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Patient Factors Associated with Adherence to Haemodialysis Therapy Among Patients with End-Stage Renal Disease at Renal Dialysis Centres in Gaborone, Botswana

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Abstract

The study sought to determine the patient factors associated with adherence to haemodialysis therapy among patients with end-stage renal disease (ESRD) at renal dialysis centres in Gaborone, Botswana. The study used a descriptive analytical design. The study population comprised 191 patients with ESRD identified from patient registers, from whom a sample of 143 participants was determined using Yamane's formula. The study collected data using a modified ESRD Adherence Questionnaire (ESRD-AQ). Descriptive statistics assessed adherence levels, while logistic regression identified patient factors associated with adherence. We assessed statistical significance at the 95% confidence level ($p < 0.05$). The findings showed high adherence to hemodialysis therapy, with 74.6% of participants demonstrating strong adherence. Adherence was significantly associated with age, gender, marital status, and educational attainment. Gender and educational level emerged as significant predictors of adherence. Female patients had significantly lower odds of adherence compared with male patients (OR = 0.32, 95% CI: 0.13–0.79, $p = 0.013$). Although age was not a statistically significant predictor, patients aged 45 years and above had nearly twice the odds of adherence compared with those younger than 45 years (OR = 1.95, 95% CI: 0.72–5.24, $p = 0.187$). The study concludes that patient-related characteristics, particularly gender and educational attainment, play an important role in adherence to haemodialysis therapy. Continuous health education and regular counselling are recommended to improve patients' understanding of disease management and self-care practices. Dialysis units should also strengthen routine adherence monitoring by tracking attendance, shortened sessions, reasons for non-adherence, and incorporating adherence reports into monthly clinical reviews.

Keywords: *Patient factors, haemodialysis therapy, level of adherence, End-Stage Renal Disease*

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1. Introduction

Renal Disease is among the top 10 causes of death worldwide and is projected to rise to the top 5 by 2040 (Owokuhaisa et al., 2024). Its prevalence across Sub-Saharan Africa is projected at 13.9% (Owokuhaisa et al., 2024), while Rwegerera et al. (2017) reported a prevalence of 13.5% in Botswana. End-stage renal disease (ESRD) represents a major global public health challenge, affecting over 2 million individuals worldwide (Mukakarangwa et al., 2020), with projections indicating that more than 70% of cases will occur in Sub-Saharan Africa by 2030 (Somji et al., 2020). In contrast, Gebrie et al. (2023) noted that inadequate implementation of registration systems has limited knowledge of the true burden of ESRD in the region.

ESRD requires the need for kidney transplantation or dialysis (Halle, et al., 2020). Approximately 89% of patients worldwide are treated with hemodialysis to improve survival (Sousa et al., 2023), and strict adherence to hemodialysis therapy is essential. Despite this, evidence highlights inadequate commitment to hemodialysis therapy as a major problem worldwide, with estimates ranging from 8.5% to 22.1% (Dsouza et al., 2023; Idilbi et al., 2022). A rise in statistics of the disease, death, expenditures, and increased workload on the medical system is associated with inadequate adherence to haemodialysis therapy (Al Atawi & Alaamri, 2022). This makes poor adherence an important issue to address. Studies have shown that 8-31% of ESRD clients either withhold or terminate their hemodialysis treatment, whereas 30-86% do not appear for their prescribed sessions (Dsousa et al., 2023), and this results in increased hospitalization rates and mortality rates.

Globally, studies have been conducted among ESRD clients and evidence revealed that ESRD patients do not adhere to haemodialysis therapy. For instance, Alzahrani and Al-Khattabi (2021) reported a 44% non-adherence rate in Saudi Arabia, while Shrestha et al. (2020) documented a 37% non-adherence rate in Nepal. Few studies have been done in Africa. Research in Cameroon reported that 21.2% of patients failed to adhere to hemodialysis therapy (Halle et al., 2020), while in Kenya, Kilonzo et al. (2021) reported a lower adherence rate of 11.11%.

