linked and serve as the treatment pillars, directly affecting morbidity and mortality rates. Noncompliance with any of these aspects has a detrimental effect on the patient's quality of life and health care expenses (Lins *et al.*, 2018).

In addition, adherence to the recommended hemodialysis regime is critical for attaining satisfactory treatment results and contributing to the decrease in morbidity, mortality, and hemodialysis adverse effects in patients receiving hemodialysis (infections, sepsis, malnutrition, muscle cramps). Failure to adhere to the fluid restriction regimen may cause anxiety, panic episodes, dyspnea, hypertension, and pulmonary edema. Repeated episodes of excessive fluid consumption place a strain on the cardiovascular system. Despite the fact that hypertension is a cardiovascular disease risk factor,

studies have found either a positive or negative association between nonadherence to fluid restriction and mortality (Alikari *et al.,* 2017).

Traditionally, the renal diet has been one of the most challenging medical nutrition regimens to teach, comprehend, and administer. End-stage renal disease's medical nutrition therapy requires patients to change their nutritional goals away from traditional dietary guidelines and toward a pattern that regulates circulating waste products and minerals between dialysis sessions. This is especially true for individuals receiving chronic hemodialysis (HD) therapy, where the interval between treatments is 48 to 72 hours. Patients are specifically advised to restrict vegetables, dairy products, legumes, whole grains, nuts, and fruits due to concerns about phosphorus and potassium. These dietary limits are made considerably more difficult by the increased protein and energy requirements. These constraints may result in dissatisfaction, a loss of autonomy, and the sense that nothing is left to eat (Biruete *et al.,* 2016).

Noncompliance with pharmaceutical and dietary regimens may result in persistently increased phosphate in the blood, which plays a critical factor in the emergence of renal osteodystrophy and secondary hyperparathyroidism. Even in young individuals, high phosphate levels may also contribute to the development of coronary artery disease, resulting in a greatly increased risk of death. Serum phosphate levels above the normal range (>6.5 mg/dl) were related to an elevated risk of relative mortality adjusted. In addition, lack of potassium compliance might result in cardiac arrest and death (Rambod *et al.,* 2010).

Increased dietary sodium consumption activates osmoreceptors, which causes thirst and increases volume intake, which results in increased total body fluid and, as a result, an increase in interdialytic weight gain (IDWG). More volume clearance during the hemodialysis process is needed when there is high interdialytic weight gain. The risk of death increases when

the relative IDWG is greater than 5.7 %; the risk of fluid overload hospitalization increases when the relative IDWG is greater than 4% (Beerappa and Chandrababu, 2019).

Compliance rates for fluid restrictions, diet restrictions, medications, and hemodialysis range from 30–74 %, 2–81 %, 17–46 %, and 0–32 %, respectively, among hemodialysis patients. These discrepancies were attributed in part to the study's diverse population and, more likely, to the inconsistency of the methods employed to quantify compliance rates. Numerous variables have been identified as influencing hemodialysis patient compliance, with differing degrees of agreement between studies. The demographic correlates of non-compliance that were consistently reported were younger age and male patients. Additionally, education, socioeconomic status, duration of hemodialysis treatment, health beliefs, and social support are also determinants (Chan *et al.,* 2012).

Furthermore, it is critical for nephrology nurses to spend frequent time with patients in order to identify the variables that contribute to the patient's failure to adhere to the therapeutic regimen. The nurse who is conversant with the patient is enabled to design tailored interventions targeted at removing impediments to adhering to the prescribed treatment regimen. Recognize which actions assist patients in overcoming the obstacles that prevent them from complying with recommended therapy. Health education is an essential part of every element of patient care. Because knowledge is crucial for dialysis patients to deal with the intricacies of renal illness and therapy (Ebrahimi *et al.,* 2016).

1.3. Statement of the Problem

Hemodialysis patients should adhere to their therapeutic regimen that includes adherence to diet, fluid, medication, and hemodialysis treatment. Non-adherence with any of these aspects has a detrimental effect on the

patient's quality of life and health care expenses. Therefore, it is necessary to assess the adherence of hemodialysis patients to their therapeutic regimen.

1.4. The objectives of the Study are to:

1- Assess the adherence of hemodialysis patients toward their therapeutic regimen.

2- Investigate the statistical differences in hemodialysis patients' adherence to the therapeutic regimen and their sociodemographic characteristics (age, gender, educational level, marital status, occupation, economic status, and residency) and clinical data (duration of hemodialysis).

1.5. Definition of Terms

1.5.1. Adherence

A. Theoretical:

Adherence is defined as "the extent to which a person's behavior (taking medications, following a recommended diet, and/or implementing lifestyle changes) corresponds with a healthcare provider's agreed-upon recommendations" (Victoria *et al.*, 2015 pp: 60).

B. Operational:

The ability of a patient undergoing hemodialysis to fully follow the identified guidelines involving attending hemodialysis sessions, adhering to prescribed medication, dietary and fluid restrictions.

1.5.2. Hemodialysis Patient

A. Theoretical:

A person who use hemodialysis technique for the extracorporeal elimination of waste products from the blood, such as creatinine, urea, and excess water, when the kidneys are in a condition of renal failure (Mukakarangwa *et al.*, 2020).

B. Operational:

A patient who has been diagnosed with ESRD and receives hemodialysis is required to adhere to a treatment regimen that includes full attendance at hemodialysis sessions, adherence to prescribed medication, fluid restriction, as well as adherence to dietary recommendations.

1.5.3. Therapeutic Regimen

A. Theoretical:

A method of organizing and incorporating into daily life's program for treating disease and its consequences that is effective at achieving specified health goals (Mendes *et al.*, 2011)**.**

B. Operational:

Refers to the four component guidelines used to assess adherence among hemodialysis patients. It included attending a hemodialysis session, adhering to medication prescribed, and dietary and fluid restrictions.

Chapter Two:

Review of Literature

Chapter Two

Review of Literature

2.1. Kidney Functions: As presented by (Tortora and Derrickson, 2014)

- **Regulation of the ionic content of the blood:** The kidneys contribute to the regulation of numerous ions in the blood, most notably calcium (Ca^{+2}), sodium (Na^{+}), chloride (Cl^{-}), potassium (K^{+}), and phosphate ($HPO4^{-2}$).

- **Blood PH regulation:** The kidneys excrete variable quantities of hydrogen ions (H^{+}), which also store bicarbonate ions (HCO^{-3}), which serve as a vital buffer for H^{+} in the blood. Both of these processes contribute to blood pH control.

- **Blood volume regulation:** The kidneys regulate the volume of blood by retaining or excreting water in the urine. Blood pressure goes up when the amount of blood in the body goes up, and it goes down when the amount of blood in the body goes down.

- **Blood osmolarity maintenance:** The kidneys keep the osmolarity of the blood around 300 milliosmoles per liter (mosm/liter) by controlling how much water and solutes are lost through the urine.

- **Blood pressure regulation:** The kidneys also contribute to the control of blood pressure by secreting renin, an enzyme that stimulates the renin–angiotensin–aldosterone system. Blood pressure rises when renin levels are elevated.

- **Hormones Production:** The kidneys are responsible for the production of two main hormones. Calcitriol, the active form of vitamin D, aids in maintaining calcium homeostasis, whereas erythropoietin promotes red blood cell synthesis.

- **Blood glucose regulation:** The kidneys, like the liver, may synthesize new glucose molecules using the amino acid glutamine. They can release glucose into the bloodstream, aiding in the maintenance of a normal blood sugar level.

- **Wastes and foreign substances elimination:** The kidneys assist in the elimination of waste and substances that serve no functional purpose in the body. Certain wastes produced in urine are the product of metabolic events occurring within the body. These include ammonia and urea produced during amino acid deamination, as well as bilirubin.

2.2. Kidney Failure

Renal failure is a disorder in which the kidneys are unable to eliminate metabolic waste products from the blood and maintain proper fluid, electrolyte, and pH balance in extracellular fluids. The underlying reason might be renal illness, systemic disease, or nonrenal urologic abnormalities. Renal failure can present as an acute or chronic condition. Acute renal failure manifests abruptly and is frequently reversible if detected and treated effectively. In comparison, chronic renal failure is the eventual outcome of irreversible kidney damage. It progresses slowly, typically over a period of years (McGrath, 2017).

2.2.1. Acute Kidney Failure

Acute renal failure (ARF) is a sudden worsening in kidney function characterized by the buildup of metabolic waste products, fluids, and electrolytes. Typically, acute kidney failure is followed by a significant reduction in urine production. ARF is typically reversible, but if left untreated or poorly treated, it can lead to irreversible renal damage and chronic kidney failure. ARF can be developed in two ways: in the community or in the hospital. Community acquired ARF is diagnosed in approximately 1% of hospital admissions during the initial examination. In comparison, acute kidney failure acquired in the hospital occurs in up to 4% of hospital admissions, and intensive care admissions account for 20% of hospitalizations. Numerous factors contribute to this rise in hospital-acquired ARF, including an older population, the rising severity of illness among

hospitalized patients, and the use of nephrotoxic drugs (Sommers and Fannin, 2015).

2.2.2. Chronic Renal Failure (CRF)

Chronic renal failure is a general concept that refers to renal damage or a three-month or longer decline in glomerular filtration rate (GFR). CRF is associated with a decline in life quality, an increase in healthcare costs, and an increased risk of early mortality. However, untreated chronic renal failure (CRF) can develop into end-stage kidney disease, necessitating kidney replacement treatment (dialysis or kidney transplantation) (McGrath, 2017).

2.2.2.1. Causes of Chronic Kidney Disease:

Various causes of CKD, such as diabetic nephropathy (Type 2 diabetes mellitus and Type 1 diabetes mellitus), vascular conditions (hypertension, ischemic renal disease), glomerular disorders: primary (lupus nephritis, vasculitis, membranous nephropathy, minimal change disease, focal segmental glomerulosclerosis, and immunoglobulin A nephropathy) and secondary (infections (e.g., hepatitis B and C, HIV, related bacterial endocarditis), amyloidosis, heroin use, and cancer (e.g., leukemia, Hodgkin lymphoma, carcinoma)), cystic disorders: polycystic kidney disease and medullary cystic disease, tubulointerstitial disease: infections of the urinary system, nephrolithiasis, blockage, sarcoidosis, multiple myeloma, and drug toxicity (e.g., proton pump inhibitors, lithium, nonsteroidal anti-inflammatory drugs) (Baumgarten and Gehr, 2011).

2.2.2.2. Classification System for CKD:

Prognosis of CKD by GFR and albuminuria categories: KDIGO 2012				Persistent albuminuria categories Description and range		
				A1	A2	A3
				Normal to mildly increased	Moderately increased	Severely increased
				< 30 mg/g < 3 mg/mmol	30–300 mg/g 3–30 mg/mmol	> 300 mg/g > 30 mg/mmol
GFR categories (ml/min/1.73 m²) Description and range	G1	Normal or high	≥ 90			
	G2	Mildly decreased	60–89			
	G3a	Mildly to moderately decreased	45–59			
	G3b	Moderately to severely decreased	30–44			
	G4	Severely decreased	15–29			
	G5	Kidney failure	< 15			

Figure (2.1): Kidney disease improving global outcomes (KDIGO) classification of chronic kidney disease and prognostic risk. Green indicates a low risk (no other signs of renal disease, no CKD); yellow indicates a slightly higher risk; orange indicates a high risk; and red indicates an extremely high risk (Rovin *et al.*, 2021).

2.3. End-Stage Kidney Disease

End stage kidney disease is characterized by having a kidney function of fewer than 15 milliliters per minute/1.73 m^2. End stage kidney disease can occur as a result of the advancement of chronic nephropathy or as a result of acute kidney damage. Kidney failure is characterized by an inability to eliminate waste products, regulate serum electrolytes, cope with the daily nutritional and metabolic acid load, and maintain fluid balance.

Additionally, kidney failure results in insufficient erythropoietin synthesis, abnormal calcium and phosphorus metabolism, hypertension, and the rapid development of cardiovascular disease. Uremia is a word that refers to a group of symptoms or a symptom complex associated with advanced renal failure or ESKD (Unruh, 2022).

The worldwide approach to ESKD is multifaceted and impacted by disease burden, culture, and socioeconomics on a country-by-country basis. In 2010, a reported 2.6 million people received kidney replacement therapy (KRT) globally. Nevertheless, 4.9–9.7 million individuals were anticipated to need KRT in 2010, meaning that about 2.3 million individuals perished because they lacked access to this life-saving treatment. Consequently, around half or fewer of the world's population requiring KRT had access to it. In addition, the percentage of ESKD patients who did not obtain KRT was significantly greater in low-income (96%) and lower-middle-income (90%) nations than in upper-middle-income (70%) and high-income (40%) nations. The greatest disparities in treatment were observed in low-income nations, notably in Africa and Asia. In Asia, between 17 and 34% of those in need of KRT received it. 9–16% of individuals who required KRT in Africa achieved treatment. The number of KRT users is expected to more than double to 5.4 million by 2030, with the largest growth occurring in Asia (Thurlow *et al.*, 2021).

2. 3.1. Pathophysiology of End Stage Renal Disease

The final products of protein metabolism (usually eliminated in urine) build up in the blood when kidney function diminishes. Uremia occurs and negatively impacts every bodily system. The severity of symptoms increases as waste accumulation increases. The degree of deterioration in kidney function and the development of ESKD are linked to the underlying disorder, the excretion of protein in urine, and the occurrence of hypertension. The illness tends to advance more quickly in people who

excrete large quantities of protein or who have high blood pressure, compared to those who do not have these problems (Kear, 2018).

2. 3.2. Clinical Manifestations of End Stage Kidney Disease

(McGrath, 2017) stated the following clinical manifestations that are frequently seen in end-stage renal disease patients:

A. Neurological System

Fatigue and weakness, tremors, confusion, seizures, poor concentration, asterixis, disorientation, legs restlessness, burning soles of the feet, and behavioral changes.

B. Cardio-vascular System

Pericardial friction rub, elevation of blood pressure, periorbital edema, pitting edema (sacrum, feet, hands), pericarditis, effusion of pericardium, pericardial tamponade, neck veins are engorged, hyperkalemia and hyperlipidemia.

C. Pulmonary System

Dyspnea, tachypnea, hyperventilation, uremic pneumonitis, crackles, atelectasis, depressed cough reflex and chest pain (pleuritic).

D. Integumentary System

Bronze-gray skin colour, dry and flaky skin, itching, black-blue marks (ecchymosis), purpura, brittle and thin nails, thin and coarse hair.

E. Gastrointestinal System

Ammonia breath odor (uremic fetor), metal taste, bleeding and mouth ulcers, nausea, vomiting, hiccups, irritable bowel movement (constipation or diarrhea), and gastrointestinal bleeding.

F. Hematologic

Anemia, thrombo-cytopenia.

G. Reproductive System

Amenorrhea, testicular atrophy, infertility, and loss of libido.

H. Muscular-skeletal System

Arthralgia, deterioration of muscles, kidney osteo-dystrophy, bone ache, fractures of the bones, and foot drop.

2.3.3. Diagnostic Tests of ESRD

The most frequent diagnostic tests that may be performed for ESRD patients, as presented by (Naiker *et al.*, 2015)

A. Laboratory tests

- In all cases, a urine examination is required, including microscopy, dipstick, and protein excretion quantification. Protein excretion can be calculated on a random sample using a formula for calculating the protein/creatinine ratio. A urine sediment that is "active" and contains microscopic hematuria and red cell casts indicates glomerulonephritis.
- Additionally, antineutrophil cytoplasmic antibodies, antinuclear antibody profiles, cryoglobulins, C-reactive protein, hepatitis C and B profiles, serum complement, venereal disease research laboratory tests, HIV, and levels of uric acid can be used to aid in the diagnosis. In patients over 40 years old with no clear CKD and anemia, use the serum Freelite assay and serum/urine protein electrophoresis to rule out paraproteinemia.
- Urea and electrolytes, serum creatinine, and estimated GFR are all tests used to identify the severity of CKD and related metabolic/hematological problems. GFR can be computed using the Cockcroft-Gault or modification of diet in renal disease (MDRD) formula, or it can be determined by monitoring creatinine clearance over 24 hours.

- Additional tests that include a complete blood count and serum phosphate, calcium, and iron levels. To determine the existence of renal osteodystrophy, alkaline phosphatase and parathyroid hormone levels are tested.

B. Radiographic examinations

- All patients should undergo renal ultrasonography, and the presence of small echogenic kidneys supports the diagnosis of chronic kidney disease. Additionally, ultrasound is useful in detecting obstructive uropathy and may diagnose asymmetrical kidney size, which may indicate the presence of renovascular disease.
- Voiding cystourethrography is performed to rule out vesicoureteral reflux.
- CT scanning is effective for the identification of nephrolithiasis and can enhance the description of renal masses and cysts.
- Magnetic resonance angiography (MRA) is capable of diagnosing renal artery stenosis with high accuracy.

C. Kidney Biopsy

- Patients with chronic kidney disease whose kidneys are of normal or near-normal size and for whom no other method of diagnosis is available.
- Patients have a specific diagnosis in which histology is important for effective treatment and prognosis, such as vasculitis or lupus nephritis.
- Patients with a known diagnosis, like diabetic nephropathy, who are experiencing inexplicable declines in renal function.

2.4. Kidney Replacement Therapy (Transplantation, Dialysis)

Renal replacement therapy (RRT) may be necessary temporarily in individuals with AKI or permanently in patients with severe CKD. Since the 1960s, when long-term RRT was introduced, the number of ESRD patients who are kept alive with dialysis and transplantation has grown significantly (Conway *et al.,* 2018).

2.4.1. Kidney Transplant

Renal transplantation provides the highest chance of long-term survival and complete rehabilitation in patients with end-stage renal disease and is the most cost-effective therapeutic option. It is capable of restoring normal kidney function and correcting all of the metabolic abnormalities associated with chronic renal disease. Unless there are active contraindications, all patients should be evaluated for transplantation (Goddard *et al.*, 2010).

2.4.2. Dialysis

Dialysis is initiated when a patient develops severe fluid overload, elevated potassium levels, acidosis, pericarditis, vomiting, lethargy, weariness, or life-threatening uremia symptoms. Both peritoneal dialysis and hemodialysis entail the passage and diffusion of particles across a semipermeable membrane from an area of high concentration to one of low concentration. Substances pass from the bloodstream to the dialysate via the semipermeable membrane (McDonald, 2015).

2.4.2. a. Peritoneal Dialysis (PD)

Peritoneal dialysis is a continuous dialysis therapy that can be performed at home by the patient or their family. The peritoneal membrane is utilized as a semipermeable membrane over which excess waste and fluids flow from the blood in peritoneal vessels into a dialysate solution infused into the peritoneal cavity. Below the patient's waistline, a peritoneal catheter is inserted between the two layers of peritoneum. This catheter is utilized to accomplish an exchange. There are three phases in the exchange procedure: (1) filling, (2) stay time, and (3) emptying (McDonald, 2015).

2.4.2.b. Hemodialysis (HD)

The diffusion of molecules in solution through a semipermeable membrane along an electrochemical concentration gradient is defined as dialysis. Hemodialysis's primary purpose is to repair the extracellular and intracellular fluid environment that are considered characteristic of healthy renal function. This is performed by the movement of solutes (e.g. urea) from the blood into the dialysate and the transfer of solutes (e.g. bicarbonate) from the dialysate into the blood. The fundamental factors in diffusion rates are molecular weight and solute concentration. Molecules that are small like urea diffuse fast, but bigger and compartmentalized molecules like 2-microglobulin albumin and phosphate, as well as proteinbound solutes like p-cresol, diffuse considerably more slowly. Solutes may also move through membrane pores by a convective process driven by osmotic or hydrostatic pressure gradients, a method known as ultrafiltration. There isn't any change in concentrations of solute during ultrafiltration; its primary function is to remove excess total body fluid (Himmelfarb and Ikizler, 2010).

2.5. Hemodialysis Historical Overview:

Hemodialysis as a substitute for renal function proved for the first time that at least the most critical functions of a complex organ could be replaced by a man-made device. The Scottish scientist Thomas Graham is credited with inventing dialysis when he discovered in 1861 that crystalloid and colloid particles included in fluids could be separated by diffusion of crystalloids through vegetable parchment functioning as a semipermeable membrane. He invented the term dialysis to describe this phenomenon (Jacobs, 2009) as presented in figure (2.2).

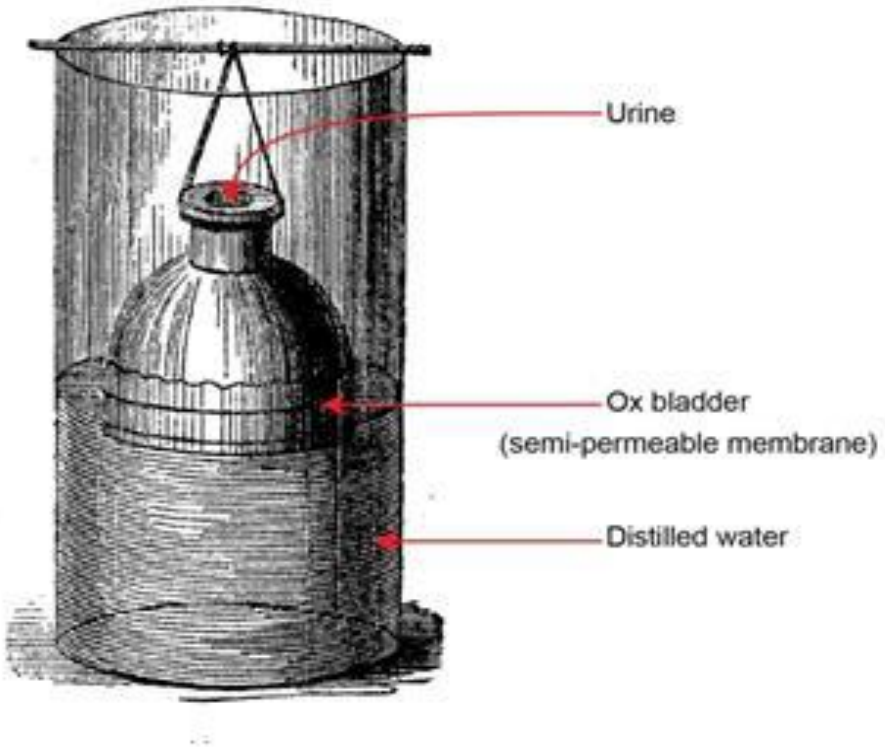


Figure (2.2): Graham's osmometer, adapted from (Cameron, 2016)

John Abel and his colleagues at the Johns Hopkins Medical School's Pharmacological Laboratory began animal studies with a revolutionary vividiffusion approach in 1912 (figure 2.3). Blood clotting is prevented by the use of a substance known as hirudin. Blood from the cannula in the femoral artery of the animal enters via tubes of semi - permeable membranes made from cellulose-based Collodion material, and then returns to the femoral vein (Featherstone and Ball, 2019).

The apparatus was then shown a year later at the 17th International Medical Congress in London, when it sparked the most attention. According to The Times newspaper, Professor Abel has created what is essentially an artificial kidney. It is feasible that this approach will eventually be used in disease treatment. Despite this early promise, Abel's group limited their efforts to quantitative study of chemicals found in the dialysate and never attempted to employ vividiffusion for renal replacement treatment (Featherstone and Ball, 2019).

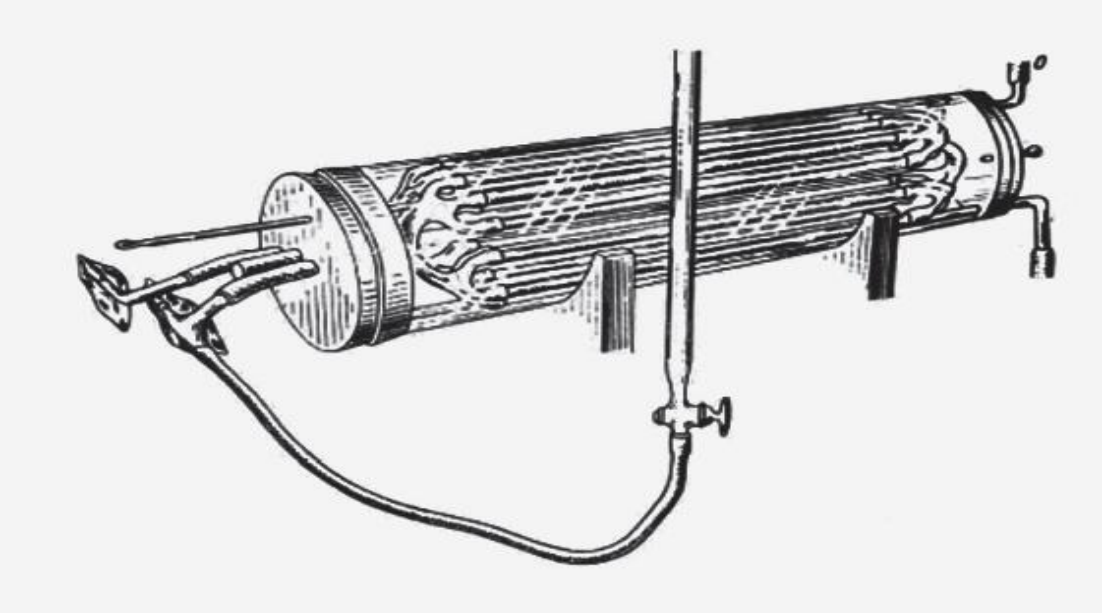


Figure (2.3): The Vividiffusion machine (Eknoyan, 2009).

In the latter part of the 1920s, the German physician Georg Haas performed the first human dialysis in Giessen. He delivered six treatments to six different patients. He used collodion membranes, and clotting was avoided with the addition of hirudin (a primitive type of heparin). Haas utilized many dialyzers in order to maximize the blood surface area exposed to the dialysis fluid. This demanded the use of up to six parallel dialyzers, and he noted that the blood's arterial pressure was inadequate to push the blood through the circuit. So, a pump was connected to the circuit (figure 2.4). By the late 1920s, Haas was aware of the lack of support from the hospital and his colleagues. By the late 1920s, he had given up, and the attempt was discontinued. In 1971, George Haas died at the age of 85 and was named as the father of dialysis (Thomas, 2014).

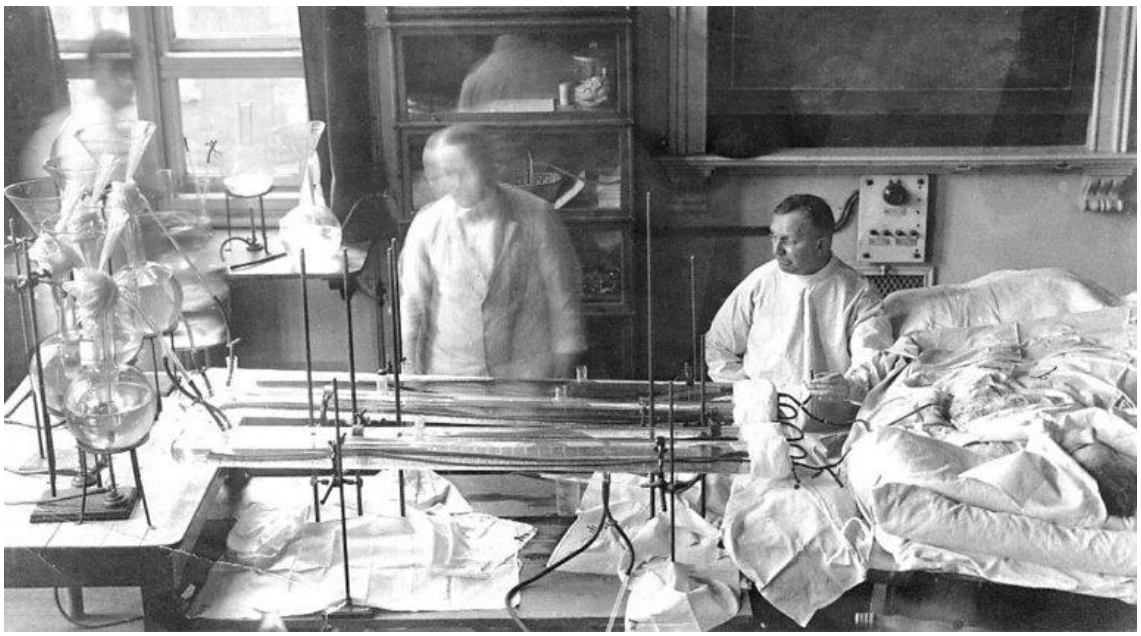


Figure (2.4): Dr. Georg Haas and his assistant demonstrate the cabin dialysis system. In the lower right-hand corner, we see the patient in his bed (Cameron, 2016).

