



Adherence of Patients with Chronic Renal Failure to Therapeutic Regimen

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Abstract

Background: Chronic renal failure is a global health and healthcare burden that is rapidly increasing. Therapeutic adherence is a crucial factor that helps these patients to achieve good therapeutic results and reduces morbidity and mortality. Adherence to the treatment was affected by several factors which are grouped to treatment regimen, psychosocial and economic factors, the factors related to healthcare system and the factors related to illness **Study aim:** Evaluate adherence of patients with chronic renal failure to therapeutic regimen. **Design:** A descriptive design was used to meet the aim of this study. **Setting:** Data was collected from dialysis unit at Zagazig university hospitals. **Subjects:** A purposive sample of all available patients who fulfilled the inclusion criteria. **Tools:** Two tools were used, Patient's Knowledge Assessment Questionnaire to assess Patient's demographic characteristics, knowledge and factors affecting Patient's adherence ; The End-Stage Renal Disease-Adherence Questionnaire to assess Patient's adherence; **Results:** The current study revealed that (54.3%) had satisfactory level of knowledge regarding renal failure and hemodialysis session, (54.3%) had moderate adherence to treatment prescriptions, (85.7%) had positive attitude regarding adherence to dialysis , respectively. **Conclusion:** More than three quarter of studied patients had satisfactory level of knowledge regarding renal failure. However, the overall level of adherence among the studied patients was moderate. Furthermore, there was a statistically positive correlation between patients' adherence and knowledge, factors affecting adherence and attitude regarding the therapeutic regimen. **Recommendation:** Continuous monitoring and evaluation of adherence behaviors among patients undergoing hemodialysis to provide appropriate supportive care

Keywords: Adherence, Chronic Renal Failure, Therapeutic Regimen.

Introduction

Chronic renal failure (CRF) is a universal public health concern, specifically in developing countries and currently one of the most severe problems worldwide with a high financial burden (**Kusuma, 2022 & Waluyo, 2023**). This condition is fatal progressive illness and a major cause of mortality which characterized by a slow and progressive loss of kidney functionality, where the ability of the kidneys to operate efficiently diminishes steadily over time (**Alshammari et al., 2024**).

Chronic renal failure is usually asymptomatic, As CRF advances, individuals may experience various clinical presentations, including persistent fatigue, weakness and pallor , uraemic foetor (**Deepika et al., 2023**), edema (in the legs, ankles or around the eyes) .Pulmonary edema can occur. Changes in urinary habits, such as increased or decreased frequency, foamy urine or difficulty urinating (**Gatehouse &**



Diamond-Fox, 2023). Muscle cramps, weakness and bone pain. **(Ng et al., 2023).**

The etiology of CRF is multifactorial, with diabetes mellitus, hypertension, and glomerulonephritis being the leading causes worldwide. Progressive fibrosis and nephron loss characterize the pathophysiology of CRF, resulting in a decline in glomerular filtration rate (GFR) and the accumulation of metabolic waste products and toxins in the body. **(Dhumale et al., 2024).**

There are serious complications of renal failures, such as hyponatremia, hyperkalemia, hyperphosphatemia, pulmonary edema, acidosis, anorexia, nausea, vomiting, infections, sepsis, undernutrition, and other uremic symptoms. **(Kanagarajah et al., 2022).** Hemodialysis is the most commonly used modality of RRT (for about 91% of patients with CRF), and does not dispense with other treatments, such as diet therapy and pharmacology. This procedure should happen 2 to 4 times a week in a treatment unit for periods of 2 to 4 h **(Ryu et al., 2020).**

The World Health Organization (WHO) report defines adherence as “The extent to which a person's behavior– taking medication, following a diet, and/or executing lifestyle changes, corresponds with agreed recommendations from a health care provider **(Mazzi et al., 2025).** CKD patients undergoing routine HD therapy must be able to adapt to various types of HD therapy programs such as routinely carrying out hemodialysis measures, maintaining and limiting fluid intake, taking routine HD medications, and following a food intake diet. **(Kristianti et al., 2020).**

Adherence to the therapeutic regimen is central and paramount to achieving optimal, effective, and successful HD outcomes. Adherence is a crucial factor that helps patients achieves good therapeutic results. It contributes to reducing morbidity, mortality, and the side effects of HD. Moreover, it reduces hospitalization risk and promotes the maintenance of a good quality of life and health. **(Dsouza et al., 2023).**

Patients undergoing hemodialysis were recommended to follow a special diet that limits the consumption of foods rich in potassium, water, and salt. Most fruits and vegetables contain potassium, so patients are advised to reduce consumption of almost all types of fruits and processed fruit products. Restriction of salt intake aims to reduce thirst, which if not controlled can lead to significant weight gain between dialysis sessions **(Wilujeng & Fauzi , 2024).**

There are three main aspects of patient non-compliance in dialysis: not following a hemodialysis program regularly, not adhering to fluid restrictions, and not following a prescribed diet program. Patient understanding and compliance are very influential on the success of hemodialysis procedures. **(Gaipov et al., 2020).**

Several factors contribute to patients adhering to their treatment. These include patient-related factors (e.g age, level of health literacy), treatment related factors (e.g. side-effects), sociocultural factors (e.g. family influence), psychological factors (e.g. depression, illness perceptions), healthcare related factors (e.g. accessibility to care) **(Burnier, 2024).** Additionally, the interpersonal dynamics and communication between healthcare providers and patients can impact adherence behaviors, emphasizing the shared responsibilities of patients and providers **(Kvarnström et al., 2021).**

