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Research Article

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Prevalence and Impact of Non-Adherence to Fluid and Dietary Restrictions on Health Outcomes in Hemodialysis Patients

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Abstract

Background: Hemodialysis is a popular therapeutic option for end-stage renal illness, and chronic kidney disease (CKD) is a worldwide public health concern. For the best results after hemodialysis, rigorous adherence to dietary and fluid restrictions is necessary.While non-adherence to these restrictions is common and associated with negative health outcomes, the frequency of non-adherence among hemodialysis patients remains poorly understood.

Objectives: The purpose of this study was to determine the frequency of dietary and fluid restriction non-adherence among hemodialysis patients and investigate the association between this behavior and specific demographic characteristics and health outcomes.

Methods: Fifty hemodialysis patients who were chosen by convenience sampling participated in a descriptive study in a dialysis facility of UPUMS Saifai, Etawah. Along with demographic and health-related outcome variables, data were gathered using a standardized instrument called the Dietary and Fluid Adherence Questionnaire, or DDFQ. The prevalence and correlations between non-adherence, demographics, and health outcomes were evaluated by statistical analysis.

Results: According to the study, 78% of patients did not follow hydration and 60% of patients did not follow dietary limitations. Non-adherence and demographic factors including age and marital status were shown to be significantly correlated ($p<0.001$). Significant correlations were seen between non-adherence and health-related outcomes, including interdialytic weight increase, fatigue, blood pressure, serum creatinine, and calcium levels ($p<0.001$), whereas muscle cramps, BUN, and sodium levels were significant ($p<0.01$). The association between potassium levels and non-adherence was moderately significant ($p>0.05$).

Conclusion: Among hemodialysis patients, non-adherence to dietary and hydration restrictions is startlingly common and linked to both negative health outcomes and demographic characteristics. This emphasizes the necessity of focused efforts to increase adherence and enhance these patients' health and quality of life.

Keywords: Non-adherence, Fluid restriction, Dietary restriction, Hemodialysis, Health outcomes, Prevalence, Chronic Kidney Disease, Interdialytic weight gain, Fatigue, Serum creatinine, Sodium levels, Blood pressure, Demographic factors.

Highlights

- Prevalence of Non-Adherence: The prevalence of non-adherence was found to be 78% for fluid restrictions and 60% for dietary restrictions among hemodialysis patients.
- Socio-Demographic Influences: Age and married status were significantly associated with non-adherence, while

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other sociodemographic factors (such as gender and education) were not.
- Health-Related Outcomes: Non-adherence to fluid and dietary restrictions was significantly associated with interdialytic weight gain, fatigue, serum creatinine, blood pressure, and calcium levels.
- Impact of Non-Adherence: Significant health outcomes were linked to non-adherence, including elevated serum creatinine, muscle cramps, and hypertension.
- Study Implications: The study highlights the need for targeted interventions to improve adherence to dietary and fluid restrictions in hemodialysis patients.

Plain Language Summary

This study looked at how well patients undergoing hemodialysis follow dietary and fluid restrictions, which are crucial for managing kidney disease. The majority of patients do not fully follow these recommendations, according to the results: 78% of patients did not follow fluid restrictions, and 60% of patients did not follow their recommended diet. It is problematic when these limitations are not followed since it can result in major health issues like exhaustion, weight gain between dialysis sessions, and abnormal blood levels of vital substances like creatinine and calcium.

Additionally, the study discovered a correlation between non-adherence and certain characteristics, such as age and marital status. For example, younger, unmarried patients were more likely to have trouble adhering to the limits, whereas older and married patients were more likely to do so. Other factors like education or income did not seem to have a major effect on how well patients followed the rules.

Non-adherence to dietary and fluid guidelines was associated with worsening health, including higher blood pressure, muscle cramps, and changes in kidney function. This emphasizes how crucial it is to help patients stick to their treatment regimens, since doing so may result in fewer problems and improved health outcomes for hemodialysis patients. According to the study, medical professionals should concentrate on developing individualized strategies to support patients in adhering to their dietary and hydration regimens.

Introduction

One of the most important public health issues facing the world today is chronic kidney disease, or CKD. The illness is typified by a progressive and irreversible decline in kidney function over time, which results in a substantial global healthcare burden [1]. Chronic kidney disease (CKD) develops in phases, with end-stage renal disease (ESRD) being the last stage that necessitates renal replacement treatments, such as dialysis or kidney transplantation [2]. The rising prevalence of CKD and ESRD, especially in low- and middle-income countries, is putting pressure on healthcare systems globally to implement a multimodal approach to patient care [3]. One of the most common renal replacement therapies, hemodialysis (HD), offers ESRD patients a potentially life-saving treatment option [4]. Patients with HD are able to live despite the loss of renal function because they receive regular dialysis to rid their blood of waste materials and extra fluid. Hemodialysis for ESRD, however, necessitates careful adherence to treatment plans, which include frequent dialysis sessions, dietary restrictions, and hydration restrictions [5].

Hemodialysis patients frequently disregard these important guidelines, which has a substantial negative impact on their health and raises the risk of problems like cardiovascular disease, fluid overload, and electrolyte abnormalities [7, 8, 9]. According to research, improving the quality of life and survival of hemodialysis patients requires rigorous adherence to dietary and hydration restrictions [4,5].