In 1943, Dr. Willem Kolff developed the rotating drum dialyzer. His device was comprised of 20 meters of cellophane tubing wrapped around a huge cylinder. The cylinder was put in a tank containing the dialysate. Blood was drawn from the patient and circulated through the cellophane tube; whose walls acted as a semipermeable membrane (figure 2.5). Dr. Willem Kolff treated a 67-year-old patient with acute renal failure by using this device without developing additional kidney impairment. This device can eliminate uremic toxins but not excess body fluid since the pressure necessary for ultrafiltration is inadequate. Thus, renal failure with fluid retention, such as hypertension or pulmonary edema, remained incurable (Tang *et al.,* 2022).

The stationary drum artificial kidney developed by Alwall has been enhanced for use in humans. In 1946, he did the first treatment with the stationary drum artificial kidney that used both dialysis and controlled ultrafiltration (Kurkus *et al.,* 2007).

Figure (2.5): Artificial kidney machine (Kolff–Brigham), France, 1955. Adapted from (Thomas, 2014).

In 1960, Wayne Quinton, David Dillard, and Belding Scribner implanted access in an artery and a neighboring vein using PTFE (Teflon) tubing, with one end burrowed subcutaneously and the opposite, exterior end of the tubes linked through a U-shaped plastic tube. This device, called the Scribner shunt, was a great moment in the history of hemodialysis vascular access since it was the first to give large area and effective access to vascular space for long-term hemodialysis (figure 2.6) (Murea *et al.*, 2019).

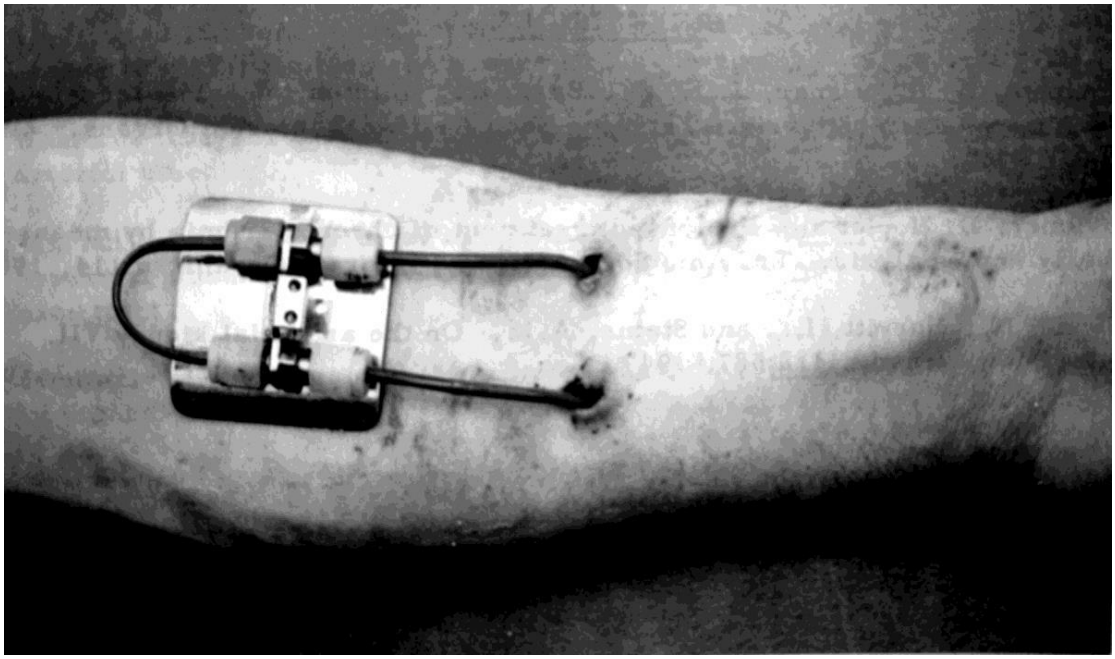


Figure (2.6): Externalized Quinton-Dillard-Scribner Arteriovenous shunt made of Teflon (Leonard *et al.*, 2011)

As the prevalence of dialysis increased, monitoring and complete control of the therapy of patients became more crucial; thus, the evolution of equipment has continued. In advanced machinery, monitoring of temperature, gauges of positive pressure, and flowmeters were all present. After that, negative-pressure monitoring, ultrafiltration capacities, and clearance values were added. Automated dialysate and water delivery and mixing to the machine raised the procedure's safety margin and accelerated the administration of dialysis therapy. The evolving patient system provides a device that continuously monitors all parameters of dialysis via microprocessors, enabling the healthcare provider to program the needs of the patient (fluid removal, dialysis duration, and blood flow). Using a high-flux (high performance) dialyzer, the average length of dialysis has been decreased to four hours or less, thrice per week (Thomas, 2014).

2.6. Complications of Hemodialysis

2.6.1. Cardiovascular Complications

Cardiovascular disease (CVD) is the leading cause of death in patients with end-stage renal disease (ESRD) on regular HD. Atherosclerosis is found in most long-term dialysis patients, if not all. At least half of patient deaths are due to CVD; it is five to ten times more common in HD patients than in the general population. This disease may result from hypertension, hyper-phosphatemia, increased phosphorus–calcium product with accumulation of calcium in the coronary arteries, HDL-cholesterol being low and hypertriglyceridemia. Low calcium dialysate content and the use of selected vitamin D analogues serve to reduce vascular calcification problems (Habas *et al.,* 2012).

2.6.2. Malnutrition

Malnutrition is frequently prevalent in patients on HD, and the duration of dialysis is a strong predictor of malnutrition. Patients who have been on HD for more than ten years often experience weight loss despite adequate protein intake. Although the underlying cause of malnutrition is unknown, it could be due to chronic metabolic acidosis or decreased physical activity due to amyloidosis rather than a decrease in energy expenditure. Zinc and selenium deficiency have been reported in chronic dialysis patients, most commonly as a result of malnutrition, and reverse osmosis water treatment may play a role (Sahathevan *et al.,* 2020).

2.6.3. Amyloidosis Associated with Dialysis

This is especially prevalent in elderly people and those who have been on dialysis for more than five years. This kind of amyloidosis is induced by beta-2 microglobulin buildup in the blood. It builds up because it cannot pass through the dialysis filter. Deposits can accumulate in a variety of

tissues, although they are most typically found in bones, joints, and tendons, causing stiffness, pain, and fluid in the joints (Scarpioni *et al.,* 2016).

2.6.4. Transmission of Infection

While dialysis has resulted in a decrease in mortality and morbidity in ESRD patients, it also predisposes these patients to blood-borne infections, partially owing to an aberrant immune system function in individuals with chronic renal disease (CKD) and ESRD receiving dialysis. Numerous studies have revealed that HD patients have a greater prevalence of hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV) than the general population. Increased infection of these viruses may be a result of dialysis equipment being shared, improper administration of intravenous medications, and insufficient infection control procedures in dialysis facilities. Blood transfusion requirements and patients' reduced body immunity may potentially contribute to the spread of these infections (Habas *et al.,* 2012).

2.6.5. Renal Osteodystrophy

Renal Osteodystrophy (ROD) is characterized as a change in bone morphology in chronic kidney disease patients. ROD is present in 90 to 100 percent of patients with severe kidney failure and those on hemodialysis (HD), with onset at GFR less than 60 ml/min. Calcitriol deficiency causes secondary hyperparathyroidism in CKD patients. This results in high turnover bone disease. Bone biopsy is the most reliable diagnostic method for finding ROD in patients with CKD (Jat *et al.,* 2016).

2.6.6. Anaphylactic Reaction

Anaphylactoid responses to the dialyzer have been recorded most frequently with cellulosic-containing membranes that are bioincompatible. There are two types of dialysis reactions: A and B. Type A responses are a result of an intermediate hypersensitivity reaction caused by IgE to the

ethylene oxide used to sterilize fresh dialyzers. This response often develops within the first few minutes of initiating a treatment. If the treatment is not discontinued quickly, anaphylaxis might become severe. If symptoms are severe, they may require treatment with steroids or epinephrine. The type B reaction is distinguished by nonspecific chest and back discomfort, which appears to be produced by complement activation and cytokine release. These symptoms often develop a few minutes into a dialysis session and diminish as the session continues (Greenberg and Choi, 2021).

2.6.7. Dialysis Disequilibrium Syndrome (DDS)

It's an uncommon syndrome that occurs in individuals with severe azotemia receiving their first HD treatment. Symptoms include weakness, nausea, headache, vomiting, coma, and seizures. DDS is caused by the quicker drop in the concentration of urea in the blood than in the brain throughout hemodialysis session (Saha and Allon, 2016).

2.6.8. Intradialytic Hypotension (IDH)

This is one of the most common HD problems, occurring in between 5% and 32.5% of HD sessions since the amount and rapidity of the treatment might result in the excessive evacuation of blood fluids. By doing so, the internal blood vessel pressure will inevitably and sometimes dramatically decrease. It is characterized by tachycardia, nausea and vomiting, dizziness, and diaphoresis (Halle *et al.*, 2020).

2.6.9. Electrolytes Disturbance

Electrolyte abnormalities are prevalent in patients undergoing chronic hemodialysis, and they can result in problems that are life-threatening. Chronic hemodialysis patients frequently experience hyperkalemia, hypocalcemia, and hyperphosphatemia (Guttee *et al.*, 2017).

2.7. Hemodialysis Vascular Access:

The number of people with end-stage renal disease who require renal replacement therapy has continuously increased worldwide. If hemodialysis (HD) is the recommended treatment, permanent vascular access (VA) is a lifeline for the majority of these patients. Thus, the effective establishment of permanent VA and proper treatment to minimize problems are required. Additionally, proper functional access is required to administer effective HD treatment to end-stage renal disease patients. Therefore, it was reported that VA dysfunction accounts for 20% of all hospitalizations. The cost of placing and caring for dialysis VA patients in the United States of America exceeds one billion dollars annually. Cuffed central venous catheter (CVC), Arteriovenous fistula (AVF), and Arteriovenous graft (AVG) are the three forms of permanent VA utilized today. They must all be able to offer appropriate HD, have a minimal risk of problems, and have a long useful life. AVF of the forearm has the greatest longevity and needs the fewest interventions. As a result, AVF of the forearm is preferred first, and then AVF in the upper arm, the AVG, and finally the CVC with cuff (Pantelias and Grapsa., 2012).

2.7.1 Arteriovenous Fistula

A vein is connected to an artery to generate an autologous AV access point. AVFs are classified into three broad categories. A radiocephalic fistula is a fistula of the forearm formed by making an anastomosis between the radial artery's side and the cephalic vein's end. Additionally, it is known as the Brescia-Cimino fistula. A brachiocephalic fistula is a fistula in the upper arm that is formed by joining the side of the brachial artery to the end of the cephalic vein at or near the level of the elbow. Lastly, the brachial artery–to–transposed basilic vein fistula is a fistula of the upper arm. This fistula is made by connecting the side of a brachial artery to the end of a basilic vein

that has been moved to the side and raised on the surface to make it easier to start dialysis (Quencer and Arici, 2015)

2.7.2. Arteriovenous Graft (AVG)

This kind of VA is characterized by making a connection between a vein and an artery using prosthetic interposition. It performs two functions: the first is to join two vessels that are too far apart to be connected; and the second is to interpose a high-capacity prosthetic segment between an artery and a vein that can also be used for HD catheter insertion. AVF is considered the first choice for vascular access and then AVG is considered the second choice. In some cases, an AVG has been considered the initial choice of treatment, such as in patients with obesity and short limbs. When the superficial veins are positioned deep in the subcutaneous tissue and in individuals with significant vascular weakness (thrombocytopenic purpura), when simple venous penetration causes injuries and severe hematoma (Santoro *et al.*, 2014).

2.7.3. Central Venous Catheter

The use of central venous catheters (CVCs) in chronic HD is discouraged. but, for a significant percentage of patients who lack other vascular access options, they are particularly advantageous. If CVC is the only alternative available for the patient, cuffed tunneled catheters should be preferred, unless they are contraindicated. Non-cuffed temporary catheters must be removed as quickly as feasible, even if no difficulties occur. In an ideal situation, they should be replaced by an AVF, AVG, and a tunneled CVC. In addition, when using stringent aseptic technique, the optimum location for insertion is the right internal jugular vein, and then the left internal jugular vein. Due to the associated complications, it is not recommended to utilize either the femoral or subclavian vein placements. One of the primary advantages of CVCs is that they can be used instantly.

However, no tunneled access should not be used for more than one week before being replaced with a tunneled catheter. Patients must be taught about the need for proper personal and hand cleanliness as well as the importance of keeping the dressing's integrity and dryness. Patients and families should be aware of what to do in the event of a CVC emergency, such as if bleeding occurs, the catheter lumens are mistakenly removed, or the CVC is cut (Murphy, 2011).

Table (2.1): advantages and disadvantages of each type of vascular access (Lomonte *et al.*, 2018; Murphy, 2011)

Type of VA	**Advantages**	**Disadvantages**
Arteriovenous fistula (AVF)	• Reduced infection rates. • Thrombosis incidence is lowest. • continue for a long period. • The cannulation sites will heal.	• Maturation is Slow. • maturation Failure. • Cannulation is more difficult. • Size increases with age. • Increased risk of aneurysm development. • Cannulation necessitates a specific skill. • Steal syndrome is a possibility. • Right-sided cardiac pressure is elevated. • cardiac output is Increased. • Hypertrophy of the left ventricle.

Arteriovenous Graft	• The AV graft has a shorter maturation time than the AV fistula. • Increased overall surface area for the purpose of cannulation. • It is less difficult to cannulate. • Blood flow and AVG size are not dependent on maturity but rather on the size of the graft.	• Expensive. • It requires careful maintenance through interventional procedures. • Infection rates are higher than those associated with AVF. • Steal syndrome is a possibility. • Right-sided cardiac pressure is elevated. • cardiac output is Increased. • Hypertrophy of the left ventricle.
Central venous catheter	• simple and quick procedure. • No punctures with a needle. • Patient preference is higher. • There is no maturing period. • No load on the heart.	• Increased risk of infection. • Increased risk of developing central venous stenosis. • There is a risk of thrombosis.

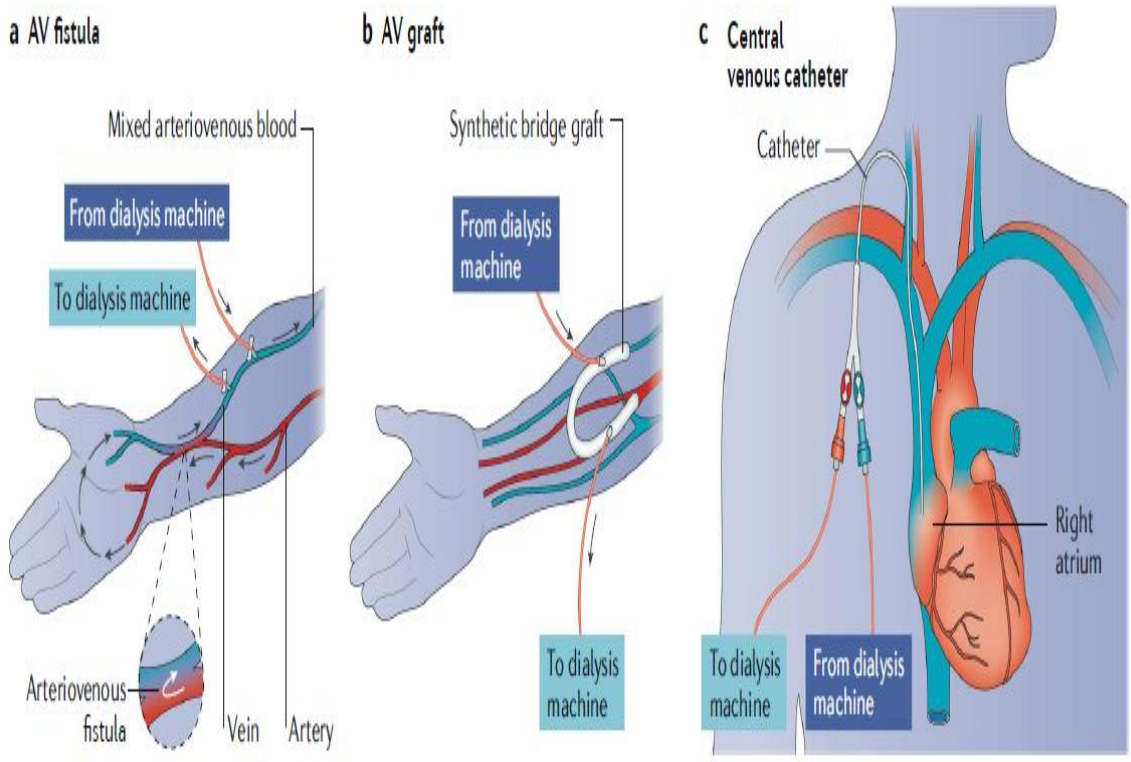


Figure (2.7): Current hemodialysis access routes (Lawson *et al.*, 2020).

2.8. Nursing Care for Patient Undergoing Hemodialysis:

2.8. 1. Nursing care Pre-hemodialysis session:

A. Body weight

Prior to beginning hemodialysis, the nurse needs to get an accurate weight measurement for the patient. Anticipate the patient to gain a few grams more than the weight after the previous session because of water retention between sessions. In addition, the hemodialysis nurse should document the patient weight that was measured. The measurement of weight will help determine the volume of fluid that must be evacuated during hemodialysis for the patient to restore his dry weight. Dry weight is weight without the excess fluid that builds up between dialysis treatments (Shepard, 2011).

B. Measuring Vital signs

The nurse must perform a comprehensive collection of vital signs and document the results. Assess if the patient's blood pressure results indicate hypertension or hypotension. Avoid monitoring arm blood pressure with the AVF or AVG; this might result in clotting and loss of access. By taking his or her temperature, the nurse can determine if the patient has a fever, which may indicate infection. Assess the rhythm, depth, and rate of breathing. Patients receiving hemodialysis are predisposed to developing dysrhythmias. While monitoring the heart rate, the nurse must take notice of the rhythm as well. While collecting vital signs, it's an excellent moment to examine the patient's general health through Make sure that the patient's skin, mental state, and complaints, like pain or nausea, are all taken into account when looking at his or her (Manacci, 2012).

C. Access site:

It is necessary to maintain the operational status of the access site. The nurse should examine the patient for any obvious problems. Examine the area for bleeding, leaking or drainage, redness, warmth, and patient complaints of discomfort. Assess by palpation the vibration or thrill, which indicates venous and arterial blood flow and patency. By auscultation, assess the swishing or bruiting sound of the vascular access (Rushing, 2011).

Also, the nurse must give the patient instructions on how to deal with vascular access, which includes the entry site should be kept clean and injury-free. Avoid wearing constricting clothes, jewelry, or applying pressure to the access region. Don't carry heavy items into the access area. When sleeping, avoid lying on the access site. Do not allow venipunctures or the insertion of an IV in the extremity of access. Do not allow blood pressure to be taken in the arm that has access. Do not take or draw blood samples from this access (Vale *et al.*, 2012).

D. Laboratory results:

Check the most recently ordered laboratory findings, paying special attention to the chemistry values such as (potassium, sodium, blood urea, and creatinine levels). It's likely that these will be raised. By comparing the pre-dialysis electrolyte findings to the post-dialysis lab results, the nurse may establish the treatment's effectiveness. The red blood cell (RBC) count, packed cell volume, and hemoglobin level are checked because these lab-rotary tests may be lower than normal levels in order to administer packed RBCs or medication such as iron and erythropoietin. It's important to remember to never draw blood from the dialysis vascular access (Shepard, 2011).

2.8.2. Nursing considerations during hemodialysis

The assessment that is performed before dialysis must continue during dialysis. Discuss with the patient about fluid/weight gain and offer support and information about fluid control. Ascertain that the patient is aware of fluid and dietary restrictions and, if necessary, refer to a nutritionist for additional support. Requested blood samples be taken before, during, or after dialysis. Ascertain that the patient obtains the proper dialysis prescription. Ensure the quality of dialysis by doing observations the blood flow rate, and completing the recommended hours. Ensure the safety of dialysis by preventing needle dislodgement and minimizing the risk of complications during treatment. Verify that the patient is taking his or her medication as prescribed. Administer any medications prescribed for dialysis, such as erythropoiesis-stimulating agents, IV iron, or IV alfacalcidol. Be attentive to the psychological and social needs of the patient. Encourage self-care and patient participation in all aspects of dialysis, e.g. weighing, blood pressure monitoring, and vascular access care. Make certain that infection prevention and control procedures are followed (Mahon *et al.*, 2013).

2.8.3. Ending Hemodialysis

Prior to disconnecting the patient from the HD machine, it is critical to verify that the right amount of fluid has been evacuated and that any HD medications have been given. The amount of blood dialyzed should be reported (in liters processed). The pump of blood must be stopped, and the arterial access must be flushed and clamped. Clamp and connect the arterial line to the washback saline fluid. The blood pump should be resumed at 150ml/min and run until the arterial line is nearly blood-free; this should take around 2 minutes. At this point, the patient's vital signs should be examined to confirm that no further fluid is required to maintain their blood pressure, and then remove the HD needles. The catheter should also be flushed with an anticoagulant and locked. Moreover, any evidence of excessive clotting on the arterial line or dialyzer should be noted, along with a recommendation to increase anticoagulation. After removing or locking the access, the HD machine should be disinfected. Weigh the patient to confirm they have met their ideal body weight. After the patient is discharged, the patient's bed, chair, and table at the HD station should be cleaned and disinfected (Mahon *et al.*, 2013).

2.9. Therapeutic Regimen of Hemodialysis Patients

It is well known that End-Stage Renal Disease (ESRD) necessitates major lifestyle adjustments for patients. In addition, ESRD patients undergo several alterations that impact the disease's prognosis. Treatment regimen adherence has a crucial role in chronic renal disease management (Naalweh *et al.*, 2017).

Hemodialysis is the most prevalent kind of renal replacement therapy and is a life-saving technique for people with end-stage kidney failure. Despite the fact that three sessions of four hours per week of dialysis equal less than 10 percent of normal renal clearance, individuals are nonetheless

susceptible to a variety of complications and side effects. In addition, individuals with ESRD must follow their therapy regimen, which includes adherence to dietary restrictions, recommended drugs, fluid restrictions, and hemodialysis sessions (Elmoghazy *et al.*, 2016).

Adherence to fluid limits, dietary, and pharmaceutical recommendations is necessary for the proper treatment of end-stage kidney disease. Adherence is described as the degree to which an individual's behavior (taking medication, adhering to recommended diets, or making lifestyle changes) corresponds to medical or health recommendations. Several studies have assessed the adherence of uremic hemodialysis patients. The adherence of uremic hemodialysis patients was determined objectively using levels of blood urea nitrogen (BUN), which is considered to reflect protein consumption; serum potassium levels, which are considered to be an indication of potassium consumption; and interdialytic weight gain (IDWG), which may be indicative of sodium and fluid consumption. Dietary restriction adherence was measured directly using blood potassium, phosphate (PO4), and BUN levels prior to dialysis. Additionally, interdialytic weight gain is measured to determine fluid adherence (Rambod *et al.*, 2010)

On the other hand, dietitians and health care providers (HCPs) provide dietary advice tailored to the specific needs of each patient. Calories are consumed in excess to meet weight and energy requirements. Protein is added to a dialysis patient's diet to compensate for the protein lost during the dialysis procedure. To prevent sodium and fluid retention, sodium is controlled. Potassium is limited, much more so as the condition progresses and the kidneys become unable to remove it. Calcium may need to be increased or supplemented to compensate for impaired vitamin D activation-related absorption. Phosphorus is limited due to elevated blood levels of phosphorus that are associated with hypocalcemia. For individuals with

hyperlipidemia, saturated fat and cholesterol are controlled. To avoid overflow, fluids are limited. To supplement the limited diet, the majority of patients receive iron, folic acid, vitamins, and minerals (Nerbass *et al.*, 2017).

Patients may have tremors as a result of an inability to control levels of potassium. Additionally, they may have bone pain and itching because of non-adherence to the limitation of phosphate. Additionally, excessive intake of sodium or fluid consumption may cause excessive weight gain. High consumption of sodium may also lead to hypertension, shortness of breath, peripheral edema, especially around the ankles, and pulmonary edema. Additionally, a high-protein diet exacerbates gradual kidney impairment. This means that patients who follow food and fluid limits can not only avoid symptoms of nonadherence and health problems, but they can also live better lives (Baraz *et al.*, 2010).

Furthermore, the correct amount of daily fluid intake is critical for supporting patients on hemodialysis and minimizing potential fluid overload complications such as hypertension, shortness of breath, headaches, abdominal bloating, edema, and heart failure. Weight gain between dialysis treatments is determined on a daily basis, and variations over the recommended level are frequently indicative of noncompliance with fluid and dietary targets. According to long-term research, ESRD patients who have high fluid buildup between dialysis treatments have a higher risk of all-cause death, particularly death from cardiovascular disease (Wong *et al.*, 2017).

In the scientific literature, the recommended daily total fluid consumption for HD patients with anuria ranges from restricted indications (0.5 to 0.9 liters/day) to significantly more lenient recommendations. This recommendation takes into account the fundamental demands of the body and the water content of regular diet meals. The weight gain between

hemodialysis sessions (interdialytic weight gain) is considered a strong indicator of hemodialysis patients' adherence to fluid restriction. According to several studies, normal daily interdialytic weight gain (daily IDWG) values are at ≤ 0.9kg/day or ≤ 1kg/day (Iborra-Molto *et al.*, 2012).

However, additional chronic diseases such as hypertension, diabetes, and cardiovascular diseases often result from the advancement of chronic renal disease. Hemodialysis patients are predisposed to secondary hyperparathyroidism, anemia, hypocalcemia, hyperphosphatemia, and hyperlipidemia. Therefore, hemodialysis patients receive an average of 10–12 frequent drugs, such as iron supplements, phosphate binders, antihypertensives, vitamin D preparations, erythropoiesis-stimulating agents, calcimimetics, and antidiabetics. ESKD patients are predisposed to a greater risk of adverse drug reactions and consequent nonadherence due to the complexity of their drug regimen (Ghimire *et al.*, 2015).

Non-compliance with medicines may be deliberate or not. Deliberate non-compliance occurs when patients choose to disregard treatment recommendations by delaying, changing, or losing medication dosages. In contrast, unintentional noncompliance is caused by a patient's poor understanding, forgetting, or poor communication with healthcare personnel. In addition, nonadherence to drugs has been linked to higher mortality and hospitalizations in ESKD patients (Lehane and McCarthy, 2007; Griva *et al.*, 2014; Denhaerynck *et al.*, 2007)

Regarding adhering to hemodialysis sessions, between 7% and 32% of chronic HD patients shorten or skip hemodialysis treatments. Nonadherence to hemodialysis can result in osteoporosis, pulmonary congestion, and electrolyte imbalances. Missing more than one HD visit each month is related to a 30% increase in mortality, but the specific processes behind this increase are unknown. Patients with ESRD are prone to developing severe complications with high morbidity and mortality risks,

necessitating emergency dialysis and/or acute hospitalization at a large cost to the healthcare system (Som *et al.*, 2017).

