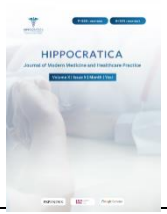

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The Relationship Between Duration of Hemodialysis and Employment Status on Fluid Restriction Adherence Among Patients with Chronic Kidney Disease at Harapan Anda General Hospital Tegal

Tri Mustikowati[1*], Erna Melastuti[2], Indah Sri Wahyuningsih[3]
[1-3] Universitas Islam Sultan Agung, Indonesia
email: trimustikowati33@gmail.com[1]

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Abstract

Chronic kidney disease requiring hemodialysis demands consistent fluid restriction to minimize interdialytic fluid accumulation and related complications. This study examined the associations between hemodialysis duration and employment status with fluid-restriction adherence among patients with chronic kidney disease at Harapan Anda General Hospital Tegal. An analytical observational study with a cross-sectional design was conducted among 62 patients undergoing maintenance hemodialysis. Hemodialysis duration was categorized as new or long-term, employment status as employed or unemployed, and fluid-restriction adherence was assessed using Interdialytic Weight Gain (IDWG). Associations were analyzed using Fisher's Exact Test at α = 0.05. Overall, 52 patients (83.9%) were adherent and 10 (16.1%) were non-adherent. Among new hemodialysis patients, 27 (96.4%) were adherent, compared with 25 (73.5%) long-term patients. Hemodialysis duration was significantly associated with fluid-restriction adherence (p = 0.024). Among employed patients, 28 (96.6%) were adherent, compared with 24 (72.7%) unemployed patients, and employment status was significantly associated with adherence (p = 0.015). These findings indicate that hemodialysis duration and employment status are significantly associated with fluid-restriction adherence, supporting individualized assessment and continuous fluid-management education throughout maintenance hemodialysis care to address adherence barriers according to patients' treatment and occupational circumstances.

Keywords: *Chronic Kidney Disease, Employment Status, Fluid-Restriction Adherence, Hemodialysis, Interdialytic Weight Gain.*

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INTRODUCTION

Chronic kidney disease (CKD) is a progressive and irreversible deterioration of renal function that increasingly contributes to the global burden of chronic illness and may ultimately require renal replacement therapy, with hemodialysis remaining one of the principal treatment modalities for patients with advanced kidney dysfunction. The clinical consequences of declining renal filtration are reflected in disturbances of metabolic waste elimination and biochemical homeostasis, including abnormalities in urea and creatinine concentrations that characterize the progressive loss of kidney function (Rahayu et al., 2022). For patients who depend on maintenance hemodialysis, treatment extends beyond attendance at dialysis sessions because long-term survival and clinical stability require continuous management of medication, diet, fluid intake, vascular access, and symptoms between treatments. Excessive interdialytic fluid accumulation is particularly important because impaired renal excretion allows consumed fluid to accumulate between dialysis sessions, increasing the likelihood of edema, hypertension, dyspnea, and cardiovascular or hemodynamic instability (Chris et al., 2024). Contemporary nursing management therefore increasingly positions fluid-restriction adherence as a central self-management behavior rather than a peripheral recommendation, because patients must repeatedly regulate fluid intake in everyday environments where thirst, dietary practices, social activities, and treatment fatigue remain present. The broader burden of hemodialysis is also multidimensional, as fatigue and other persistent symptoms can coexist with demanding treatment schedules and potentially influence patients' capacity to sustain complex self-care behaviors over time (Santoso et al., 2022). Recent evidence further shows that adherence and quality of life among patients undergoing hemodialysis are shaped by interacting clinical, behavioral, and social determinants,

indicating that fluid management should be evaluated within the broader context of long-term adaptation to CKD rather than as an isolated act of compliance (Trisnaningtyas et al., 2026).

Fluid-restriction adherence has consequently become an important outcome in hemodialysis research because it represents the patient's ability to translate clinical recommendations into repeated behavioral decisions between dialysis sessions. Interdialytic Weight Gain (IDWG) offers a clinically observable indicator of fluid accumulation between consecutive treatments, although adherence itself is influenced by factors extending beyond physiological fluid balance and includes knowledge, self-efficacy, perceived burden, motivation, and environmental support. Cross-sectional evidence has demonstrated that self-efficacy is associated with adherence to fluid-intake restrictions among patients with CKD receiving hemodialysis, reinforcing the importance of behavioral capability in managing daily intake (Mailani et al., 2023). Other research has identified dietary and fluid adherence as a multifactorial phenomenon in which personal characteristics, treatment-related conditions, and supportive factors interact rather than operate independently (Safitri et al., 2023). Thirst remains one of the most immediate physiological challenges because patients must restrict intake while simultaneously experiencing a subjective drive to drink, which can make adherence difficult even when the consequences of fluid overload are understood (Esti et al., 2022). Recent qualitative evidence also indicates that patients with end-stage kidney disease experience fluid and dietary restriction as an ongoing negotiation involving symptoms, routines, social participation, and the psychological burden of sustained self-control (Liao et al., 2026). These findings suggest that observable adherence reflects an adaptive process shaped simultaneously by disease burden, treatment experience, personal agency, and the social circumstances in which fluid-control decisions are made.

