



# Determinants of Adherence to Haemodialysis Frequency among Patients with End-Stage Kidney Disease at a Private Hospital in Nairobi, Kenya

Gabriel Njuguna Kilonzo\*, Albanus Mutisya Kyalo and Joan Shisoka

*School of Nursing, Jomo Kenyatta University of Agriculture and Technology (JKUAT), P.O. BOX 62000 Nairobi;*

**\*Corresponding author:** Gabriel Njuguna Kilonzo, School of Nursing, Jomo Kenyatta University of Agriculture and Technology, Nairobi, Kenya. Email: gabrielkilonzo3@gmail.com.

**ORCID Number:** 0000-0002-5136-7385

---

## Summary

### BACKGROUND

Globally chronic kidney disease (CKD) is on the increase. It has become a public health concern because of the increasing number of patients maintained on haemodialysis (HD). CKD patients require HD thus making adherence to prescribed treatment essential. Poor adherence to HD is associated with increased mortality, morbidity, increased healthcare expenses and workload in HD units. In the renal unit of Avenue hospital, informal observation and clinical experience indicate that there is poor adherence to HD. Therefore, this study aimed to establish the level of adherence to HD and the factors affecting adherence to HD among patients with end-stage kidney disease (ESKD) at Avenue hospital.

### MATERIALS AND METHODS

Between the months of June and August 2020, the study adopted an analytical cross-sectional study in Avenue hospital Nairobi to establish the level of adherence to HD and its associated factors. The study subjects were adult patients with ESKD on HD. Census was used. A total of 27 patients with ESKD participated in the study. Data was collected through a modified end-stage kidney disease adherence questionnaire (ESKD-AQ). It was then coded, cleaned and analyzed using Statistical Package for Social Sciences (SPSS) version 22. Bivariate analysis with Fischer's exact test was used to compare the independent and dependent variables. A P-value of <0.05 was considered statistically significant at a 95% confidence interval. The significant variables in the bivariate analysis were then subjected to multivariate logistic regression for further analysis to establish an association with adherence to HD.

### RESULTS

Adherence to HD as assessed by ESKD-AQ revealed that more than half 14(51.85%) had high adherence while 3(11.11%) had low adherence. Bivariate analysis showed that cramping ( $p<0.001$ ) and distance to the hospital ( $p=0.005$ ) were significantly associated with adherence to HD. Multivariate logistic regression analysis revealed that only cramping [OR=0.027 CI 95% (0.002-0.301) P=0.003] was significantly associated with adherence to HD.

### CONCLUSION

Many patients are non-adherent to maintenance HD in Avenue hospital with the distance they have to travel to the HD unit and HD-associated muscular cramping contributing to the non-adherence significantly.

*Keywords:* End-Stage Kidney Disease; Haemodialysis; Determinants; Adherence.

[*Afr. J. Health Sci.* 2021 34(6): 742-748]

---

## Introduction

CKD is defined as a progressive and irreversible loss of kidney function. According to glomerular filtration rate (GFR), CKD is a spectrum ranging from stage 1 to stage 5. Stages 1-3 are mild to moderate disease, stage 4 severe disease and stage 5 ESKD [1]. ESKD is an irreversible decline in kidney function, which is fatal in the absence of dialysis or transplantation [1]. In ESKD, individuals have an estimated GFR of less than 15 mL/minute/1.73 m<sup>2</sup> body surface area and require dialysis [1]. About two-thirds of people with ESKD receive HD, one quarter has kidney transplants, and one-tenth receive peritoneal dialysis [1].

Globally ESKD is a public health concern because of the high morbidity, mortality and increasing number of patients who require renal replacement therapy (RRT) which includes HD [2]. The increase in ESKD patients necessitates the management of patients with HD thus making adherence to prescribed treatment essential [3]. HD depends upon diffusion, osmosis, ultrafiltration and hydrostatic pressure. HD uses diffusion to remove solutes. The removal of the solutes is driven by a concentration gradient of solutes across a semi-permeable membrane [4]. Concentration gradient is maintained by countercurrent exchange of blood and dialysis fluid in a dialysis membrane. The two are driven in opposite directions at a ratio of 1:2. Blood moves across the dialysis membrane at a rate of 200-400ml/min whereas the dialysis fluid moves on the other side of the membrane about twice as fast at a rate of 500-800ml/min. Double lumen catheters, arterio-venous fistula or arterio-venous grafts are required for HD [5].

While HD can prolong life, it is unable to replicate the complexities of the human renal system. Patients endure physical and emotional distresses associated with HD such as fatigue, pain, reduced physical activity, constraints on holidays, social activities, employment, lower socioeconomic status,

marital and family relationships problems and depression [6].

Due to the shortage of kidney allograft donors and resource constraints, kidney transplant is not popular and HD remains the preferred modality of treatment in developing countries [3]. HD requires strict adherence to the prescribed regimen for adequate dialysis and better outcomes. Adherence to HD refers to doing 2-3 sessions of HD in a week with each session lasting 4-5 hours, not missing scheduled dialysis sessions or rescheduling prescribed HD sessions [7]. Adherence to HD remains a major obstacle in the management of CKD patients. Available literature reveals that approximately 2-50% of individuals on maintenance HD are not adherent to the prescribed HD regimen [7, 8]. Poor adherence to HD is associated with increased mortality, frequent hospital visits and admissions, morbidity, increased healthcare expenses and workload in HD units [8].

Globally, missed, rescheduled and shortened HD sessions have been attributed to different factors [8]. Some of the factors that have been shown to affect adherence to HD include patient-related, therapy-related, health-care-related, socio-economic and disease-related factors [8].