Nevertheless, noncompliance with the recommended regimen is a typical occurrence in patients undergoing hemodialysis (HD) and is associated with higher morbidity and death. According to studies, the prevalence of non-adherence to fluid restrictions is between 30% and 70%. Additionally, estimates of non-adherence to the dietary regimen varied between 2 and 34% of patients for potassium consumption and between 19 and 57% for phosphate intake. Drug non-adherence is a major concern among HD patients, with recent studies indicating that between 19 and 99 percent of patients were non-compliant with their medications. In addition, among chronic HD patients, non-adherence via missed dialysis sessions ranged from 7% to 32% (Ibrahim *et al.*, 2015).

On the other hand, numerous studies have revealed a variety of variables that impact patient adherence. The WHO has classified probable non-adherence risk factors into five categories: therapy-related, condition-related, healthcare team-related, system-related, and social/economic. Non-adherence can be linked to several factors, such as beliefs of patients, the regimen's intricacy, a strained connection between the therapist and the patient, side effects, a lack of social support, the patient's personality, level of education, or economic circumstances. The majority of these studies concur that all relevant variables should be investigated in order to enhance HD patients' capacity to adhere to their treatment regimen (Victoria *et al.*, 2015).

According to Orem, because patients are unable to care for themselves, nurses can assist them by encouraging and training them to do so. This would enhance the quality of life of hemodialysis patients and emphasize the critical role of nursing. Through appropriate training strategies, nurses can improve their patients' quality of life. They are in a

situation that is good to organize renal patient training. Patient-centered training, which enhances patients' health and quality of life, is a critical component of nursing and patients' rights. It is a critical aspect of a nurse's professional responsibility. Moreover, nurses are directly responsible for the care of dialysis patients. They should provide essential information to patients and their families and assist them with self-care. Patients who are well-informed about their condition can be more successful in therapy if they know more about their condition (Parvan *et al.*, 2015).

2.10. Theoretical Framework

The theoretical framework explains the relationship that exists between developed theory and its implementation in practice. Health belief model (HBM) (Figure 2.8) was developed in the 1950s to predict health-promoting behaviors. As a result, the HBM has been utilized to investigate ill-role behaviors such as adherence to medical advice. The health belief model is an effective healthcare model that aids in the understanding of quality healthcare delivery and adherence among hemodialysis patients. This model describes the fundamental improvements made in healthcare to increase patient well-being (Jones et al., 2014).

The health belief model also aids in understanding the underlying link between an individual and his or her health behavior, which is described by personal beliefs and socio-demographic. Adherence to dietary restrictions, fluid intake, hemodialysis sessions, and medication prescriptions are critical to enhancing healthcare quality. Every hemodialysis patient recognizes the need of being dedicated and adhering to the present treatment regimen in order to have a better focus on their health improvement. Perceived susceptibility involves the vulnerability of a person to compliance with the prevailing conditions. Several factors impact adherence to hemodialysis, including educational level, economic status, and

interactions with healthcare personnel (Green and Murphy, 2014; Jones *et al.*, 2014; Abraham and Sheeran, 2014).

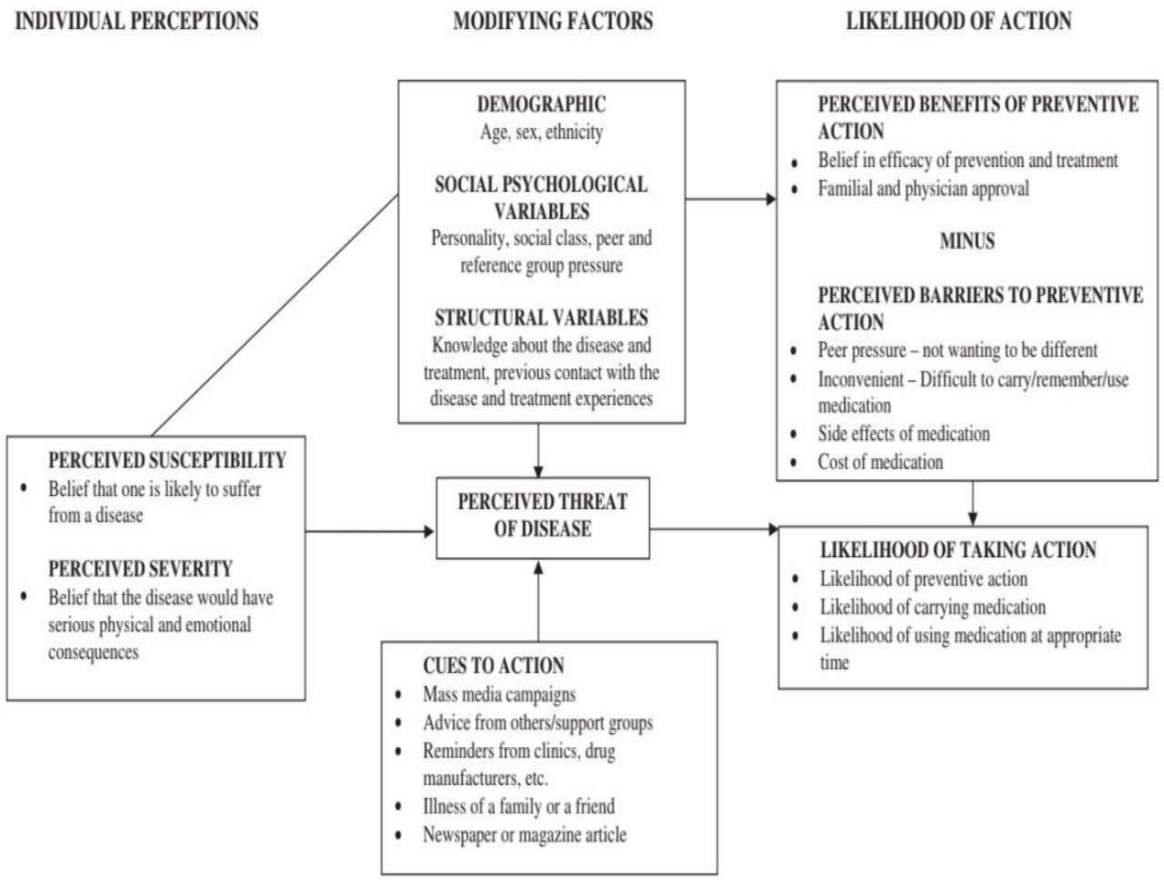


Figure (2.8): The health belief model (Jones *et al.*, 2014)

2.11. Education to Enhance Self-management in Patient Undergoing Hemodialysis:

Self-care management is when a person takes charge of and is involved in their own health care in order to improve their health, prevent complications, control symptoms, and keep the disease from getting in the way of their lifestyle as much as possible (Debora, 2019).

Therefore, self-care refers to actions that aid in survival, functional integration, and well-being in HD patients. Diet management, management of vascular access, administration of medication, exercise, blood pressure

and weight control, and physical management are all included in this. Patients with HD must continue to practice self-care in order to effectively manage their illness, avoid and treat acute and chronic problems, and improve their overall life quality. Self-care is frequently difficult, as it demands patients maintain rigorous self-control for the remainder of their lives. Several studies on the self-care management of patients undergoing hemodialysis have revealed a poor degree of self-care management (Kim and Cho, 2021).

On the other hand, patients with ESRD confront a variety of problems as a result of illness complications and dialysis, all of which need a patient's persistent and successful self-management. Improved self-management of patients with end-stage renal disease (ESRD) undergoing hemodialysis has been shown to be an effective method to minimize mortality and complications and enhance quality of life (Gela and Mengistu, 2018).

Numerous patients encounter obstacles while attempting to apply the recommended hemodialysis self-management. Numerous factors may influence the self-management of hemodialysis patients. These may include sociodemographic factors such as age, marital status, gender, and educational attainment, as well as disease-related factors such as hemodialysis duration and frequency, complications, hemodialysis knowledge, self-efficacy, psychological status (anxiety and depression), and social support (Gela and Mengistu, 2018).

According to the literature, increasing a patient's self-efficacy level can help improve their condition. Self-efficacy is the personal belief in one's ability to succeed in a specific situation. In other words, self-efficacy is the process of examining one's own opinions and judgements about one's capacity to perform certain tasks in specific situations (Hafezieh *et al.*, 2020).

Furthermore, it should be highlighted that inadequate patient skills and knowledge may lead to a decrease in their willingness to adopt preventative measures, as well as a decrease in their self-efficacy and self-management. It is essential to conduct an empowerment program in order to enhance hemodialysis patients' knowledge and self-efficacy. This program may strengthen patient self-management and improve their health and quality of life (Havas *et al.,* 2016; Sorat, 2018).

2.12. Previous Studies

2.12.1. First Study:

A study conducted by (Beerappa and Chandrababu, 2019) titled "Adherence to Dietary and Fluid Restrictions among Patients Undergoing Hemodialysis: An Observational Study". The objective of this study was to determine the compliance of patients receiving hemodialysis with dietary and fluid restrictions. They used an observational research design between February and July 2016 in a tertiary hospital's outpatient dialysis facility in Karnataka, India with 60 participants. A purposive sampling method was used to select samples that met all inclusion criteria. The data collection instrument was a self-administered fluid and dietary adherence questionnaire. According to the study findings, adherence to fluid and dietary limitations was moderate to excellent. The study recommends that because adherence varies significantly across hemodialysis patients, specifically targeted interventions and ongoing encouragement are required to increase adherence and achieve a favorable therapeutic result.

2.12.2. Second Study:

A descriptive and analytic study conducted by (Alikari *et al.,* 2018) titled "Adherence to Therapeutic Regimen in Adults Undergoing Hemodialysis: The Role of Demographic and Clinical Characteristics." This study aimed to measure the adherence levels among patients undergoing

hemodialysis and correlate the adherence levels with demographic and clinical characteristics. To conduct the study, 350 patients undergoing hemodialysis completed the GR-Simplified-Medication Adherence Questionnaire-Hemodialysis (GR-SMAQ-HD). Demographic and clinical data were recorded. Statistical data analysis was performed using IBM SPSS Statistics Version 19. Multiple linear regression test, stepwise method and logarithmic transformations were used. The level of statistical significance was set at up to 0.05. The mean age of the patients was 56.5 years old (SD = 10.0 years). The whole score of GR-SMAQ-HD was 6.05 (SD = 1.54) while for the dimensions of Medication Adherence it was 3.01 (SD = 1.01), for Attendance at HD Session 1.75 (SD = 0.51) and for Diet/Fluid Restrictions was 1.3 (SD = 0.70). The educational level and the absence of children were independently associated with the attendance at HD Session (P = 0.001 and P = 0.007, respectively). The daily number of pills was independently associated with attendance at HD sessions (P = 0.020) and medication adherence score (P = 0.026). The vascular access site was independently associated with the total score of the adherence scale (P < 0.001) and the medication adherence score (P < 0.001). Adherence levels among patients undergoing hemodialysis are moderate, while the role of demographic and clinical characteristics is crucial.

2.12.3. Third Study:

A study carried out by (Hassan *et al.*, 2017) titled "Assess Hemodialysis Patient Compliances to Therapeutic Regimen". The objective of this study is to demonstrate the compliance of hemodialysis patients with their treatment regimen. This study used a descriptive design. This research enrolled 120 adult hemodialysis patients who matched the study's inclusion criteria. The research was conducted in hemodialysis units at Mansoura University's Urology and Nephrology Center in Egypt. Two instruments were adopted for the study: an interview questionnaire and a compliance

scale. The results indicated that 46.7 percent of patients were between the ages of 40 and 50, that 58.3 % were male, and that 30.8 % were illiterate. Additionally, the results indicated that 64.25 % were compliant, while 35.8 % were non-compliant. The study concluded that almost a third of hemodialysis patients did not adhere to their treatment regimen. Consequently, they did not adhere to the practice of a proper treatment regimen. The study recommended that social support networks and family counseling with programs of health promotion in order to enhance hemodialysis patients' quality of life

2.12.4. Fourth Study:

A study conducted by (Naalweh *et al.*, 2017) titled "Treatment Adherence and Perception in Patients on Maintenance Hemodialysis: a Cross – Sectional Study From Palestine". The objective of this study is to determine compliance with dietary restrictions, fluid consumption, medicines, and HD sessions. The study was a cross-sectional carried out during the summer of 2016 on HD patients at Al-Najah National University Hospital. A reliable and validated questionnaire was used to elicit self-reported adherence behavior (End-Stage Renal Disease Adherence Questionnaire: ESRD-AQ). Potassium and phosphate blood levels were determined as clinical indications of dietary and pharmacological compliance, respectively. In addition, the interdialytic weight gain (IDWG) was taken from patient records, which indicates compliance with fluid restrictions. A total of 220 patients responded to all ESRD-AQ-related questions. The mean and standard deviation of the individuals' ages were 56.82 ± 14.51 years, respectively. Dietary adherence was recorded in 24% of patients, whereas fluid restriction adherence was observed in 31%. Adherence to HD sessions was reported to be 52%, whilst medication adherence was 81%. Overall, 122 patients (55.5 %) are good adherence, 89 (40.5 %) adhered moderately, and 9 (4.1 %) adhered poorly. Male patients scored considerably higher on all

measures of adherence than female patients (p = 0.034). There was a significant association between reported diet adherence and pre-HD blood potassium levels (p = 0.01). Additionally, a significant correlation between reported adherence to fluid restriction and IDWG (p = 0.01). However, no correlation was found between adherence and pre-HD phosphate levels. There was a significant relationship between overall perception and overall adherence score (p = 0.001). The study concluded that a significant proportion of patients showed overall moderate or poor adherence. The study recommends that counseling and education of patients with HD are essential to a successful treatment result.

2.12.5. Fifth Study:

A study conducted by (Mahmood and Al-Ani, 2014) titled "Assessment of Hemodialysis Patients' Compliance to Treatment and Follow-up in Baghdad Teaching Hospitals." The objective of this study was to establish compliance with hemodialysis therapy and follow-up in Baghdad Teaching Hospitals. A descriptive study was undertaken at five teaching hospitals in the Baghdad governorate from the period of 15/5/2012 to 15/8/2013. A non-probability (purposive) sample of 200 ESRD patients treated in dialysis centers in Baghdad Teaching Hospitals (AL-Kindey, AL-Kadhmia, AL-Karama, and AL-Yarmok) had an age range of between 18 and less than 70 and had received hemodialysis therapy for at least six months. A questionnaire was used for data gathering. The questioner's validity was determined by a panel of specialists in the subject of study, and its reliability was determined using the test-retest approach and was found to be (r = 0.89). Interviews utilizing questionnaires were used to collect data, which was then analyzed using inferential and descriptive statistical methods using SPSS software program. According to the study's findings, 54 % of the sample consisted of males, the majority of whom were between the ages of 30 and 39 years old. 54 % were single, while 28 % were married. In addition,

39% of the sample were housewives, 54% had not completed secondary school, and 48% had insufficient monthly income. The study revealed that 58 % of them had a medical history of fewer than five years with hemodialysis, and that half of them had had hemodialysis three times per week, with 75.5% of them receiving four hours per session. The study concluded that the majority of participants adhered to the treatment regimen but did not adhere to the follow-up. The study recommended that Iraq should improve its national hemodialysis programs. It also recommended that more research is needed in the field of hemodialysis patients.

Chapter Three:

Methodology

Chapter Three

Methodology

3. 1. Design of the Study

A descriptive cross-sectional study was conducted to assess the adherence of hemodialysis patients toward their therapeutic regimen in Al-Hilla Teaching Hospitals (Al-Imam Al-Sadiq Teaching Hospital /artificial kidney unit and Marjan Medical City/artificial kidney center) from the 19th of September, 2021, to the 6th of July, 2022.

3.2. Administrative Arrangements

A series of administrative arrangements have been made for the current study to obtain official consent and facilities as presented in Appendix (A) as follows:

1. An approval was obtained from the Research Ethical Committee in the Faculty of Nursing/University of Babylon (Appendix A1).

2. An official requisition was sent from the College of Nursing/University of Babylon to the Ministry of Health/Babylon Health Directorate for approval (Appendix A2).

3. An official permission was obtained from the Ministry of Health/Babylon Health Directorate/Development and A Training Center, then this center submitted requests to the Marjan Medical City and Al-Imam Al-Sadiq Teaching Hospital in order to facilitate data collection, and official approval was obtained from these hospitals (Appendix A3 and A4).

4. The researcher obtained verbal approval from the participants in the study after explaining the objectives and purpose of the study and focusing that all the collected data would be used only for the purpose of the research.

3.3. Setting of the Study

The current study was carried out in Al-Hilla City at the Marjan Medical City (artificial kidney center) and the Al-Imam Al-Sadiq Teaching Hospital (artificial kidney unit).

3.3.1. Al-Imam Al-Sadiq Teaching Hospital's Artificial Kidney Unit

The artificial kidney unit at "Al-Imam Al-Sadiq Teaching Hospital" is located on the ground floor, and there are three mixed hemodialysis rooms with eighteen beds and twenty machines for both female and male patients. This unit also includes a patient's waiting room, a laboratory, a water processing room, a catheter insertion room, a pharmacy, a statistics room, and three administrative rooms. This unit opened on the 16th of April, 2017. In March 2022, the number of patients receiving hemodialysis sessions was approximately (146).

3.3.2. Marjan Medical City's Artificial Kidney Center

It is a building consisting of one floor located in Marjan Medical City, which consists of eighteen beds distributed among five rooms; four rooms for hepatitis C patients that contain sixteen beds (there are six beds in the first room, four beds in the second room, three beds in the third room, and three beds in the fourth room); and one room containing two beds for hepatitis BC and hepatitis B patients, This center also contains a patient's waiting room, a laboratory room, a water processing room, a catheter insertion room, a pharmacy room, a statistics room, and two administrative rooms. This center was established on the 18th of May, 2014. In March 2022, the total number of patients who received hemodialysis sessions were 167, 157 of them infected with hepatitis C, three (3) patients with hepatitis B, and seven (7) patients with hepatitis BC.

3.4. The Study Sample

Non-probability (purposive sample) consisted of (100) patients with ESRD who received hemodialysis treatment. The study's sample was chosen according to the following criteria:

1- Age at least 18 years old.

2-Patient diagnosis of end-stage renal disease.

3-They were undergoing hemodialysis for not less than 6 months.

4-Patients from both genders (male and female).

5-Willing to participate in the study.

6-Conscious or stable-condition patients.

7-Patients free from mental illness

3.5. Instrument of the Study

The questionnaire was constructed based on a comprehensive review of the relevant literature in order to collect data for the purpose of the current study. The questionnaire format, comprising three parts, was designed to cover all aspects of the study, as shown in Appendix (B).

3.5.1. Part one: socio-demographic characteristics

The socio-demographic characteristics are composed of seven items, which include age, gender, marital status, educational level, occupation, residency, and economic status of the patient

3.5. 2. Part two: clinical data

This part is composed of five items as follows:

1-Other Chronic Diseases

2- Duration of hemodialysis

3-Number of hemodialysis sessions per week

4. Smoking history

5. Body Mass Index

3.5.3. Part three: Adherence of Hemodialysis Patients toward their Therapeutic Regimen:

This part is composed of four domains as follows:

1. Hemodialysis patients' adherence to dietary restrictions domain, which includes thirteen items.

2. Hemodialysis patients' adherence to fluid consumption domain, which includes nine items.

3. Hemodialysis patients' adherence to hemodialysis sessions domain, which includes five items.

4. Hemodialysis patients' adherence to prescribed medications domain, which includes seven items.

3.6. Rating and Scoring

Mean of scores calculated as follows

$$M.S = \frac{f1*s1 + f2*s2 + f3*s3}{N}$$

M.S. = mean of scores, f = frequencies, S = scores, N = numbers of sample.

$$\text{Range of Score} = \frac{\text{Max(M.S)} - \text{Min (M.S)}}{\text{Rating}} = \frac{3-1}{3} = 0.66$$

The items were classified and scored using the following patterns:

1.Three scales were used to assess therapeutic regimen adherence in hemodialysis patients. Positive items were scored as (1) never, (2) sometimes, and (3) always, whereas negative items were scored as (1) always, (2) some time, and (3) never.

2.Three scales were used to assess hemodialysis patients' adherence to their therapeutic regimens. Extreme difficulty, moderate difficulty, and no difficulty were assigned to the items. The three points were scored in negative items as (1) for extreme difficulty, (2) for moderate difficulty, and (3) for no difficulty.

To determine the therapeutic regimen adherence score for hemodialysis patients, the researcher divided the scales into three levels, as shown below:

Table (3.1): shows the rating scales and scoring.

Scale	**score**	**Grade**
Therapeutic regimen adherence	(1 - 1.66)	poor
	(1.67 – 2.33)	Moderate
	(2.34 – 3)	good

3.7. The Study Instrument's Validity

Thirteen experts reviewed the validity of the questionnaire in order to estimate its clarity and relevancy. These were multi-disciplinary field experts with experience of not less than 10 years of experience in their field. The questionnaire was thoroughly revised, and changes were made based on their opinion and recommendations.

They were distributed as two experts from the College of Nursing/ University of Babylon, four from the College of Nursing/ University of Kufa, one expert from the College of Nursing/ University of Baghdad, three experts from the College of Nursing/ University of Karbala, one expert from Al-Hilla University college/department of nursing, and two nephrologists from Al-Imam Al-Sadiq Teaching Hospital. They had been asked to assess and review the designed questionnaire, as seen in the appendix (C)**.**

3.8 Pilot Study

A pilot study was performed before beginning data gathering. It was done in AL-Imam Al-Sadiq Teaching Hospital from 3rd to 19th February 2022, a pilot sample that consisted of (10) hemodialysis patients who were excluded from the original study sample.

It is done in order to:

1 .Evaluate the reliability of the instrument.

2 .Find out the tool's clarity, relevancy, and adequacy.

3 .Estimate the time required for each interview.

4. Identify any obstacles that the researcher may face during the course of the study.

The findings demonstrated that:

- The questionnaire is reliable.
- The items in the questionnaire were clear and could be easily understood.
- The period required to complete the instrument's questions ranged from 15 to 20 minutes.

3.9 Reliability of the Study Instrument

Study instrument reliability implies ensuring that the response is almost the same when applied repeatedly to the same people at various periods. After establishing the instrument's apparent validity, the researcher used it on a sample of ten hemodialysis patients, which composed 10% of the study sample. In which the participants of this sample were later excluded from the original sample on which the final research was performed, the questionnaire's determination of reliability was based on the manner of "internal consistency/Alpha Cronbach". Reliability is calculated by using (SPSS) version 26 of reliability analysis as shown below.

Table 3-2: Questionnaire Reliability (*n=10*)

variable	Items	Alpha Cronbach	Assessment
Therapeutic regimen adherence	34-items	0.88	Accepted

3.10 Collection of the Data

Data was collected using a constructed questionnaire, and the method of data collection was by interviewing each patient included in the study. The researcher took the verbal agreement from each patient participant in the study and clarified the study questionnaire. Each interview takes approximately 15–20 minutes. The Arabic version is only used for all participants. Data collection is carried out from the 21st of February 2022 to the 15th of April 2022.

3.11. Methods of Statistical Data Analysis

The researcher utilized SPSS ver. 26 and Microsoft Excel (2010) programs to analyze the data acquired from the study sample and deal with it statistically, to determine the relationships between the variables, and to arrive at the final study findings based on a series of statistical tests.

3.11.1. Descriptive approach

Descriptive statistics are a set of mathematical and statistical methods used to quantitatively describe the main features of data using tables and charts. Descriptive statistics always aim to present and describe the data which is required to be processed, organized, summarized, and categorized, as well as present them in a simple and clear manner that makes it easier for

the recipient to recognize and understand their content. The analysis was performed using:

A. The "Frequencies and Percent" statistical tables, which are:

$$\% = \frac{\boldsymbol{Frequency}}{\boldsymbol{Sample\ Size}}\ x100$$

B. Mean of scores.

The average score can be calculated by using the following:

$$M.S = \frac{\sum \text{ri} = 1\text{Fi x Si}}{\sum \text{ri} = \ 1\text{Fi}}\ x100$$

The overall responses of therapeutic adherence according to total mean of score which follow:

M= 34-56 refers to Poor Adherence.

M=57-79 refers to Moderate Adherence.

M=80-102 refers to Good Adherence.

C. Standard Deviation test ±*SD*.

$$SD = \sqrt{\frac{1}{n-1}\sum_{i=1}^{n}(Xi - \tilde{\chi})^2}$$

D. It uses a correlational coefficient " alpha Cronbach" used in estimating the internal consistency of the study tool, which can be calculated by using the following:

$$\alpha = \frac{K}{K-1}\left[1 - \frac{\sum_{i=1}^{K}\sigma_{ii}}{\sum_{i=1}^{K}\sum_{j=1}^{K}\sigma_{ij}}\right]$$

3.11.2. Inferential approach

1. **One Way ANOVA**

Analysis of variance (ANOVA) for equality of Means (testing for coincidence when the parameter of the mean is different).

Source of variance	Sum of square	d.f	Mean square	F
Between Groups	$SS_B = \sum \frac{(\sum xP1)^2}{n} - \frac{(\sum xP)^2}{n}$	$df_B = K\text{-}1$	$\frac{MS\beta}{MS\beta}$	$\frac{MSB}{MSW}$
Within Groups	$SS_w = \sum \frac{(\sum xP1)^2}{N} \frac{(\sum xP)^2}{}$	$df_w = N\text{-}k$	$\frac{SSw}{DFw}$	
Total	$SS_T = \sum \frac{(\sum xP1)^2}{N} \frac{(\sum xP)^2}{}$	$df_t = N\text{-}1$		

2. Independent sample t-test

To determine whether there is statistical evidence that the associated population means are significantly different, the researcher used the independent sample t-test to compare the means of two independent groups.

$$t = \frac{\mu_A - \mu_B}{\sqrt{\left[\frac{\left(\Sigma A^2 - \frac{(\Sigma A)^2}{n_A}\right) + \left(\Sigma B^2 - \frac{(\Sigma B)^2}{n_B}\right)}{n_A + n_B - 2}\right] \cdot \left[\frac{1}{n_A} + \frac{1}{n_B}\right]}}$$

$(\Sigma A)^2$: Sum of data set A, squared (Step 2).
$(\Sigma B)^2$: Sum of data set B, squared (Step 2).
μ_A: Mean of data set A (Step 3)
μ_B: Mean of data set B (Step 3)
ΣA^2: Sum of the squares of data set A (Step 4)
ΣB^2: Sum of the squares of data set B (Step 4)
n^A: Number of items in data set A
n^B: Number of items in data set B

The following are abbreviations for measuring significance relative to the level:

- "Sig: Significant at $P \leq 0.05$"
- "NS: Non significant at $P > 0.05$"

Chapter Four: Results of the Study

Chapter Four

Results of the Study

Under the objectives of the current study findings, the descriptive and inferential statistic approach organized in tables and figures that includes the followings:

4-1. Patients Characteristics

Table 4-1-1: Distribution of the study sample according to their socio-demographic Variables (SDVs)

SDVs	Classification	Freq.	%
Age/years	20-29	5	5.0
	30-39	17	17.0
	40-49	21	21.0
	50-59	21	21.0
	≥60 years	**36**	**36.0**
Gender	**Male**	**58**	**58.0**
	Female	42	42.0
Education level	Illiterate	32	32.0
	Read and write	14	14.0
	Primary school	**32**	**32.0**
	Secondary school	14	14.0
	Diploma and above	8	8.0
Marital status	Single	14	14.0
	Married	**74**	**74.0**
	Widow	12	12.0
Occupation	Employee	8	8.0
	Free work	16	16.0
	Retired	**42**	**42.0**
	Jobless	36	36.0
Residents	Rural	45	45.0
	Urban	**55**	**55.0**
Economic status	Enough	13	13.0
	Enough to certain limit	38	38.0
	Not enough	**49**	**49.0**

The findings in table (4-1-1) showed participants' demographic information, the age ≥ 60 years old was recorded at the highest percentage (36%). Regarding gender, more than half of the study sample were male (58%) as

compared with those who were female (42%). Regarding the education level, one-third of participants were primary school graduates (32%). Marital status related findings: two-thirds of respondents were married (74%). It is obvious from the findings that the retired predominated (42%). In terms of residents, most of the study participants were urban residents (55%) as compared with those who were rural (45%). In regard to economic status, the present study revealed that for half of them, their economic status was not enough.