Research examining treatment duration has produced a clinically plausible but not entirely uniform picture, because prolonged exposure to hemodialysis may strengthen knowledge and behavioral adaptation while also generating fatigue, monotony, and declining motivation. Patients who have undergone dialysis for longer periods may become more familiar with fluid limits, signs of overload, dialysis routines, and the consequences of excessive IDWG, yet prolonged treatment also represents an enduring disease burden capable of affecting psychological and physical well-being. Recent evidence directly examining hemodialysis duration and fluid-restriction compliance supports an association between treatment exposure and adherence, although the direction and magnitude remain dependent on the characteristics of the population studied (Setiawati & Lalu, 2024). Senja et al. (2024) similarly reported a relationship between duration of hemodialysis and adherence to a fluid-related diet, strengthening the argument that accumulated treatment experience can influence self-management behavior. At the same time, studies examining duration of hemodialysis in relation to quality of life show that longer treatment exposure is embedded in a broader process of adaptation and disease burden rather than representing a uniformly beneficial experience (Putri et al., 2024; Setyorini et al., 2023). More recent evidence also identifies a relationship between duration of hemodialysis and quality of life, illustrating that long-term dialysis exposure can simultaneously provide experience and impose substantial chronic-treatment demands (Amal et al., 2026). This tension creates an important conceptual gap: treatment duration should not automatically be interpreted as a simple proxy for either improved adherence or worsening adjustment, because the behavioral consequences may depend on how patients adapt to repetitive treatment and integrate fluid control into everyday life.

Employment status introduces a second dimension that has received comparatively less direct attention in fluid-adherence research despite its potential influence on daily routines, access to beverages, physical activity, social interaction, economic roles, and treatment scheduling. Patients who remain employed may have structured routines and social roles that support motivation and functional independence, but working conditions can simultaneously make fluid monitoring more difficult when occupational demands increase thirst, limit opportunities for self-monitoring, or require adaptation around dialysis schedules. Studies of Indonesian hemodialysis populations have demonstrated that social and functional characteristics are associated with quality of life, indicating that employment should be understood as part of the patient's broader socioeconomic and daily-activity context rather than merely as a demographic label (Nurbadriyah et al., 2023). Symptom burden may also interfere with patients' capacity to remain economically and socially active, making the relationship between employment and treatment behavior potentially bidirectional rather than straightforward (Pradhita, 2024). Recent investigations of non-adherence to fluid restriction confirm that adherence is influenced by multiple patient-level and contextual factors, supporting closer examination of routine social

conditions that may facilitate or constrain fluid-control behavior (Asumta et al., 2024). Evidence concerning determinants of fluid-restriction adherence likewise suggests that no single clinical variable adequately explains adherence, strengthening the rationale for simultaneously considering treatment-related and social characteristics such as dialysis duration and employment status (Yulianti & Tresnawan, 2025). The limited integration of these two variables in the same analytical framework leaves an empirical gap in understanding whether long-term treatment experience and occupational circumstances independently correspond with fluid-restriction adherence within a defined hospital population.

The unresolved question has practical importance because fluid overload is preventable only when clinical recommendations are translated into sustainable behavior outside the dialysis unit, where healthcare professionals have limited direct control over patients' daily intake. Nursing care must therefore identify patients who may require differentiated education and reinforcement rather than assuming that prolonged dialysis experience automatically produces stronger adherence or that employment uniformly facilitates self-management. Recent evidence from patients undergoing hemodialysis identifies several factors associated with fluid-restriction adherence, emphasizing the value of individualized assessment in long-term renal care (Darmawati et al., 2025). Adherence is also closely connected with broader patient outcomes, as studies have documented meaningful relationships between treatment adherence and quality of life among individuals receiving maintenance hemodialysis (Sugiarto et al., 2024). Evidence-based nursing and nutritional management requires ongoing education, symptom monitoring, motivational support, and adaptation of recommendations to the patient's individual circumstances rather than reliance on standardized instructions alone (Rosdiana et al., 2025). From a broader etiological perspective, CKD develops within a heterogeneous adult population with multiple underlying risk factors, reinforcing the need to recognize diversity in patient trajectories before and during renal replacement therapy (Arriyani & Wahyono, 2023). Quantitative investigation of such clinical relationships requires clearly defined populations, samples, measurements, and analytical procedures so that observed associations can be interpreted systematically rather than inferred from isolated clinical impressions (Candra Susanto et al., 2024; Heryana, 2025). The scientific urgency therefore lies in identifying readily observable patient characteristics that can assist nurses in recognizing adherence vulnerability and tailoring fluid-management counseling without reducing a complex behavioral outcome to a single explanatory factor.

Against this background, the present study positions duration of hemodialysis and employment status as two clinically accessible characteristics that may capture different dimensions of adaptation to long-term renal replacement therapy among patients with CKD at Harapan Anda General Hospital Tegal. The study evaluates 62 patients and examines fluid-restriction adherence using IDWG-related assessment, while distinguishing patients according to whether they are relatively new or longer-term recipients of hemodialysis and whether they are employed or not employed. The empirical premise is that treatment duration reflects accumulated exposure to dialysis routines and chronic self-management demands, whereas employment status reflects a social and activity context within which fluid-control behavior must be implemented. By examining these variables within the same patient population, the study seeks to determine whether differences in adherence are associated with treatment experience and everyday occupational circumstances rather than considering either factor in isolation. The primary objective is to analyze the relationship between duration of hemodialysis and fluid-restriction adherence and the relationship between employment status and fluid-restriction adherence among patients with CKD receiving hemodialysis at Harapan Anda General Hospital Tegal. The study contributes theoretically by framing adherence as an outcome situated at the intersection of treatment adaptation and social functioning, while methodologically providing patient-level quantitative evidence that can support more differentiated nursing assessment, education, and counseling for long-term fluid management.