With over 800 million people affected globally—roughly 10% of the adult population—CKD has a significant global impact. In nations like India, where the prevalence of CKD is roughly 785 per million people and the incidence of ESRD has been estimated to be 150–200 per million, the effects of CKD are more noticeable [10]. With over 100,000 additional patients starting renal replacement therapy each year, the majority of whom receive hemodialysis, the healthcare burden of end-stage renal disease (ESRD) is increasing in India [2]. Even though dialysis dramatically increases life rates, rigorous adherence to medical regimens, such as food and hydration restrictions, is still crucial for the effective management of end-stage renal disease (ESRD) [11].

The management of chronic kidney disease becomes particularly complex when patients have coexisting medical conditions and require long-term hemodialysis. A published case report describing a patient with CKD receiving maintenance hemodialysis illustrates the importance of individualized dietary management, clinical monitoring, and coordinated multidisciplinary care. These considerations further emphasize the need to investigate adherence to prescribed dietary and fluid restrictions as an important component of comprehensive renal care [37].

Fluid and Dietary Restrictions in Hemodialysis

Hemodialysis patients are at risk for fluid overload, which can show up as a variety of symptoms like edema, dyspnea, and high blood pressure, because their kidneys are no longer able to effectively control fluid balance [7]. If left untreated, fluid overload can worsen pre-existing cardiovascular diseases, raise the chance of heart failure, and potentially cause early death [7]. In controlling ESRD, dietary limits are also crucial, particularly with regard to potassium, salt, and phosphorus intake, because of the kidneys' reduced capacity to eliminate waste products. Twelve Life-threatening disorders like arrhythmias and bone damage can result from elevated potassium and phosphorus levels [13]. It has been demonstrated that following dietary and hydration guidelines improves patient outcomes by lowering hospitalization rates and raising the standard of life for hemodialysis patients [4,5].

Notwithstanding the significance of these limitations, studies repeatedly show that many hemodialysis patients face serious difficulties with non-adherence. discovered in a systematic review and meta-analysis that many patients worldwide have trouble following dietary and hydration recommendations, which has serious health consequences [5].

According to certain studies, adherence rates are considerably lower, especially in some geographic areas, and more than 50%

of hemodialysis patients do not fulfill their recommended fluid and food restrictions [15]. In addition to raising the possibility of unfavorable health outcomes, noncompliance with these important health recommendations also raises healthcare expenses, adding to the strain already placed on the healthcare system [4].

The fact that about 70% of hemodialysis patients have trouble maintaining enough fluid intake is concerning since it can result in serious side effects like cramps, nausea, and even syncope episodes [8]. The strain on healthcare resources can be further enhanced by these consequences, which can also considerably lower the patient's quality of life and increase the likelihood of hospitalization [16]. Also linked to an increased risk of cardiovascular illness, including congestive heart failure, are fluid excess and electrolyte abnormalities, especially those involving potassium [9]. Since non-adherence has serious repercussions and can lead to early mortality, measures to increase hemodialysis patient adherence are desperately needed [12].

Factors Influencing Adherence to Fluid and Dietary Restrictions
The non-adherence to fluid and dietary restrictions among hemodialysis patients is influenced by a variety of factors. These can be broadly classified into patient-related factors, healthcare provider-related factors, and societal or cultural factors, each contributing to the complexities surrounding treatment adherence [5,18]. A greater knowledge of these characteristics is critical for creating more effective therapies aimed at improving adherence and, subsequently, enhancing the clinical outcomes of hemodialysis patients.

Factors Associated with Patients
A key determinant of adherence is the patient's comprehension of their illness and the significance of adhering to medical advice. Studies have indicated that patients are more likely to follow dietary and hydration guidelines if they are better informed about their condition and available treatments [12]. Enhancing patient comprehension of the repercussions of non-adherence and the advantages of adhering to medical guidance is the goal of educational interventions that have been shown to increase adherence rates [11]. But in spite of these initiatives, a lot of patients still have trouble adhering because of a variety of psychological and personal issues, including anxiety and despair [1,20].

Patients who experience psychological discomfort, such as despair or "death anxiety," may find it extremely difficult to stick to their treatment plans. According to research, those who are more depressed are more prone to disregard food and hydration recommendations, perhaps as a result of mental suffering or a decline in hope [21]. A vicious loop involving these psychological issues makes managing CKD and ESRD more difficult because non-adherence results in inferior clinical outcomes, which can further exacerbate psychological anguish [21].

Factors Associated with Healthcare Providers
Effective communication and patient-centered care are two important ways that healthcare providers can affect patient adherence. A significant contributing factor to non-adherence has been found to be inadequate communication between patients and healthcare providers [22].

Patients may not completely understand the need for dietary and hydration limitations if medical personnel do not communicate with them in an empathic, patient-centered manner or do not adequately explain their significance, which could result in poor adherence [1]. In the majority of cases, non-compliance was largely caused by communication gaps between patients and healthcare teams, according to a study by underscoring the need for better communication techniques [18,19].