Nurses are an integral part of health professionals that interact with patients. There are several responsibilities of hemodialysis nurses, namely: reviewing the patient's condition, teaching how to regulate hemodialysis units, considering patient learning needs and providing education about patient care, making training plans for each patient, giving medication according to the prescription, evaluating the ability of the patient during hemodialysis treatment, and collaborating with doctors regarding changes in the patient's condition. Accordingly, nurses are the ones who have the most direct contact with CRF patients. Nurses are closely linked with caring attitudes in the treatment process **(Zahra & Edison, 2020) & (Thema & Marutla, 2025).**

Significance

In Egypt, the estimated annual incidence of ESKD is nearby 74 per million, and the total prevalence of patients on dialysis is 264 per million population **(Hassaballa et al., 2022).** The most recent available estimate for the prevalence of dialysis in Egypt is in 2019 and is reported to be 0.61 per 1000 people with an incidence estimate of 0.19 per 1000 people **(Farag & El-Sayed ,2022).** In our 2020 ERDS data,



we had a mortality of 5.7% over a reporting period of nearby 1 year, which can be roughly converted to slightly more than 57 per thousand patient-years (**Masters of public Health, 2021**).

Non-adherence to prescribed therapies is recognized as a major challenge among patients with CRF and can have implications for poor outcomes, including disease progression, adverse events, quality of life, and health care costs (**Tesfaye et al., 2020**). Therefore, the current study will be conducted to assess the needs and adherence of patients with chronic kidney failure to therapeutic regimen.

Aim of the study

The aim of this study is to evaluate needs and adherence of patients with chronic renal failure to therapeutic regimen.

Objectives:

-This aim will be fulfilled through the following objective

- Assess level of patients' knowledge about chronic renal failure.
- Determine the factors affecting adherence of chronic renal failure patients in relation to therapeutic regimen.
- Determine adherence level of patients with chronic renal failure to therapeutic regimen.

Research Questions: -

-This study will answer the following questions

- What is the level of patients' knowledge regarding chronic renal failure?
- What are the factors affecting adherence of chronic renal failure patients in relation to therapeutic regimen?
- What is the extent of adherence of chronic renal failure patients to therapeutic regimen?

Subjects and methods

Research Design

A descriptive design was utilized to accomplish the aim of this study and to answer the research questions (descriptive research "is a method used to describe the existing phenomena as accurately as possible" The phenomena observed in descriptive research are already available. What is necessary for a researcher to do is collecting the available data through the use of research instruments such as test, questionnaire, interview, or even observation. The main goal of descriptive research is to describe systematically the existing phenomena under the study (**younas et al., 2023**).

Setting:

This study was conducted at dialysis unit of internal medicine hospital at Zagazig university hospitals, Sharqia governorate, Egypt.

Subjects:

A purposive sample of patients (70 patients) in the previous mentioned study setting will be selected to be participants in the current study according to the following:

Inclusion Criteria: An adult patients 20 - 60 years, confirmed medical diagnosis of chronic renal failure and managed by hemodialysis since one year, Conscious patient able to communicate and accept to participate in the study.

Tools of data collection:

Two tools will be constructed to achieve the aim of the study as following:

Tool (I): Patient's Knowledge Assessment Questionnaire (PKAQ).

Tool (II): The End-Stage Renal Disease-Adherence Questionnaire (ESRD-AQ).

Tool (I): Patient's Knowledge Assessment Questionnaire (PKAQ):



This tool was designed by the researcher after reviewing related literature to collect necessary data for the study (Goma et al., 2021). It was translated into Arabic, validity and reliability was tested. It will consist of four parts:

Part 1: Socio demographic data:

Patient's socio demographic data composed of 11 closed end questions in the form of multiple-choice questions (MCQ) that covered the following variables: patient's name, age, sex, marital status, occupation, smoking history, education level, income, place of residence, socioeconomic status, hospital name and sources of information.

Part 2: Past medical surgical history: -

This part was used to assess patients' information about their health history, which contained nine dichotomous (yes / no) questions. It covered the following areas: past medical history diabetes, kidney disease, hypertension, heart disease, liver diseases, pulmonary diseases, cancer, blood diseases, History of hospitalization, family history, allergy history, past surgical history, surgical complications .

Part 3: Laboratory investigations and physical assessment:

This part was developed to assess patient's laboratory investigations and physical assessment. Which contained 46 questions in the form of yes or no questions. It covered the following areas: Investigations includes liver and kidney function, electrolytes, Complete blood count, blood sugar tests. Physical assessment includes general health status, vital signs, head and neck, cardiovascular system, respiratory system, gastrointestinal system, renal system, musculoskeletal system, nervous system and skin condition. This part designed by the researcher and adapted from (Soriano, 2025).

The total score of physical assessment is 45 grades. These scores were summed and converted into a percent score. It was classified into two categories

- **Good health if** score satisfactory $\geq 60\%$.

- **Poor health if** score unsatisfactory $<60\%$.