RESEARCH METHODS

This study used empirical quantitative data and employed an analytical observational design with a cross-sectional approach to examine the relationship between duration of hemodialysis, employment status, and fluid-restriction adherence among patients with chronic kidney disease receiving hemodialysis at Harapan Anda General Hospital Tegal. The study population comprised patients with chronic kidney disease undergoing maintenance hemodialysis at the hospital, from whom

62 respondents were included according to predetermined research criteria. The inclusion criteria were patients diagnosed with chronic kidney disease, receiving hemodialysis at the study site, able to undergo body-weight assessment between dialysis sessions, and willing to participate, whereas patients whose clinical condition prevented completion of the required measurements were excluded from analysis. Cross-sectional designs are appropriate when the objective is to assess associations between patient characteristics and health-related outcomes at a defined point or period without manipulating exposure variables (Candra Susanto et al., 2024). Data collection included respondent characteristics, duration of hemodialysis, employment status, and measurements used to determine Interdialytic Weight Gain (IDWG), because IDWG is an important clinical indicator of fluid accumulation between consecutive hemodialysis sessions (Chris et al., 2024). The data-collection process followed structured quantitative procedures so that the observed variables could be classified consistently and analyzed systematically in relation to fluid-restriction adherence (Heryana, 2025).

Duration of hemodialysis and employment status were treated as the independent variables, while fluid-restriction adherence was the dependent variable and was determined using IDWG-based assessment, with higher interdialytic weight gain interpreted as reflecting greater fluid accumulation and poorer adherence to prescribed fluid restriction. The duration of hemodialysis was categorized into newer and longer-term treatment groups, while employment status was categorized as employed or unemployed, and adherence was classified according to the predefined IDWG criterion used in the study. IDWG has been widely used in hemodialysis research because it provides an objective reflection of fluid gain between sessions and is clinically relevant to the assessment of fluid-management behavior (Asumta et al., 2024). Descriptive analysis was first performed to summarize respondent characteristics, treatment duration, employment status, and fluid-restriction adherence, after which bivariate analysis was conducted using Fisher's Exact Test to evaluate associations between each independent variable and adherence because of the categorical structure of the data and the small expected cell counts. Fisher's Exact Test was interpreted using a significance level of 0.05, with p-values below this threshold considered statistically significant, consistent with the analytical objective of identifying associations rather than estimating causal effects. Ethical conduct included voluntary participation, confidentiality of respondent information, respect for autonomy, and use of the data solely for research purposes, while study participation was undertaken after informed consent in accordance with accepted standards for patient-based clinical research (Rosdiana et al., 2025).

RESULTS AND DISCUSSION

Demographic and Clinical Characteristics of Patients Undergoing Hemodialysis

The study included 62 patients with chronic kidney disease undergoing hemodialysis at Harapan Anda General Hospital Tegal, with demographic characteristics analyzed to provide a clinical context for subsequent assessment of fluid-restriction adherence. Age distribution showed that the largest group was the early elderly category aged 46–55 years, comprising 21 respondents or 33.9% of the sample. This was followed by late adulthood aged 36–45 years with 15 respondents (24.2%), while the late elderly and older-person groups each consisted of 10 respondents (16.1%). Only five respondents (8.1%) were in early adulthood and one respondent (1.6%) was in late adolescence, indicating that the study population was concentrated predominantly in middle-to-later adulthood. CKD prevalence and progression are strongly influenced by age-related physiological decline, cumulative exposure to chronic disease risk factors, and long-term comorbid conditions, making this age distribution clinically plausible within a hemodialysis population (Arriyani & Wahyono, 2023). The predominance of older age groups also implies that treatment adherence may be shaped not only by clinical recommendations but by functional capacity, symptom burden, family support, and the cumulative demands of chronic disease management.

The gender distribution showed that 37 respondents (59.7%) were male and 25 respondents (40.3%) were female, indicating a modest predominance of male patients in the sample. This composition provides descriptive information about the population receiving hemodialysis at the study site but should not be interpreted as evidence that gender independently determines fluid-restriction adherence. Differences in CKD burden between men and women may reflect biological, behavioral, and healthcare-related pathways, while adherence behavior itself is more likely to emerge from a combination of clinical and psychosocial influences. Chronic kidney disease often develops alongside hypertension, diabetes, and other long-term health conditions that accumulate over time and eventually

contribute to renal function decline (Hinkle & Cheever, 2021). Gender may also interact with work status, family responsibilities, health-seeking behavior, and social support, all of which can influence how patients organize fluid intake and adapt to repeated dialysis schedules. Within this dataset, gender therefore serves primarily as a contextual variable that helps characterize the sample before the main relationships involving hemodialysis duration, employment status, and adherence are examined.

Marital status was dominated by married respondents, with 52 patients (83.9%) reporting that they were married. Four respondents (6.5%) were unmarried, another four (6.5%) were widowed, and two respondents (3.2%) were widowers. This distribution suggests that most participants lived within a family structure in which spouses or other household members could potentially contribute to treatment support, dietary regulation, transportation, and daily care. Family and social support are often relevant in long-term hemodialysis because patients must maintain complex treatment routines that extend far beyond the dialysis unit itself (Nurbadriyah et al., 2023). Marital status alone does not establish the quality or effectiveness of support received, but it can reflect the availability of close interpersonal resources that may facilitate adherence-related behaviors. The high proportion of married patients therefore provides an important social context for interpreting fluid-management behavior, particularly because adherence may be reinforced or undermined through household routines, shared meals, and family involvement in care.