Additionally, the accessibility of medical resources has an impact on adherence. It can be challenging for patients to get the help they require to properly manage their condition in low-resource environments because they might not always have access to nephrologists, nutritionists, or other medical specialists [4]. Strict adherence to food and hydration restrictions is made more difficult by the lack of access to professional care and financial limitations [3].

Health outcomes are more likely to worsen and adherence rates are frequently poorer in such settings, which raises the risk of hospitalization and other unfavorable clinical events [16].

Cultural and Social Aspects
Social and cultural factors, in addition to those pertaining to patients and healthcare providers, have a big impact on how closely people follow food and hydration guidelines. Food has profound social and cultural value in many countries, thus hemodialysis patients may feel that following dietary restrictions is a significant hardship [5]. Patients may find it difficult to strike a balance between medical recommendations and cultural standards, and traditional dietary practices may be at odds with them. Studies have highlighted the importance of incorporating cultural competence into healthcare interventions to address these challenges [5,15]. For example, in some cultures, the social aspects of food—such as family meals and religious observances—can make it more difficult for patients to adhere to prescribed dietary restrictions [23].

Family support systems also play an important role in patient adherence. Since family members can help with meal preparation, offer emotional support, and keep an eye on adherence, research has shown that patients who have good family support are more likely to follow food and hydration restrictions [15]. Patients without family support, on the other hand, could find it more difficult to control their illness and follow treatment guidelines [18]. Thus, social and cultural elements—such as family relationships and societal norms—are crucial to take into account when creating successful interventions meant to increase adherence [14].

Effects of Non-Compliance on Health Outcomes
Patients on hemodialysis may suffer serious health consequences if they disregard their dietary and fluid regimens. Fluid overload, which can result in heart failure, pulmonary edema, and hypertension, is one of the most dangerous side effects [7]. Although too much phosphorus might result in bone disease, electrolyte imbalances, such as high potassium levels, can trigger potentially fatal arrhythmias [4]. Moreover, inadequate dietary compliance raises the risk of malnutrition, which is prevalent in hemodialysis patients because of limitations on their intake of protein, potassium, and phosphate [13]. By lowering quality of life, increasing hospitalizations, and raising healthcare expenses,

these problems increase the total toll that ESRD has on patients and healthcare systems [16].

Furthermore, non-adherence has grave long-term repercussions. Patients who do not adequately manage their disease are more likely to die, according to studies, since improperly controlled fluid and electrolyte levels can cause systemic organ malfunction and ultimately death [4]. The consequences of non-adherence go beyond personal health outcomes; they can lead to higher healthcare consumption, higher expenses, and a larger strain on healthcare institutions [1,12].

Need for Further Research

Many studies have been conducted on hemodialysis treatment adherence in Western and Middle Eastern nations, but little is known about adherence in other regions, especially in nations like India. The particular demographic, cultural, and healthcare system problems faced by patients in India may influence their adherence to food and hydration restrictions in ways that have not been fully researched. Understanding these aspects is critical for creating focused therapies that are suited to the specific needs of Indian hemodialysis patients.

In order to improve adherence and, consequently, the health outcomes of hemodialysis patients, research that examines the obstacles to adherence in the Indian context and the elements that lead to successful adherence is desperately needed. This research will not only help patients in India but may also help guide global strategies for enhancing treatment adherence among ESRD patients, especially in settings with limited resources.

In summary, follow-through on dietary and fluid restrictions is crucial for hemodialysis patients' care and has a big influence on their results. These limitations are still frequently broken by hemodialysis patients around the world, which can lead to a number of negative health outcomes, such as fluid overload, electrolyte imbalances, and higher mortality rates. A number of factors, including patient education, psychological distress, communication between healthcare providers, and cultural influences, all have an impact on adherence levels. In order to improve patient compliance and, eventually, the clinical results and quality of life of hemodialysis patients, it is imperative to comprehend these factors and create customized interventions. The particular difficulties that patients in India and other areas face must be investigated further in order to create plans to enhance adherence and reduce the burden of ESRD globally.

Materials and Methods

Research Design and Approach

This research employs a descriptive design and a quantitative, non-experimental methodology.

The design was used to determine the frequency of hemodialysis patients who do not follow their dietary and fluid regimens and to investigate the connections among non-adherence, demographic characteristics, and health outcomes.

Setting

In Saifai, Etawah, Uttar Pradesh, India, at the dialysis unit of UPUMS Hospital, the study was carried out. As part of their renal replacement therapy, patients with end-stage renal disease (ESRD) who get hemodialysis can be treated in this facility.

Population and Sample

The study's target population included all hemodialysis patients with end-stage renal disease (ESRD) receiving treatment at UPUMS Hospital's dialysis unit. Participants who fulfilled the inclusion requirements were chosen by convenient sampling. Fifty patients receiving hemodialysis made up the final sample.

Inclusion criteria:

- Individuals receiving hemodialysis at the time of the research who had been diagnosed with ESRD.
- Patients who could converse in English or Hindi.
- Individuals who gave their informed consent to take part in the research.
- Patients with severe cognitive impairments that would make it impossible for them to comprehend the study procedures are excluded.
- Individuals with urgent medical issues that could skew the findings.