Part4: Patients' knowledge regarding renal failure disease process and hemodialysis session:

This part was used to assess patient's knowledge about chronic renal failure disease process and hemodialysis session. It is composed of two sections as the following:

- **The first section** concerned with assessment of patient's knowledge about chronic renal failure disease process which contains seven questions in the form of multiple choice questions and six questions in the form of yes or no questions. It includes Definition, types, causes, manifestations, diagnostic tests, complications, etc.

- **The second section** concerned with assessment of patient's knowledge about hemodialysis which contains 12 questions (six in the form of multiple choice questions and six questions in the form of yes or no questions. It includes (definition, purposes, scientific name of the shunt, complications and Patients' weighing, etc. This part designed by the researcher and adapted from (Goma et al., 2021).

- **Knowledge Scoring System:** For the knowledge items, a correct answer was scored one and the incorrect answer was scored zero. For each area of knowledge, the scores of the items were summed up and the total divided by the number of the items, giving a mean score for the area. These scores were converted into percentage scores. It was classified into two categories

- **Satisfactory if** score satisfactory $\geq 60\%$.

- **Unsatisfactory if** score unsatisfactory $<60\%$.

Part5: Factors affecting Patients' adherence to therapeutic regimen:

This part was developed by (Mansour et al., 2022). To assess factors affecting Patients' adherence to therapeutic regimen which contains 25 questions in the form of yes or no questions, divided into five subscales. (patient related factors subscale which contains seven items, medications related factors subscale which contains six items, socio-economic factors subscale which contains five items, psychological related factors subscale which contains three items, health care system related factors subscale which contains four items) based on the related literature

- **Factors Scoring System:** Each factor item that found to affect Patients' adherence was scored one, while factor that didn't affect adherence were scored zero. The scores were summed up and the total divided by the number of the items, giving a mean score for the total factors. These scores were converted into percentage



scores. It was classified into two categories

- **Affected if score $\geq 60\%$.**
- **Unaffected if score $< 60\%$.**

Tool (II): The End-Stage Renal Disease-Adherence Questionnaire (ESRD-AQ) this tool was developed by the researcher to measure treatment adherence behaviors which contained 46 questions in the form of multiple choice questions, divided into five subscales (general information which contains five questions, HD attendance subscale which contains 14 questions, medication use subscale which contains nine questions, fluid restrictions subscale which contains 10 questions, diet recommendation subscale which contains eight questions and Patients' attitude toward the therapeutic regimen was evaluated as a subcomponent of the scale through four items (11, 22, 32 and 41) based on the related literature from (Kim et al., 2010).

The scoring system of adherence is typical research practice defines:

- **Good adherence:** $\geq 80\%$.
- **Moderate adherence:** 60–79%.
- **Poor adherence:** $< 60\%$.

The total score of attitude is 25. The scoring system is typical research practice defines:

- **Positive attitude $\geq 70\%$.**
- **Negative attitude $< 70\%$.**

Tools Validity and Reliability

It was used to modify the tools to determine whether the tools covered the aim or not. Once the tool was prepared in their preliminary form, the data collection tools were presented to a panel of five experts from nursing field, these include three professors and two assistant professors of medical surgical nursing from faculty of nursing at Zagazig University. These experts reviewed the tools for relevance comprehensiveness, accuracy, clarity, and ease of administration. Minor modifications were done according to the experts' judgment. Internal consistency reliability of all items of the tools was assessed using a Chronbach's Alpha test and presented as following:

Variables	Cronbach's Alpha	Cronbach's Alpha
Health condition score	.879	45
Knowledge score	0.7	22
Factor affect patient adherence score	.690	25
Adherence of Kidney Patients to Treatment Prescriptions score	0.72	6
Attitude score	0.74	4

Pilot Study

A pilot study was carried out on seven patients representing (10%) of the total study sample. The purpose of the pilot was to check and ensure the clarity, applicability, and feasibility of the tools, to identify the difficulties that may be faced during data collection. It also helped to estimate the time needed to fill-in the forms. Participants in the pilot study were excluded from the main study sample.

Field Work

A letter was delivered by the dean of the faculty of nursing to the head of the dialysis unit, requesting the required agreement to carry out the current study. Once permission to continue the study was obtained, the researcher began data collection. Initially the patients were interviewed by the researcher to initiate a line of communication. Data collection was carried out over a period of three months, from the beginning of July 2025 to the beginning of October 2025. Each patient was interviewed individually during the study period two days (Sunday and Wednesday) per week in two shifts at morning and afternoon shift. Each patient was met individually, and was given a full explanation about the aim of the



study and was invited to participate, the time used for finishing the self-administered questionnaire ranged between 30-45 minutes for each patient according to patient's physical and mental readiness.

Administrative Design

To carry out the study, the necessary approvals were obtained from the head of the internal medicine department and the general director of Zagazig University Hospitals, based on official letters issued to them from the Dean of faculty of Nursing at Zagazig University, explaining the aim of the study to obtain their permission and help.

Ethical considerations

At the initial interview, each potential subject was informed about the nature, purpose, benefits of the study, and informed that his/her participation is voluntary. Confidentiality and anonymity of the subjects were also assured through coding of all data. The researcher assured that the data collected, and information will be confidential and would be used only to improve their health and for the purpose of the study and there was no risk for study subject during application of the research. In addition, an informed consent was obtained from each participant prior to inclusion into the study and after a full explanation of its aim and procedures. They were informed about their rights to refuse or withdraw from the study at any time with no reason to be given or consequences.