Educational attainment also varied across the sample, although most respondents had completed senior high school. A total of 40 respondents (64.5%) were senior high school graduates, 14 respondents (22.6%) had completed higher education, and eight respondents (12.9%) had completed elementary school. These differences may influence how patients understand fluid restrictions, interpret medical advice, and apply self-management recommendations in daily life. Health literacy and comprehension are important in hemodialysis because patients must integrate information about fluid intake, sodium restriction, medications, symptoms, and interdialytic weight gain into repeated behavioral decisions. Evidence from adherence studies indicates that knowledge and self-efficacy are relevant factors in the successful management of fluid intake among patients undergoing hemodialysis (Mailani et al., 2023). The educational profile shown in Table 1 therefore provides a useful background for later interpretation, although the present analysis does not test education as an independent predictor.

As summarized in Table 1, the sample was characterized by a predominance of early elderly patients, male gender, married status, and senior high school education. These patterns indicate that the respondent population was not demographically homogeneous, but several categories were clearly more common than others. The age structure is especially important because 41 of the 62 respondents were aged 46 years or older, representing a substantial concentration in later adult life. This demographic profile is consistent with the broader burden of chronic disease and functional limitations frequently observed among patients receiving maintenance hemodialysis (Rafliyani et al., 2024). The composition of the sample also suggests that fluid-restriction adherence should be interpreted within the interaction of age, household context, educational background, and treatment burden rather than as a purely individual behavioral choice. These characteristics provide the baseline population context for understanding the distributions of hemodialysis duration, employment status, and adherence reported in the following section.

Table 1. Frequency Distribution of Characteristics of Patients with Chronic Kidney Disease Undergoing Hemodialysis at Harapan Anda General Hospital Tegal in 2026

Respondent Characteristics	Frequency (n)	Percentage (%)
Age		
Late Adolescence (17–25 years)	1	1.6
Early Adulthood (26–35 years)	5	8.1
Late Adulthood (36–45 years)	15	24.2
Early Elderly (46–55 years)	21	33.9
Late Elderly (56–65 years)	10	16.1
Older Persons (>65 years)	10	16.1
Gender		
Male	37	59.7

Female	25	40.3
Marital Status		
Married	52	83.9
Unmarried	4	6.5
Widow	4	6.5
Widower	2	3.2
Educational Attainment		
Elementary School	8	12.9
Senior High School	40	64.5
Higher Education	14	22.6
Total	**62**	**100**

The demographic findings also have implications for nursing assessment because patient education and adherence support should be adapted to the functional and social characteristics of the population receiving treatment. Older patients may face greater symptom burden or dependence, while working-age adults may experience competing occupational and family responsibilities that affect adherence routines. Patients with different educational backgrounds may also require variation in the way fluid-management information is communicated, reinforced, and monitored. Evidence-based management of CKD emphasizes individualized education and sustained support rather than one-time instruction, particularly because adherence must be maintained across repeated dialysis cycles (Rosdiana et al., 2025). The present demographic profile therefore supports a patient-centered approach in which clinical communication is matched to age, literacy, family context, and daily activity patterns. This interpretation provides a foundation for evaluating whether the observed differences in hemodialysis duration and employment status are associated with the likelihood of adhering to fluid restrictions.

Hemodialysis Duration, Employment Status, and Fluid-Restriction Adherence Profile

The distribution of hemodialysis duration showed that 34 of the 62 respondents (54.8%) were classified as having undergone hemodialysis for a long duration, whereas 28 respondents (45.2%) were classified as new to hemodialysis. The difference between these groups was relatively modest, with long-term patients exceeding new patients by six respondents, indicating that both stages of treatment experience were substantially represented in the sample. Duration of hemodialysis is clinically relevant because repeated exposure to dialysis can increase familiarity with treatment routines, dietary recommendations, fluid limits, and recognition of symptoms associated with fluid accumulation. Recent evidence indicates that duration of hemodialysis is related to patient adaptation and quality of life, although longer treatment exposure does not necessarily produce uniformly favorable outcomes (Amal et al., 2026). Prolonged therapy may simultaneously strengthen practical knowledge while increasing treatment burden, fatigue, and psychological saturation associated with repetitive disease management. This dual process is important for interpreting adherence because accumulated experience may facilitate self-management in some patients while sustained restrictions may become increasingly difficult to maintain in others.

Table 2. Frequency Distribution of Respondents by Duration of Hemodialysis

Duration of Hemodialysis	Frequency (n)	Percentage (%)
New	28	45.2
Long-term	34	54.8
Total	**62**	**100**

Table 2 demonstrates that long-term hemodialysis patients constituted the larger treatment-duration category, although the 54.8% versus 45.2% distribution indicates that the sample was not heavily concentrated in one category. This relatively balanced composition is analytically useful because the subsequent association analysis compares adherence between 28 new and 34 long-term hemodialysis patients rather than between markedly unequal groups. Previous research has identified

an association between duration of hemodialysis and adherence to fluid-related dietary restrictions, suggesting that treatment exposure may influence how patients incorporate restrictions into everyday behavior (Senja et al., 2024). Similar evidence specifically examining fluid-restriction compliance has supported the relevance of hemodialysis duration as a treatment-related characteristic requiring attention in adherence assessment (Setiawati & Lalu, 2024). Long-term dialysis should nevertheless not be interpreted as an automatic indicator of behavioral mastery because the cumulative burden of repeated treatment can coexist with adaptation. The observed distribution consequently provides an appropriate empirical basis for testing whether the duration categories differ in fluid-restriction adherence within this hospital population.