Table 4-1-2: Distribution of the study sample according to their clinical data

Factors	Classification	Freq.	%
Chronic Diseases	No	32	32.0
	Hypertension	**40**	**40.0**
	DM	4	4.0
	Hypertension & DM	24	24.0
Duration of Hemodialysis	**6-12 months**	**46**	**46.0**
	1-4 years	40	40.0
	>4 years	14	14.0
Sessions/week	**Two times**	**72**	**72.0**
	Three times	28	28.0
Smoking status	**Non-smoker**	**76**	**76.0**
	Smoker	10	10.0
	Ex-smoker	14	14.0
BMI	Underweight (<18.5 kg/m^2)	16	16.0
	Normal (18.5-24.9 kg/m^2)	**42**	**42.0**
	Overweight (25-29.9 kg/m^2)	24	24.0
	Obese (30-34.9 kg/m^2)	14	14.0
	Extremely Obese (≥35 kg/m^2)	4	4.0

The results in table (4-1-2) are presented in the form of frequencies and percentages. Out of 100 respondents, hypertension was expressed as a chronic disease associated with their hemodialysis. 46% showed 6-12 months as the duration of hemodialysis. 72% had hemodialysis sessions two times per week. 76% were non-smokers as compared with those who were smokers and ex-smokers. 42% were of normal weight as compared with those who were underweight and obese.

4.2. Adherence of hemodialysis patients toward their therapeutic regimen

Table 4-2-1. Hemodialysis patients' adherence to dietary restrictions

List	Dietary Restrictions Items	Class	Freq.	%	*M.s ± SD*	*Ass.*
1	Visit a dietitian to modify your diet	Never	88	88.0	*1.12±0.326*	*Poor*
		Sometime	12	12.0		
		Always	0	0.0		
2	Receive detailed instructions for following a proper diet from a health professional (your doctor, nurse, dietician, or other health professional).	Never	24	24.0	*2.02±0.710*	*Moderate*
		Sometime	50	50.0		
		Always	26	26.0		
3	Watch the contents of the food you eat every day	Never	39	39.0	*1.77±0.708*	*Moderate*
		Sometime	45	45.0		
		Always	16	16.0		
4	Have you had any difficulty following your dietary recommendations?	Always	12	12.0	*2.27±0.664*	*Moderate*
		Sometime	49	49.0		
		Never	39	39.0		
5	Keep track of eating small amounts of food frequently throughout the day.	Never	44	44.0	*1.80±0.804*	*Moderate*
		Sometime	32	32.0		
		Always	24	24.0		
6	Are you getting the recommended amount of protein in your diet (meat, eggs, poultry, fish)?	Never	26	26.0	*2.06±0.763*	*Moderate*
		Sometime	42	42.0		
		Always	32	32.0		
7	Eat dairy products on a daily basis	Always	26	26.0	*1.90±0.643*	*Moderate*
		Sometime	58	58.0		
		Never	16	16.0		
8	Are you following the limit of salt in your diet?	Never	18	18.0	*2.21±0.728*	*Moderate*
		Sometime	43	43.0		
		Always	39	39.0		
9	Prefer to use herbs and flavors instead of salt to improve the taste of your meal?	Never	63	63.0	*1.43±0.607*	*Poor*
		Sometime	31	31.0		
		Always	6	6.0		
10	Avoid consume potassium-rich foods such as avocados, bananas, potatoes, tomatoes, kiwis, and dry fruits.	Never	18	18.0	*2.25±0.743*	*Moderate*
		Sometime	39	39.0		
		Always	43	43.0		
11	Limit or avoid eat phosphorous-rich foods such as processed meats, dairy products, beans, chocolate, nuts, and cola.	Never	31	31.0	*1.83±0.652*	*Moderate*
		Sometime	55	55.0		
		Always	14	14.0		
12	Limit foods that contain saturated fats such as butter, palm and coconut oils, cheese, fried and fast food, chips, and high-fat cuts of meat.	Never	18	18.0	*2.41±0.779*	*Good*
		Sometime	23	23.0		
		Always	59	59.0		
13	Are you following the recommended routine laboratory tests?	Never	8	8.0	*2.37±0.630*	*Good*
		Sometime	47	47.0		
		Always	45	45.0		

"(M.s) Mean of Scores, (SD) Standard deviation, Level of Assessment (Poor≤ 1.66, Moderate= 1.67-2.33, Good ≥2.34)"

In terms of statistical mean and standard deviation, the table (4-2-1) illustrated that the hemodialysis patients expressed moderate responses regarding adherence to dietary restrictions at all items of the scale, as indicated by moderate

mean scores, except for items 1 and 9, where the responses were poor, as indicated by low mean scores, as well as the patients expressed good adherence in terms of *limiting foods that contain saturated fats and following the recommended routine laboratory tests.*

Table 4-2-2: Overall hemodialysis patients' adherence to dietary restrictions

Adherence to Dietary Restrictions	*Freq.*	*%*	*M ± SD*
Poor (*M=13-21*)	14	14.0	*25.44 ± 4.11*
Moderate (*M=22-30*)	76	76.0	
Good (*M=31-39*)	10	10.0	
Total	100	100.0	

M: Mean for total score, SD=Standard Deviation for total score

The findings in table (4-2-2) and figure (4-1) demonstrated that the (76%) of hemodialysis patients exhibited a moderate therapeutic regimen in terms of adherence to dietary restrictions as described by moderate mean of scores *25.44* (*±4.11*).

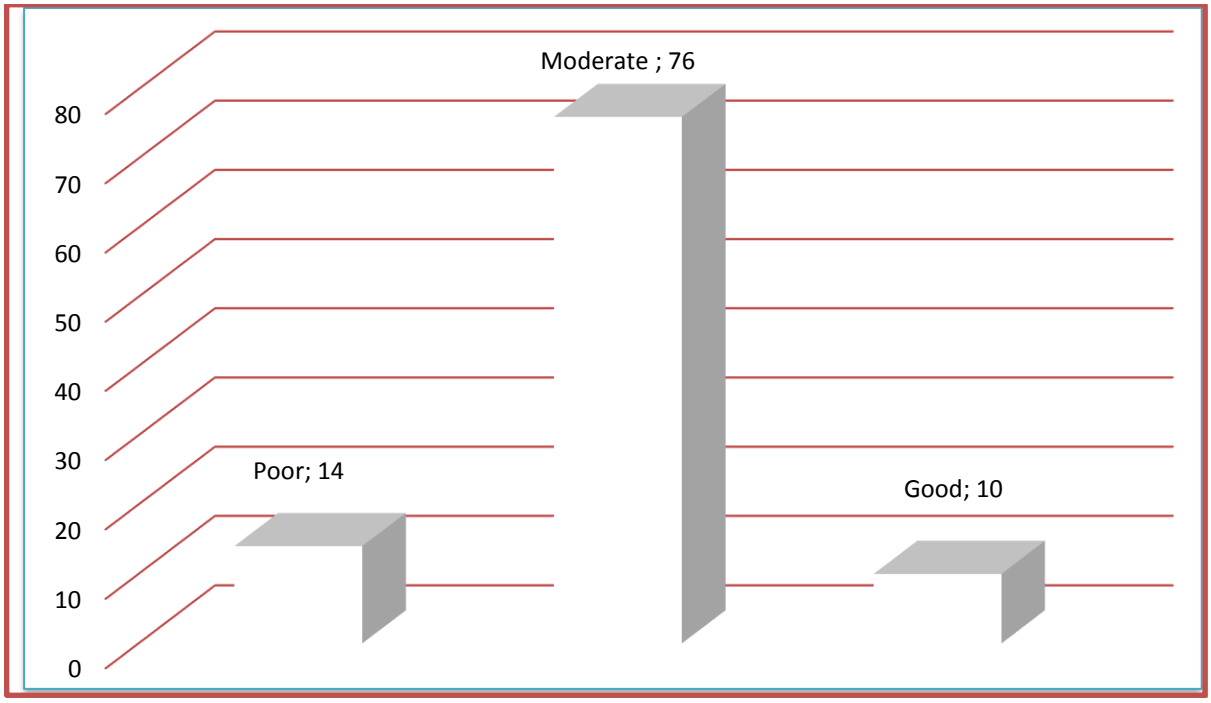


Figure 4-1: Hemodialysis patients' adherence to dietary restrictions

Table 4-2-3. Hemodialysis patients' adherence to fluid consumption

List	Fluid Consumption Items	Class	Freq.	%	*M.s ± SD*	*Ass.*
1	Receive detailed instructions about your fluid restrictions from a health professional, like your doctor, nurse, dietitian, or other health professional.	Never	16	16.0	*2.08±0.630*	*Moderate*
		Sometime	60	60.0		
		Always	24	24.0		
2	Perform many methods to decrease the feeling of thirst.	Never	30	30.0	*2.01±0.784*	*Moderate*
		Sometime	39	39.0		
		Always	31	31.0		
3	Drink plenty of water to control your thirst	Always	35	35.0	*1.86±0.738*	*Moderate*
		Sometime	44	44.0		
		Never	21	21.0		
4	Calculate the amount of water you consume in a day	Never	42	42.0	*1.81±0.787*	*Moderate*
		Sometime	35	35.0		
		Always	23	23.0		
5	Prefer to drink beverages instead of water	Always	39	39.0	*1.79±0.728*	*Moderate*
		Sometime	43	43.0		
		Never	18	18.0		
6	Drink a glass of water when taking medication	Always	26	26.0	*2.11±0.790*	*Moderate*
		Sometime	37	37.0		
		Never	37	37.0		
7	Have you had any difficulty with limiting your fluid intake?	Always	15	15.0	*2.14±0.651*	*Moderate*
		Sometime	56	56.0		
		Never	29	29.0		
8	Measure your weight outside the hemodialysis center	Never	62	62.0	*1.52±0.731*	*Poor*
		Sometime	24	24.0		
		Always	14	14.0		
9	There is an increase in your body weight between hemodialysis sessions of more than one kilogram per day.	Always	37	37.0	*1.75±0.657*	*Moderate*
		Sometime	51	51.0		
		Never	12	12.0		

"(M.s) Mean of Scores, (SD) Standard deviation, Level of Assessment (Poor≤1.66, Moderate=1.67-2.33, Good ≥ 2.34)"

In terms of statistical mean and standard deviation, the table (4-2-3) illustrated that the hemodialysis patients expressed a moderate response regarding adherence to fluid consumption at all items of the scale, as indicated by moderate mean scores, except that the patients expressed poor adherence in terms of *measuring weight outside the hemodialysis center.*

Table 4-2-4: Overall hemodialysis patients' adherence to fluid consumption

Adherence to fluid consumption	*Freq.*	*%*	*M ± SD*
Poor (*M=9-15*)	22	22.0	*17.07 ± 2.69*
Moderate (*M=15.1-21*)	73	73.0	
Good (*M=21.1-27*)	5	5.0	
Total	100	100.0	

M: Mean for total score, SD=Standard Deviation for total score

The findings in table (4-2-4) and figure (4-2) demonstrated that the (73%) of hemodialysis patients exhibited a moderate therapeutic regimen in terms of adherence to fluid consumption as described by moderate mean of scores *17.07* (*±2.69*).

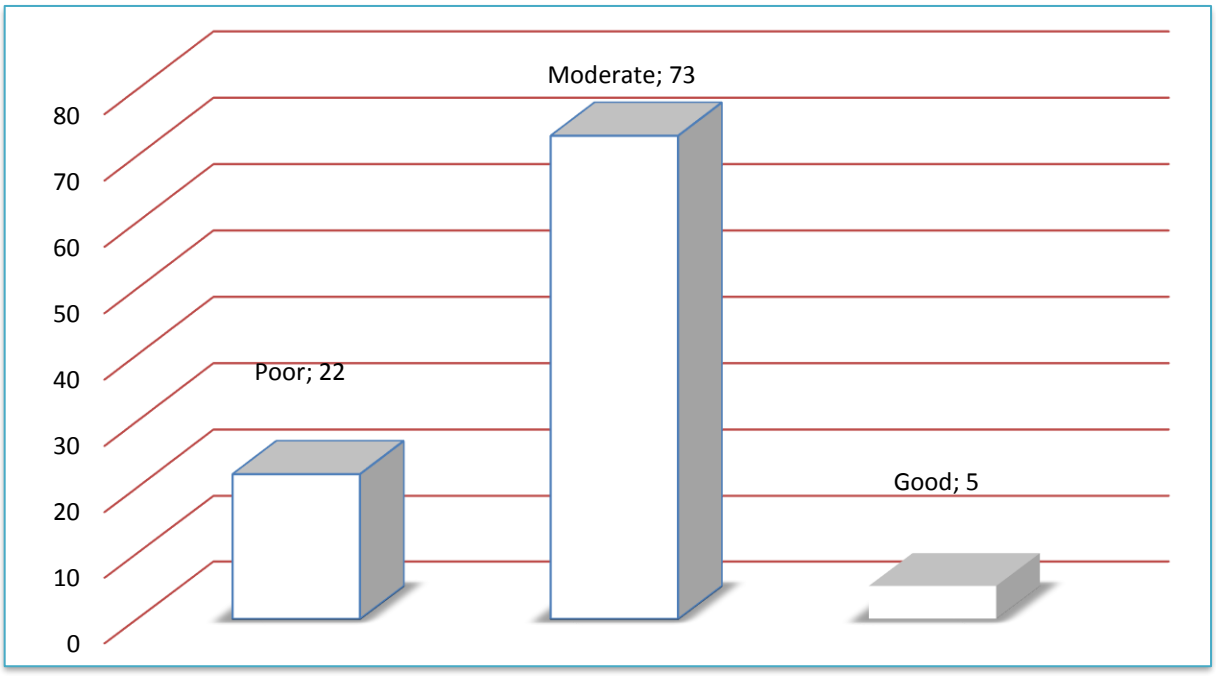


Figure 4-2: Hemodialysis Patients' adherence to fluid consumption

Table 4-2-5. Hemodialysis patients' adherence to hemodialysis sessions

List	Hemodialysis Sessions Items	Class	Freq.	%	*M.s ± SD*	*Ass.*
1	Receive detailed instructions from a health professional about hemodialysis treatment.	Never	24	24.0	*2.08±0.747*	*Moderate*
		Sometime	44	44.0		
		Always	32	32.0		
2	How much difficulty have you had staying for your entire dialysis treatment as ordered by your doctor?	Extreme difficulty	28	28.0	*1.88±0.655*	*Moderate*
		Moderate difficulty	56	56.0		
		No difficulty	16	16.0		
3	You adhere to the dialysis schedule	Never	2	2.0	*2.78±0.462*	*Good*
		Sometime	18	18.0		
		Always	80	80.0		
4	Skipped ≥ 1 hemodialysis session per month	Always	4	4.0	*2.34±0.794*	*Good*
		Sometime	58	58.0		
		Never	38	38.0		
5	Shortened hemodialysis session by ≥ 10 minutes	Always	6	6.0	*2.62±0.735*	*Good*
		Sometime	26	26.0		
		Never	68	68.0		

"(M.s) Mean of Scores, (SD) Standard deviation, Level of Assessment (Poor ≤ 1.66, Moderate= 1.67-2.33, Good ≥ 2.34)"

In terms of statistical mean and standard deviation, the table (4-2-5) illustrates that the hemodialysis patients expressed moderate responses regarding adherence to hemodialysis sessions in terms of *receive detailed instructions from a health professional about hemodialysis treatment, tough to complete the whole dialysis treatment as prescribed by doctor*, as indicated by moderate mean scores. While adherence in terms of *dialysis schedule, skipped ≥ 1 hemodialysis session per month and shortened hemodialysis session by ≥ 10 minutes,* patients expressed good adherence as indicated by a higher mean of scores.

Table 4-2-6: Overall hemodialysis patients' adherence to hemodialysis sessions

Adherence to Hemodialysis Sessions	*Freq.*	*%*	*M ± SD*
Poor (*M=5-8*)	12	12.0	*11.7 ± 1.41*
Moderate (*M=8.1-12*)	80	80.0	
Good (*M=12.1-15*)	8	8.0	
Total	100	100.0	

M: Mean for total score, SD=Standard Deviation for total score

The findings in table (4-2-6) and figure (4-3) demonstrated that the (80%) of hemodialysis patients exhibited a moderate therapeutic regimen in terms of adherence to hemodialysis sessions as described by moderate mean of scores *11.7* (*±1.41*).

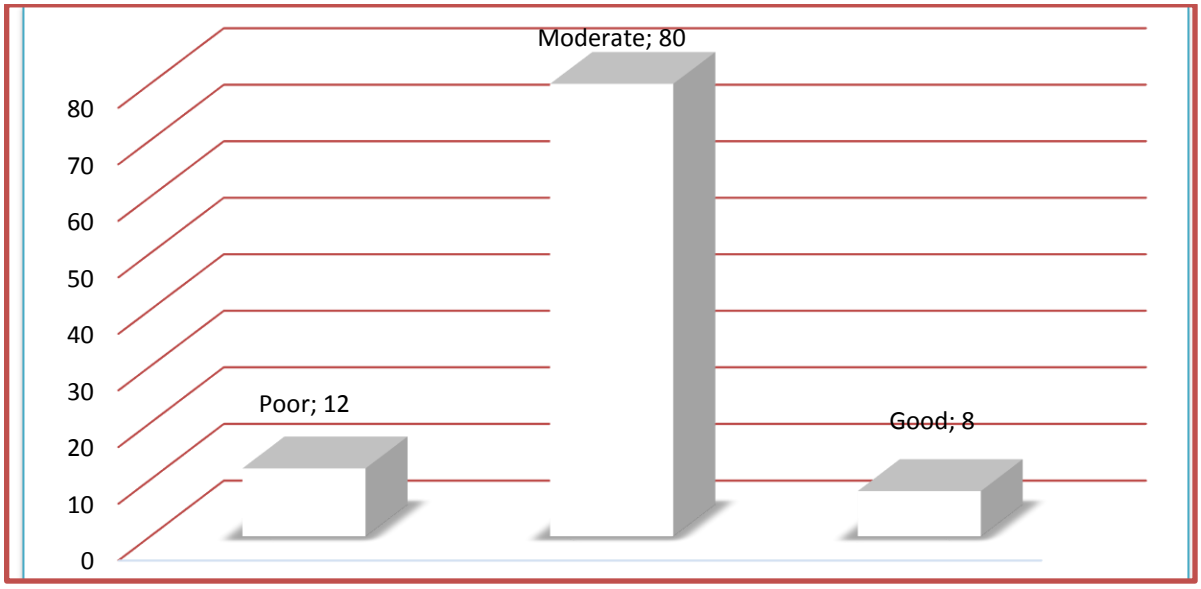


Figure 4-3: Hemodialysis patients' adherence to hemodialysis sessions

Table 4-2-7. Hemodialysis patients' adherence to prescribed medications

List	Prescribed Medications Items	Class	Freq.	%	*M.s ± SD*	*Ass.*
1	Receive detailed instructions on your medications from a health professional (your doctor, nurse, dietitian, or other health staff).	Never	17	17.0	*2.14±0.681*	*Moderate*
		Sometime	52	52.0		
		Always	31	31.0		
2	Take your medication at the times designated for you	Never	11	11.0	*2.34±0.669*	*Good*
		Sometime	44	44.0		
		Always	45	45.0		
3	Take the exact same dose of medication prescribed by your doctor	Never	7	7.0	*2.59±0.621*	*Good*
		Sometime	27	27.0		
		Always	66	66.0		
4	Have you had any difficulty with taking your medications?	Always	37	37.0	*1.73±0.633*	*Moderate*
		Sometime	53	53.0		
		Never	10	10.0		
5	How often have you missed your prescribed medications during the past week?	Always	2	2.0	*2.57±0.742*	*Good*
		Sometime	39	39.0		
		Never	59	59.0		
6	Visit a doctor when side effects appear after taking medications	Never	15	15.0	*2.11±0.633*	*Moderate*
		Sometime	59	59.0		
		Always	26	26.0		
7	If you feel worse, do you stop taking your medicines?	Always	28	28.0	*1.96±0.723*	*Moderate*
		Sometime	48	48.0		
		Never	24	24.0		

"(M.s) Mean of Scores, (SD) Standard deviation, Level of Assessment (Poor ≤ 1.66, Moderate= 1.67-2.33, Good ≥ 2.34)"

In terms of statistical mean and standard deviation, the table (4-2-7) illustrates that the hemodialysis patients expressed a moderate response regarding adherence to prescribed medication at all items of the scale, as indicated by moderate mean scores, except that the patients expressed good adherence in terms of *taking medication at the times designated, taking the exact same dose of medication prescribed, and how often have you missed your prescribed medications during the past week?).*

Table 4-2-8: Overall Hemodialysis patients' adherence to prescribed medications

Adherence to Prescribed Medications	*Freq.*	*%*	*M ± SD*
Poor (*M=7-11*)	3	3.0	*15.44 ± 2.17*
Moderate (*M=12-16*)	87	87.0	
Good (*M=17-21*)	10	10.0	
Total	100	100.0	

M: Mean for total score, SD=Standard Deviation for total score

The findings in table (4-2-8) and figure (4-4) demonstrated that the (87%) of hemodialysis patients exhibited a moderate therapeutic regimen in terms of adherence to the prescribed medication as described by a moderate mean of scores *15.44* (*±2.17*).

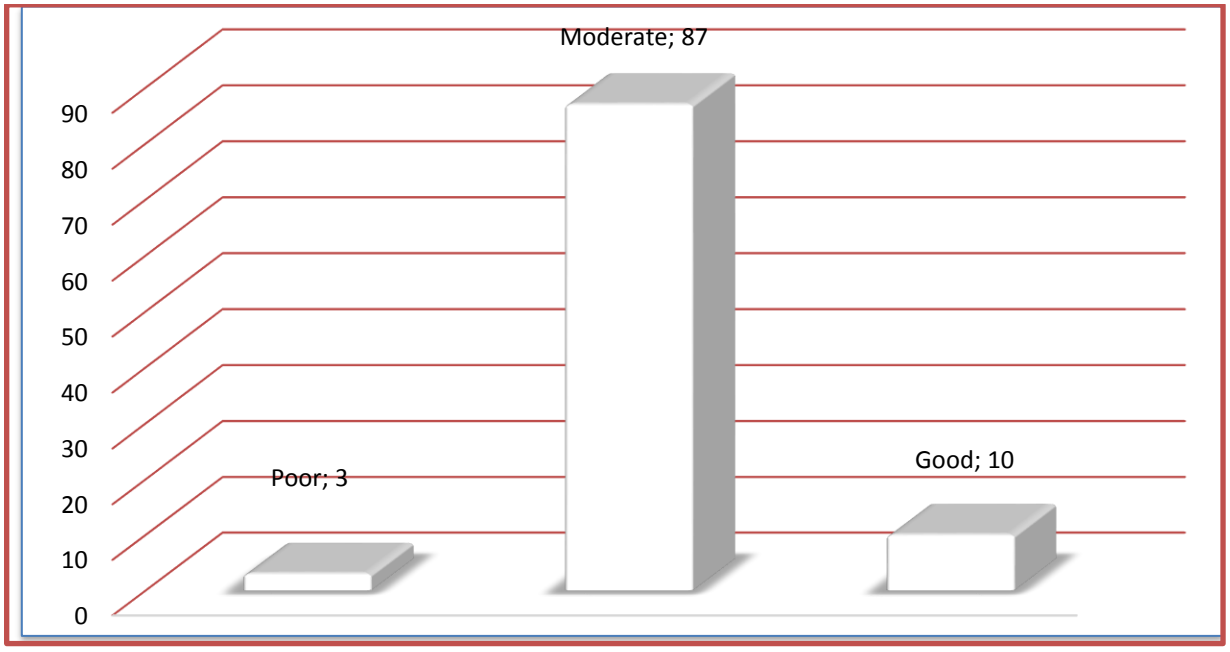


Figure 4-4: Hemodialysis patients' adherence to prescribed medications

Table 4-2-9: Overall adherence toward therapeutic regimen among hemodialysis patients

Overall Adherence	*Freq.*	*%*	*M ± SD*
Poor (*M=34-56*)	8	8.0	*69.65 ± 8.48*
Moderate (*M=57-79*)	90	90.0	
Good (*M=80-102*)	2	2.0	
Total	100	100.0	

M: Mean for total score, SD=Standard Deviation for total score

The findings in table (4-2-9) and figure (4-5) demonstrated that the majority (90%) of hemodialysis patients exhibited a moderate adherence to therapeutic regimen as described by moderate mean of scores *69.65* (*±8.48*).

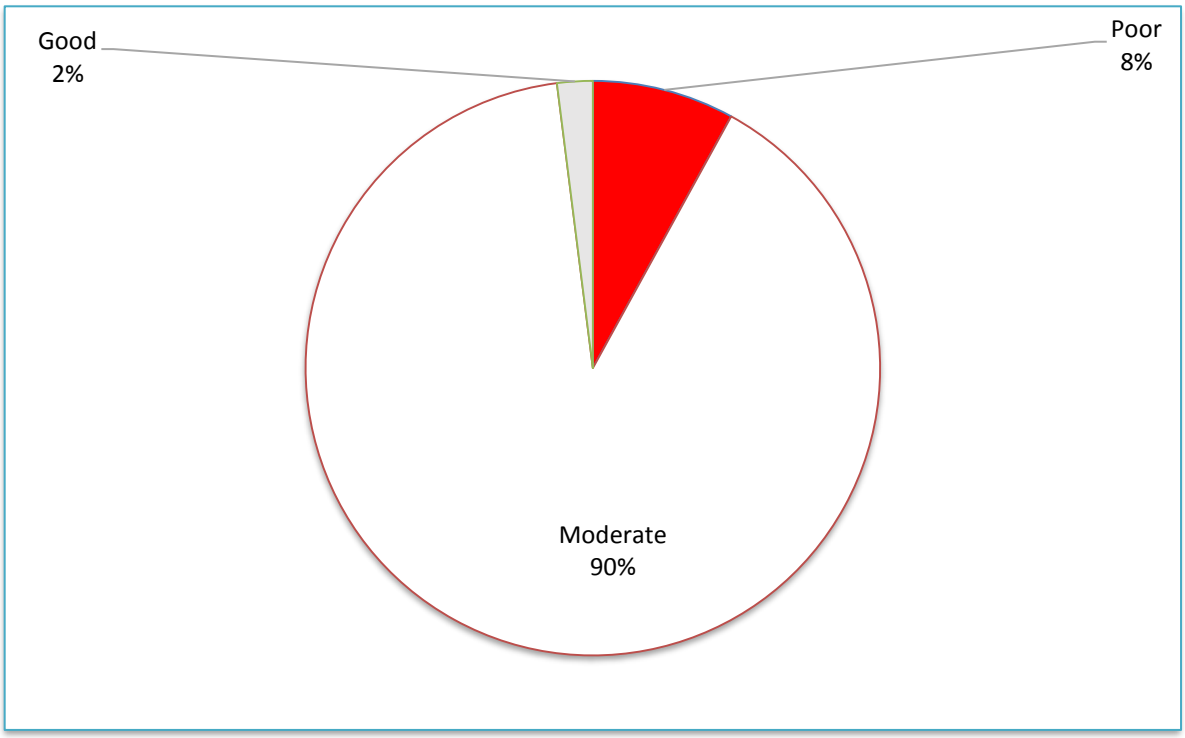


Figure 4-5: Adherence of therapeutic regimen among hemodialysis patients

4.3. Significant differences in adherence to therapeutic regimen among hemodialysis patients with regard to their socio-demographic Variables

Table 4-3-1: Statistical differences adherence to therapeutic regimen among hemodialysis patients with regard to their Age *(n=100)*

Age	Source of variance	Sum of Squares	d.f	Mean Square	*F-statistic*	*p-value*
Therapeutic Adherence	Between Groups	2.046	4	.511	19.401	.000
	Within Groups	2.504	95	.026		
	Total	4.550	99			

The findings in table (4-3-1) demonstrated that there were significant differences in adherence to therapeutic regimen among hemodialysis patients with regard to age groups *(p = 0.000).*

The adherence of hemodialysis patients to therapeutic regimen was significantly decreased with advanced age (≥60 years) and significantly increased with small age groups (Fig. 4-6).