Statistical analysis

All data were collected, tabulated and statistically analyzed using the IBM SPSS (Statistical Package for the social sciences) statistics for windows, version 23.0 IBM Corp., Armonk, NY: USA.. Quantitative data were expressed as the mean $\pm$ SD & median (range), and qualitative data were expressed as absolute frequencies (number) & relative frequencies (percentage). Percent of categorical variables were compared using Chi-square test. Pearson's correlation coefficient was calculated to assess relationship between various study variables, (+) sign indicate direct correlation & (-) sign indicate inverse correlation, also values near to 1 indicate strong correlation & values near 0 indicate weak correlation. Multiple linear regressions is used to describe data and to explain the relationship between one dependent continuous variable and one or more continuous independent variables

All tests were two sided. p-Value < 0.05 was considered statistically significant, p and p-value ≥ 0.05 was considered statistically insignificant (NS).

Results

Table1 presents that less than half of patients their age ranged between (40–60) age group (42.9%), three fifth (60%) are males, 71.4% are married. Regarding educational levels, 37.1% have attained university-level education, all studied patients (100%) had insufficient income. one fifth (20%) are smokers and 14.3% have attempted to quit. A majority (91.4%) reside in rural areas. More than half of access to healthcare is health insurance hospitals (54.3%). Regarding the source of information, all studied patients (100%) had information from healthcare providers.

Table (2) shows that more than three quarter of studied patients (77.1%) had satisfactory level of knowledge regarding renal failure with Mean $\pm$ SD = 8.66 $\pm$ 1.75, and less than three fifth of studied patients (57.1%) had unsatisfactory level of knowledge about hemodialysis with Mean $\pm$ SD = 5.29 $\pm$ 0.75. Regarding total knowledge regarding renal failure and hemodialysis, more than half of studied patients (54.3%) had satisfactory level of knowledge with Mean $\pm$ SD = 13.94 $\pm$ 2.06.

Table (3) illustrates that majority of studied patients (91.4%) reported that economic and social factors affecting on their medication adherence with mean $\pm$ SD = 3.57 $\pm$ 0.7, and 85.7% affected by psychological factors with mean $\pm$ SD = 2.1 $\pm$ 0.64. While, more than two thirds of studied patients (68.6%) didn't affected by medication and treatment-related factors with mean $\pm$ SD = 3.23 $\pm$ 1.08, and nearly to two thirds of studied patients (65.7%) didn't affected by patient-related factors with mean $\pm$ SD = 3.46 $\pm$ 1.67. Regarding total score of factors affecting studied patient's medication adherence, more than half (54.3%) had medication adherence affecting with mean $\pm$ SD = 15 $\pm$ 2.62.



Table (4) shows that less than three quarter of studied patients (74.3%) had good adherence to treatment with Mean $\pm$ SD =184.29 $\pm$ 28.92, and 34.3% had moderate adherence to fluid with Mean $\pm$ SD =111.43 $\pm$ 38.23. While, more than three quarter (77.1%) had poor adherence to diet with Mean $\pm$ SD = 60.43 $\pm$ 38.23. Regarding total adherence to treatment prescriptions, more than half (54.3%) had moderate adherence to treatment prescriptions with Mean $\pm$ SD =867.86 $\pm$ 140.98.

Table (5) shows that less than two thirds of studied patients (64.3%) think that following the dialysis schedule is extremely important, more than two thirds of studied patients (67.1%) think that taking medications as scheduled is very important, and 31.4% think that watching the types of food they eat each day is sometimes important. While, 5.7% think that limiting fluid intake is not important. Regarding Total attitude to adherence to dialysis, majority of studied patients (85.7%) had positive attitude with Mean $\pm$ SD = 12.2 $\pm$ 2.1.

Table (6) documented that, there was no statistically significant relation between patient's total adherence to renal dialysis and patient's socio-demographic variables with $P > 0.05$.

Table (7) shows that, there were a statistically significant relation between patient's total knowledge and both fluid adherence and total adherence with P value (0.04 and 0.008), respectively. While, there were no statistically significant relation between patient's total knowledge and adherence to session attendance, adherence to dialysis duration, session completion, treatment adherence and dietary adherence with P value (0.104, 0.103, 0.07, 0.65 and 0.56), respectively.

Table (8) demonstrates that, there were a statistically significant relation between factors affecting medication adherence and adherence to dialysis duration, session completion, fluid adherence, dietary adherence, and total treatment adherence with P value (0.02, 0.001, 0.002, 0.01 and 0.006), respectively.

Table (9) there were a positive significant correlation between, Knowledge score and, Factors affecting patient adherence score, adherence to treatment prescription score, Attitude score ($r = 0.671$, $p < 0.001$), ($r = 0.502$, $p < 0.001$), ($r = 0.575$, $p < 0.001$), ($r = 0.543$, $p < 0.001$), respectively.

Table (10): illustrates that there were a linear regression analysis performed on 70 patients revealed that the attitude score, health condition score, and factors affecting patient adherence score were statistically significant predictors of adherence to treatment prescriptions among kidney patients. These variables explained 53% of the variance in adherence scores ($R^2 = 0.53$).

Figure1 reveals that more than half (54.3%) of studied patients reported that various factors affecting on medications adherence.