Employment status presented a similarly balanced distribution, although respondents who were not working formed the larger group. Among the 62 patients, 33 respondents (53.2%) were unemployed and 29 respondents (46.8%) remained employed, producing a difference of only four patients between the categories. Employment among patients receiving maintenance hemodialysis is clinically meaningful because regular dialysis schedules, disease-related symptoms, fatigue, and functional limitations can interfere with the capacity to sustain occupational activities. Fatigue is frequently experienced by patients undergoing hemodialysis and may affect physical functioning and participation in daily activities (Santoso et al., 2022). Employment status may also represent more than economic activity because remaining employed can reflect functional capacity, structured routines, independence, social participation, and motivation to preserve health. Conversely, unemployment cannot be interpreted as a direct marker of poor self-management because retirement, disease severity, age, occupational conditions, and family circumstances may independently determine whether a patient continues working.

Table 3. Frequency Distribution of Respondents by Employment Status

Employment Status	Frequency (n)	Percentage (%)
Employed	29	46.8
Unemployed	33	53.2
Total	**62**	**100**

As presented in Table 3, nearly half of the sample remained employed despite undergoing regular hemodialysis, while slightly more than half were unemployed. The difference of 6.4 percentage points between employed and unemployed patients indicates substantial representation of both occupational conditions and provides a meaningful basis for the subsequent bivariate comparison. Studies of patients undergoing hemodialysis have shown that quality of life and functional status are influenced by interacting demographic, clinical, and social factors, making employment an important contextual characteristic rather than an isolated socioeconomic variable (Nurbadriyah et al., 2023). Symptom burden can similarly affect patients' ability to perform daily and occupational roles, which complicates interpretation of the direction between health status and employment (Pradhita, 2024). Patients who remain employed may benefit from structured daily routines and a stronger incentive to preserve functional health, but occupational demands can also create challenges for fluid restriction through physical activity, thirst, work schedules, and access to beverages. The relationship between employment and adherence therefore requires direct empirical analysis rather than an assumption that either employed or unemployed patients will inherently manage fluid intake more effectively.

Fluid-restriction adherence showed a more pronounced distribution than either hemodialysis duration or employment status. Table 4 records 52 of the 62 respondents (83.7%) as adherent and 10 respondents (16.3%) as non-adherent, indicating that adherence predominated within the study population. Fluid restriction remains a central component of hemodialysis self-management because impaired renal excretion increases susceptibility to interdialytic fluid accumulation, and IDWG provides a clinically useful indicator for monitoring this process (Chris et al., 2024). High adherence at the group level does not eliminate clinical concern because the 10 non-adherent patients still represent a subgroup potentially exposed to greater fluid-management difficulties and related complications. Research on hemodialysis populations demonstrates that non-adherence can be influenced by multiple factors, including thirst, knowledge, self-efficacy, treatment demands, and psychosocial circumstances (Asumta et al., 2024). The distribution should consequently be interpreted as evidence of generally

favorable adherence alongside a clinically relevant minority requiring more intensive assessment and support.

Table 4. Frequency Distribution of Respondents by Fluid-Restriction Adherence

Fluid-Restriction Adherence	Frequency (n)	Percentage (%)
Adherent	52	83.7
Non-adherent	10	16.3
Total	**62**	**100**

The pattern presented in Table 4 also emphasizes that adherence is a behavioral outcome embedded in the everyday experience of living with hemodialysis rather than simply a consequence of receiving clinical instructions. Patients must repeatedly control drinking behavior between treatment sessions despite thirst, habitual intake, social situations, and the physical and psychological burden associated with chronic therapy. Qualitative evidence indicates that patients with end-stage kidney disease encounter continuing practical and emotional challenges when attempting to sustain dietary and fluid restrictions in everyday life (Liao et al., 2026). Self-efficacy is another relevant determinant because confidence in the ability to regulate fluid consumption can influence whether knowledge is successfully translated into consistent behavior (Mailani et al., 2023). The coexistence of an 83.7% adherence proportion with a 16.3% non-adherence proportion therefore supports individualized assessment rather than uniform education for every patient. Clinically, the distribution provides the outcome framework required to determine whether treatment duration and employment status distinguish patients with different probabilities of adherence.

Taken together, Tables 2–4 show that the study population contained relatively balanced distributions of hemodialysis duration and employment status but a substantially higher proportion of patients classified as adherent to fluid restriction. Specifically, 54.8% were long-term hemodialysis patients, 53.2% were unemployed, and 83.7% were classified as adherent, demonstrating that predominance in one exposure category did not correspond directly to predominance in non-adherence. Contemporary studies characterize fluid-restriction adherence as a multidimensional behavior influenced by clinical experience, self-management capability, social circumstances, and treatment-related burden rather than by a single patient characteristic (Yulianti & Tresnawan, 2025). Evidence also suggests that adherence is intertwined with quality of life, making sustained fluid management relevant not only to physiological stability but also to broader patient outcomes during maintenance hemodialysis (Sugiarto et al., 2024). These univariate distributions cannot establish whether long-term treatment or unemployment is associated with poorer adherence because such interpretation requires direct cross-tabulation and inferential testing. The subsequent analyses therefore examine the observed adherence proportions within each hemodialysis-duration and employment-status category while preserving the cross-sectional nature of the evidence.