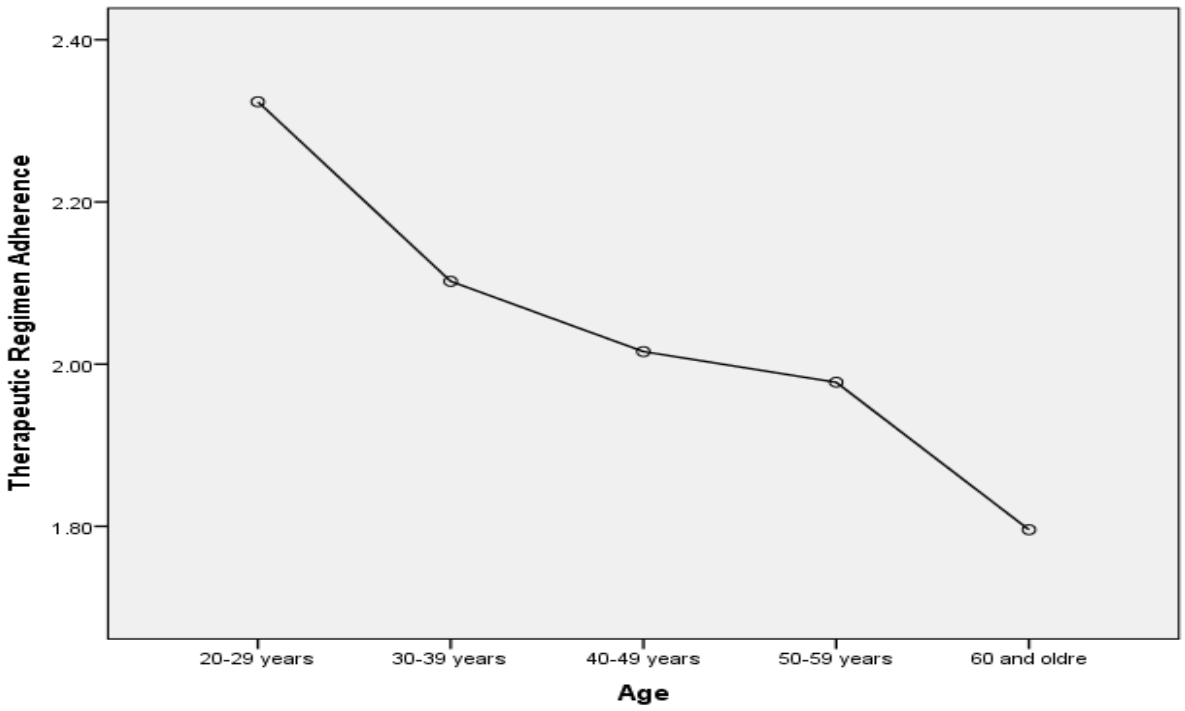


Figure 4-6: Adherence of therapeutic regimen according to age groups

Table 4-3-2: Statistical differences adherence to therapeutic regimen in hemodialysis patients with regard to their gender *(n = 100)*

Variables	Gender	Mean	SD	t-value	d.f	*p-value*
Therapeutic Adherence	Male	1.94	.220	.699	98	*.486*
	Female	1.97	.206			

"SD: Standard deviation, t: t-test, d.f: Degree of freedom, p: probability value"

The results in table (4-3-2) demonstrated that no significant differences existed in adherence to the therapeutic regimens between male and female hemodialysis patients (t = 0.699; p = 0.486).

Table 4-3-3: Statistical differences adherence of therapeutic regimen among hemodialysis patients with regard to their education level (n=100)

Education Level	Source of variance	Sum of Squares	d.f	Mean Square	*F-statistic*	*p-value*
Therapeutic Adherence	Between Groups	1.570	4	.392	12.506	.000
	Within Groups	2.981	95	.031		
	Total	4.550	99			

The findings in table (4-3-3) revealed that there were significant differences in adherence to therapeutic regimen among hemodialysis patients with regard to education level (p = 0.000).

As being, the adherence of therapeutic regimen among hemodialysis patients is significantly improved with higher education level (diploma and above) and decreased with those who are low education level (Fig. 4-7).

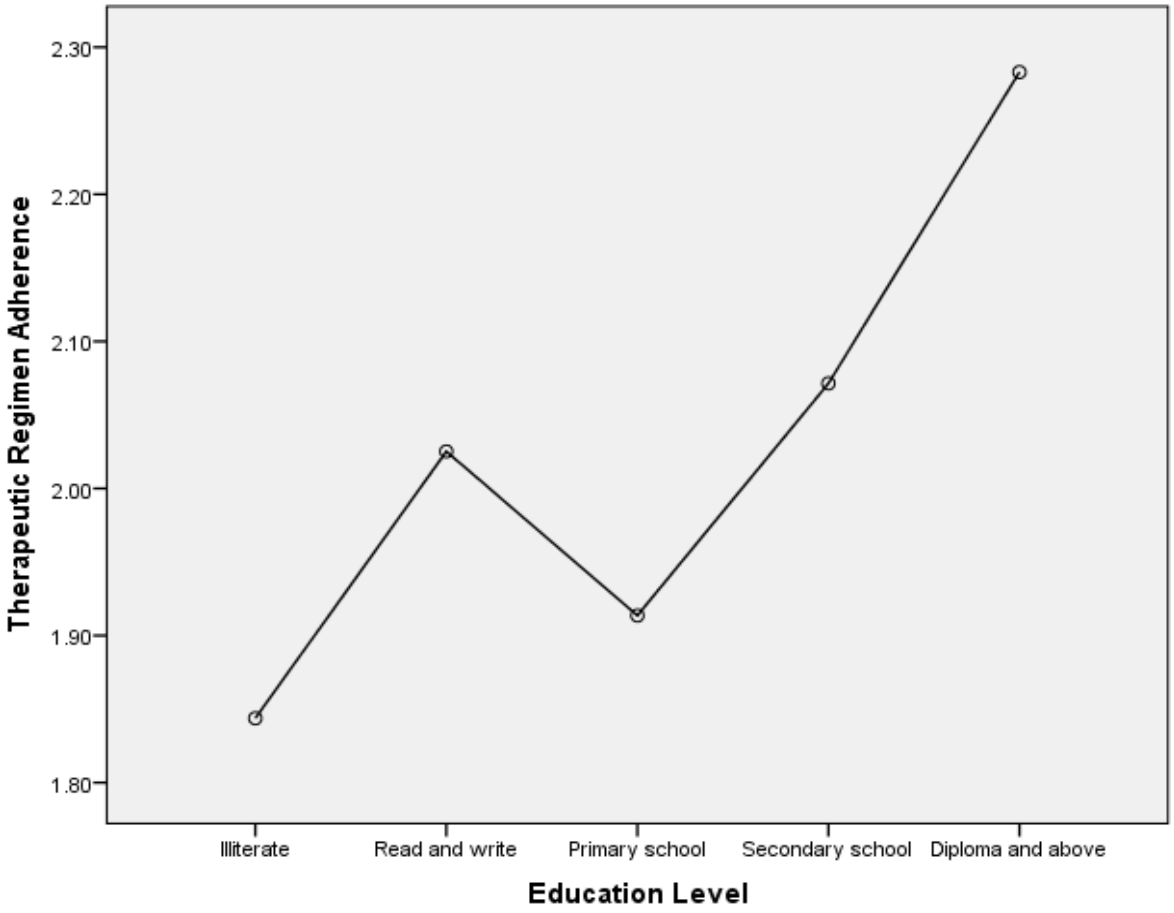


Figure4-7: Adherence of therapeutic regimen according to education level

Table 4-3-4: Statistical differences adherence to therapeutic regimen in hemodialysis patients with regard to their marital status (n = 100)

Marital Status	Source of variance	Sum of Squares	d.f	Mean Square	*F-statistic*	*p-value*
Therapeutic Adherence	Between Groups	.298	2	.149	3.398	.037
	Within Groups	4.252	97	.044		
	Total	4.550	99			

The findings in table (4-3-4) demonstrated that there were significant differences in adherence of therapeutic regimen among hemodialysis patients with regard to marital status (p=0.037).

It was noted that the adherence of therapeutic regimen among hemodialysis patients was significantly increased with those who were married and decreased with those who were single (Fig. 4-8).

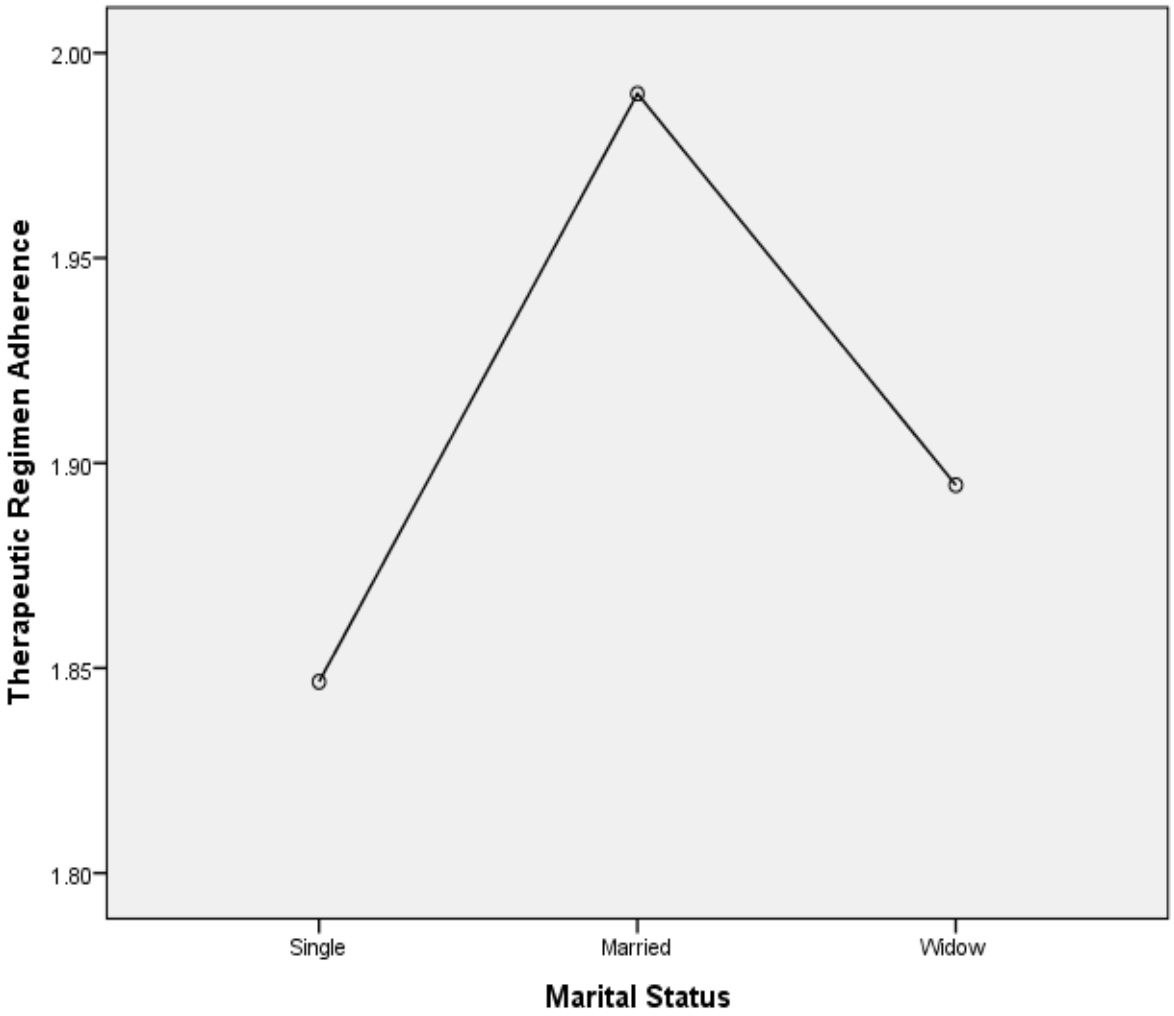


Figure4-8: Adherence of therapeutic regimen according to marital status

Table 4-3-5: Statistical differences adherence of therapeutic regimen among hemodialysis patients with regard to their occupational status (*n=100*)

Occupational Status	Source of variance	Sum of Squares	d.f	Mean Square	*F-statistic*	*p-value*
Therapeutic Adherence	Between Groups	.320	4	.080	1.795	.136
	Within Groups	4.231	95	.045		
	Total	4.550	99			

The findings in table (4-3-5) showed that there were no significant differences in adherence of therapeutic regimen among hemodialysis patients with regards occupational status (p=0.136).

Table 4-3-6: Statistical differences adherence to therapeutic regimen in hemodialysis patients with regard to their economic status (n = 100)

Economic Status	Source of variance	Sum of Squares	d.f	Mean Square	*F-statistic*	*p-value*
Therapeutic Adherence	Between Groups	2.101	2	1.051	41.604	.000
	Within Groups	2.449	97	.025		
	Total	4.550	99			

The findings in table (4-3-6) demonstrated that there were significant differences in adherence to therapeutic regimen among hemodialysis patients with regard to economic status (p = 0.000).

It is illustrated that the adherence of therapeutic regimen among hemodialysis patients was significantly increased with those who had enough income and decreased with those who didn't have enough (Fig. 4-9).

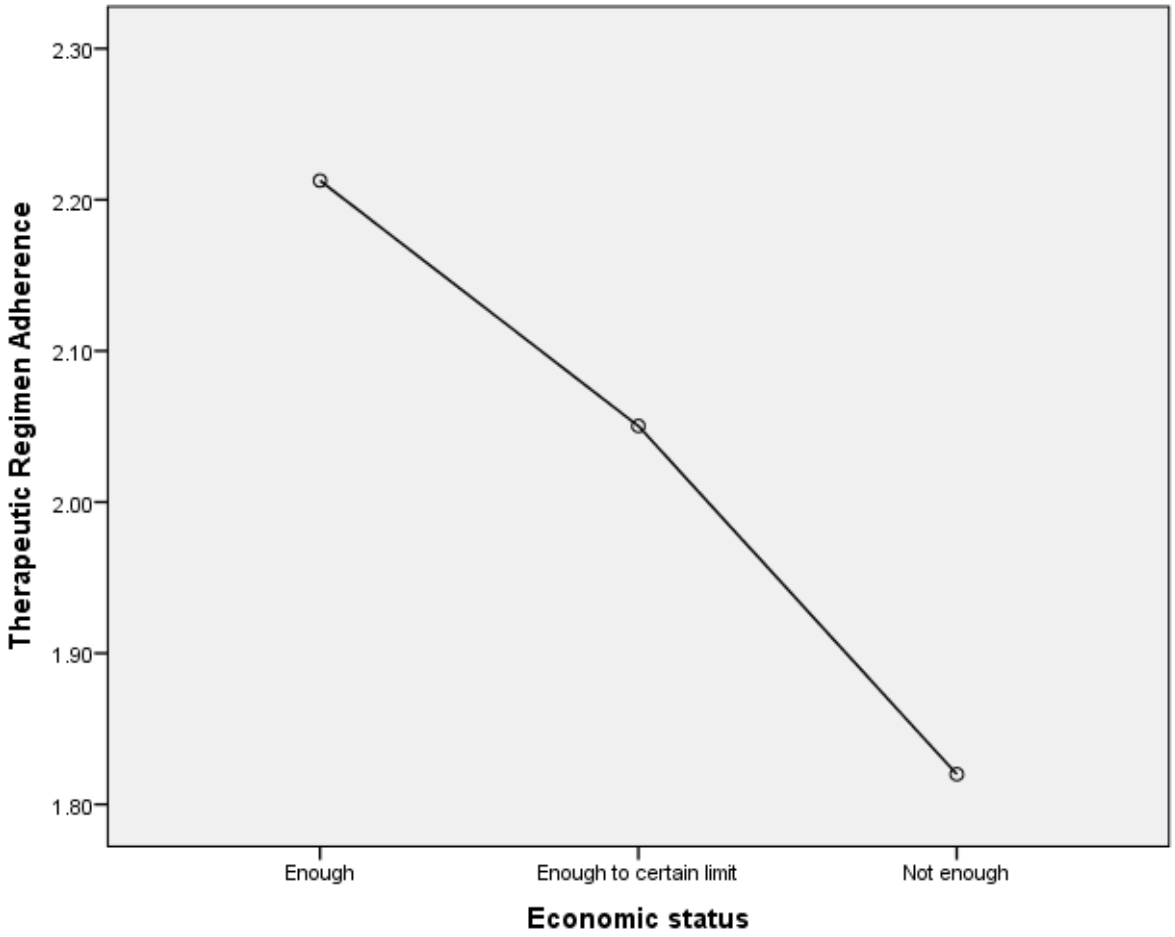


Figure 4-9: Adherence of therapeutic regimen according to economic status

Table 4-3-7: Statistical differences adherence to the therapeutic regimen in hemodialysis patients with regards to their residents (n = 100).

Variables	Residents	Mean	SD	t-value	d.f	*p-value*
Therapeutic Adherence	Rural	2.00	.212	1.797	98	*0.075*
	Urban	1.92	.211			

"SD: Standard deviation, t: t-test, d.f: Degree of freedom, p: probability value"

The findings in table (4-3-7) demonstrated that there were no significant differences in adherence to therapeutic regimen among hemodialysis patients with regard to those who lived in rural and urban residents (t = 1.797; p = 0.075).

Table 4-3-8: Statistical differences adherence to the therapeutic regimen in hemodialysis patients with regard to their duration of hemodialysis (n = 100)

Duration	Source of variance	Sum of Squares	d.f	Mean Square	*F-statistic*	*p-value*
Therapeutic Adherence	Between Groups	.370	2	.185	4.289	.016
	Within Groups	4.181	97	.043		
	Total	4.550	99			

The findings in table (4-3-8) demonstrated that there were significant differences in adherence to therapeutic regimen among hemodialysis patients with regard to duration of hemodialysis (p = 0.016).

It is indicated that the adherence to therapeutic regimen among hemodialysis patients was significantly decreased in those who had a long duration of hemodialysis (> 4 years) and increased in those who had a short duration of hemodialysis (Fig. 4-10).

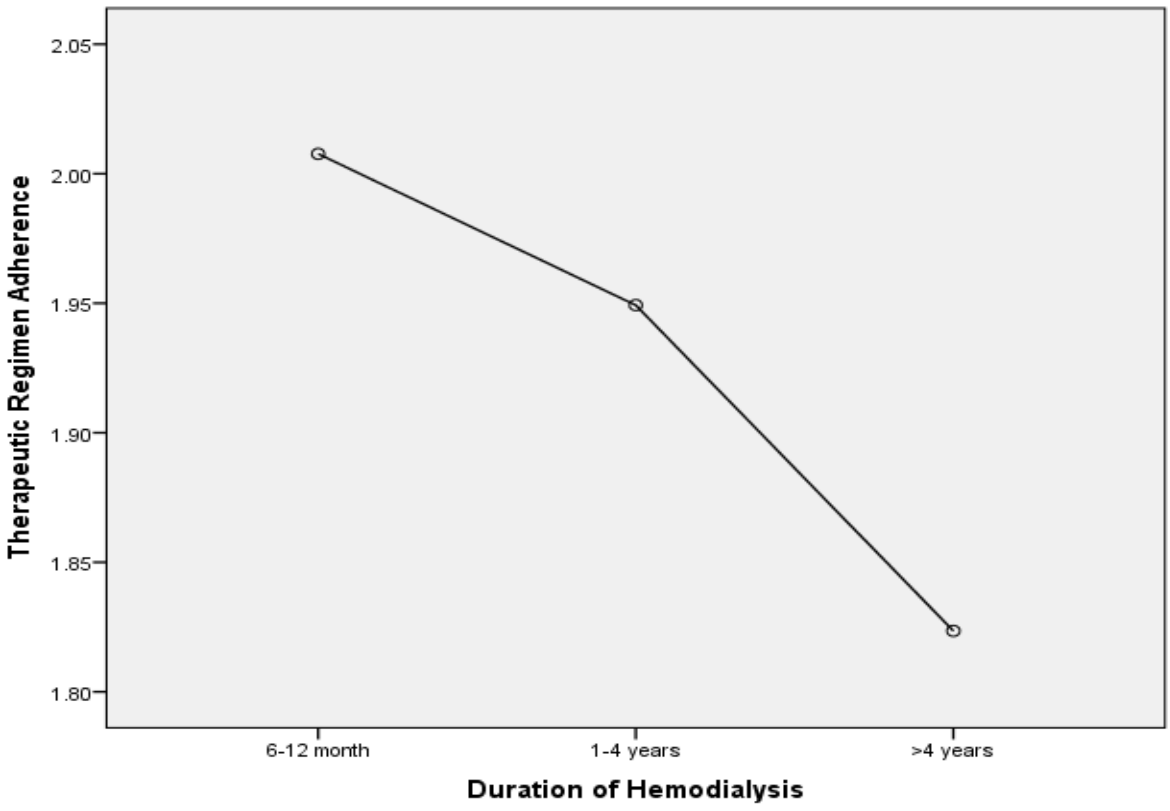


Figure 4-10: Adherence to therapeutic regimen according to duration of hemodialysis

Chapter Five: Discussion of the Study Results

Chapter Five

Discussion of the Study Results

This chapter presents the discussions and interpretations of the present study findings. The presentation of interpretations was ordered systematically with respect to the study objectives. The findings were supported by research evidence that is available in the literature.

5.1. Hemodialysis Patients' Sociodemographic Characteristics

According to the current study's findings, the highest percentage of hemodialysis patients (36%) their aged 60 years and more. This result was expected because most of the chronic diseases, such as hypertension, diabetes mellitus, and prostatic enlargement, occur mostly at advanced age, and these diseases increase the risk of ESRD. Furthermore, ESRD dramatically increases with aging, particularly after the age of 50 years. This result agreed with the finding of (Hameed and Al-Brzanji, 2014), which revealed that the highest percentage (31.9%) of age groups was between 60 years and older.

As well, this result was in line with a study done by (Athbi, 2015) in Holy Karbala, Iraq. The study revealed that around one-third of patients (32 %) were over the age of sixty years old, and 10 % of them were between the ages of 21 and thirty years old. The age ranges from 51–60 years comprises the second-largest proportion of respondents included in the research. Furthermore, these results agreed with the study carried out by (Rakshitha *et al.,* 2019) in India, who reported that half of the sample their age were more than 60 years old constituted (n = 75; 50%) of the whole sample. In contrast, the results of the current study disagreed with the results of (Rini *et al.,* 2021) in Indonesia, who reported that the highest age group was between (46-55), which constituted (n = 45; 36 %) of the whole sample.

In regards to gender, the current study results revealed that more than half of the research sample (58%) were male, as compared with those who were female (42%). This increased frequency of CRF in men may be attributable to their smoking and alcohol drinking behaviors. Diet, kidney size, changes in glomerular hemodynamics, and the direct effects of sex hormones may all play a role in this gap between men and women. According to a number of studies, estrogen slows the progression of renal disorders. Several research studies noted the impact of selective estrogen receptor modulators on kidney function in humans (AL-Shamaa and Salih, 2015).

However, this finding is comparable to that of (Naser and Mohammed, 2016), who revealed that the research sample included (80) hemodialysis patients. More than two thirds (65%) of them were male, and the remaining were female. This result was also supported by (Sharaf, 2016), who reported that the prevalence of chronic renal failure was substantially higher among males (53.3%) than females (46.7%). In addition, this finding consistent with the findings of (Ramezani *et al.*, 2019) in Iran, who showed that most participants in their study were males (57.1%).

Regarding education level, the results showed that one-third of participants were primary school graduates (32%). This might be due to most hemodialysis patients' age in our study being above 60 years old, and in the past, education was poor because of a shortage of schools and most Iraqi families were below the poverty line. Even in young patients, the disease's effects made the patients difficult to continue in their study. These findings were consistent with the research conducted by (Suganthi *et al.*, 2020). This was carried out on patients receiving hemodialysis. The results declared that 33% of the sample had a low educational level (primary school).

Moreover, this result was supported by (Naser and Mohammed, 2016). Their findings indicated that a greater number of patients

demonstrated low educational levels, such as illiteracy, reading and writing, and primary school. On the other hand, these findings disagreed with (Rini *et al.,* 2021), who showed that the largest proportion of the sample (40%) were secondary school graduates.

Concerning marital status, current study findings revealed that the majority of respondents (74%) were married compared with those who were single and widowed. Based on cultural issues, being married is the more socially acceptable option in our culture, and also, due to their progressed age, the researcher found that most of the participants were married. This result conformed with a study carried out by (Al-Khattabi, 2019), who reported that the majority of the participants (62.3%) were married. This finding concurred with (Elmoghazy *et al.,* 2016) in Egypt, who reported that more than two thirds of the sample (65.8%) were married. This result is also consistent with (Sharaf, 2016), who revealed that most participants were married (n= 36; 80%) of the whole sample.

In relation to occupation, results declared that the most (42%) of the research sample consisted of retirees. This result may be attributable to the effects of ESRD on the physical state of patients, the time required for hemodialysis, and the challenges of being employed after the initiation of treatment. This outcome was consistent with a study that was carried out by (Alikari *et al.,* 2017) on 107 patients undergoing hemodialysis in Athens (Greece), who found (57%) of the sample were retired. This result is also similar to the findings of a descriptive analytical research of 60 Iranian hemodialysis patients that was done by (Asgari *et al.,* 2017), who reported that the high percent of the present study's participants (38.7 percent) were retired, whereas just a small percent (1.7%) were government employees. Instead, these findings were inconsistent with the findings of (Athbi, 2015), who found that more than one third of the study sample (34%) were housewives.

In terms of resident, most of the study participants were urban residents (55%) as compared with those who were rural (45%) as displayed in table (4-1-1). The higher prevalence of non-communicable diseases such as obesity, diabetes, hypertension, and dyslipidemia in urban people than in rural ones makes chronic renal failure more common in urban people than in rural ones. This result is congruent with that found by (Asgari *et al.,* 2017), who revealed that 91.7% (n = 55) resided in urban regions. This data is also consistent with research done by (Baqer *et al.,* 2018) in the Al-Najaf governorate of Iraq, which indicated that 78% of the sample population resided in urban residential areas. The current study's findings were inconsistent with a study conducted by (Elmoghazy *et al.,* 2016) in Egypt that found a little more than half of the participants (50.8%) live in rural regions

According to economic status, the half of the study sample (49%) recorded insufficient economic status. Poor economic status due to the burden of hemodialysis treatment, which requires specific dietary requirements and a lot of medications, as well as sometimes patients have to buy the necessary hemodialysis equipment. Furthermore, most hemodialysis patients leave their jobs due to the disease's effects. These findings were similar to the findings conducted by (Deif *et al.,* 2015), in which they revealed that most patients (95%) had insufficient monthly income. This result was in agreement with that of (Nasiri *et al.,* 2013) in Iran, where the majority of the sample claimed that their income was insufficient to cover their living costs. Likewise, these results agreed with the study conducted in Egypt by (Sharaf, 2016) , who reported that the majority of the study sample (n = 42; 93.4%) reported that their monthly income was not enough.