Discussion

Chronic renal failure (CRF) is a global health and healthcare burden that is rapidly increasing. It is caused by irreversible progressive permanent loss of kidney function for a period exceeding three months, resulting in extremely high mortality rates in this population. (Thurlow et al., 2021).

More than two fifth of studied patients in the current study their age ranged between (40–60) age group. This finding is consistent with (Zhianfar et al., 2020) who mentioned in study titled "Effectiveness of a Multifaceted Educational Intervention to Enhance Therapeutic Regimen Adherence and Quality of Life Amongst Iranian Hemodialysis Patients: A Randomized Controlled Trial (MEITRA Study)" that More than two fifth of studied patients their age ranged between (40–60) age group. In my opinion, Kidney function begins to deteriorate after the age of 40 years, as the number of nephrons decreases by approximately 20%, leading to a decline in kidney performance. This reduction results in a decrease of 10 mL/min/1.73 m² in GFR with each passing decade.



Three fifth of patients in the current study were males. This finding is harmony with **(de Cássia Bitencourt & dos Reis, 2024)**. Who mentioned in study titled "Adherence to treatment in patients with chronic kidney disease undergoing hemodialysis" that about three fifth of studied patients were males. In my opinion, this may be due to most men pay less attention to their health and/or maintain a healthy lifestyle than women, so their chances of developing CKD are greater. Besides that, the lifestyle and eating patterns of male respondents who drink coffee and smoke more often also play a role in increasing the possibility of suffering from CKD.

Regarding residence, the current studies revealed that majority of studied patients were residing in rural areas. This finding of the present study is harmony with **(Masoud et al., 2023)**. Who mentioned in study titled "Self-efficacy and adherence to medication and fluid restriction among patients undergoing hemodialysis: a correlational study" that more than two thirds of studied patients were live in rural areas. In my opinion, this may be due to lower health awareness, poor control of chronic diseases, and delayed medical follow-up in rural populations, leading to advanced CKD requiring hemodialysis.

Regarding marital status, the current study revealed that less than three quarters were married. This finding is agreed with **(Al-Khattabi, 2020)**. Who mentioned in study titled "Adherence to Different Treatment Modalities among Patients on Maintenance Hemodialysis" that about two thirds of studied patients were married. Also, agreed with **(Kalyoncuo et al., 2024)**. Who mentioned in study titled "Determination of compliance deficiencies of hemodialysis patients" that more than three quarter studied patients were married. In my opinion, this may reflect the adult age distribution of CKD patients, as marriage is more common in the age groups most affected by chronic kidney diseases.

Regarding educational level, the current study revealed that nearly to two fifth have attained university-level education. This finding is agreed with **(Mailani et al., 2021)** who mentioned in study titled " The Fluid Management Experience in Patients with Chronic Kidney Disease Undergoing Hemodialysis in Indonesia: A Qualitative Study" that less than two fifth studied patients had Bachelor's degree. From the researcher point of view, this may due to higher health awareness, better healthcare access, and increased likelihood of seeking treatment among educated individuals. While, this finding is disagreed with **(Gamal et al., 2024)**. Who mentioned that about two fifth of studied patients were illiterate.

Regarding employment, the current study showed that more than half were unemployed. This finding was consist with **(Alshogran et al., 2022)** who mentioned in study titled "The experience of adherence among hemodialysis patients undergoing therapeutic regimen: a qualitative study" that more than two thirds of studied patients were unemployed. While, this finding is contradicted with **(Al-Khattabi et al., 2020)**. Who mentioned that the majority of studied patients were employed. From the researcher point of view, this may reflect better functional status, allowing them to maintain work despite CKD, and potentially greater access to healthcare through employment.

Regarding to total score of patient's knowledge among patients, the current study showed that more than half of studied patients had satisfactory knowledge about renal failure and hemodialysis session. This finding was agreed with **(Goma et al., 2021)**. Who mentioned in study titled "Adherence of Chronic Renal Failure Patients Undergoing Maintenance Hemodialysis with Their Therapeutic Regimen" that about two fifth of studied patients had good level of knowledge about renal failure and hemodialysis session. In my opinion this may be due to repeated interactions with healthcare providers, previous medical consultations, routine follow-ups, and counseling on disease management

Regarding total score of factors affecting medication adherence, the current study shows that there was more than half of studied patients many factors affected their adherence. This finding was agreed with **(Seng et al., 2020)**. Who mentioned in study titled "Factors affecting medication adherence among pre-dialysis chronic kidney disease patients: a systematic review and meta-analysis of literature" that there was a majority of studied patients many factors affected their adherence.

Regarding total score of patient's attitude to treatment adherence, the present study clarified that three fifth of studied patients had positive attitude regarding therapeutic regimen. This finding aligns with **(Agustiyowati, 2020)**. Who mentioned in study entitled "Knowledge and Attitude toward Chronic



Kidney Disease among Pre Dialysis Patients in Indonesia" that found the majority of studied patients had a favorable score of attitude. In my opinion, this may result from understanding their disease, receiving continuous healthcare support, and experiencing improvements from treatment interventions.