Association Between Hemodialysis Duration and Fluid-Restriction Adherence

The bivariate analysis identified a clear difference in fluid-restriction adherence according to the duration of hemodialysis among the 62 patients studied. Among 28 respondents classified as new to hemodialysis, 27 patients (96.4%) were adherent to fluid restriction, whereas only one patient (3.6%) was classified as non-adherent. In comparison, among 34 respondents in the long-term hemodialysis group, 25 patients (73.5%) were adherent and nine patients (26.5%) were non-adherent. The proportion of non-adherence was consequently greater among long-term patients than among patients who had more recently initiated hemodialysis, despite the expectation that greater treatment experience might facilitate adaptation to fluid-management recommendations. Previous research has similarly demonstrated that duration of hemodialysis is associated with adherence to fluid-related dietary restrictions, although adherence patterns may change as patients accumulate treatment experience (Senja et al., 2024). This finding indicates that treatment duration should be considered as a potentially relevant characteristic in clinical adherence assessment rather than being interpreted merely as a chronological description of dialysis exposure.

The relationship is presented quantitatively in Table 5, which demonstrates that the difference between duration groups was not limited to their overall sample sizes but was particularly apparent in

the distribution of non-adherence. The long-term group contained nine of the 10 non-adherent patients identified in the study, while only one non-adherent patient belonged to the new hemodialysis group. Fisher's Exact Test produced a p-value of 0.024, which was below the predetermined significance level of 0.05 and indicated a statistically significant association between duration of hemodialysis and fluid-restriction adherence. This result is consistent with previous evidence identifying a significant relationship between hemodialysis duration and compliance with fluid restrictions among patients with CKD (Setiawati & Lalu, 2024). Statistical significance should nevertheless be interpreted as evidence of association rather than causation because the cross-sectional design measures exposure and outcome within the same observational framework. The finding therefore supports the relevance of treatment duration to adherence patterns while leaving the temporal and behavioral mechanisms underlying the association open to further investigation.

Table 5. Association Between Duration of Hemodialysis and Fluid-Restriction Adherence Among Patients with Chronic Kidney Disease at Harapan Anda General Hospital Tegal (n = 62)

Duration of Hemodialysis	Adherent n (%)	Non-adherent n (%)	Total n (%)	P value
New	27 (96.4%)	1 (3.6%)	28 (100%)	0.024
Long-term	25 (73.5%)	9 (26.5%)	34 (100%)	
Total	**52 (83.9%)**	**10 (16.1%)**	**62 (100%)**	

The pattern in Table 5 challenges a simple linear assumption that longer exposure to hemodialysis necessarily improves adherence through greater knowledge and familiarity with treatment recommendations. Patients who remain in treatment for extended periods can acquire considerable practical experience regarding dialysis schedules, fluid limitations, IDWG monitoring, dietary management, and symptoms of fluid overload, but accumulated knowledge does not guarantee sustained behavioral adherence. Research linking hemodialysis duration with quality of life indicates that prolonged therapy represents a complex adaptation process in which increasing familiarity with treatment coexists with persistent physical and psychosocial demands (Putri et al., 2024). Long-term exposure may normalize dialysis routines, but repeated restrictions can also reduce the perceived novelty and urgency of recommendations that were followed more carefully during earlier phases of treatment. This interpretation is compatible with the present finding that adherence remained high at 73.5% among long-term patients but was appreciably lower than the 96.4% observed among newer patients. The data therefore suggest that accumulated treatment experience alone may be insufficient to maintain consistently high fluid-restriction adherence over the course of chronic hemodialysis.

A plausible behavioral explanation involves the cumulative burden of maintaining restrictive self-care practices over prolonged periods, particularly when patients must repeatedly manage thirst and fluid intake between dialysis sessions. Fluid restriction is not a one-time therapeutic task but a recurring daily behavior that must be maintained despite physiological thirst, social eating and drinking practices, habitual consumption, and changing psychological responses to chronic illness. Patients undergoing hemodialysis have reported substantial practical and experiential difficulties in maintaining dietary and fluid restrictions, illustrating why knowledge of recommended limits may not translate automatically into sustained adherence (Liao et al., 2026). Thirst is particularly relevant because it creates a direct physiological challenge to fluid control and can persist regardless of how long a patient has been receiving dialysis (Esti et al., 2022). Repeated exposure to these demands may contribute to behavioral fatigue or declining motivation in some long-term patients, even when they understand the clinical consequences of excessive fluid accumulation. The greater proportion of non-adherence observed in the long-term group can consequently be interpreted as a potential manifestation of accumulated self-management burden, although treatment fatigue itself was not measured and cannot be confirmed from the present data.

The clinical importance of this association becomes clearer when fluid adherence is considered in relation to interdialytic fluid accumulation rather than solely as a behavioral classification. Excessive IDWG can reflect inadequate fluid control between dialysis sessions and is clinically relevant because greater fluid accumulation can complicate volume management during subsequent treatment (Chris et al., 2024). Studies examining determinants of fluid-restriction adherence have also demonstrated that

adherence emerges from interacting patient-related and treatment-related factors, making duration of dialysis one element within a broader behavioral system rather than an independent explanation for non-adherence (Darmawati et al., 2025). Self-efficacy may further modify this relationship because patients who remain confident in their ability to control fluid intake may sustain adherence despite prolonged exposure to treatment demands. Evidence among patients with CKD undergoing hemodialysis supports an association between self-efficacy and compliance with fluid-intake restrictions, emphasizing the importance of psychological capacity alongside clinical experience (Mailani et al., 2023). For nursing practice, these observations suggest that long-term patients should not receive less adherence support merely because they are already familiar with dialysis procedures. Periodic reassessment of IDWG patterns, perceived barriers, thirst management, motivation, and understanding of fluid restrictions remains clinically relevant throughout the course of maintenance hemodialysis.