Currently, there are limited studies done in Southern Africa; the only study accessible was done in Zimbabwe in 2014 by Chironda et al. 2014). Haemodialysis treatment adherence in Botswana remains largely unknown despite the increasing prevalence of diabetes and hypertension, which are the primary contributors to chronic kidney disease. On the contrary, CKD, unspecified is the second primary cause of inpatient mortality, accounting for 4.7% of deaths, (Statistics Botswana, 2023). Hemodialysis treatment is outsourced to various private centers in Botswana, and the costs are being covered by the government, but some still fail to adhere to their hemodialysis therapy. This highlights that many factors influence patients' adherence to hemodialysis therapy. Mohamedi and Mosha (2022) mentioned that additional research is required to discover further determinants that have an impact on adherence to hemodialysis. Therefore, this research aims to examine all potential determinants likely to impact adherence behavior to improve clinical outcomes for patients on dialysis.

1.1 Problem Statement

Haemodialysis is a widespread modality used to sustain life among ESRD patients in Gaborone. The proportion of haemodialysis patients in Gaborone is 48.6 % (266/547) (Ministry of Health, 2024). Haemodialysis needs a strict level of follow- up to the recommended treatment for sufficient dialysis and better outcomes (Kilonzo et al., 2021). Despite this, informal observation and clinical experience suggest inadequate adherence to haemodialysis treatment amongst ESRD patients in Gaborone. Lack of adherence increases hospitalization rates (Arad et al., 2021). The number of patients admitted in medical wards with ESRD was 588 out of 3522 admissions (16.7%) of all causes of morbidity (Annual Report, 2023) at Princess Marina Hospital (PMH). Data derived from the patient's admission and discharge register book showed monthly statistics of a number of hemodialysis patients admitted with other prevailing complications such as uremia, catheter-related sepsis, and catheter obstruction to be 11.8% (81/684) from June 2023 to December 2023 and 14.9% (89/596) from January 2024 to June 2024. Deaths recorded amongst these admitted patients with ESRD from January 2024 to June 2024 were 11% (6/51).

This data may reflect national statistics, since this facility serves as the main public referral hospital in the country and all patients on hemodialysis are admitted in medical wards. In spite of the significance of adherence to haemodialysis treatment, there are limited studies in Botswana on haemodialysis patients. This highlights a knowledge gap in understanding adherence among ESRD patients, as the literature indicates that poor adherence increases hospitalization (Sultan et al., 2022). Therefore, this research aims to determine adherence to hemodialysis therapy among ESRD patients in Renal Dialysis Centers in Gaborone, Botswana. This requires Health Care providers to be cognizant of factors that contribute to non-adherence in order to deliver effective care to these patients.

1.2 Objectives of the Study

i. To assess the level of adherence to haemodialysis therapy among patients with ESRD at Renal Dialysis Centres in Gaborone
ii. To determine patient factors associated with adherence to haemodialysis therapy among patients with ESRD at Renal Dialysis Centres in Gaborone.

2. Literature Review

2.1 Adherence to haemodialysis

The duration of haemodialysis is usually 4- 5 hours, twice or three times a week, depending on the doctor's prescription (Kilonzo et al., 2021). Inadequate adherence to haemodialysis session is described as failure to attend one or multiple dialysis sessions within a month, or reducing the haemodialysis sessions by ≥ 10 minutes, (Varghese, 2021). Idilbi et al. (2022) reported that the average reduction in haemodialysis session length among clients was 20 minutes. Halle et al. (2020) reported that non-adherence to hemodialysis sessions differs by 0.6%, defined as shortening sessions by 10 minutes or more. This can rise to 55.9% when defined as missing one or more sessions in the previous month.

Research carried out at Kenyatta National Hospital among haemodialysis clients showed that 47.4% were adherent to haemodialysis treatment (Choge, 2020). Another study by Chege (2022) showed adherence to haemodialysis to be 53%. Variation on the level of adherence could be a result of quality haemodialysis services being delivered in the facility.

Several factors are associated with missed, rescheduled, or shortened haemodialysis sessions, including socio-economic factors, patient disease, as well as factors related to the healthcare system (Kilonzo et al., 2021).

2.2 Patient factors linked with adherence to haemodialysis therapy

2.2.1 Age

A range of patient-related factors affect commitment to haemodialysis, with age being a prominent one. Research has indicated that age plays a significant role in determining compliance with haemodialysis schedules. Older patients tend to follow their prescribed treatment regimens more consistently than younger patients, who may struggle to adhere due to work responsibilities and other commitments. In contrast, older individuals often adhere more strictly because they are more aware of the seriousness of their condition. For instance, a study done by Varghese (2021) demonstrated that patients over 60 years of age exhibited higher adherence to haemodialysis compared to younger individuals. Patients in the younger age group might consider themselves to be in better health, whereas elderly patients, being more conscious of mortality, are more likely to follow their prescribed therapy (Chege, 2022).