5.2. Clinical Data of Hemodialysis Patients

Concerning chronic disease, results indicated that 40% of patients had hypertension, 24% had hypertension with diabetes, and 4% had diabetes.

This may be due to the fact that the prevalence of hypertension is higher and its control more difficult, and this may cause renal failure, which may lead to a rise in the number of patients with kidney failure. This study is supported by a study done by (Beerendrakumar *et al.*, 2018) who reported that 72% of hemodialysis patients had hypertension. (Ozen *et al.*, 2019) conducted another descriptive study on 274 hemodialysis patients in Turkey, and revealed hypertension to be the most common chronic disease (42%) among the study sample.

Concerning the duration of hemodialysis, most of the study sample (46%), had a 6-12-month period. This finding was consistent with results that were obtained by (Shyaa and Ahmed, 2017), which were conducted in Holy Karbala, Iraq, and which showed that fifty percent (50%) of hemodialysis patients had been getting hemodialysis treatment for less than one year. Likewise, (Chironda *et al.*, 2014) showed that the highest percent (22.4%) of patients had a duration on hemodialysis of (3–12) months.

The present study indicated that the majority of the sample (72%) received hemodialysis sessions two times per week. Today, national recommendations on hemodialysis in the majority of nations recommend patients should have treatment at least three times each week. However, the lack of resources in low and middle-income nations has led to a considerable number of patients receiving less frequent hemodialysis in these settings. Observational studies of individuals undergoing twice-weekly dialysis indicated that survival rates were comparable to those of people undergoing three-week dialysis. This reduce health care expenditures and expand access to renal replacement treatment in low-resource countries (Savla *et al.*, 2017).

This result agreed with a study conducted by (Dhaidan, 2018) in Iraq's Baghdad Governorate, which found that 75% of patients took twice-weekly dialysis sessions. As well (Mousa *et al.*, 2020) , demonstrates that approximately (56.1%) of patients receive two sessions per week.

Oppositely, this results in disagreement with the study carried out by (Mollaoglu and Kayatas, 2015) , who revealed that (82.3%) of hemodialysis patients receive hemodialysis sessions three times per week.

Concerning smoking status, results illustrated that (76%, 10%, and 14%) were not smokers, smokers, and ex-smokers, respectively. This result was expected because the therapeutic regimen of hemodialysis patients requires cessation of smoking. These results agreed with the study by (Khalil *et al.*, 2012), in which they found that most participants (72.6%) were nonsmokers. Moreover, a study conducted by (Goma *et al.*, 2021) found that most hemodialysis patients (86.0%) were nonsmokers.

However, regarding the patients' body mass index, the biggest proportion (42%) was among those with a normal weight, followed by overweight (24%), followed by those underweight (16%), followed by obese (14%), and then those extremely obese (4%). The duration of dialysis is a strong predictor of malnutrition. Patients who have been on HD for more than ten years often experience weight loss despite adequate protein intake, and the researcher found that the majority of study samples' hemodialysis duration is less than one year. These results were supported by the study (Kadhum and Mohammed, 2012) among 70 hemodialysis patients in Iraq at Al-Najaf Al-Ashraf governorate. The result showed that more than half of the study sample (51.4%) was of normal weight, followed by underweight people (31.4%), and then those who were overweight (12.9%). Lastly, only 4.3% of them had obesity.

5.3. Adherence of Hemodialysis Patients toward their Therapeutic Regimen

5.3.1. Hemodialysis patients' adherence to dietary restrictions

Findings revealed that the majority of hemodialysis patients (76%) displayed a moderate therapeutic regimen in terms of adherence to dietary

restrictions. This behavior is the outcome of dietary intake, which is impacted by personal food choices and is a complex process including social, psychological, biological, and cultural aspects. It is important that the nurse must focus on food as a source of nutrition, a sensible choice to address the body's nutrient demands, in addition food is a source of reward, pleasure, and energy, and it also brings people together. As a result, eating habits reflect all of these things (Nerbass *et al.,* 2017). A similar study in India found that 20% of participants had minor deviations from dietary recommendations, whereas 69% of participants had moderate deviations from dietary recommendations (Beerendrakumar *et al.,* 2018).

Furthermore, these results agreed with the study by (Khalil and Darawad, 2014), in their study about hemodialysis patients' adherence. They found at least 54% (102 patients) of the participants were deemed non-adherent to dietary restrictions because they did not comply with potassium, protein, or phosphorus limits. The other 46% of participants adhered to all dietary indicators without any changes in their blood phosphorus, potassium, and BUN levels. In contrast, these current study results disagreed with the study (Opiyo *et al.*, 2019) in Kenya that found poor diet prescription adherence among hemodialysis patients (only 36.3% of the study sample followed their dietary recommendations).

5.3.2 Hemodialysis Patients' Adherence to Fluid Consumption

A moderate therapeutic regimen in terms of adherence to fluid consumption was revealed in this study in 73% of hemodialysis patients. As anticipated, several participants attributed their fluid restriction nonadherence to thirst. In fact, as psychologist Fitzsimons stated, "the sensation of thirst is basic to our very existence; its gratification is universally held to be one of the pleasures of life; it cannot be ignored, and if water is lacking, the sensation comes to dominate our thoughts and behavior" (Nerbass *et al.*, 2017).

This result is supported by (Beerendrakumar *et al.,* 2018) , who studied the adherence of hemodialysis patients on 100 patients, and they found that the majority of the study sample (69%) of the patients had moderate adherence to fluid restrictions. The current study findings were contradicted by the findings of (Al-Khattabi, 2019), which was carried out on 361 patients in Makah city, Saudi Arabia. According to the findings of the study, 87.78% of HD patients complied with fluid restriction guidelines.

Another study done by (Chan *et al.,* 2012) in Malaysia on 188 patients also disagreed with our findings in which they found compliance rates of fluid restrictions at 24.5%. Moreover, the results of the hemodialysis adherence in the current study are unsupported by a study conducted by (Mollaoglu and Kayatas, 2015) who demonstrated that the vast majority of patients on hemodialysis (68.8%) did not adhere to fluid restriction.

5.3.3. Hemodialysis Patients' Adherence to Hemodialysis Sessions

The current findings of hemodialysis patients revealed that (80%) of hemodialysis patients had a moderate therapeutic regimen in terms of adherence to hemodialysis sessions. However, it is likely that patient's nonadherence to dialysis is associated with generalized anxiety related to the therapy and depression that is frequently ignored by healthcare providers. Due to their inability to resist the impulse and desire to smoke during dialysis, smokers prefer to shorten their sessions. Furthermore, because of the shortage of available hemodialysis machines, health care providers tend to shorten dialysis sessions. There is a correlation between HD session adherence and the kind of transportation (taxi, personal vehicle), or distance between the dialysis facility and the patient's house. Others, however, found that individuals who utilize private transportation (e.g., driven by a family

member or themselves) have a higher rate of attendance than those who use public transit (Cohen and Kimmel, 2018; Mohamedi and Mosha, 2022).

In a study (Deif *et al.,* 2015), they found adherence to hemodialysis treatment scores pre-program that most of the study sample (68.33%) reported moderate adherence to hemodialysis sessions. The findings of the current study agreed with the results of this study before receiving the educational program. These findings were inconsistent with the previous study done by (Chironda *et al.*, 2014) on a sample of 85 ESRD adult patients from Zimbabwe, which declared a non-adherence rate of 97.6%, which was very high. Also, these results disagreed with the study conducted by (Sree *et al.,* 2021) in India, in which majority of the patients showed high adherence to dialysis sessions (97%).

5.3.4. Hemodialysis Patients' Adherence to Prescribed Medications

Results demonstrated that the majority (87%) of hemodialysis patients exhibited a moderate therapeutic regimen in terms of adherence to the prescribed medication. This occurs due to Various aspects of pharmaceutical beliefs were identified as potential impediments to adherence. These included beliefs, benefits, and the necessity of the medication therapy. Patients with lower beliefs in the necessity of medication and greater concerns about potential adverse effects were more likely to be non-adherent. Moreover, the majority of hemodialysis patients were taking antihypertensive and phosphate-binding drugs that are linked with unpleasant effects and lead to nonadherence. On the other hand, Patients who take phosphate binders frequently experience constipation and gastrointestinal distress. Similarly, antihypertensive drugs may contribute to hypotension after dialysis, and patients might discontinue these medications due to the hemodynamic consequences they experience. Consequently, it is

vital to consider patients' beliefs, needs, and concerns during prescription and treatment review to promote informed choice and best adherence to recommended therapy. In addition, the complexity of the pharmaceutical regimen (frequency and dosing schedule) was substantially linked with nonadherence (Ghimire *et al.,* 2015).

This finding is in line with the research done by (Rakshitha *et al.,* 2019). They found that a high percentage of the research sample (42%) adhered to prescribed medicines moderately, whereas 28 percent of patients were highly adherent and 30 percent were adherent poorly. In addition, these results agree with findings by (Alkatheri *et al.,* 2014) in Saudi Arabia on 90 patients : 31.46 percent (N = 28) demonstrated low adherence, 40.45 percent (N = 36) demonstrated medium adherence, and 28.09 percent (N = 25) demonstrated high adherence. Furthermore, this study was consistent with another study done by (Sontakke *et al.,* 2015) in India on 150 patients with chronic kidney disease. The highest percent was moderate adherence, which recorded 55.3%, while high adherence reported 7.3% of medication adherence and low adherence reported 37.3%.

5.3.5. Overall Adherence of Hemodialysis Patients toward their Therapeutic Regimen

The overall adherence of the therapeutic regimen showed that the majority (90%) of hemodialysis patients exhibited moderate adherence to the therapeutic regimen. This might be because patient-related, psychological, disease-related, socioeconomic, therapy-related, and healthcare-related variables are the six types of factors that contribute to nonadherence in CKD patients (Chironda and Bhengu, 2016).

This result parallels the descriptive-analytic study in Iran which was carried out by (Rahdar *et al.,* 2019), showing most patients (77%) had moderate compliance with the treatment regimen. (Rafiee *et al.,* 2013) also

supported the current study, which revealed that the majority of patients adhered moderately to hemodialysis therapy across four dimensions of adherence: diet (78.9%), hemodialysis schedule (78.9%), fluid restriction (70.4%), and medication (56.3%).

On the other hand, a study conducted in Iran by (Noghan *et al.,* 2018) about "Resilience and therapeutic regimen compliance in patients undergoing hemodialysis in hospitals of Hamedan, Iran" found that hemodialysis patient therapeutic regimen adherence is poor. At the same time, this study didn't support the findings of the current study.

5.4. Significant Differences in Hemodialysis Patients' Adherence to Therapeutic Regimen and their Socio-demographic Characteristics and Clinical Data.

This study demonstrated that there were significant differences in therapeutic regimen adherence among hemodialysis patients with regard to age groups. However, it was noted that adherence to therapeutic regimen in hemodialysis patients decreased with presented age (≥ 60 years) and increased with small age groups. This may be due to complex pharmaceutical regimens, forgetfulness, and a lack of illness awareness may all contribute to this low adherence rate among the elderly.

This result conformed with a study conducted by (Ahlawat and Tiwari, 2016) in which they found that patients older than 60 years old, the chance of nonadherence to medication therapy was dramatically increased. Also, these results come along with findings obtained from research done by (Gerbino *et al.*, 2011) that also documented decreased compliance among older patients.

In regard to gender, the findings revealed that there were no significant statistical differences in therapeutic regimen adherence between male and female hemodialysis patients ($p = 0.486$). The results agree with

the study carried out by (Ibrahim *et al.*, 2015), who report that no relationship was found between gender and compliance among hemodialysis patients. Also (Rambod *et al.*, 2010), their findings illustrated that there was no association between a patient's gender and adherence to (BUN, PO4, and potassium) levels and IDWG. In contrast, these results were inconsistent with the study done by (Chan *et al.*, 2012), who reported that women were more adherent to dietary and fluid restrictions than males.

Regarding educational level, the results showed that there were significant differences between hemodialysis patients' adherence to their therapeutic regimen and educational level. Hemodialysis patients' adherence to the therapeutic regimen improved with higher education level (diploma and above) and decreases with lower education level. The explanation for this finding is that those with a higher level of education had greater access to information. In addition, it is likely that having greater social and financial resources boosts the adherence of highly trained patients. Furthermore, it may be related to the likelihood that patients with high educational levels can gain access and use resources that can help them cope with their health problems more effectively (Mollaoglu and Kayatas, 2015).

The results agreed with the study carried out by (Beerendrakumar *et al.*, 2018), who found that the degree of education of the participants was related to their level of adherence, as illiterates had higher deviations from dietary and fluid restrictions. Likewise, the study by (Alikari *et al.*, 2018) found that high school graduates had significantly higher scores in all domains of adherence in comparison to illiterate and primary school graduates.

Concerning marital status, according to the findings in table (4-3-4), there were significant differences in adherence to the therapeutic regimen among hemodialysis patients based on marital status ($p = 0.037$). It has been reported that adherence to therapeutic regimen among hemodialysis patients

was significantly higher in those who were married and lower in those who were singles. This may be linked to the perception that patients who live alone may experience a lack of social support. Furthermore, social support can supply resources for greater access and adherence to treatment. Also, as a result of their emotional or genetic ties to the patients, family members can have a substantial impact on their adherence to therapy.

The result agreed with the research carried out by (Halle *et al.*, 2020), which indicated that unmarried patients were more prone to not adhering to fluid restriction. Another study done by (Dantas *et al.*, 2013) mentioned that living alone was found to be an independent predictor of missing the HD sessions. In addition (Alzahrani and Al-Khattabi, 2021), they carried out a study in Saudi Arabia, which revealed married patients were much more likely than unmarried patients to adhere to dialysis treatments.

The result of the current study clarified that no significant differences were seen in adherence to the therapeutic regimen among hemodialysis patients with regard to occupational status ($p=0.136$). This study is similar to that done by (Ibrahim *et al.*, 2015), who observed no significant difference in this regard between the compliance and noncompliance groups ($P > 0.05$). The results also concurred with the study carried out by (Mukakarangwa *et al.*, 2018), which demonstrated that there was no significant association between occupation and adherence to hemodialysis among ESRD patients.

There were statistically significant differences in therapeutic regimen adherence among hemodialysis patients based on economic status. It has been observed that adherence to therapeutic regimen among hemodialysis patients was significantly higher in those with sufficient economic status and lower in those with insufficient economic status. ESRD sufferers are seen to have economic difficulties due to their inability to be productive and live a regular life as a result of their sickness. In addition, limited financial resources reduce the frequency of dialysis. Many of the psychological

pressures faced by ESRD patients were related to the economic and logistical aspects of their treatment. It is believed that the expense of treatment, transportation, or other costs, a decline in social life, job interference, and the length of therapy are linked to economic difficulties (Toroitich *et al.*, 2020).

According to a study done on hemodialysis patients in Rwanda, which declared that the majority of participants cited poverty as a factor impacting attendance at hemodialysis sessions, since missed dialysis sessions were frequently attributable to financial difficulties (Mukakarangwa *et al.*, 2020). Moreover, in another study done by (Toroitich *et al.*, 2020), who revealed significant statistical differences between hemodialysis patients' adherence to therapeutic regimen and economic status, they found that participants who received financial assistance from significant others were able to maintain food orders.

The findings of the current study indicated that there were no significant statistical differences in therapeutic regimen adherence between rural and urban hemodialysis patients ($p = 0.075$). This result aligns with that of (Hassan *et al.*, 2017), who reported no significant statistical differences between residence and compliance to the therapeutic regimen in their study. Also, no association was found in residence between non-compliant and compliant HD patients (Suganthi *et al.*, 2020). Furthermore, (Hassan *et al.*, 2017) study was in agreement with the present study's findings, which found that there were no significant associations between residence and adherence to therapeutic regimen ($p = 0.821$).

This study demonstrated that there were significant differences in therapeutic regimen adherence among hemodialysis patients with regard to duration of hemodialysis ($p = 0.016$). The adherence of the therapeutic regimen among hemodialysis patients was significantly lower in those who had been on hemodialysis for a long time (> 4 years) and higher in those who

had been on hemodialysis for a short time. According to (Lam *et al.*, 2010), they anticipated that patients with end-stage renal disease may be more motivated to modify their dietary habits in order to comply with the criteria of a recently obtained life-saving hemodialysis therapy. Nonetheless, as time passes, many individuals may get bored and easily annoyed by the need to adhere to extensive lists of food and fluid restrictions. Patients who are new to dialysis may also receive additional social support; hence, a better degree of adherence is anticipated. On the other hand, patients may find it difficult to reject the vast array of accessible meals over the long term.

This finding concurred with a study (Lam *et al.*, 2010) where they revealed that people with lengthier hemodialysis treatment durations were more likely to be non-compliant. On the other hand, the current study results did not similar with the study of (Chan *et al.*, 2012) in Malaysia, who claimed that there was high adherence among patients who had a longer duration of hemodialysis.

Chapter Six:

Conclusions and Recommendations

Chapter Six

Conclusions and Recommendations

This chapter introduces conclusions that result from the analysis and discussion of the study findings. The recommendations were established based on the research conclusions.

6.1 Conclusions

According to the interpretation of the results of this study, it can be concluded as follows:

1. A large proportion of the study sample was aged 60 years and older, with most of the participants were males. The majority of the sample were married, and one-third were primary school graduates. Most of them were retired and lived in urban areas. Furthermore, about half of participants their economic status was not enough.

2. Most of the study participants had hypertension as a chronic disease, hemodialysis duration of 6–12 months, and the majority of the study sample received two hemodialysis sessions per week. Also, most of them were non-smokers and had a normal body weight.

3. Regarding the adherence to dietary restrictions, fluid consumption, hemodialysis sessions, and prescribed medications, the majority of hemodialysis patients exhibited a moderate therapeutic regimen.

4. The majority of hemodialysis patients exhibited moderate adherence to the therapeutic regimen.

5. There was a significant difference between adherence to therapeutic regimen and some patients' characteristics (age, educational level, marital status, economic status, and duration of hemodialysis).

6.2 Recommendations

Based on the conclusions of the current study, the following recommendations are made:

1. To promote adherence among hemodialysis patients, it is necessary to educate patients with family involvement about the significance of adherence to hemodialysis treatment attendance, medication adherence, and dietary and fluid restrictions.

2. Effective communication between the nursing staff, the patient, and his or her family can enhance adherence.

3. All hemodialysis patients should have access to a simple, Arabic-language pamphlet including all the pertinent information.

4. The dietitian should serve as a consultant for renal diet planning and answer questions in the patient's language, explain the frequency of food consumption, and develop optimal planning according to the patient's socioeconomic status.

5. Enhance the economic status of hemodialysis patients by allocating a monthly salary from the ministry of labor and social affairs.

6. Future studies on a large sample should focus on identifying the variables that influence hemodialysis patient adherence.

References

References

1- المصادر العربية

القرآن الكريم، سُورةُ البقرة, الآية (٣٢)

2- المصادر الاجنبية

Abbasi, M., Chertow, G., & Hall, Y. (2010). End-stage Renal Disease. *American Family Physician*, *82*(12), 1512–1514.

Abraham, C., & Sheeran, P. (2014). The health belief model. In M. Conner & P. Norman (Eds.), *Cambridge Handbook of Psychology, Health and Medicine* (2nd ed., pp. 97-102). Open University Press.

Ahlawat, R., & Tiwari, P. (2016). Prevalence and Predictors of Medication Non-Adherence in Patients of Chronic Kidney Disease: Evidence from A Cross Sectional Study. *Journal of Pharmaceutical Care & Health Systems*, *03*(01), 1–6. https://doi.org/10.4172/2376-0419.1000152

Alikari, V., Tsironi, M., Matziou, V., Babatsikou, F., Psillakis, K., Fradelos, E., & Zyga, S. (2018). Adherence to Therapeutic Regimen in Adults Patients Undergoing Hemodialysis: The Role of Demographic and Clinical Characteristics. International Archives of Nursing and Health Care, 4(3), 2–7. https://doi.org/10.23937/2469-5823/1510096

Al-Khattabi, G. H. (2019). Prevalence of Treatment Adherence among Attendance at Hemodialysis in Makkah. *Journal of Advanced Research Design*, *58*(1), 1–11. www.akademiabaru.com/ard.html

AL-Shamaa, Y. M., & Salih, A. H. M. (2015). The Effect of Postural Changes on the Blood Velocity, Blood Pressure and Hemoglobin during Hemodialysis.

IOSR Journal of Dental and Medical Sciences, *14*(5), 69–73. https://doi.org/10.9790/0853-14516973

Ali, S. A. (2013). Adherence of Dietary Modification for Patient Receiving Hemodialysis. *Mosul Journal of Nursing*, *1*(1), 7–12. https://doi.org/10.33899/mjn.2013.162899

Alikari, V., Matziou, V., Tsironi, M., Kollia, N., Theofilou, P., Aroni, A., Fradelos, E., & Zyga, S. (2017). A modified version of the Greek Simplified Medication Adherence Questionnaire for hemodialysis patients. *Health Psychology Research*, *5*(1), 2–7. https://doi.org/10.4081/hpr.2017.6647

Alkatheri, A. M., Alyousif, S. M., Alshabanah, N., Albekairy, A. M., Alharbi, S., Alhejaili, F. F., Alsayyari, A. A., Qandil, A. M., & Qandil, A. M. (2014). Medication Adherence among Adult Patients on Hemodialysis. *Saudi Journal of Kidney Diseases and Transplantation*, *25*(4), 762–768.

Alzahrani, A. M. A., & Al-Khattabi, G. H. (2021). Factors Influencing Adherence to Hemodialysis Sessions among Patients with End-Stage Renal Disease in Makkah City. *Saudi Journal of Kidney Diseases and Transplantation*, *32*(3), 763–773. https://doi.org/10.4103/1319-2442.336772

Ammirati, A. L. (2020). Chronic Kidney Disease. *Rev Assoc Med Bras*, 66(Suppl1), 3–9. https://doi.org/http://dx.doi.org/10.1590/1806-9282.66.S1.3

Asgari, M. R., Asghari, F., Ghods, A. A., Ghorbani, R., Motlagh, N. H., & Rahaei, F. (2017). Incidence and severity of nausea and vomiting in a group of maintenance hemodialysis patients. *Journal of Renal Injury Prevention*, *6*(1), 49–55. https://doi.org/10.15171/jrip.2017.09

Athbi, H. A. (2015). Compliance behaviors among patients undergoing hemodialysis therapy in Holy Kerbala / Iraq. *Kerbala Journal of Pharmaceutical Sciences*, 9, 78–90.

Baqer, H. M., Jabur, F., & Kadhum, S. (2018). Impact of end stage renal disease upon physical activity for adult patients undergoing hemodialysis at AL-Najaf governorate hospitals. *Journal of Pharmaceutical Sciences and Research*, *10*(5), 1170–1174.

Baraz, S., Parvardeh, S., Mohammadi, E., & Broumand, B. (2010). Dietary and fluid compliance: An educational intervention for patients having haemodialysis. *Journal of Advanced Nursing*, *66*(1), 60–68. https://doi.org/10.1111/j.1365-2648.2009.05142.x

Baumgarten, M., & Gehr, T. (2011). Chronic kidney disease: Detection and evaluation. *American Family Physician*, *84*(10), 1139–1148.

Beerappa, H., & Chandrababu, R. (2019). Adherence to dietary and fluid restrictions among patients undergoing hemodialysis: An observational study. *Clinical Epidemiology and Global Health*, *7*(1), 1–4. https://doi.org/10.1016/j.cegh.2018.05.003

Beerendrakumar, N., Ramamoorthy, L., & Haridasan, S. (2018). Dietary and Fluid Regime Adherence in Chronic Kidney Disease Patients. *Journal of Caring Sciences*, *7*(1), 17–20. https://doi.org/10.15171/jcs.2018.003

Biruete, A., Jeong, J. H., Barnes, J. L., & Wilund, K. R. (2016). Modified Nutritional Recommendations to Improve Dietary Patterns and Outcomes in Hemodialysis Patients. *Journal of Renal Nutrition*, *27*(1), 1–9. https://doi.org/10.1053/j.jrn.2016.06.001

Cameron, J. S. (2016). The prehisitory of hemodialysis as a treatment for uremia. *Italian Journal of Nephrology*, *33*(66), 1–14.

Centers for Disease Control and Prevention (CDC). (2021). Chronic kidney disease in the United States, 2021. *Atlanta, GA: US Department of Health and Human Services, Centers for Disease Control and Prevention*, *3*.

Chan, Y. M., Zalilah, M. S., & Hii, S. Z. (2012). Determinants of compliance behaviours among patients undergoing hemodialysis in malaysia. *Plos One*, *7*(8), 1–7. https://doi.org/10.1371/journal.pone.0041362

Chironda, G., & Bhengu, B. (2016). Contributing Factors to Non-Adherence among Chronic Kidney Disease (CKD) Patients: A Systematic Review of Literature. *Medical & Clinical Reviews*, *02*(04), 1–9. https://doi.org/10.21767/2471-299x.1000038

Chironda, G., Manwere, A., Nyamakura, R., Chipfuwa, T., & Bhengu, B. (2014). Perceived health status and adherence to haemodialysis by End Stage Renal Disease patients: A case of a Central hospital in Zimbabwe. *IOSR Journal of Nursing and Health Science*, *3*(1), 22–31. https://doi.org/10.9790/1959-03152231

Cohen, S. D., & Kimmel, P. L. (2018). Management of nonadherence in ESKD patients. *Clinical Journal of the American Society of Nephrology*, *13*(7), 1080–1082. https://doi.org/10.2215/CJN.13331117

Conway, B., Phelan, P., & Stewart, G. (2018). Nephrology and urology. In S. H. Ralston, I. D. Penman, M. W. Strachan, & R. P. Hobson (Eds.), *Davidson's Principles and Practice of medicine* (23rd ed, p. 420). Elsevier Ltd.

Dantas, L. G., Cruz, C. M. S., Rocha, M., Moura, J. A., Paschoalin, E., Paschoalin, S., & Marcilio De Souza, C. (2013). Prevalence and predictors of nonadherence to hemodialysis. *Nephron - Clinical Practice*, *124*(1–2), 67–71. https://doi.org/10.1159/000355866

Debora, S. J. (2019). Effectiveness of Nurse Led Education on Self Care Management of Renal Failure among Haemodialysis Patients. *Indian Journal of Surgical Nursing*, *8*(1), 13–18. https://doi.org/10.21088/ijsn.2277.467X.8119.3

Deif, H. I. A., Elsawi, K., Selim, M., & NasrAllah, M. M. (2015). Effect of an Educational Program on Adherence to Therapeutic Regimen among Chronic Kidney Disease Stage 5 (CKD5) Patients under Maintenance Hemodialysis. *Journal of Education and Practice*, *6*(5), 21–34.

Denhaerynck, K., Manhaeve, D., Dobbels, F., Garzoni, D., Nolte, C., & De Geest, S. (2007). Prevalence and consequences of nonadherence to hemodialysis regimens. *American Journal of Critical Care*, *16*(3), 222–236. https://doi.org/10.4037/ajcc2007.16.3.222

Dhaidan, F. A. (2018). Prevalence of end stage renal disease and associated conditions in hemodialysis Iraqi patients. *International Journal of Research in Medical Sciences*, *6*(5), 1515–1518. https://doi.org/10.18203/2320-6012.ijrms20181279

Ebrahimi, H., Sadeghi, M., Amanpour, F., & Dadgari, A. (2016). Influence of nutritional education on hemodialysis patients' knowledge and quality of life. *Saudi Journal of Kidney Diseases and Transplantation*, *27*(2), 250–255. https://doi.org/10.4103/1319-2442.178253

Eknoyan, G. (2009). The wonderful apparatus of john jacob abel called the "artificial kidney." *Seminars in Dialysis*, *22*(3), 287–296. https://doi.org/10.1111/j.1525-139X.2009.00527.x

Elmoghazy, G. E. E., Hassan, S. A. A., Sorour, A. S., & Donia, A. F. (2016). Nursing Intervention for Enhancing Hemodialysis Patient Adherence to Therapeutic Regimen. *Journal of American Science*, *12*(11), 84–93. https://doi.org/10.7537/marsjas121116.08.