Data Collection Tools and Techniques

Data were collected using the following tools:

- In order to gather sociodemographic data, such as age, gender, marital status, educational background, and length of hemodialysis therapy, a structured questionnaire was employed.
- The variables in this area included interdialytic weight gain, edema, exhaustion, blood pressure, serum creatinine, BUN, sodium, potassium, and calcium levels, as well as symptoms including dyspnea and cramping in the muscles. Routine clinical data taken from hospital records were used to measure the health outcomes.
- The Dietary and Fluid Adherence Questionnaire (DDFQ) is a widely used instrument for evaluating how well hemodialysis patients follow their dietary and fluid regimens. It gauges alleged departures from nutritional and fluid recommendations. Higher scores on the DDFQ indicate a perceived severity of non-adherence.

The scale goes from 0 to 14. The score interpretation is as follows:

- 0: No deviation
- 1-3: Mild deviation
- 4-6: Moderate deviation
- 7-10: Severe deviation
- 11-14: Very severe deviation

Study Procedure

Ethical Considerations

An institutional review board (IRB) or ethics committee granted ethical approval for the study under the number UPUMS/NSG/295/17-18. After being informed about the study's goals, methods, and participants' right to confidentiality, all participants gave their informed consent and were guaranteed that their information would be kept private.

Participant Recruitment

After receiving ethical approval, subjects were chosen from the UPUMS Hospital's dialysis unit in Saifai, Etawah. Predetermined inclusion criteria were used to identify eligible patients.

These prospective volunteers were addressed by the study coordinator, who answered any questions they might have had and thoroughly discussed the goals and methods of the study.

Written informed permission was requested from patients who satisfied the inclusion requirements and indicated an interest in taking part.

Informed Consent

Participants were fully briefed on the goals of the study, the voluntary nature of their involvement, and the possible risks and rewards prior to any data collection beginning. It was also explained to them that they might leave the study at any time without suffering any repercussions. To ensure openness and complete comprehension of the research procedure, all participants provided written informed consent.

Data Collection

Data collection took place over a period of three months. The process involved the following steps:

- **Demographic Questionnaire:** Age, gender, marital status, educational attainment, and length of hemodialysis therapy were among the structured demographic questions that each participant answered.
- The purpose of the food and Fluid Adherence Questionnaire (DDFQ) was to evaluate compliance with food and fluid guidelines. Based on the patient's self-reported departures from recommended limitations, this instrument was created to assess the degree of non-adherence. • • To guarantee clarity and reduce the possibility of question misunderstanding or misinterpretation, it was conducted in front of a qualified researcher.
- **Health-Related Outcome Measures:** Through patient interviews and medical records, information on health-related outcomes was gathered, including interdialytic weight gain, edema, exhaustion, blood pressure, and serum levels (creatinine, sodium, potassium, calcium, and BUN). Clinical data were used to cross-verify this information to ensure accuracy.

Monitoring and Supervision

The research team met on a regular basis during the data collection period to discuss any problems or discrepancies in the data gathering procedure, assess the study's progress, and make sure the protocol was followed. As a result, the study team was able to resolve participant concerns, preserve data quality, and offer continuous assistance to data collectors.

Completion of Data Collection

Following data collection, all information was safely kept in a password-protected database.

To maintain confidentiality, only the research team and the primary investigator had access.

The completeness of the data collecting forms was examined, and any inconsistent or missing information was noted for further investigation. As there was no missing data, no imputation or exclusion of cases was necessary. The integrity of the collected data was carefully ensured, and the study team verified the accuracy of all information before analysis.

Data Analysis

Statistical techniques for both descriptive and inferential analysis were applied to the data.

Descriptive statistics (e.g., frequency, percentage, mean, median) were used to compile the demographic details of the participants and the frequency of non-adherence to dietary and fluid limitations. The associations between demographic factors, health-related outcomes, and non-adherence to dietary and fluid limitations were investigated using inferential statistics, including chi-square tests for categorical variables.

For continuous variables, the data were categorized into relevant groups based on clinically established thresholds. Once categorized, chi-square tests were used to analyze the relationship between non-adherence and these categorized health outcomes. This approach was selected to examine the association between non-adherence and the distribution of these continuous variables across different adherence categories. SPSS version 20 was used for all statistical analyses.

Results

Socio-Demographic Variables

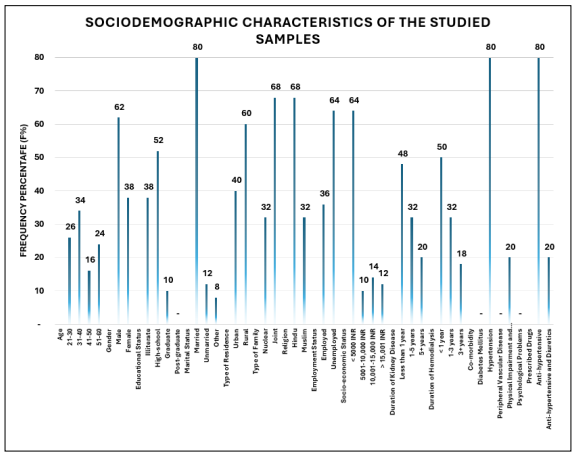


Figure 1: Frequency and Percentage Distribution of Socio-Demographic Variables

The sociodemographic traits of the study's hemodialysis patients are shown in Figure 1. Sixty-two percent of patients were male, and the majority (X%) were in the age range of 31 to 40.