The statistically significant association observed in this study ultimately indicates that duration of hemodialysis is relevant to the distribution of fluid-restriction adherence within the studied population, but its interpretation requires recognition of the limitations inherent in observational cross-sectional evidence. The markedly higher adherence proportion among newer patients may reflect stronger initial motivation, closer attention to recently received education, differences in disease burden, or other characteristics that were not included in the bivariate analysis. Contemporary evidence similarly portrays adherence among patients undergoing hemodialysis as a multidimensional outcome influenced by several determinants rather than by treatment duration in isolation (Trisnaningtyas et al., 2026). Long-term hemodialysis is also associated with broader changes in quality of life and adaptation, reinforcing the possibility that the behavioral effects of treatment duration operate through interconnected physical, psychological, and social pathways (Amal et al., 2026). The present analysis cannot establish whether longer treatment caused lower adherence, nor can it exclude confounding by age, employment, education, family support, disease severity, self-efficacy, or other unmeasured factors. Its principal contribution lies in identifying a clinically meaningful adherence disparity that supports continued monitoring and individualized fluid-management education across different stages of long-term hemodialysis rather than assuming that treatment experience alone ensures sustained adherence.

Association Between Employment Status and Fluid-Restriction Adherence and Nursing Implications

The bivariate analysis demonstrated a distinct pattern of fluid-restriction adherence according to employment status among patients undergoing hemodialysis at Harapan Anda General Hospital Tegal. Of the 29 respondents who were employed, 28 patients (96.6%) were adherent to fluid restriction and only one patient (3.4%) was classified as non-adherent. Among the 33 unemployed respondents, 24 patients (72.7%) were adherent, whereas nine patients (27.3%) were non-adherent. The substantially higher proportion of adherence among employed patients indicates that employment status was associated with differences in fluid-management behavior within the study population. Employment may represent a broader dimension of functional independence, socioeconomic resources, structured daily routines, and social participation rather than functioning solely as a demographic characteristic. Research among Indonesian patients undergoing hemodialysis has similarly shown that social and functional characteristics are relevant to patient outcomes, although their effects occur within a complex interaction of clinical and individual factors (Nurbadriyah et al., 2023).

The statistical results presented in Table 6 support the observed difference between the two employment groups. The initial Chi-square analysis yielded a p-value of 0.011, but one cell had an expected count below five, making Fisher's Exact Test more appropriate for inferential interpretation under the observed contingency-table structure. Fisher's Exact Test produced a p-value of 0.015, which remained below the significance threshold of 0.05 and confirmed a statistically significant association between employment status and fluid-restriction adherence. This pattern is compatible with contemporary evidence indicating that fluid-restriction adherence among hemodialysis patients is determined by interacting demographic, behavioral, and contextual characteristics rather than clinical knowledge alone (Yulianti & Tresnawan, 2025). The finding does not establish that employment itself produces better adherence because the cross-sectional design cannot determine temporal direction or separate employment from related differences in health and functional capacity. Employment status

should consequently be interpreted as a clinically informative correlate of adherence within this sample rather than as an independent causal determinant.

Table 6. Association Between Employment Status and Fluid-Restriction Adherence Among Patients with Chronic Kidney Disease at Harapan Anda General Hospital Tegal (n = 62)

Employment Status	Adherent n (%)	Non-adherent n (%)	Total n (%)	P value
Employed	28 (96.6%)	1 (3.4%)	29 (100%)	0.015
Unemployed	24 (72.7%)	9 (27.3%)	33 (100%)	
Total	**52 (83.9%)**	**10 (16.1%)**	**62 (100%)**	

The pattern in Table 6 warrants a multidimensional interpretation because employment can simultaneously reflect physical capacity, psychological motivation, economic security, social engagement, and organization of everyday activities. Patients who are sufficiently well to continue working may retain greater functional capacity and structured routines, which could facilitate systematic medication use, attendance at dialysis sessions, and monitoring of fluid consumption. Conversely, unemployment among patients receiving hemodialysis may partly reflect greater disease or symptom burden rather than constitute the origin of poor adherence, creating the possibility of health-related selection into employment categories. Symptom burden among patients with CKD undergoing hemodialysis is closely connected with quality of life and daily functioning, supporting caution when interpreting occupational status independently of clinical condition (Pradhita, 2024). Fatigue is another relevant consideration because persistent fatigue can restrict productive activity while simultaneously reducing patients' capacity to sustain demanding self-management behaviors (Santoso et al., 2022). The higher non-adherence proportion among unemployed respondents may therefore reflect a combination of social, functional, and disease-related conditions that were not independently measured in the present analysis. This interpretation avoids treating unemployment as a behavioral deficiency and instead recognizes it as a potential marker of broader vulnerability requiring more detailed clinical assessment.