Featherstone, P. J., & Ball, C. M. (2019). A brief history of haemodialysis and continuous renal replacement therapy. *Anaesthesia and Intensive Care*, *47*(3), 220–222. https://doi.org/10.1177/0310057X19853391

Gela, D., & Mengistu, D. (2018). Self-management and associated factors among patients with end-stage renal disease undergoing hemodialysis at health facilities in Addis Ababa, Ethiopia. *International Journal of Nephrology and Renovascular Disease*, 11, 329–336. https://doi.org/10.2147/IJNRD.S184671

Geldine, C. G., Bhengu, B., & Manwere, A. (2017). Adherence of adult Chronic Kidney Disease patients with regard to their dialysis, medication, dietary and fluid restriction. *Research Journal of Health Sciences*, *5*(1), 3–17. https://doi.org/10.4314/rejhs.v5i1.2

Gerbino, G., Dimonte, V., Albasi, C., Lasorsa, C., Vitale, C., & Marangella, M. (2011). Adherence to therapy in patients on hemodialysis. *Italian Journal of Nephrology*, *28*(4), 416–424.

Ghimire, S., Castelino, R. L., Lioufas, N. M., Peterson, G. M., & Zaidi, S. T. R. (2015). Nonadherence to medication therapy in haemodialysis patients: A systematic review. *Plos One*, *10*(12), 1–19. https://doi.org/10.1371/journal.pone.0144119

Goddard, J., Turner, A. N., & Stewart, L. H. (2010). Kidney and urinary tract disease. In N. R. Colledge, B. R. Walker., & S. H. Ralston (Eds.), *Davidson's principles and practice of medicine* (21st ed, pp. 495–496). Elsevier ltd.

Goma, H., Basal, A., Okasha, K., & Shaban, Z. (2021). Adherence of Chronic Renal Failure Patients Undergoing Maintenance Hemodialysis with Their Therapeutic Regimen. *Tanta Scientific Nursing Journal*, *23*(4), 351–377. https://doi.org/10.21608/tsnj.2021.210733

Green, E. C., & Murphy, E. (2014). Health Belief Model. *The Wiley Blackwell Encyclopedia of Health, Illness, Behavior, and Society*, *4*(34), 1–4.

Greenberg, K. I., & Choi, M. J. (2021). Hemodialysis Emergencies: Core Curriculum 2021. *American Journal of Kidney Diseases*, *77*(5), 796–809. https://doi.org/10.1053/j.ajkd.2020.11.024

Griva, K., Lai, A. Y., Lim, H. A., Yu, Z., Foo, M. W. Y., & Newman, S. P. (2014). Non-adherence in patients on peritoneal dialysis: A systematic review. *Plos One*, *9*(2), 1–11. https://doi.org/10.1371/journal.pone.0089001

Guttee, V., Nie, Y., Wang, Y., & Ding, X. (2017). Impact of Abnormal Serum Electrolyte Levels and Acid-Base Disorders on Clinical Outcomes among Maintenance Hemodialysis Patients. *Open Access Library Journal, 04*(05), 1–14. https://doi.org/10.4236/oalib.1103623

Habas, E., Rayani, A., & Khammaj, A. (2012). Long-term Complications of Hemodialysis Long-term Complications of Hemodialysis. *Sebha Medical Journal*, *11*(1), 12–18.

Hafezieh, A., Dehghan, M., Taebi, M., & Iranmanesh, S. (2020). Self-management, self-efficacy and knowledge among patients under haemodialysis: a case in Iran. *Journal of Research in Nursing*, *25*(2), 128–138. https://doi.org/10.1177/1744987120904770

Halle, M. P., Hilaire, D., Francois, K. F., Denis, T., Hermine, F., & Gloria, A. E. (2020). Intradialytic Hypotension and Associated Factors among Patients on Maintenance Hemodialysis: A Single-Center Study in Cameroon. *Saudi Journal of Kidney Diseases and Transplantation*, *31*(1), 215–223. https://doi.org/10.4103/1319-2442.279944

Hameed, R. Y., & Al-Brzanji, R. I. A. (2014). Quality of Life for Hemodialysis Patients in Kirkuk Governorate/Iraq. *Kufa Journal for Nursing Sciences*, *3*(3), 1–8.

Hassan, S. H., Sherif, W. I., & Hassanin, A. A. (2017). Assess hemodialysis patients' compliances to therapeutic regimen. *Mansoura Nursing Journal*, *4*(2), 160–170. https://doi.org/10.21608/mnj.2017.149639

Havas, K., Bonner, A., & Douglas, C. (2016). Self-management support for people with chronic kidney disease: Patient perspectives. *Journal of Renal Care*, *42*(1), 7–14. https://doi.org/10.1111/jorc.12140

Himmelfarb, J., & Ikizler, T. A. (2010). Hemodialysis. *The New England Journal of Medicine*, *363*(16), 1833–1845. https://doi.org/10.1056/NEJMra0902710

Iborra-Molto, C., Lopez-Roig, S., & Pastor, M. A. (2012). Prevalence of adherence to fluid restriction in kidney patients in haemodialysis: objective indicator and perceived compliance. *Nephrology Journal*, *32*(4), 477–485. https://doi.org/10.3265/Nefrologia.pre2012.Feb.11236

Ibrahim, S., Hossam, M., & Belal, D. (2015). Study of non-compliance among chronic hemodialysis patients and its impact on patients' outcomes. *Saudi Journal of Kidney Diseases and Transplantation*, *26*(2), 243–249. https://doi.org/10.4103/1319-2442.152405

Jacobs, C. (2009). Replacement of renal function by hemodialysis. A century and a half of history. *Nephrology and Therapeutics*, *5*(4), 306—312. https://doi.org/10.1016/j.nephro.2009.03.001

Jampour, L., Dehzad, M. J., Eftekhari, M. H., & Akbarzadeh, M. (2018). The Evaluation of Adherence to Dietary and Liquid Intake Recommendations in Hemodialysis Patients Hemodialysis Diet Chronic kidney disease. *International Journal of Nutritional Sciences*, *3*(2), 92–98.

Jat, J. A., Mal, P., & Kumar, D. (2016). Renal Osteodystrophy in End Stage Renal Failure Patients on Maintenance Haemodialysis. *Journal of Clinical & Experimental Nephrology*, *01*(04), 1–3. https://doi.org/10.21767/2472-5056.100025

Jones, C. J., Smith, H., & Llewellyn, C. (2014). Evaluating the effectiveness of health belief model interventions in improving adherence: a systematic review. *Health Psychology Review*, *8*(3), 253–269. https://doi.org/10.1080/17437199.2013.802623

Kadhum, I. A., & Mohammed, W. K. (2012). Nutritional status of adult hemodialysis patients in Al-Najaf Al-Ashraf Governorate. *Iraqi National Journal of Nursing Specialties*, *25*(1), 64–78.

Kear, T. (2018). Management of Patients With Kidney Disorders. In J. L. Hinkle & K. H. Cheever (Eds.), *Brunner & Suddarth's Textbook of Medical-Surgical Nursing* (14th Ed, p. 4173). Wolters Kluwer.

Khalil, A. A., Darawad, M., Al Gamal, E., Hamdan-Mansour, A. M., & Abed, M. A. (2012). Predictors of dietary and fluid non-adherence in Jordanian patients with end-stage renal disease receiving haemodialysis: A cross-sectional study. *Journal of Clinical Nursing*, *22*(1–2), 1–10. https://doi.org/10.1111/j.1365-2702.2012.04117.x

Khalil, A. A., & Darawad, M. W. (2014). Objectively measured and self-reported nonadherence among Jordanian patients receiving hemodialysis. *Hemodialysis International*, *18*(1), 95–103. https://doi.org/10.1111/hdi.12093

Kim, H., & Cho, M. K. (2021). Factors influencing self-care behavior and treatment adherence in hemodialysis patients. *International Journal of Environmental Research and Public Health*, *18*(24), 1–13. https://doi.org/10.3390/ijerph182412934

Kurkus, J., Nykvist, M., Lindergard, B., & Segelmark, M. (2007). Thirty-Five Years of Hemodialysis: Two Case Reports as a Tribute to Nils Alwall. *American Journal of Kidney Diseases*, *49*(3), 471–476. https://doi.org/10.1053/j.ajkd.2007.01.022

Lam, L. W., Twinn, S. F., & Chan, S. W. C. (2010). Self-reported adherence to a therapeutic regimen among patients undergoing continuous ambulatory peritoneal dialysis. *Journal of Advanced Nursing*, *66*(4), 763–773. https://doi.org/10.1111/j.1365-2648.2009.05235.x

Lawson, J. H., Niklason, L. E., & Roy-Chaudhury, P. (2020). Challenges and novel therapies for vascular access in haemodialysis. *Nature Reviews Nephrology*, *16*(10), 586–602. https://doi.org/10.1038/s41581-020-0333-2

Lehane, E., & McCarthy, G. (2007). Intentional and unintentional medication non-adherence: A comprehensive framework for clinical research and practice? A discussion paper. *International Journal of Nursing Studies*, *44*(8), 1468–1477. https://doi.org/10.1016/j.ijnurstu.2006.07.010

Leonard, E. F., Cortell, S., & Jones, J. (2011). The path to wearable ultrafiltration and dialysis devices. *Blood Purification*, 31, 92–95. https://doi.org/10.1159/000321846

Lins, S. M. S. B., Leite, J. L., Godoy, S. D., Tavares, J. M., Rocha, R. G., & Silva, F. V. C. (2018). Treatment adherence of chronic kidney disease patients on hemodialysis. *Acta Paul Enferm*, *31*(1), 54–60. https://doi.org/10.1590/1982-0194201800009

Lomonte, C., Basile, C., Mitra, S., Combe, C., Covic, A., Davenport, A., Kirmizis, D., Schneditz, D., & Sande, F. V. D. (2018). Should a fistula first policy be revisited in elderly haemodialysis patients? *Nephrology Dialysis Transplantation*, *34*(10), 1–8. https://doi.org/10.1093/ndt/gfy319

Mahmood, F. M., & Al-Ani, B. A. J. (2014). Assessment Of Hemodialysis Patients' Compliance To The Treatment And Follow Up In Baghdad Teaching Hospitals. *Kufa Journal for Nursing Sciences*, *4*(2), 1–10.

Mahon, A., Jenkins, K., & Burnapp, L. (2013). *Oxford Handbook of Renal Nursing* (1st ed). Oxford University Press. https://doi.org/10.1093/med/9780199600533.001.0001

Majeed, Y. Y., Al-Lami, F. H., Baldawi, K., & Ali, A. S. (2018). Haemodialysis services in Iraq in 2012: situation analysis, epidemiology and infrastructure. *Iraqi New Medical Journal*, *4*(8), 91–99.

Manacci, C. (2012). *Critical Care Nursing Made Incredibly Easy* (3rd ed). Lippincott Williams & Wilkins.

McDonald, M. (2015). Nursing Care of Patients with Disorders of the Urinary System. In Linda S. Williams & P. D. Hopper (Eds.), *Understanding Medical Surgical Nursing* (5th ed, p. 858,861). F.A. Davis Company.

McGrath, I. (2017). Management of patients with kidney disorders. In M. Farrell (Ed.), *Smeltzer & Bare's Textbook of Medical-Surgical Nursing* (4th ed, pp. 1218, 1219, 1227, 1233). Lippincott Williams & Wilkins.

Mehmood, Y., Ghafoor, S., Ashraf, M. I., Riaz, H., Atif, S., & Saeed, M. (2016). Intradialytic Complications Found in Patients at a Tertiary Care Hospital. *Austin Journal of Pharmacology and Therapeutics*, *4*(1), 1–5.

Mendes, L. C., Sousa, V. E. C., & Lopes, V. O. (2011). Accuracy of diagnosis of the defining characteristics of ineffective family therapeutic regimen management. *Acta Paul Enferm*, *24*(2), 219–224.

Mohamedi, S., & Mosha, I. H. (2022). Hemodialysis Therapy Adherence and Contributing Factors among End-Stage Renal Disease Patients at Muhimbili National Hospital, Dar es Salaam, Tanzania. *Kidney and Dialysis*, *2*(1), 123–130. https://doi.org/10.3390/kidneydial2010014

Mollaoğlu, M., & Kayataş, M. (2015). Disability is associated with nonadherence to diet and fluid restrictions in end-stage renal disease patients undergoing

maintenance hemodialysis. *International Urology and Nephrology*, *47*(11), 1863–1870. https://doi.org/10.1007/s11255-015-1102-1

Mousa, L., Naj, A., Mohammed, W., & Ali, A. (2020). Nutritional status of Iraqi adults on maintenance hemodialysis: A multicenter study. *Journal of Renal Nutrition and Metabolism*, *6*(4), 89–96.

Mukakarangwa, M. C., Chironda, G., Bhengu, B., & Katende, G. (2018). Adherence to Hemodialysis and Associated Factors among End Stage Renal Disease Patients at Selected Nephrology Units in Rwanda: A Descriptive Cross-Sectional Study. *Nursing Research and Practice*, 2018, 1–8. https://doi.org/10.1155/2018/4372716

Mukakarangwa, M. C., Chironda, G., Nkurunziza, A., Ngendahayo, F., & Bhengu, B. (2020). Motivators and barriers of adherence to hemodialysis among patients with end stage renal disease (ESRD) in Rwanda: A qualitative study. *International Journal of Africa Nursing Sciences*, *13*(June), 1–6. https://doi.org/10.1016/j.ijans.2020.100221

Murea, M., Geary, R. L., Davis, R. P., & Moossavi, S. (2019). Vascular access for hemodialysis: A perpetual challenge. *Seminars in Dialysis*, *32*(6), 1–8. https://doi.org/10.1111/sdi.12828

Murphy, F. (2011). The ongoing challenges with renal vascular access. *British Journal of Nursing*, *20*(4), 6–14. https://doi.org/DOI: 10.12968/bjon.2011.20.sup1.s6

Naalweh, K. S., Barakat, M. A., Sweileh, M. W., Al-Jabi, S. W., Sweileh, W. M., & Zyoud, S. H. (2017). Treatment adherence and perception in patients on maintenance hemodialysis: A cross - Sectional study from Palestine. *BMC Nephrology*, *18*(1), 1–9. https://doi.org/10.1186/s12882-017-0598-2

Naiker, I. P., Assounga, A. G., & Meyers, A. M. (2015). Diagnostic approach to chronic kidney disease. *South African Medical Journal*, *105*(3), 1–3. https://doi.org/10.7196/SAMJ.9414

Naser, A. M., & Mohammed, W. K. (2016). Effectiveness of Instructional Health Educational Vascular Access on Hemodialysis Patients' Knowledge at Al-Hussein Teaching Hospital in AL- Nasiriyah City. *Iraqi National Journal of Nursing Specialties*, *29*(1), 86–95.

Nasiri, M., Kheirkhah, F., Rahimiyan, B., Bijan, A., Hasannejad, H., & Jahfari, M. (2013). Stressful factors, coping mechanisms and quality of life in hemodialysis patients. *Iran J Crit Care Nurs*, *6*(2), 119–126. http://www.inhc.ir/files/site1/user_files_662776/eng/nasiri-A-10-344-4-0ff80eb.pdf

Nerbass, F. B., Correa, D., Santos, R. G. D., Kruger, T. S., Sczip, A. C., Vieira, M. A., & Morais, J. G. (2017). Perceptions of hemodialysis patients about dietary and fluid restrictions. *Brazilian Journal of Nephrology*, *39*(2), 154–161. https://doi.org/10.5935/0101-2800.20170031

Nettina, S. M. (2010). *Lippincott manual of nursing practice* (9th ed.). wolters kluwer health.

Noghan, N., Akaberi, A., Pournamdarian, S., Borujerdi, E., & Hejazi, S. S. (2018). Resilience and therapeutic regimen compliance in patients undergoing hemodialysis in hospitals of Hamedan, Iran. *Electronic Physician*, *10*(5), 6853–6858. https://doi.org/DOI: http://dx.doi.org/10.19082/6853

Opiyo, R. O., Nyasulu, P. S., Olenja, J., Zunza, M., Nguyen, K. A., Bukania, Z., Nabakwe, E., Mbogo, A., & Were, A. O. (2019). Factors associated with adherence to dietary prescription among adult patients with chronic kidney disease on hemodialysis in national referral hospitals in Kenya: A mixed-

methods survey. *Renal Replacement Therapy*, *5*(1), 1–14. https://doi.org/10.1186/s41100-019-0237-4

Ozen, N., Cinar, F. I., Askin, D., Dilek, M. U. T., & Turker, T. (2019). Nonadherence in hemodialysis patients and related factors: A multicenter study. *Journal of Nursing Research*, *27*(4), 1–11. https://doi.org/10.1097/jnr.0000000000000309

Pantelias, K., & Grapsa., E. (2012). Vascular access today. *World Journal of Nephrology, 1*(3), 69–78. https://doi.org/10.5527/wjn.v1.i3.69

Parvan, K., Hasankhani, H., Seyyedrasooli, A., Riahi, S. M., & Ghorbani, M. (2015). The Effect of Two Educational Methods on Knowledge and Adherence to Treatment in Hemodialysis Patients: Clinical Trial. *Journal of Caring Sciences*, *4*(1), 83–93. https://doi.org/10.5681/jcs.2015.009

Quencer, K. B., & Arici, M. (2015). Arteriovenous fistulas and their characteristic sites of stenosis. *American Journal of Roentgenology*, *205*(4), 726–734. https://doi.org/10.2214/AJR.15.14650

Rafiee, V. L., Parvin, N., Mahmoodi, S. G., Molaie, E., Shariati, A., & Hasheminia, S. (2013). Adherence to hemodialysis treatment and some related factors in hemodialysis patients admitted in Shahrekord Hajar Hospital. *Journal of Clinical Nursing and Midwifery*, *2*(4), 17-25.

Rahdar, Z., Jahantigh, H. M., Mansouri, A., Siasary, A., Alahyari, J., & Jahantigh, F. (2019). Probing the Relationship Between Treatment Regimen Compliance and the Quality of Life in Hemodialysis Patients: A Descriptive-Analytic Study. *Medical - Surgical Nursing Journal*, *8*(2), 1–5. https://doi.org/10.5812/msnj.95599

Rakshitha, B., Nalini, G., Sahana, G., Deepak, P., Nagaral, J., Mohith, N., & Divyashree, C. (2019). Adherence to treatment in patients undergoing

dialysis. *International Journal of Basic & Clinical Pharmacology*, *8*(5), 1024–1029. https://doi.org/10.18203/2319-2003.ijbcp20191595

Rambod, M., Peyravi, H., Shokrpour, N., & Taghi Sareban, M. (2010). Dietary and fluid adherence in iranian hemodialysis patients. *Health Care Manager*, *29*(4), 359–364. https://doi.org/10.1097/HCM.0b013e3181fa0691

Ramezani, T., Sharifirad, G., Rajati, F., Rajati, M., & Mohebi, S. (2019). Effect of educational intervention on promoting self‐care in hemodialysis patients: Applying the self‐efficacy theory. *Journal of Education and Health Promotion*, *8*(65), 1–8. https://doi.org/10.4103/jehp.jehp_148_18

Rini, I. S., Rahmayani, T., Sari, E. K., & Lestari, R. (2021). Differences in the quality of life of chronic kidney disease patients undergoing hemodialysis and continuous ambulatory peritoneal dialysis. *Journal of Public Health Research*, *10*(2), 301–305. https://doi.org/10.4081/jphr.2021.2209

Rovin, B. H., Adler, S. G., Barratt, J., Bridoux, F., Burdge, K. A., Chan, T. M., Cook, H. T., Fervenza, F. C., Gibson, K. L., Glassock, R. J., Jayne, D. R. W., Jha, V., Liew, A., Liu, Z. H., Mejía-Vilet, J. M., Nester, C. M., Radhakrishnan, J., Rave, E. M., Reich, H. N., … Floege, J. (2021). KDIGO 2021 Clinical Practice Guideline for the Management of Glomerular Diseases. *Kidney International*, *100*(4), 1–276. https://doi.org/10.1016/j.kint.2021.05.021

Rushing, J. (2011). Caring for a patient's vascular access for hemodialysis. *Nursing Management*, *41*(10), 47. https://doi.org/10.1097/01.NURSE.0000388519.08772.eb

Saha, M., & Allon, M. (2016). Diagnosis, Treatment, and Prevention of Hemodialysis Emergencies. *Clinical Journal of the American Society of Nephrology*, *12*(2), 1–13. https://doi.org/10.2215/CJN.05260516

Sahathevan, S., Khor, B. H., Ng, H. M., Abdul-Gafor, A.-H., Daud, Z. A. M., Mafra, D., & Karupaiah, T. (2020). Understanding development of malnutrition in hemodialysis patients: A narrative review. *Nutrients*, *12*(10), 1–31. https://doi.org/10.3390/nu12103147

Santoro, D., Benedetto, F., Mondello, P., Pipito, N., Barilla, D., Spinelli, F., Ricciardi, C. A., Cernaro, V., & Buemi, M. (2014). Vascular access for hemodialysis: Current perspectives. *International Journal of Nephrology and Renovascular Disease*, 7, 281–294. https://doi.org/10.2147/IJNRD.S46643

Savla, D., Chertow, G. M., Meyer, T., & Anand, S. (2017). Can twice weekly hemodialysis expand patient access under resource constraints? *Hemodialysis International*, *21*(4), 445–452. https://doi.org/10.1111/hdi.12501

Scarpioni, R., Ricardi, M., Albertazzi, V., De Amicis, S., Rastelli, F., & Zerbini, L. (2016). Dialysis-related amyloidosis: Challenges and solutions. *International Journal of Nephrology and Renovascular Disease*, 9, 319–328. https://doi.org/10.2147/IJNRD.S84784

Shahgholian, N., & Yousefi, H. (2018). The lived experiences of patients undergoing hemodialysis with the concept of care: A phenomenological study. *BMC Nephrology*, *19*(338), 1–7. https://doi.org/https://doi.org/10.1186/s12882-018-1138-4

Sharaf, A. (2016). The impact of educational interventions on hemodialysis patients' adherence to fluid and sodium restrictions. *IOSR Journal of Nursing and Health Science*, *5*(3), 50–60. https://doi.org/10.9790/7388-0603025060

Shepard, L. H. (2011). Preparing your patient for hemodialysis. *Nursing Made Incredibly Easy*, *9*(6), 5–9. https://doi.org/10.1097/01.NME.0000406037.23361.77

Shyaa, W. L., & Ahmed, S. A. (2017). Effectiveness of an Instructional Program on Knowledge of Patients Undergoing Hemodialysis Related to Fatigue at Habib Ibn Mudahir Al-Asadi Centre in Holy Karbala. *IOSR Journal of Nursing and Health Science*, *06*(01), 94–100. https://doi.org/10.9790/1959-06010494100

Som, A., Groenendyk, J., An, T., Patel, K., Peters, R., Polites, G., & Ross, W. R. (2017). Improving Dialysis Adherence for High Risk Patients Using Automated Messaging: Proof of Concept. *Scientific Reports*, *7*(1), 1–7. https://doi.org/10.1038/s41598-017-03184-z

Sommers, M. S., & Fannin, E. F. (2015). *Diseases and disorders A Nursing Therapeutics Manual* (4th ed). F. A. Davis Company.

Sontakke, S., Budania, R., Bajait, C., Jaiswal, K., & Pimpalkhute, S. (2015). Evaluation of adherence to therapy in patients of chronic kidney disease. *Indian Journal of Pharmacology*, *47*(6), 668–671. https://doi.org/DOI: 10.4103/0253-7613.169597

Sorat, W. (2018). The association of self-efficacy and self-management behavior in adult patients with chronic kidney disease: an integrative review. *Journal of Kidney Treatment and Diagnosis*, *1*(1), 33–40.

Sree, K. R., Prithiba, S., Rani, J., Jeganath, S., Nitish, B., & Jena, D. (2021). Impact of patient counseling on medication adherence and quality of life in hypertensive patients. *Saudi Journal of Kidney Diseases and Transplantation*, *32*(5), 1382–1387. http://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=140346317&site=eds-live

Suganthi, S., Porkodi, A., & Geetha, P. (2020). Assess the illness perception and treatment adherence among patients with end-stage renal disease. *Iranian Journal of Nursing and Midwifery Research*, *25*(1), 12–17. https://doi.org/10.4103/ijnmr.IJNMR_74_19

Sulistyaningsih, D. R., Nurachmah, E., Yetti, K., & Priyo Hastono, S. (2020). The experience of adherence among hemodialysis patients undergoing therapeutic regimen: a qualitative study. *F1000Research*, *9*(1485), 1–13. https://doi.org/10.12688/f1000research.27729.1

Tang, Y. S., Tsai, Y. C., Chen, T. W., & Li, S. Y. (2022). Artificial Kidney Engineering: The Development of Dialysis Membranes for Blood Purification. *Membranes*, *12*(177), 1–16. https://doi.org/10.3390/membranes12020177

Thomas, N. (2014). The History of Dialysis and Transplantation. In N. Thomas (Ed.), *Renal nursing* (4th ed, pp. 2, 5, 8). John Wiley & Sons, Ltd. https://doi.org/10.4324/9781315378589

Thurlow, J. S., Joshi, M., Yan, G., Norris, K. C., Agodoa, L. Y., Yuan, C. M., & Nee, R. (2021). Global epidemiology of end-stage kidney disease and disparities in kidney replacement therapy. *American Journal of Nephrology*, *52*(2), 98–107. https://doi.org/10.1159/000514550

Toroitich, J. K., Oloo, A. J., & Arudo, J. (2020). Determinants of Diet and Fluid Adherence Among End Stage Renal Disease Patients Undergoing Haemodialysis At Moi Teaching and Referral Hospital, Uasin Gishu County, Kenya. *Journal of Health, Medicine and Nursing*, *5*(4), 14–27. https://doi.org/10.47604/jhmn.1144

Tortora, G. J., & Derrickson, B. (2014). *Principles of Anatomy & Physiology* (14th Ed). Willey. https://doi.org/10.1007/978-3-540-75863-1_1

Unruh, M. L. (2022). End -Stage Renal Disease. *Access Medicine*, 6(4), 1–16.

Vale, E., Lopez-vargas, P., & Polkinghorne, K. (2012). Nursing care of arteriovenous fistula / arteriovenous graft. *Kidney Health Australia-Care Guidelines*, 1–23.

Victoria, A., Evangelos, F., & Sofia, Z. (2015). Family Support, Social and Demographic Correlations of Non-Adherence among Haemodialysis Patients. *American Journal of Nursing Science*, *4*(2), 60–65. https://doi.org/10.11648/j.ajns.s.2015040201.21

Wang, J., Yue, P., Huang, J., Xie, X., Ling, Y., Jia, L., Xiong, Y., & Sun, F. (2018). Nursing Intervention on the Compliance of Hemodialysis Patients with End-Stage Renal Disease: A Meta-Analysis. *Blood Purification*, *45*(1-3), 102–109. https://doi.org/10.1159/000484924

Wong, M., Ghebleh, P., & Phillips, S. (2017). Tips for Dialysis Patients With Fluid Restrictions. *Journal of Renal Nutrition*, *27*(5), 35–38. https://doi.org/10.1053/j.jrn.2017.06.001

Yangoz, S. T., and Ozer, Z. (2020). Nursing Approach Based on Watson's Theory of Human Caring in Treatment Adherence in Hemodialysis Patients. *Bezmialem Science*, *8*(2), 189–195. https://doi.org/10.14235/bas.galenos.2019.3546

Appendices

Appendix (A)

Administrative Arrangements: Appendix (A1)

University of Babylon
College of Nursing
Research Ethics Committee

جـامـعة بـــابـل
كـــلية التمريـض
لجنة اخلاقيات البحث العلمي

Issue No:

Date: / /2021

Approval Letter

To,
Salah hadi ali

The Research Ethics committee at the **University of Babylon, College of Nursing** has reviewed and discussed your application to conduct the research study entitled **" Adherence of Hemodialysis Patients toward their Therapeutic Regimen in Al-Hilla Teaching Hospitals**

The Following documents have been reviewed and approved:

1. Research protocol
2. Research instrument/s
3. Participant informed consent

Committee Decision.