With 52% of patients having finished high school and 38% being illiterate, a sizable percentage of patients were either illiterate or only had a high school education. Eighty percent of the patients reported being married. The majority of patients in the sample lived in joint households (68%), and 60% of them were from rural areas. Regarding socioeconomic background, the majority of patients (64%) stated that they made less than 5000 Indian rupees each month.

Fifty percent of patients had been receiving hemodialysis for less than a year, and forty-eight percent of patients had been diagnosed with renal disease for less than a year. The majority

of patients (80%) were using anti-hypertensive medication, and hypertension was the most frequent comorbidity, reported by 80% of patients.

Health-Related Outcomes

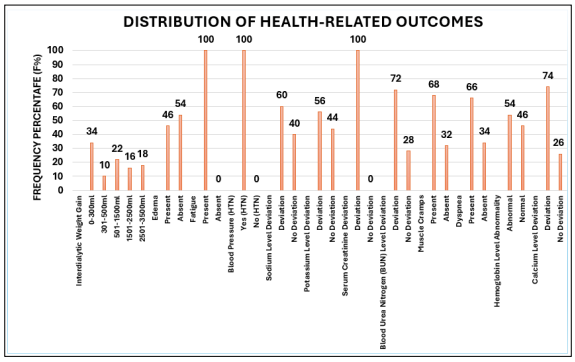


Figure 2: Frequency and Percentage distribution of health-related outcomes

The health-related results for the study population are displayed in Figure 2. 100% of patients reported having fatigue and hypertension (HTN). While 68% of patients felt muscle cramps and 66% reported dyspnoea, 54% of patients did not exhibit edema.

As far as biochemical markers go, most patients had abnormal serum creatinine levels (100%), and a sizable percentage had aberrant sodium (60%), potassium (56%), and calcium (74%). Anemia was common, as seen by the 54% of individuals with abnormal hemoglobin levels.

Prevalence of Non-Adherence to Dietary and Fluid Restrictions

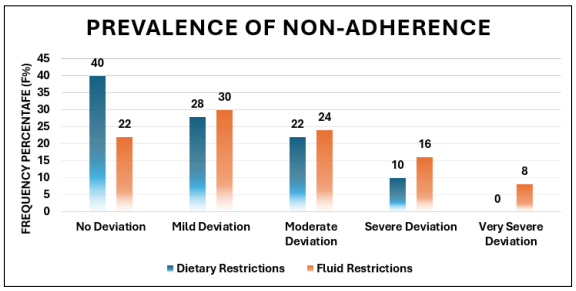


Figure 3: Prevalence of Non-Adherence to Dietary and fluid Restrictions in the Past 14 Days

Non-adherence to dietary and hydration limitations during the previous 14 days is prevalent, as seen in Figure 3. Forty percent of patients absolutely followed the recommended diet, whereas sixty percent of patients indicated some degree of non-adherence. The majority of the non-adherent patients had modest (28%) or moderate (22%) dietary deviations, with 10% displaying severe deviations. No patients complained of really serious dietary restriction noncompliance.

Although only 22% of patients strictly followed their fluid intake guidelines, a larger percentage of patients (78%), were non-adherent to fluid restrictions, and among the non-adherent group, 30% had mild deviations, 24% moderate deviations, 16% severe deviations, and 8% very severe deviations from fluid intake recommendations. These findings collectively demonstrate a significant level of non-adherence to both dietary and fluid restrictions among hemodialysis patients.

Relationship Between Non-Adherence and Socio-Demographic Variables

Table 1: Relationship Between Fluid and Dietary Restrictions with Selected Socio-Demographic Variables

S. No.	Socio-Demographic Variables	Non-Adherence to Diet (Chi-Square Test, X^2)	df	P-Value (S/NS)	Non-Adherence to Fluid (Chi-Square Test, X^2)	df	P-Value (S/NS)
1	Age	33.94	12	<0.001 (S)	35.10	12	<0.001 (S)
2	Gender	05.04	4	>0.05 (NS)	05.14	4	>0.05 (NS)
3	Educational Status	05.64	12	>0.05 (NS)	05.75	12	>0.05 (NS)
4	Marital Status	25.32	8	<0.001 (S)	35.03	8	<0.001 (S)
5	Type of Residence	09.57	4	>0.05 (NS)	08.92	4	>0.05 (NS)
6	Type of Family	05.97	4	>0.05 (NS)	06.40	4	>0.05 (NS)
7	Religion	01.67	4	>0.05 (NS)	60.07	4	>0.05 (NS)
8	Employment Status	02.25	4	>0.05 (NS)	03.01	4	>0.05 (NS)
9	Patient's Socioeconomic Status	12.61	12	>0.05 (NS)	14.31	12	>0.05 (NS)
10	Co-morbid Condition	06.36	12	>0.05 (NS)	01.36	12	>0.05 (NS)
11	Duration of Kidney Disease	09.25	8	>0.05 (NS)	06.78	8	>0.05 (NS)
12	Duration of Hemodialysis	09.72	8	>0.05 (NS)	07.92	8	>0.05 (NS)

Note: NS: Non-Significant, S: Significant

The relationship between different sociodemographic factors and noncompliance with dietary and hydration limitations is shown in Table 1. Non-adherence was shown to be significantly correlated with age and marital status ($p < 0.001$). The likelihood of patients

in the older age group not adhering to dietary and hydration restrictions was increased. Furthermore, compared to their married counterparts, unmarried patients exhibited higher levels of non-adherence.