2.2.2 Gender

Gender also significantly impacts attendance to haemodialysis. A study conducted in Al- Ahsa, Saudi Arabia, showed that female haemodialysis patients were considerably more likely to maintain good adherence compared to their male colleagues (Alhamad, et al., 2023). Women also tend to report a higher burden of symptoms such as muscle cramps, which may shape how they perceive and engage with treatment. Conversely, men may face additional barriers such as work demands or low health-seeking behaviour that can negatively affect their attendance. Similarly, a cross-sectional study conducted in Morocco reported male gender as a predictor of low overall adherence (Mazzi et al., 2025).

2.2.3 Level of education

Greater educational attainment is frequently linked to greater health literacy, which can improve understanding and is essential for effective self-management and patient outcomes. Dsouza et al. (2023) found that patient understanding of the condition and treatment is linked to better adherence. Notably, a different study by Alhamad et al. (2023) found lower education attainment was linked to better adherence in some cases.

2.2.4 Marital status and support

Research indicates that married individuals tend to show better adherence, suggesting that marriage provides emotional support, which is crucial for managing chronic conditions. A study conducted in Saudi Arabia among ESRD patients showed that strong support from family members, friends, and peers contributes to greater compliance with haemodialysis regimens (Alhamad et al., 2023). Similarly, research in Tanzania by Mohamedi and Mosha (2022) found that marital status is associated with good adherence, highlighting the potential role of a family

support system. Social support improves an individual's psychological well-being, which in turn promotes adherence, as ESRD clients often feel loved and appreciated.

2.2.5 Existence of Comorbidity

The presence of other comorbidities that require numerous medications, the multifaceted nature of ESRD, and the increased burdens and adverse effects of hemodialysis procedures make it difficult to manage ESRD clients (Mukakarangwa et al., 2020). Studies have shown that 71% of ESRD patients on haemodialysis treatment are on numerous treatments as a result of CKD. Hypertension and diabetes are predominantly found among ESRD patients. This underscores the critical need for effective measures to prevent and manage these health issues to reduce the incidence of ESRD. Chege (2022) noted that side effects of medications used to manage comorbidities, such as nausea, vomiting, and headache, are often aggravated during dialysis, which can lead to early termination and shorter sessions.

3. Materials and Methods

A descriptive analytical study was conducted to evaluate adherence to haemodialysis therapy among individuals with ESRD. The study included 191 ESRD patients in Gaborone, and Table 3.1 summarizes the data derived from the patient register. The actual sample size was 143, calculated using Yamane's formula. A modified and adapted questionnaire based on the elements of the ESRD Adherence Questionnaire (ESRD-AQ), was developed and employed in this research. The research instrument was reviewed for completeness before data entry, and the data were examined using SPSS version 28. Frequencies and percentages were computed for descriptive statistics, while inferential statistics were conducted using the chi-square test to test for linkage among variables. Fisher's exact test was used for variables with lower frequencies. Determinants of adherence to haemodialysis treatment were examined through logistic regression analysis. A p-value of <0.05 and a 95% confidence level were used.

4. Results

4.1 Participants characteristics

The findings showed that a large proportion of the participants were male, 85(63.4%), with most of them falling within the 46-64 age range, 58(43.3%). Regarding educational background, 52 (38.8%) participants reported completing secondary school (junior/senior), and nearly half of respondents were married, 65 (48.5%). In addition, 104(77.6%) participants reported having other chronic illnesses, with hypertension being the most common, affecting 69(51.49%) individuals. Nearly all respondents (131, 97.8%) stated that they did not belong to any health social group, and 89 (66.4%) typically attended the dialysis center unaccompanied.