The committee approves the study to be conducted in the presented form. The Research Ethics committee expects to be informed about any changes occurring during the study, any revision in the protocol and participant informed consent.

Prof. Dr. Salma K. Jehad
Chair Committee
College of Nursing
Research Ethical Committee
30 / 1 /2022

Appendix (A)

Administrative Arrangements: Appendix (A2)

وزارة التعليم العالي والبحث العلمي
جمهورية العراق
Ministry of Higher Education and Scientific Research

جامعة بابل
كلية التمريض
لجنة الدراسات العليا

University of Babylon
College of Nursing

Ref. No. :
Date: / /

التاريخ: ٢١ / ١ / ٢٠٢٢
العدد: ٤٥

الى / دائرة صحة بابل/ مركز التدريب والتطوير
م/ تسهيل مهمة

تحية طيبة :

يطيب لنا حسن التواصل معكم ويرجى تفضلكم بتسهيل مهمة طالب الماجستير (صلاح هادي علي) لغرض جمع عينة دراسة الماجستير والخاصة بالبحث الموسوم :

التزام مرضى الانفاذ الدموي باتجاه نظامهم العلاجي في مستشفيات الحلة التعليمية.

Adherence of Hemodialysis Patients toward their Therapeutic Regimen in AL-Hilla Teaching Hospitals.

مع الاحترام ...

المرافقات //
- بروتوكول.
- استبانة.

أ.م. د. نهلة محمد قاسم الدوري
معاون العميد للشؤون العلمية والدراسات العليا
٢٠ / ١ / ٢٠٢٢

صورة عنه الى //
- مكتب السيد العميد للتفضل بالاطلاع مع الاحترام
- لجنة الدراسات العليا
- الصادرة .

E-mail:nursing@uobabylon.edu.iq

STARS RATED FOR EXCELLENCE

وطني 07711632208
المكتب 009647711632208

www.uobabylon.edu.iq

Appendix (A)

Administrative Arrangements: Appendix (A3)

جمهورية العراق

Ministry Of Health Babylon Health Directorate Email:- Babel_Healthmoh@yahoo.com Tel:282628 or 282621		وزارة الصحة والبيئة دائرة صحة محافظة بابـــل المديـــر العـــام مركـز التدريب والتنمية البشرية وحدة أدارة البحوث العدد : ١٤٠ التاريخ : ٢١ / ١ /٢٠٢٢

إلى / مستشفى الأمام الصادق (ع)
مستشفى مرجان التعليمي

وزارة الصحة
دائرة صحة بابل
مركز التدريب والتنمية البشرية

م/ تسهيل مهمة

السلام عليكم ...

أشارة إلى كتاب جامعة بابل /كلية التمريض / لجنة الدراسات العليا ذي العدد ٥٤١ في ٢٠٢٢/١/٣١

نرفق لكم ربطا استمارات الموافقة المبدئية لمشروع البحث العائد للباحث طالب الماجستير (صلاح هادي علي)

للتفضل بالاطلاع وتسهيل مهمة الموما أليه من خلال توقيع وختم استمارات أجراء البحث المرفقة في مؤسساتكم وحسب الضوابط والإمكانات لاستحصال الموافقة المبدئية ليتسنى لنا أجراء اللازم على أن لا تتحمل مؤسساتكم أية تبعات مادية وقانونية .... مع الاحترام

المرفقات :
استمارة عدد /٢

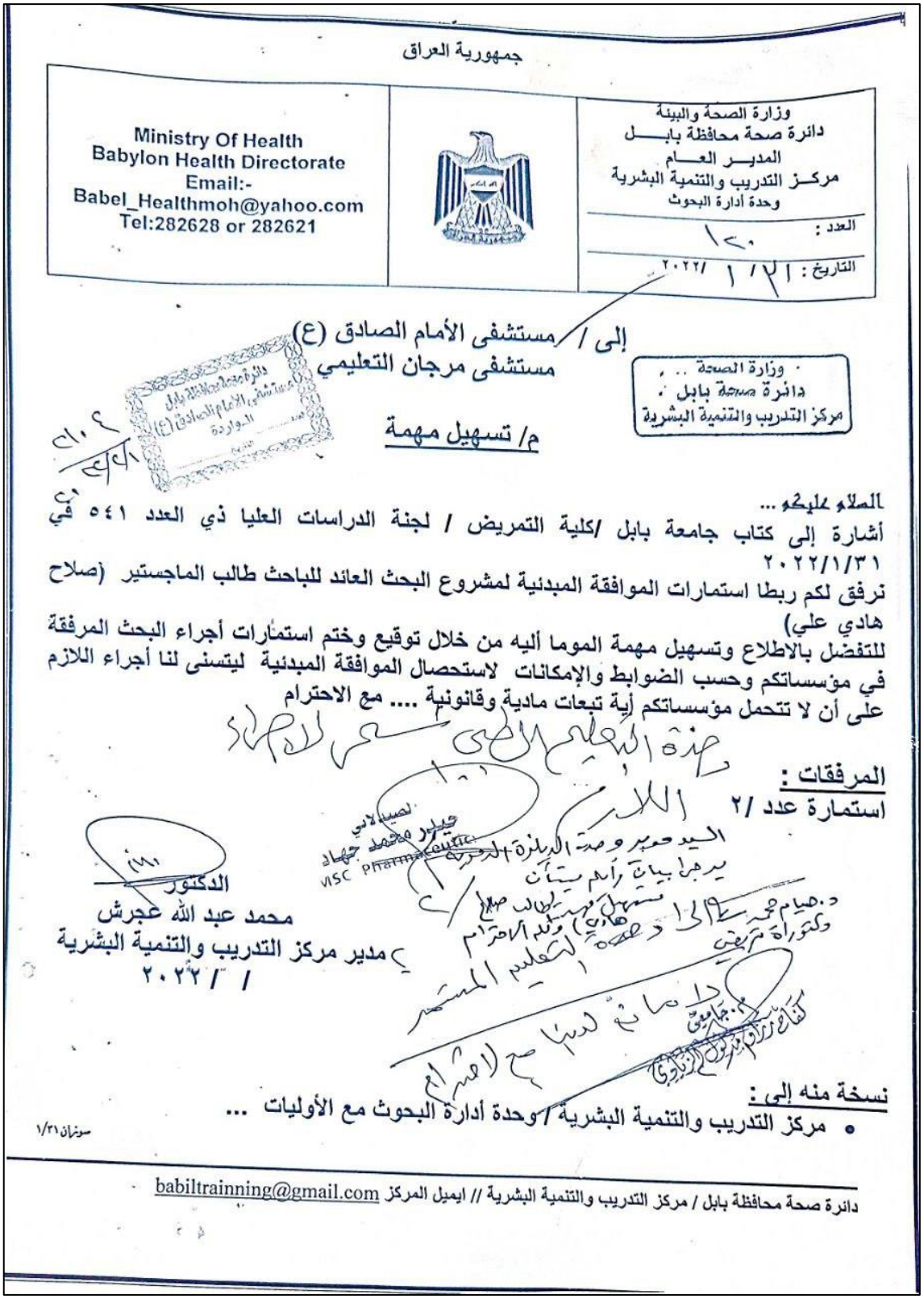
الدكتور
محمد عبد الله عجرش
مدير مركز التدريب والتنمية البشرية
/ /٢٠٢٢

نسخة منه إلى :
- مركز التدريب والتنمية البشرية / وحدة أدارة البحوث مع الأوليات ...

سونران ١/٣١

Appendix (A)

Administrative Arrangements: Appendix (A4)



جمهورية العراق

Ministry Of Health
Babylon Health Directorate
Email:-
Babel_Healthmoh@yahoo.com
Tel:282628 or 282621

وزارة الصحة والبيئة
دائرة صحة محافظة بابل
المدير العام
مركز التدريب والتنمية البشرية
وحدة ادارة البحوث

العدد : ١٤٠
التاريخ : ٢٠٢٢/ ١/ ٣١

إلى / مستشفى الأمام الصادق (ع)
مستشفى مرجان التعليمي

وزارة الصحة
دائرة صحة بابل
مركز التدريب والتنمية البشرية

م/ تسهيل مهمة

السلام عليكم ...
أشارة إلى كتاب جامعة بابل /كلية التمريض / لجنة الدراسات العليا ذي العدد ٥٤١ في ٢٠٢٢/١/٣١
نرفق لكم ربطا استمارات الموافقة المبدئية لمشروع البحث العائد للباحث طالب الماجستير (صلاح هادي علي)
للتفضل بالاطلاع وتسهيل مهمة الموما أليه من خلال توقيع وختم استمارات أجراء البحث المرفقة في مؤسساتكم وحسب الضوابط والإمكانات لاستحصال الموافقة المبدئية ليتسنى لنا أجراء اللازم على أن لا تتحمل مؤسساتكم أية تبعات مادية وقانونية .... مع الاحترام

الدكتور
محمد عبد الله عجرش
مدير مركز التدريب والتنمية البشرية
٢٠٢٢/ /

المرفقات :
استمارة عدد /٢

نسخة منه إلى :
- مركز التدريب والتنمية البشرية /وحدة أدارة البحوث مع الأوليات ...

سونران ١/٣١

Appendix (A)

Administrative Arrangements: Appendix (A5)

جمهورية العـــراق

Ministry Of Health Babylon Health Directorate Email:- Babel_Healthmoh@yahoo.com Tel:282628 or 282621		وزارة الصحة والبيئة دائرة صحة محافظة بابـــل المديـــر العـــام مركـز التدريب والتنمية البشرية لجنة البحوث

استمارة رقم :-٠٣ /٢٠٢١

رقم القرار :- ٤٢
تاريخ القرار :-٤٢ / ٢٠٢٢/٢

وزارة الصحة
دائرة صحة بابل
مركز التدريب والتنمية البشرية
لجنة البحوث

قرار لجنة البحوث

تحية طيبة ...

درست لجنة البحوث في دائرة صحة بابل مشروع البحث ذي الرقم (٢٠ ٠/٢٠٢٢/ بابل) المعنـون (التزام مرضى الإنفاذ الدموي باتجاه نظامهم العلاجي في مستشفيات الحلة التعليمية) والمقـدم من الباحث(صلاح هادي علي) إلى وحدة أدارة البحوث والمعرفي مركز التدريب والتنمية البشرية في دائرة صحة بابل بتاريخ ٢٠٢٢/٢/٨ وقررت :

قبول مشروع البحث أعلاه كونه مستوفيا للمعايير المعتمدة في وزارة الصحة والخاصة بتنفيذ البحوث ولا مانع من تنفيذه في مؤسسات الدائرة .

مـــــع الاحتـــرام

الدكتور / محمد عبد الله عجرش
رئيس لجنة البحوث
٢٠٢٢/ /

نسخة منه إلى :
- مكتب المدير العام / مركز التدريب والتنمية البشرية / وحدة إدارة البحوث ... مع الأوليات.

سوزان

Appendix (B)

English Questionnaire

Part one: Socio-demographical data:

1-Age: ☐ years

2- Gender:

Female ☐ Male ☐

3-Level of education:

- Illiterate ☐
- Read and write ☐
- Primary school ☐
- Secondary school ☐
- diploma and above ☐

4- Marital Status:

Single ☐ Married ☐

Divorce ☐ Widowed ☐

Separated ☐

5- Occupation:

Student ☐ Employee ☐

Appendix (B)

Jobless ☐ Free working ☐

Retired ☐

6- Residency:

Rural ☐ Urban ☐

7- **Economic Status**

Enough ☐ Enough to certain limit ☐ Not enough ☐

Part two: Clinical data:

1-Other Chronic Disease:

Yes ☐ NO ☐

If yes what are these diseases?

1-
2-
3-
4-
5-
6-

2-Duration of hemodialysis ☐

3-Number of hemodialysis sessions per week ☐

Appendix (B)

4-Smoking

- **Yes**
- **No**
- **Ex-smoker**

5-Body Mass Index: weight (Kg) height (cm)

BMI =

Part three: Adherence of Hemodialysis Patients toward Their Therapeutic Regimen

1- Hemodialysis patients' adherence to dietary restrictions

No	Items	Always	Sometimes	Never
1	Visit a dietitian to modify your diet.			
2	Receive detailed instructions for following a proper diet from a health professional (your doctor, nurse, dietician, or other health professional).			
3	Watch the contents of the food you eat every day.			
4	Have you had any difficulty when following your dietary recommendations?			
5	Keep track of eating small amounts of food frequently throughout the day.			

6	Are you getting the recommended amount of protein in your diet (meat, eggs, poultry, fish)?			
7	Eat dairy products on a daily basis			
8	Are you following the limit of salt in your diet?			
9	Prefer to use herbs and flavors instead of salt to improve the taste of your meal			
10	Avoid consume potassium-rich foods such as avocados, bananas, potatoes, tomatoes, kiwis, and dry fruits.			
11	Limit or avoid eat phosphorous-rich foods such as processed meats, dairy products, beans, chocolate, nuts, and cola.			
12	Limit foods that contain saturated fats such as butter, palm and coconut oils, cheese, fried and fast food, chips, and high-fat cuts of meat.			
13	Are you following the recommended routine laboratory tests?			

Appendix (B)

2- Hemodialysis patients' adherence to fluid Consumption

No	Items	Always	Sometimes	Never
1	Receive detailed instructions about your fluid restrictions from a health professional, like your doctor, nurse, dietitian, or other health professional.			
2	Perform many methods to decrease the feeling of thirst.			
3	Drink plenty of water to control your thirst			
4	Calculate the amount of water you consume in a day			
5	Prefer to drink beverages instead of water			
6	Drink a glass of water when taking medication			
7	Have you had any difficulty with limiting your fluid intake?			
8	Measure your weight outside the hemodialysis center.			
9	There is an increase in your body weight between hemodialysis sessions of more than one kilogram per day.			

Appendix (B)

3- Hemodialysis patients' adherence to hemodialysis sessions

No	Items	No difficulty	Moderate difficulty	Extreme difficulty
1	How much difficulty have you had staying for your entire dialysis treatment as ordered by your doctor?			
		Always	Sometimes	never
2	Receive detailed instructions from a health professional about hemodialysis treatment			
3	You adhere to the dialysis schedule.			
4	Skipped ≥ 1 hemodialysis session per month.			
5	Shortened hemodialysis session by ≥ 10 minutes.			

4- Hemodialysis patients' adherence to prescribed medications

No	Items	Always	Sometimes	Never
1	Receive detailed instructions on your medications from a health professional (your doctor, nurse, dietitian, or other health staff).			
2	Take your medication at the times designated for you.			

Appendix (B)

3	Take the exact same dose of medication prescribed by your doctor.			
4	Have you had any difficulty with taking your medications?			
5	How often have you missed your prescribed medications during the past week?			
6	Visit a doctor when side effects appear after taking medications			
7	If you feel worse, do you stop taking yours medicines?			

Appendix (B)

Arabic Questionnaire

الجزء الأول: البيانات الاجتماعية – الديموغرافية:

١-**العمر:** ☐ سنة

٢- **الجنس:** – ☐ انثى ☐ ذكر

٣-**المستوى التعليمي:** –

☐ لا يقرأ ولا يكتب ☐ يقرأ و يكتب ☐ ابتدائية

☐ ثانوية ☐ دبلوم فما فوق

٤- **الحالة الاجتماعية:** –

☐ أعزب ☐ متزوج

☐ مطلق ☐ أرمل

☐ منفصل

Appendix (B)

٥ – المهنة : –

طالب ☐ موظف ☐

عاطل عن العمل ☐ اعمال حرة ☐

متقاعد ☐

٦– السكن

حضر ☐ ريف ☐

٧– الحالة الاقتصادية

تكفي ☐ تكفي الى حد ما ☐ لاتكفي ☐

الجزء الثاني: – البيانات السريرية

١–امراض مزمنة اخرى

يوجد ☐ لايوجد ☐

اذا كانت الاجابة يوجد تذكر

١–
٢–
٣–
٤–
٥–
٦–

٢- مدة الإنفاذ الدموي ☐

٣-عدد جلسات الإنفاذ الدموي في الاسبوع ☐

٤- التدخين:

نعم ☐ كلا ☐ مدخن سابقا ☐

٥- مؤشر كتلة الجسم: الوزن ☐ (كجم) الطول ☐ (سم)

مؤشر كتلة الجسم = ☐

الجزء الثالث: التزام مرضى الأنفاذ الدموي باتجاه نظامهم العلاجي

١- التزام مرضى الأنفاذ الدموي بالقيود الغذائية

ت	العناصر	دائما	احيانا	ابدا
١	تقوم بزيارة اختصاصي التغذية لتعديل نظامك الغذائي.			
٢	تحصل على تعليمات مفصلة لاتباع نظام غذائي سليم من الملاك الصحي (طبيب, ممرض, اختصاصي التغذية أو أي طاقم طبي آخر).			
٣	تتفحص محتويات الغذاء الذي تتناوله كل يوم.			
٤	تواجه صعوبة عند اتباع توصيات نظامك الغذائي.			
٥	تتبع تناول كميات صغيرة من الطعام بشكل متكررخلال اليوم.			
٦	تتبع تناول الكمية الموصى بها من البروتين في نظامك الغذائي مثل (اللحوم والبيض والدواجن والأسماك).			
٧	تتناول بشكل يومي منتجات الالبان.			

٨	تتبع الحد من تناول الأملاح مع النظام الغذائي.			
٩	تفضل استخدام الأعشاب والنكهات بدلاً من الملح لتحسين طعم وجبتك.			
١٠	تتجنب تناول الأطعمة الغنية بالبوتاسيوم مثل (الأفوكادو ,الموز ,البطاطس ,الطماطم ,الكيوي , والفواكه الجافة).			
١١	تتبع الحد من تناول الأطعمة الغنية بالفوسفور أو تجنبها مثل (اللحوم المصنعة ، منتجات الألبان ، الفول ، الشوكولاتة ، المكسرات ، الكولا).			
١٢	تتبع الحد من تناول الأطعمة التي تحتوي على الدهون المشبعة مثل (الزبدة وزيوت النخيل وزيوت جوز الهند والجبن والأطعمة المقلية والوجبات السريعة ورقائق البطاطس وقطع اللحم عالية الدهون).			
١٣	تتبع الفحوصات المختبرية الروتينية الموصى بها.			

٢- التزام مرضى الأنفاذ الدموي بشرب السوائل

ت	العناصر	دائما	احيانا	ابدا
١	تحصل على تعليمات مفصلة من الملاك الصحي (طبيب, ممرض, ,أخصائي التغذية أو أي طاقم طبي آخر) حول التقيد بشرب السوائل.			
٢	تقوم بعدة طرق لتقليل شعورك بالعطش.			
٣	تشرب الكثير من الماء للسيطرة على عطشك.			
٤	تحسب كمية الماء التي تستهلكها في اليوم.			
٥	تفضل تناول المشروبات بدلاً من الماء.			
٦	تقوم بشرب كأس من الماء عند تناول الأدوية.			
٧	تواجه صعوبة في الحد من تناول السوائل.			
٨	تقوم بقياس وزنك خارج مركز الانفاذ الدموي.			

٩	هناك زيادة في وزن جسمك بين جلسات الانفاذ الدموي بأكثر من كيلوجرام واحد في اليوم.			

٣- التزام مرضى الأنفاذ الدموي بجلسات الإنفاذ الدموي

ت	العناصر	لا توجد صعوبة	صعوبة متوسطة	صعوبة بالغة
١	ما مقدار الصعوبة التي تواجهها في البقاء حتى انتهاء فترة الانفاذ الدموي بالكامل المحددة من قبل الطبيب.			
		دائما	احيانا	ابدا
٢	تحصل على تعليمات مفصلة من الملاك الصحي حول علاج الإنفاذ الدموي.			
٣	تلتزم بجدول الإنفاذ الدموي.			
٤	فاتك المجيء الى جلسة او اكثر من جلسة في الشهر من جلسات الانفاذ الدموي.			
٥	قمت بتقصير وقت جلسة الإنفاذ الدموي عشر دقائق او اكثر.			

٤- التزام مرضى الأنفاذ الدموي بالأدوية الموصوفة.

ت	العناصر	دائما	احيانا	ابدا
١	تحصل على تعليمات مفصلة من الملاك الصحي (طبيب, ممرض, ,أخصائي التغذية أو أي طاقم صحي آخر) حول عن أدويتك.			
٢	تتناول الأدوية في ألاوقات المحددة لك.			
٣	تاخذ نفس جرعة الدواء بالضبط الموصوفة من قبل طبيبك.			
٤	تواجه صعوبات عند تناول الدواء.			

Appendix (B)

٥	خلال الأسبوع الماضي ، كم مرة فاتتك تناول الادوية الموصوفة لك؟			
٦	تقوم بزيارة الطبيب عند ظهور أعراض جانبية بعد تناول الأدوية.			
٧	إذا كنت تشعر بسوء ، هل تتوقف عن تناول أدويتك؟			

Appendix (C)

Panel of Experts

قائمة بأسماء خبراء الاستبانة:

ت	أسم الخبير	أللقب العلمي	ألاختصاص	مكان العمل	سنوات ألخبرة
1	د. حسن علوان بيعي	أستاذ	طب الصحة العامة	كلية الحلة الجامعة/ قسم التمريض	40
2	د. راجحة عبدالحسن حمزة	أستاذ	تمريض صحة البالغين	جامعة الكوفة / كلية التمريض	37
3	د. هدى باقر حسن	أستاذ	تمريض صحة البالغين	جامعة بغداد/ كلية التمريض	34
4	د. سحر أدهم علي	أستاذ	تمريض صحة البالغين	جامعة بابل / كلية التمريض	27
5	د. شذى سعدي محمد	أستاذ	تمريض صحة البالغين	جامعة بابل / كلية التمريض	23
6	د. سعد جون حمزة	طبيب أستشاري	الطب الباطني تخصص دقيق أمراض وزرع الكلى	مستشفى الامام الصادق (ع)	26
7	د. فاطمة مكي محمود	أستاذ مساعد	تمريض صحة البالغين	جامعة كربلاء/ كلية التمريض	27

Appendix (C)

8	د.حسام عباس داود	أستاذ مساعد	تمريض صحة البالغين	جامعة كربلاء /كلية التمريض	20
9	د. حسن عبدالله عذبي	أستاذ مساعد	تمريض صحة البالغين	جامعة كربلاء/ كلية التمريض	19
10	د. أبراهيم علوان كاظم	أستاذ مساعد	تمريض صحة البالغين	جامعة الكوفة / كلية التمريض	16
11	د. محمد عبدالكريم مصطفى	أستاذ مساعد	تمريض صحة البالغين	جامعة الكوفة / كلية التمريض	13
12	د. جهاد جواد كاظم	أستاذ مساعد	تمريض صحة البالغين	جامعة الكوفة / كلية التمريض	13
13	د.علي جاسم السلطاني	أستاذ مساعد	الطب الباطني تخصص دقيق أمراض وزرع الكلى	جامعة بابل/ كلية الطب + مستشفى الامام الصادق (ع)	10

Appendix (D)

Linguistic Approval

Ministry of Higher Education and Scientific Research
وزارة التعليم العالي والبحث العلمي
University of Babylon
جامعة بابل
College of Education for Human Sciences
كلية التربية للعلوم الانسانية

Ref. No : الواردة العدد / ١٩٢١
Date: التاريخ / ٨ / ٢٠٢٢

العدد : ٢١٧٤
التاريخ : ١٩ / ٧ / ٢٠٢٢

الى/ مكتب السيد معاون العميد للشؤون العلمية المحترم
م/ تقويم لغوي

تحية طيبة///

اشارة الى كتاب جامعة بابل / كلية التمريض ذي العدد ٢٤٠٦ في ٢٠٢٢/٧/١٧ ترسل اليكم رسالة الطالب الدراسات العليا / الماجستير (صلاح هادي علي) بعد تقويمها لغويا"من قبل (أ.م.د حسن حميد معيوف)

مع الاحترام

أ.م.د. حسين حميد معيوف
رئيس قسم اللغة الانكليزية

الصادرة مع الاوليات

البريد الالكتروني bad_edu_humsci@yahoo.com
امنية 07801010633

www.uobabylon .edu.iq

المستخلص

مرض الكلى في المرحلة النهائية هو مشكلة صحية عالمية تؤدي إلى زيادة عدد المرضى الذين يستخدمون الانفاذ الدموي كأول علاج بديل للكلى. يعد الالتزام بالإرشادات الغذائية ، وتناول السوائل ، والأدوية الموصوفة ، وعلاج الانفاذ الدموي أمرًا ضروريًا للعلاج الأمثل والناجح. يرتبط عدم الالتزام بمجموعة متنوعة من النتائج السريرية السلبية ويقلل من جودة حياة المرضى.

تهدف الدراسة لتقييم التزام مرضى الانفاذ الدموي باتجاه نظامهم العلاجي وتقصي الفروق الإحصائية في التزام مرضى الانفاذ الدموي باتجاه نظامهم العلاجي ومتغيراتهم الاجتماعية والديموغرافية والبيانات السريرية .

دراسة وصفية مقطعية بدأت من ١٩ أيلول ٢٠٢١ إلى ٦ تموز ٢٠٢٢. أجريت الدراسة في مركزين للكلى الصناعية في مستشفيات الحلة التعليمية. تكونت العينة الغير الاحتمالية (الغرضية) من (١٠٠) مريض يعانون من مرض الكلى في المرحلة النهائية والذين يتلقون علاج الانفاذ الدموي. جمعت البيانات من خلال استعمال استبانة معدة وملائمة لهذا الغرض و قد حللت البيانات الكترونيا باستخدام برنامج التحليل الإحصائي (SPSS version 26) .

أظهرت النتائج أن ٩٠٪ من مرضى الانفاذ الدموي أظهروا مستوى متوسط من الالتزام بالنظام العلاجي. يرتبط التزام مرضى الانفاذ الدموي بالنظام العلاجي ارتباطًا وثيقًا بالعمر (P=٠,٠٠٠)، والحالة الاجتماعية (P=٠,٠٣٧)، والمستوى التعليمي (P=٠,٠٠٠)، والحالة الاقتصادية (P=٠,٠٠٠)، ومدة الانفاذ الدموي (P=٠,٠١٦).

أظهر غالبية مرضى الانفاذ الدموي عن مستوى متوسط من الالتزام بالنظام العلاجي. لتعزيز الالتزام بين مرضى الانفاذ الدموي، من الضروري تثقيف المرضى وبمشاركة عوائلهم حول

أهمية الالتزام بحضور جلسات الانفاذ الدموي، الالتزام بالأدوية ، والالتزام بالقيود الغذائية وشرب السوائل

جمهورية العراق

وزارة التعليم العالي والبحث العلمي

جامعة بابل

كلية التمريض

التزام مرضى الأنفاذ الدموي بأتجاه نظامهم العلاجي في مستشفيات الحلة التعليمية

رسالة مقدمة من قبل

صلاح هادي علي

الى مجلس كلية التمريض, جامعة بابل كجزء من متطلبات نيل درجة

الماجستير علوم في التمريض

بأشراف

أ.د فخرية جبر محيبس

١٤٤٤ هـ **٢٠٢٢ م**