According to these relationships, younger, single patients can have a harder time following their treatment plans.

Relationship Between Non-Adherence and Health-Related Outcomes

Table 2: Relationship between Fluid and Dietary Restrictions with Selected Health-Related Outcomes

S. No.	Health-Related Outcomes	Non-adherence to Diet				Non-adherence to Fluid			
		Chi-Square Test (X^2)	df	P Value	Significance	Chi-Square Test (X^2)	df	P Value	Significance
1	Interdialytic Weight Gain	39.80	16	>0.001	S	58.58	16	<0.001	S
2	Edema	03.89	4	<0.05	S	09.31	4	<0.05	S
3	Sodium Level	18.43	4	<0.01	S	-	-	-	-
4	Potassium Level	10.96	4	<0.05	S	-	-	-	-
5	BUN* Level	17.66	4	<0.01	S	-	-	-	-
6	Muscle Cramps	17.18	4	<0.01	S	-	-	-	-
7	Dyspnea	06.47	4	>0.05	NS	-	-	-	-
8	Hemoglobin Level	06.37	4	>0.05	NS	-	-	-	-
9	Calcium Level	20.16	4	<0.001	S	-	-	-	-

- **S** = Significant, **NS** = Non-Significant * BUN: Blood Urea Nitrogen

The association between health-related outcomes and non-adherence to food and hydration limitations is summarized in Table 2. Interdialytic weight increase, edema, calcium levels, sodium and potassium levels, BUN levels, and cramping in the muscles were all found to have significant correlations with non-adherence (designated as "S"). Patients who had more interdialytic weight gain and cramping in their muscles were more prone to break their dietary and hydration regimens.

Non-adherence, however, did not significantly correlate with either hemoglobin levels (designated as "NS") or dyspnea. According to this, adherence to dietary and hydration limitations may not have a direct effect on some clinical outcomes, such as respiratory symptoms and anemia, even when non-adherence is highly linked to other outcomes.

Degree of Non-Adherence

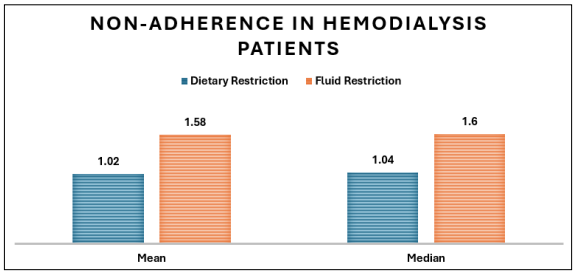


Figure 4: Mean and Median of Degree of Non-Adherence to Dietary and Fluid Restrictions

For the degree of non-adherence to dietary and hydration limitations, the mean and median values are shown in Figure 4. Dietary non-adherence had mean and median values of 1.02 and 1.04, respectively, suggesting a minor general departure from recommended dietary guidelines.

When compared to dietary constraints, the mean for fluid non-adherence was 1.58 and the median was 1.6, indicating a higher overall degree of departure from recommended fluid intake.

Discussion

Assessing the frequency of hemodialysis patients' noncompliance with dietary and fluid restrictions and investigating its connection to health outcomes were the objectives of the current investigation. High rates of non-adherence to diet (60%) and fluid (78%) limitations were found in the data, which is consistent with earlier research that has shown non-compliance to be a crucial problem in the treatment of hemodialysis patients with chronic kidney disease (CKD) [5,6]. It is very difficult to manage chronic kidney disease (CKD) when patients do not follow their recommended treatment plans, particularly when it comes to dietary and fluid restrictions, which are essential for avoiding complications and enhancing patient outcomes [24].

The findings will be further discussed, placed within the perspective of previous research, and the effects of sociodemographic characteristics, health-related consequences, and the clinical ramifications of non-adherence will be examined.

Prevalence of Non-Adherence to Dietary and Fluid Restrictions

Concerningly high rates of non-adherence to dietary and hydration limitations were noted in this study. Seventy-eight percent of the 50 patients who were included did not consume the recommended amount of fluids, and sixty percent indicated some degree of non-adherence to dietary restrictions. These results support past studies, including one by Moustafa et al, which found that hemodialysis patients worldwide frequently avoid following nutritional and hydration guidelines. In line with findings from other studies, which indicate that fluid management is especially difficult for hemodialysis patients, a

larger rate of non-adherence to fluid restrictions (78%) than to dietary restrictions (60%) was seen [25].

In this population, noncompliance with fluid restriction is frequently linked to serious outcomes such fluid overload, hypertension, and cardiovascular problems, which can raise morbidity and death. Patients receiving hemodialysis are especially at risk for fluid overload and hypertension because their kidneys are frequently underdeveloped, making it challenging to maintain fluid balance [25]. The current study also discovered that fluid intake deviations were typically more severe than dietary adherence deviations. This underscores the pressing need for interventions aimed at enhancing fluid management.