Concerning total score of adherence to treatment prescription, the current study showed that more than half of studied patients had moderate adherence to therapeutic regimen. This finding goes on the line with **(Mazzi et al., 2025)**. Who mentioned in study entitled "Over all adherence in hemodialysis patients and associated factors: Across-sectional study from Morocco" that about two thirds of studied patients had moderate adherence to treatment prescription. From the researcher point of view, this may reflect partial compliance due to challenges like complex treatment regimens, lifestyle limitations, or intermittent motivation and support. While, this finding was disagreed with **(Cedillo-Couvert et al., 2018)**. Who mentioned that one-third of studied patients had low adherence to treatment prescription

Concerning relation between patient's total knowledge and patient's adherence to treatment prescription. The current study illustrated that there were significant relation between knowledge and patient's adherence to treatment prescription. This finding goes on the same line with **(Rondhianto et al., 2024)**. Who found that there was significant relation between total knowledge and patient's adherence to treatment prescription

The current study demonstrated that there were a significant positive correlation between patient's total knowledge and treatment adherence. This finding was agreed with **(Mirzaei-Alavijeh et al., 2023)**. Who studied "Determinants of medication adherence in hemodialysis patients: a cross-sectional study based on capability-opportunity motivation and behavior model" and found that there were a significant correlation between patient's total knowledge and treatment adherence.

The current study demonstrated that there were a significant positive correlation between patient's knowledge and attitude. This finding was inconsistent with **(Xu et al., 2023)**. Who studied "Knowledge, attitude, and practice of patients receiving maintenance hemodialysis regarding hemodialysis and its complications: a single-center, cross-sectional study in Nanjing" that the knowledge and attitude scores were not significantly correlated .

The current study demonstrated that there was a positive correlation between patient's attitude and treatment adherence. This finding was on the same side with **(Naalweh et al., 2017)**. Who found that there were a positive correlation between patient's attitude and treatment adherence.

Conclusion

The findings of the present study concluded that patients with chronic renal failure had a satisfactory level of knowledge regarding the therapeutic regimen. More than half of the studied patients were affected by various factors influencing adherence to the therapeutic regimen. In addition, the total attitude of the patients toward the therapeutic regimen was positive. However, the total level of adherence among the studied patients was moderate. Furthermore, there was a statistically positive correlation between patients' adherence and knowledge, factors affecting adherence and attitude regarding the therapeutic regimen.

Recommendation

Based on the study findings, it was recommended that

- Conduct regular monitoring and evaluation of adherence behaviors among patients undergoing hemodialysis.
- Develop supportive interventions targeting factors affecting adherence to improve patients' compliance with the therapeutic regimen.
- Continuous educational programs should be provided for patients with chronic renal failure to maintain and improve their knowledge and adherence regarding the therapeutic regimen.

Authors' contributions

F.A.M.; carried out the overall supervision and contributed to aim and research question, tool revision, introduction, significance of the study, review, discussion, conclusion, and recommendations. N.A.M; formed the study, explained and gathered data, wrote the original draft, and she is a corresponding author



.E.H.M.; reviewed and edited the manuscript and provided critical comments, did statistical data analysis and interpretation of data. M.H.A; provided draft of the manuscript before its publication, participated in all the steps of research. All authors participated, revised and approved the final manuscript.

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Table (1): Frequency and Percentage Distribution of Chronic Renal Failure Patients according to Demographic Characteristics, (n.70).

Variables	N	%
Age per years		
Under 20 years	2	2.9
20-40 years	24	34.3
40-60 years	30	42.9
Over 60 years	14	20.0
Gender		
Male	42	60.0
Female	28	40.0
Marital Status		
Married	50	71.4
Single	20	28.6
Education Level		
Illiterate	22	31.4
Secondary Education	22	31.4
University Education	26	37.1
Employment		
Employed	30	42.9
Unemployed	40	57.1
Income		
Insufficient	70	100.0
Smoking		
Yes	14	20.0
No	56	80.0
Have you tried to quit smoking		
Yes	10	14.3
No	60	85.7
Place of Residence		
Rural	64	91.4
Urban	6	8.6
Hospital providing service		
Health Insurance	38	54.3
University	32	45.7
Source of information about chronic renal failure		
Health care provider	70	100.0
Audio visual	18	25.7
Friends and family member	8	11.4



Table (2): Mean and Standard Deviation of Studied Patient's Knowledge regarding Renal Failure and Hemodialysis (n.70):

Knowledge domains	No.	%	Mean $\pm$ SD median (range)
Knowledge about renal failure	54	77.1	8.66 $\pm$ 1.75
Unsatisfactory	16	22.9	8(5-12)
Knowledge about hemodialysis	30	42.9	5.29 $\pm$ 0.75
Satisfactory	40	57.1	5(3-6)
Unsatisfactory			
Total knowledge score	38	54.3	13.94 $\pm$ 2.06
Satisfactory	32	45.7	14(10-18)
Unsatisfactory			

Table (3): Mean and Standard Deviation of Factors Affecting Studied Patients to Medication Adherence (n.70):

Factors domains	Affected		unaffected		Mean $\pm$ SD median (range)
	No.	%	No.	%	
Patient-Related Factors	24	34.3	46	65.7	3.46 $\pm$ 1.67 3(1-7)
Medication and Treatment-Related Factors	22	31.4	48	68.6	3.23 $\pm$ 1.08 3(2-6)
Economic and Social Factors	64	91.4	6	8.6	3.57 $\pm$ 0.73 4(2-5)
Psychological Factors	60	85.7	10	14.3	2.1 $\pm$ 0.64 2(1-3)
Health team related factors	38	54.3	32	45.7	2.6 $\pm$ 0.94 3(0-4)
Total factors related to medication adherence	38	54.3	32	45.7	15 $\pm$ 2.62 15(11-24)