Fluid-restriction adherence also depends on psychological and behavioral resources that cannot be inferred directly from whether a patient is employed. Patients must regulate intake repeatedly in the presence of thirst, habits, family routines, emotional responses to chronic illness, and social situations in which drinking behavior may be difficult to control. Previous research has identified multiple factors associated with dietary and fluid-restriction adherence, supporting a model in which adherence emerges from interactions between individual capacity and the patient's surrounding environment (Safitri et al., 2023). Non-adherence among patients undergoing hemodialysis has likewise been associated with several influencing factors, demonstrating that a single demographic characteristic cannot adequately explain fluid-management behavior (Asumta et al., 2024). The present finding that nine of the 10 non-adherent respondents were unemployed identifies an important concentration of non-adherence within this group, but it cannot establish whether unemployment preceded or followed deterioration in health and self-management capacity. Unmeasured factors such as income, occupational type, retirement status, family support, depressive symptoms, disease severity, self-efficacy, and health literacy could plausibly influence both employment status and adherence. Future multivariable analyses would therefore be required to determine whether employment remains independently associated with fluid restriction after adjustment for these potential confounding factors.

From a nursing perspective, the associations involving employment status and hemodialysis duration indicate that fluid-management education should be responsive to the patient's treatment experience and everyday circumstances rather than delivered as a uniform intervention. Evidence-based management of CKD emphasizes continuing nursing and nutritional support because effective fluid control requires repeated assessment, education, and reinforcement throughout long-term therapy (Rosdiana et al., 2025). For employed patients, counseling may need to address strategies for controlling fluid intake during working hours, managing thirst during physical activity, maintaining dialysis schedules, and adapting recommendations to workplace routines. Unemployed patients may require assessment of the factors underlying their employment status, particularly functional limitations, symptom burden, dependence on family members, reduced social engagement, or motivational difficulties that could interfere with self-management. Education should also incorporate objective monitoring of IDWG because excessive interdialytic weight gain can provide clinically meaningful

evidence of difficulties in maintaining prescribed fluid limits (Chris et al., 2024). Family participation can strengthen daily monitoring and support, while individualized counseling can help identify barriers that may not become apparent through routine instructions alone. Nursing assessment should consequently use employment and treatment duration as signals for deeper evaluation rather than as labels that predetermine whether a patient is expected to adhere.

The findings must finally be interpreted within the methodological boundaries of a single-center cross-sectional study involving 62 respondents. Although Fisher's Exact Test demonstrated statistically significant associations for employment status and, as reported previously, duration of hemodialysis, the design cannot establish temporal sequence or demonstrate that either characteristic caused differences in fluid-restriction adherence. Quantitative cross-sectional analysis is appropriate for identifying associations within a defined population, but causal inference requires stronger longitudinal or experimental evidence and adequate control of confounding variables (Candra Susanto et al., 2024). The study also did not simultaneously model other potentially relevant determinants, including self-efficacy, family support, thirst intensity, knowledge, psychological status, disease severity, comorbidities, socioeconomic conditions, and the quality or frequency of previous education. Recent evidence indicates that adherence and quality of life among patients receiving hemodialysis arise from multiple interacting determinants, highlighting the importance of broader explanatory models in future research (Trisnaningtyas et al., 2026). Larger multicenter studies using longitudinal designs and multivariable regression would provide stronger evidence regarding whether employment status and duration of hemodialysis retain independent associations with adherence after relevant clinical and psychosocial factors are controlled. Within these limitations, the present results provide clinically useful evidence for risk-oriented nursing assessment and support individualized, continuous fluid-management interventions for patients undergoing maintenance hemodialysis.

CONCLUSION

This study involving 62 patients with chronic kidney disease undergoing hemodialysis at Harapan Anda General Hospital Tegal demonstrated that fluid-restriction adherence was generally high, with 52 respondents (83.9%) classified as adherent and 10 respondents (16.1%) as non-adherent. Among the 28 patients classified as new to hemodialysis, 27 respondents (96.4%) were adherent and one respondent (3.6%) was non-adherent. In contrast, among the 34 patients who had undergone long-term hemodialysis, 25 respondents (73.5%) were adherent and nine respondents (26.5%) were non-adherent. Fisher's Exact Test yielded a p-value of 0.024 ($p < 0.05$), indicating a statistically significant association between duration of hemodialysis and fluid-restriction adherence. The lower proportion of adherence among long-term patients suggests that greater treatment experience does not necessarily correspond to more consistent fluid-management behavior. Prolonged exposure to hemodialysis may coexist with cumulative treatment burden and challenges in maintaining restrictive self-management practices over time, although these mechanisms were not directly measured in this study. These findings support continued assessment and reinforcement of fluid-management behavior throughout the course of hemodialysis rather than concentrating adherence education only during the early phase of treatment.

Employment status was also significantly associated with fluid-restriction adherence, with 28 of 29 employed respondents (96.6%) classified as adherent and one respondent (3.4%) as non-adherent. Among the 33 unemployed respondents, 24 patients (72.7%) were adherent, whereas nine patients (27.3%) were non-adherent. Fisher's Exact Test produced a p-value of 0.015 ($p < 0.05$), demonstrating a statistically significant association between employment status and fluid-restriction adherence in the study population. The higher adherence observed among employed patients should not be interpreted as evidence that employment directly causes better adherence because occupational status may reflect differences in functional capacity, socioeconomic circumstances, daily routines, health status, and other unmeasured factors. Taken together, the findings establish statistically significant associations of both hemodialysis duration and employment status with fluid-restriction adherence among patients with chronic kidney disease at Harapan Anda General Hospital Tegal. Nursing management should incorporate treatment duration and employment circumstances into individualized assessment, continuous education, IDWG monitoring, motivational reinforcement, and identification of barriers to fluid management, particularly among long-term hemodialysis patients and those who are not working. Future multicenter and longitudinal studies with larger samples and adjustment for potential

confounding variables are needed to clarify the independent contribution of these factors and strengthen the evidence for targeted fluid-management interventions.

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