Clinical practice has generally recognized the connection between hemodialysis patients' dietary and fluid adherence. For dialysis patients, fluid overload continues to be one of the most frequent and serious side effects, frequently resulting in emergency room visits, hospital stays, and in the worst situations, death [26]. Apart from fluid overload, significant electrolyte imbalances are caused by dietary errors such high potassium, sodium, and phosphate intake, which are frequently observed in non-compliant hemodialysis patients and further increase morbidity and death [9, 27].

Socio-Demographic Factors and Non-Adherence

Our research revealed a strong correlation between sociodemographic characteristics, specifically age, married status, and educational attainment, and noncompliance with dietary and fluid limitations. found that older hemodialysis patients were more likely to follow recommended treatment regimens, and the results show that older patients were more likely to follow food and hydration restrictions [28]. Since older patients may have felt the negative consequences of non-adherence more keenly than younger patients, this could be explained by their greater level of health awareness and greater drive to stick with their therapy.

On the other hand, younger patients were more likely to exhibit higher levels of non-adherence, which could be caused by a number of things, such as a lower perceived risk, a lack of knowledge about the long-term effects, and more difficulty changing their lifestyle [29].

Furthermore, adherence was significantly influenced by marital status, with unmarried patients showing greater rates of non-adherence. This result supports earlier studies that suggested unmarried people might not have the social support needed to successfully adhere to treatment plans [30]. As is typical in married couples, family support can offer both practical and emotional help in coping with the intricate requirements of dialysis therapy, such as stringent dietary and fluid restrictions. This relationship may be mediated by several psychosocial and practical factors. Married individuals often benefit from greater social support, which can enhance motivation and accountability for following treatment-related advice. Spouses may also play a key role in meal preparation, grocery choices, and monitoring daily fluid intake, thus contributing to better adherence. Additionally, emotional support from a partner can help mitigate stress and anxiety, which are known to affect health behaviors. Conversely, unmarried or widowed individuals may lack consistent caregiving or emotional backing, potentially leading to poorer self-management. These findings align with previous literature highlighting the role of familial and social structures in chronic disease management and underscore the need for individualized adherence counseling that considers the patient's social environment [31].

Despite the fact that socioeconomic position and educational background did not substantially correlate with non-adherence in this study, this finding contradicts some research that indicates better adherence is favorably connected with both socioeconomic status and higher levels of education. However, socio-economic factors can have complex relationships with adherence behavior, and other factors, such as psychological well-being or understanding of the treatment regimen, may mediate these effects [32]. The interaction between socio-demographic variables, adherence, and health outcomes requires careful consideration in future studies.

Regarding the effect of socioeconomic factors on adherence, other research conducted in various locations have similarly produced conflicting results. In certain nations, for example, poorer adherence has been linked to lower socioeconomic position and education levels. This is probably because these groups have less access to healthcare services or are less aware of the significance of treatment plans [16]. Nevertheless, there is not always a constant correlation between adherence and socioeconomic position, indicating that patients' adherence to treatment plans may also be influenced by other underlying psychological or cultural issues.

Health-Related Outcomes and Non-Adherence

This study found a strong correlation between a number of health-related outcomes and non-adherence to dietary and hydration limitations. Notably, non-adherence was found to be significantly correlated with blood creatinine, calcium levels, edema, and interdialytic weight gain. According to these results are consistent with their research, which highlighted the substantial correlation between problems such as muscle cramps, fluid overload, and poor laboratory values and deviations from dietary and hydration limits [33].

Non-adherence to fluid restriction was substantially associated with interdialytic weight gain, a measure of fluid retention in between dialysis sessions. Significant weight gain between dialysis sessions is a clear sign of fluid overload, which can cause serious cardiovascular problems, including heart failure, therefore this is a crucial finding [34]. Adherence is crucial for maintaining kidney function, as seen by the strong correlation found between serum creatinine levels and non-adherence. Elevated serum creatinine is a key marker of impaired kidney function, and its association with non-adherence highlights the role of strict dietary and fluid management in slowing disease progression [35].

Calcium imbalances, which were observed in a large proportion of the study population, also had a significant relationship with non-adherence. Hemodialysis patients often have calcium abnormalities, such as hypocalcemia and hypercalcemia, which are regulated by dietary factors, such as calcium and phosphate

consumption, which are important for treating bone mineral disorders in chronic kidney disease [36]. Significant disturbances in mineral metabolism can result from noncompliance with dietary guidelines that control calcium and phosphate consumption, making the treatment of chronic kidney disease (CKD) even more difficult.

The relationship between dietary and fluid non-adherence and renal outcomes has been consistently documented in the literature, especially regarding serum creatinine and fluid overload [17]. Elevated creatinine and persistent fluid overload are well-established markers for poor clinical outcomes in hemodialysis patients. Further studies have demonstrated that better adherence to dietary restrictions can significantly improve the overall clinical status of patients, especially in preventing progression toward end-stage renal disease [6].