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Table 1: Characteristics of ESRD patients (N=134)

Characteristic	Categories	Frequency	Percentage (%)
Gender	Male	85	63.4
	Female	49	36.6
Age group (years)	18–25	3	2.2
	26–45	35	26.1
	46–64	58	43.3
	65+	38	28.4
Education Level	Non-formal	13	9.7
	Primary	30	22.4
	Secondary (Junior/Senior)	52	38.8
	Tertiary	39	29.1
Marital Status	Married	65	48.5
	Never married	58	43.3
	Living together	2	1.5
	Divorced	3	2.2
	Widowed	6	4.5
Presence of Comorbidity	Yes	104	77.6
	No	30	22.4
Type of comorbidity	Hypertension	69	51.49
	Diabetes	22	16.42
	HIV	13	9.7
	Other	1	0.75
Accompanied to dialysis centre	Yes	45	33.6
	No	89	66.4
Belongs to a Health Social Group	Yes	3	2.2
	No	131	97.8

4.2 Patient characteristics linked to haemodialysis adherence among ESRD individuals

The results revealed a notable association between gender and compliance to therapy, with males demonstrating a higher adherence rate compared to females χ^2 (1) = 5.27, p = 0.022. Age was also a significant factor, with patients aged 45 years and above demonstrating higher adherence to their treatment than younger patients, χ^2 (1) = 7.84, p = 0.005. Education level

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emerged as another significant factor associated with adherence χ^2 (2) = 8.95, p = 0.011; patients with lower education had higher adherence compared to those with secondary or tertiary education. Similarly, marital status significantly influenced adherence, with married individuals showing higher adherence than those who had never married (χ^2 (1) = 4.76, p = 0.029).

Table 2: Association of Patient characteristics with adherence to haemodialysis therapy

	Non adherent (N = 34)	Adherent (N=100)			
Variable	**n (%)**	**n (%)**	**χ^2**	**Df**	**p-value**
Gender			5.27	1	0.022
Male	16(47.1)	69(69)			
Female	18(52.9)	31(31)			
Age			7.84	1	0.005
<45y	16(47.1)	22(22)			
45 y and above	18(52.9)	78(78)			
Education level			8.95	2	0.011
Primary or less	4(11.8)	39(39)			
Secondary	16(47.1)	36(36)			
Tertiary level	14(41.2)	25(25)			
Marital status			4.76	1	0.029
Never married	23(67.6)	46(46)			
Married	11(32.4)	54(54)			
Have you been diagnosed with any other chronic illness?			0.44	1	0.509
Yes	25(73.5)	79(79)			
No	9(26.5)	21(21)			
Belongs to a Health social group			2.76	1	0.096*
Yes	2(5.9)	1(1)			
No	32(94.12)	99(99)			

Note: *Denotes Fisher's Exact Test

4.3 Adherence levels to haemodialysis therapy among ESRD patients

The results show the distribution of adherence among the 134 participants, with 100 (74.6%) respondents exhibiting high adherence. Therefore, adherence in this study was high.

Table 3: Adherence level among study participants, N=134

Adherence level	Number of respondents	Percentage (%)
High	100	74.6
Moderate	13	9.7
Low	21	15.7

4.4 Logistic Regression Analysis

Table 4 presents the independent predictors of adherence to hemodialysis treatment. Gender emerged as a significant determinant of adherence, with females showing considerably lower odds of adherence than males (OR = 0.32, 95% CI: 0.13–0.79, $p = 0.013$). Age did not show a statistically significant effect, although patients aged 45 years and above had nearly twice the odds of adherence compared to those younger than 45 years (OR = 1.95, 95% CI: 0.72–5.24, $p = 0.187$).

Academic attainment was also an important factor. Compared with patients with lower education, individuals with secondary academic attainment had lower odds of adherence (OR = 0.30, 95% CI: 0.08–1.11, p = 0.072), which was marginally significant. Patients with tertiary education, however, were significantly less likely to adhere than those with lower educational attainment (OR = 0.19; 95% CI, 0.05–0.72; $p = 0.014$).

Marital status was not associated with adherence, as married patients had similar odds of adherence compared with unmarried study participants (OR = 1.24, 95% CI: 0.47–3.28, $p = 0.666$).