**Table (4):** Mean and Standard Deviation of Studied Patient's Total Adherence to Treatment Prescriptions (n.70):

Adherence parameters	Mean $\pm$ SD median (range)	Good adherence		moderate adherence		Poor adherence	
		No.	%	No.	%	No.	%
Adherence to session attendance	241.43 $\pm$ 89.67 300(50-300)	46	65.7	10	14.3	14	20.0
Adherence to dialysis duration	162.86 $\pm$ 50.13 200(50-200)	40	57.1	14	20.0	16	22.9
Session completion	73.57 $\pm$ 31.82 100(25-100)	38	54.3	6	8.6	26	37.1
Treatment adherence	184.29 $\pm$ 28.92 200(100-200)	52	74.3	14	20.0	4	5.7
Fluid adherence	111.43 $\pm$ 38.23 100(50-200)	2	2.9	24	34.3	44	62.9
Dietary adherence	60.43 $\pm$ 38.23 50(50-200)	6	8.6	10	14.3	54	77.1
Total Adherence to Treatment Prescriptions	867.86 $\pm$ 140.98 900(575-1100)	20	28.6	38	54.3	12	17.1

Table (5): Frequency and Percentage Distribution of Studied Patient's Attitude regarding Adherence to Renal Dialysis (n.70):

Attitude	Extremely important		Very important		sometimes important		Not important	
	No.	%	No.	%	No.	%	No.	%
Importance of the dialysis schedule	45	64.3	19	27.1	4	5.7	2	2.9
Importance of taking medicines as scheduled	16	22.9	47	67.1	7	10.0	0	0
Importance of limiting fluid intake	15	21.4	40	57.1	11	15.7	4	5.7
Importance of watching the types of food you eat each day	11	15.7	34	48.6	22	31.4	3	4.3
Total attitude	Positive Negative 60(85.7%) 10(14.3%) Mean $\pm$SD median(range) 12.2$\pm$2.1 13(9-16)							

**Table (6):** Relation between Studied Patients' Total Adherence to Therapeutic Prescription and Demographic Characteristics (n = 70)

Variables	Patients 'Total Adherence to therapeutic prescription						N	χ^2	P
	Good n.20		Moderate n.38		Low n.12				
	No.	%	No.	%	No.	%			
Age per years									
Under 20 years	0	0	1	50.0	1	50.0	2	10.229	0.115
20-40 years	7	29.2	13	54.2	4	16.7	24		
40-60 years	12	40.0	16	53.3	2	6.7	30		
Over 60 years	1	7.1	8	57.1	5	35.7	14		
Education Level									
Illiterate	8	36.4	10	45.5	4	18.2	22	1.295	0.86
Secondary Education	5	22.7	13	59.1	4	18.2	22		
University Education	7	26.9	15	57.7	4	15.4	26		
Gender									
Male	12	28.6	22	52.4	8	19.0	42	0.29	0.86
Female	8	28.6	16	57.1	4	14.3	28		
Marital Status									
Married	17	34.0	23	46.0	10	20.0	50	4.85	0.088
Single	3	15.0	15	75.0	2	10.0	20		
Employment									
Employed	12	40.0	12	40.0	6	20.0	30	4.624	0.099
Unemployed	8	20.0	26	65.0	6	15.0	40		

χ^2 : Chi-square test, $p > 0.05$: no significant, $* p < 0.05$: significant

Table (7): Relation between Studied patients' Total knowledge and Adherence to Treatment Prescriptions (n.70)

Dimensions of Adherence	Patients' total knowledge				χ^2	p
	Satisfactory n.38		Unsatisfactory n.32			
	No.	%	No.	%		
Adherence to session attendance					4.535	0.104
Good	29	76.3	17	53.1		
Moderate	3	7.9	7	21.9		
Poor	6	15.8	8	25.0		
Adherence to dialysis duration					4.56	0.103
Good	25	65.8	15	46.9		
Moderate	8	21.1	6	18.8		
Poor	5	13.2	11	34.4		
Session completion					5.26	0.07
Good	23	60.5	15	46.9		
Moderate	5	13.2	1	3.1		
Poor	10	26.3	16	50.0		
Treatment adherence					.86	0.65
Good	27	71.1	25	78.1		
Moderate	8	21.1	6	18.8		
Poor	3	7.9	1	3.1		
Fluid adherence					6.52	0.04*
Good	2	5.3	0	.0		
Moderate	17	44.7	7	21.9		
Poor	19	50.0	25	78.1		
Dietary adherence					1.17	0.56
Good	3	7.9	3	9.4		
Moderate	7	18.4	3	9.4		
Poor	28	73.7	26	81.3		
Total adherence to Treatment Prescriptions					9.76	0.008*
Good	16	42.1	4	12.5		
Moderate	19	50.0	19	59.4		
Poor	3	7.9	9	28.1		

χ^2 : Chisquare test, $p > 0.05$: no significant, $* p < 0.05$: significant



Table (8): Relation between Factors Affecting Medication Adherence and Adherence to Treatment Prescriptions (n = 70)