In contrast, we found no significant association between non-adherence and dyspnea or hemoglobin levels. While other clinical measures, such weight growth and serum creatinine levels, may be more directly connected to food and fluid adherence, dyspnea is frequently a marker of fluid overload and cardiovascular problems in hemodialysis patients. Also, there was no significant correlation between non-adherence and anemia, a major consequence of chronic kidney disease (CKD). This may be due to the complexity of anemia in CKD, which may take time to resolve with dietary and hydration changes alone [14].

These results imply that noncompliance with food and fluid limitations has a distinct and substantial effect on vital indicators like fluid balance, kidney function, and mineral metabolism, even though it may not have an equivalent effect on all health outcomes.

Therefore, in order to maximize the health outcomes of hemodialysis patients, increased adherence to dietary and hydration restrictions should be a primary focus of care.

Degree of Non-Adherence and Clinical Implications

Relatively low mean and median scores (1.02 and 1.04, respectively) for the degree of non-adherence to dietary rules indicate that dietary deviations were typically modest. In contrast, the mean and median for non-adherence to fluid restriction were considerably greater (1.58 and 1.6, respectively), suggesting more significant departures from the prescribed fluid consumption. The fact that even slight variations in fluid consumption can have serious health effects is troubling, especially for hemodialysis patients who are already at risk for cardiovascular problems, hypertension, and fluid overload [25].

To increase adherence to dietary and hydration limitations, focused interventions are required due to the high prevalence of non-adherence and its possible repercussions. Patients may benefit from educational programs that highlight the significance of adherence as well as techniques for enhancing self-management abilities. These interventions may also help patients comprehend the vital role that proper food and fluid management have in their general health [33].

The root causes of adherence, such as low motivation, a lack of comprehension of the therapy, and social or psychological problems, may also be addressed with the aid of behavioral modification strategies, psychological support, and individualized counselling [32]. Involving family members may help increase adherence by offering social support and encouragement, especially for patients who are single [31].

Multi-component therapies that combine psychological counseling, educational assistance, and useful self-management techniques have been demonstrated to increase hemodialysis patients' adherence to treatment plans, according to recent studies [12]. To improve adherence and, consequently, clinical results, health practitioners must work with patients to develop practical, customized treatment plans that take into account each patient's particular situation, preferences, and lifestyle.

The high frequency of hemodialysis patients not adhering to dietary and fluid limitations is highlighted by this study, which also shows a strong correlation between non-adherence and negative health consequences such fluid overload, renal failure, and aberrant mineral metabolism. Important sociodemographic characteristics affecting adherence included age, marital status, and education, but clinical outcomes like serum creatinine, calcium levels, and interdialytic weight gain were strongly associated with non-adherence. Given the possible consequences of non-adherence, healthcare practitioners should concentrate on enhancing behavioral treatments, psychological support, and patient education in order to encourage adherence and enhance patient outcomes. In the end, addressing these problems will improve the quality of life for CKD patients and lower the morbidity and mortality linked to hemodialysis.

Limitation

This study was based on convenience sampling from a single-center cohort of 50 hemodialysis patients, which limits the external validity and generalizability of the findings. The sample showed demographic homogeneity, particularly with a predominance of rural participants and lower socioeconomic status, which may not reflect the broader hemodialysis population across diverse regions. Furthermore, the cross-sectional nature of the study prevents any causal inferences between non-adherence and clinical outcomes. Additionally, categorizing continuous variables for chi-square analysis may have led to a loss of valuable information and reduced statistical sensitivity.

Recommendation

Future studies should consider a larger, multi-center design with random or stratified sampling to ensure greater representativeness across socioeconomic and geographic groups. Employing longitudinal designs would help establish causal relationships and better understand the progression of non-adherence and related health outcomes. It is also recommended to use non-parametric statistical tests or regression models when analyzing continuous variables to preserve data richness and improve sensitivity. Finally, more in-depth exploration of cultural factors—such as traditional diets, beliefs, and family influence—could offer insights into patient behaviors and support the development of culturally sensitive intervention strategies.

Conclusion

This study highlights the serious problem of dietary and fluid restriction non-adherence among hemodialysis patients, with

a higher rate of non-compliance with fluid restrictions. The results show that a significant number of patients do not follow recommended fluid intake guidelines, which can result in serious health complications, such as fluid overload, hypertension, and cardiovascular problems. Age and marital status were identified as important socio-demographic factors influencing adherence, with older patients and those who were married demonstrating better compliance. Furthermore, non-adherence was strongly linked to important health outcomes like interdialytic weight gain, elevated serum creatinine, and calcium imbalances, further highlighting the clinical risks associated with poor adherence.

These findings highlight how urgently tailored treatments are needed to increase adherence to dietary and hydration restrictions, which are critical for controlling chronic renal disease and averting problems in patients receiving hemodialysis. In addition to improving patient education, interventions should target behavioral, social, and psychological obstacles to adherence. Prospective investigations have to go deeper into these elements and formulate customized approaches that take into account each patient's unique requirements, including their sociodemographic attributes, mental health, and comprehension of the significance of rigorous treatment plan compliance. In order to optimize health outcomes and quality of life and, eventually, lessen the burden of chronic renal disease and its related consequences, it is imperative that adherence in this patient population be improved.

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