Table 4: Logistic regression of factors influencing adherence

Variable	Odds ratio	Z	P	95%CI	
				LL	UL
Gender					
Male	reference				
Female	0.32	-2.48	0.013	0.131	0.788
Age					
<45y	reference				
45 y and above	1.95	1.32	0.187	0.724	5.243
Education level					
Primary or less	reference				
Secondary	0.30	-1.8	0.072	0.082	1.111
Tertiary level	0.19	-2.45	0.014	0.049	0.717
Marital status					
Never married	reference				
Married	1.24	0.43	0.666	0.468	3.284

Note: CI – confidence interval range, LL – lower bound, UL- upper bound

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5. Discussion

5.1 Adherence level to haemodialysis therapy among ESRD individuals

The findings showed a generally high level of adherence to haemodialysis therapy, with 107 (79.9%) respondents attending all scheduled sessions and 96 (71.6%) never shortening their dialysis sessions. Overall, 100 (74.6%) respondents demonstrated strong adherence. These findings align with studies from Saudi Arabia and Rwanda, which reported high attendance and highlighted patients' recognition of dialysis as essential for survival and wellbeing (Alatawi et al., 2024; Mukakarangwa et al., 2020). The relatively high adherence may be attributed partly to government support in Botswana, including coverage of haemodialysis services and, for eligible patients, financial and transportation assistance.

Despite high adherence, 15.7% of respondents showed low adherence, and 12 (9.0%) reported missing one or two sessions, mainly because of transportation difficulties. Similar barriers have been reported in Botswana, Rwanda, and other Sub-Saharan African settings (Khame, 2021; Mukakarangwa et al., 2020; Japiong et al., 2023). The winter season during data collection may also have contributed to difficulties in travelling to dialysis centres, although this requires further investigation. Overall, the findings highlight the importance of continued transportation and social support to address barriers and sustain adherence among haemodialysis patients.

5.2 Patient factors linked to haemodialysis adherence

The study found significant associations between gender, age, education level, and marital status and adherence to haemodialysis therapy. Male participants had significantly higher adherence than females, $\chi^2(1) = 5.27$, $p = 0.022$, although previous studies have reported mixed findings (Alhamad et al., 2023; Lnu et al., 2024). Patients aged 45 years and above also demonstrated significantly higher adherence, $\chi^2(1) = 7.84$, $p = 0.005$, consistent with findings that older patients may have more structured routines and greater awareness of the consequences of non-adherence (Alatawi et al., 2024). Education level was also significantly associated with adherence, $\chi^2(2) = 8.95$, $p = 0.011$, with participants with primary education or less showing higher adherence than those with secondary or tertiary education. This finding differs from studies suggesting that higher education improves adherence and may reflect differences in patient responsibilities, counselling, and health literacy across settings (Lnu et al., 2024; Mohamedi & Mosha, 2022).

Marital status was significantly associated with adherence, $\chi^2(1) = 4.76$, $p = 0.029$, with married participants demonstrating higher adherence than those who were never married. This may indicate the importance of family and spousal support in helping patients maintain regular dialysis attendance, consistent with findings from Tanzania (Mohamedi & Mosha, 2022). However, the study found no significant association between being accompanied to dialysis sessions and adherence. Most participants attended sessions without a companion (89; 66.4%), and 131 (97.9%) did not belong to a health-related social support group. Similar patterns have been reported in Kenya and North India (Chege, 2022; Lnu et al., 2024), although peer-support groups may still provide emotional encouragement and shared experiences that could support treatment adherence.

Comorbidities were common, with 104 (77.6%) participants reporting additional chronic conditions and hypertension being the most prevalent at 69 (51.5%). This finding is consistent with studies from Gaborone, North India, and Nepal that identified hypertension as a common comorbidity among haemodialysis patients (Mosiko et al., 2021; Lnu et al., 2024; Luitel et al., 2020). However, comorbidity status was not significantly associated with adherence in the present study. This may be because patients with multiple chronic conditions recognize dialysis's importance for survival and remain motivated to follow their treatment schedules. Overall, the findings suggest that several patient-related characteristics influence adherence, particularly gender, age, education, and marital status, while social support and comorbidity status showed less clear associations.

6. Conclusion

This research is the first to offer insights into compliance with haemodialysis therapy among ESRD patients and the factors influencing it. The results revealed a high level of adherence, with 74.6% of participants exhibiting strong compliance with haemodialysis therapy. Adherence was significantly associated with age, gender, marital status, and educational attainment, with gender and educational attainment identified as predictors.

7. Recommendations

Continuous health education and regular counselling sessions by health professionals to enhance patient adherence levels. Strategies should be established to ensure patients receive continuous information and counselling programs for illness management and self- care routines. This can include individualized teaching tailored to the patient's educational level, health literacy, and preferred learning style, such as simplified materials.

Dialysis units should regularly monitor adherence, track attendance and reasons for absences/shortening, and present adherence reports as part of monthly clinical reviews.

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