Adherence Dimensions	Factors affecting Medication Adherence				χ^2	p
	Affected n.38		Unaffected n.32			
	No.	%	No.	%		
Dialysis treatment level						
Good	28	73.7	18	56.3	5.59	0.06
Moderate	2	5.3	8	25.0		
Poor	8	21.1	6	18.8		
Times have you shortened the dialysis time						
Good	27	71.1	13	40.6	8.45	0.02*
Moderate	7	18.4	7	21.9		
Poor	4	10.5	12	37.5		
Treatment was shortened						
Good	25	65.8	13	40.6	14.923	0.001*
Moderate	6	15.8	0	.0		
Poor	7	18.4	19	59.4		
Missed your prescribed medicines						
Good	27	71.1	25	78.1	0.855	0.652
Moderate	8	21.1	6	18.8		
Poor	3	7.9	1	3.1		
How often have you followed the fluid restriction						
Good	2	5.3	0	.0	12.013	0.002*
Moderate	19	50.0	5	15.6		
Poor	17	44.7	27	84.4		
Times have you followed the dietary recommendations?						
Good	5	13.2	1	3.1	9.29	0.01*
Moderate	9	23.7	1	3.1		
Poor	24	63.2	30	93.8		
Adherence to Treatment Prescriptions						
Good	15	39.5	5	15.6	10.32	0.006*
Moderate	21	55.3	17	53.1		
Poor	2	5.3	10	31.3		

χ^2 :Chisquare test, f:Fisher exact test, p>0.05: no significant , * p<0.05: significant



Table (9): Correlation Matrix between Health Condition, Knowledge, Factors Affecting patient's Adherence, Adherence to Treatment Prescription, and Attitude Score (n.70)

Variables	Health status score		Knowledge score		Factors score		Adherence to treatment prescription	
	r	p	r	p	r	p	r	p
Health status score	1							
Knowledge score	.309*	0.009	1					
Factors affect patient adherence score	0.092	0.45	.671*	.0001	1			
Adherence to treatment prescription	.462*	.0001	.502*	.0001	.530*	.0001	1	
Attitude score	.360*	0.002	.543*	.0001	.639*	.0001	.632*	.0001

Pearson'(r) correlation coefficient * Correlation is significant is significant $p < 0.05$ level

Table (10): Linear Regression for Predicting Adherence of Studied Patients to Treatment Prescriptions (n.70)

Predictors	Unstandardized Coefficients (β)	Std. Error	T	Sig
(Constant)	90.379			
Attitude score	16.614	4.861	3.418	.001*
Health condition score	5.478	1.791	3.058	.003*
Factors affect patient adherence score	12.360	6.143	2.012	.048*
Model				
R	0.73			
R ²	0.53			
F	25.29			
P	0.0001			

β = regression coefficients, $p < 0.05$ significant, f:anova of model

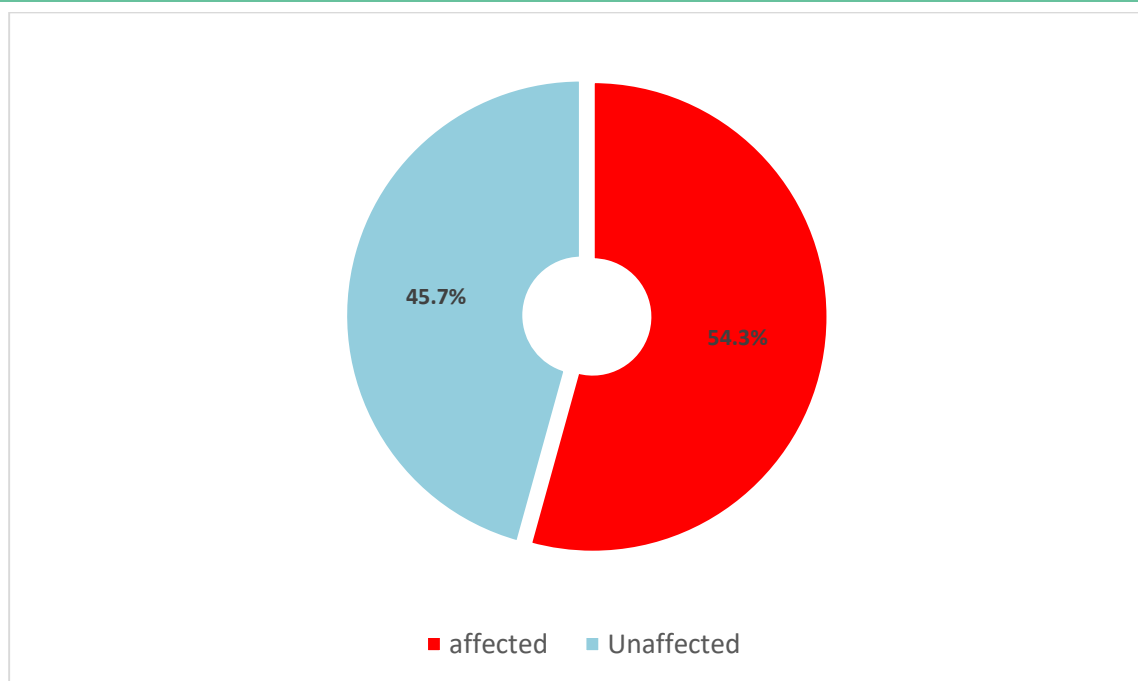


Figure1: Frequency and Percentage distribution of Total Factors Affecting Studied Patients to Medication Adherence.

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