In Kenya approximately four million people have CKD and only 10,000 of these have dialysis access. Furthermore, the level of awareness on CKD and adherence to treatment with HD is low in Kenya [9]. This study aimed to establish the level of adherence to HD, and the factors affecting adherence to HD among patients with ESKD at Avenue hospital using a modified ESKD-AQ. The ESKD-AQ questionnaire was used because it is easy to administer and has an acceptable validity of 0.99 and test-retest reliability of between 0.83-1.00 [10].

## Materials and Methods

### *Study design*

This was a quantitative analytical cross-sectional study done between the months



of June and August 2020 at Avenue hospital which is a tertiary referral private hospital in Nairobi Kenya. Avenue Hospital has a renal unit that offers HD treatment. The renal unit has a capacity of 7 beds and is manned by a nephrologist, qualified renal nurses and patient attendants. It has the capacity to treat 14-17 patients per day. The ancillary services include a laboratory and out-patient pharmacy for patient support. Study subjects consisted of all patients who had been diagnosed with ESKD and were on maintenance HD at the time of the study. Census was used. Included in the study were all adult outpatient CKD patients who were on HD for at least 3 months, who were able to read and write and gave informed consent. Excluded were all acute kidney injury patients and critically ill patients who were admitted at the time of the study. Critically ill patients were those patients who were mechanically ventilated.

### **Study tools**

A modified ESKD-AQ was used. The modified ESKD-AQ was developed using components of the ESRD-AQ questionnaire and literature. It was researcher administered. Quality assurance was ensured through pretesting with five patients which were 10% of the actual population. Face validity was ensured by structuring the questionnaire into four parts. Part one captured the demographic data of the participants. Part two obtained information on the level of adherence to HD among the study subjects. Part three captured information about therapy-related factors affecting adherence to HD. Part four obtained information about healthcare-related factors affecting adherence to HD. Construct validity was ensured by checking items in the data collection instrument against study objectives to ensure that all constructs under study were measured. Cronbach alpha was performed to measure the internal consistency and reliability of the instrument. It was found to be 0.74 meaning that the instrument was a reliable measure of adherence to HD.

### **Study procedure**

Once informed consent was obtained, the participants who met the inclusion criteria were assisted in filling the ESKD-AQ to collect relevant data. The completeness of the filled-in questionnaires was then checked. Data obtained from the study were entered into a computer, coded and then secured by a password to ensure confidentiality. An adherence score was then calculated to come up with adherence scores for HD. To measure compliance to HD, an HD scoring system using an ordinal Likert scale was used.

### **Data analysis**

Data analysis was done using SPSS software version 22. Shapiro Wilk test was used to test for normality of data before analysis. Descriptive statistics were used to describe the level of adherence to HD among ESKD patients.

To analyze the level of adherence to HD, the responses on adherence level to HD from the modified ESKD-AQ were classified in a Likert scale and then scores were calculated to reveal the level of adherence to HD in form of percentages. A score of between 80 and 100% was classified as high, between 70 and 79% as moderate and below 70% as low. The scoring system for this study had a minimum attainable score of 10 and a maximum attainable score of 34 and was expressed as a percentage. The scale was adopted from Mukakarangwa *et al.*, [11] and Chironda *et al.*, [8].

Inferential statistics inform of chi-square (Fischer's exact test) and logistic regression using odds ratio were used to test for association between therapy and health-care variables and level of adherence to HD among the ESKD patients. At 95% confidence, a p-value of <0.05 was considered significant.

### **Ethical consideration**

The study was approved by Nairobi Hospital Bioethics and Research Committee (NHBRC), reference number TNH/ADMIN/CEO/27/04/20. It was then



licensed by the National Council of Science Technology and Innovation (NACOSTI), reference number NACOSTI/P/20/4900. The study was carried out in adherence to the requirements of the Declaration of Helsinki.

## Results

### *Demographic characteristics*

As shown in table 1, the mean age was  $55.6 \pm 14.2$  years. Males accounted for two thirds 18(66.7%) of the participants. Most of the study subjects 21(77.8%) were married. Fourteen (51.9%) of the participants were educated up to college or university level.

### *Adherence scores among the participants*

Table 2 shows adherence to HD scores among the study subjects. The maximum adherence score obtained in this study was 32 (94%) and the minimum adherence was 19 (55.88%). More than half 14 (51.85%) had a high adherence score of above 80%, while 11.11% had a low adherence score of below 70%.

### *Therapy and healthcare related factors associated with adherence to HD*

Table 3 below shows that distance to the hospital  $P < 0.005$  and cramping  $P < 0.001$  had

a significant inverse association with adherence to HD. Other variables like cost of HD ( $P < 0.335$ ), poor blood flow ( $P < 0.148$ ), restlessness  $P < 1.000$ , clotting dialyzer ( $P < 0.481$ ), intradialytic hypotension ( $P < 1.000$ ) and machine malfunction ( $P < 0.094$ ) were not significantly associated with adherence to HD.

### *Factors associated with adherence to haemodialysis*

Multivariate logistic regression revealed that cramping  $P < 0.003$  had a significant association with adherence to HD as illustrated in table 4.

## Discussion

Most of the participants were older than 60 years which is in agreement with other study findings where CKD is more prevalent in the elderly [12]. There were more males than a female which is a finding reported by other studies elsewhere [12].

The findings showed that, among the participants, 51.85% had high adherence to HD, while 11.11% had low adherence to HD. These findings correlate with other studies which indicate that between 2-50% of patients on HD are not adherent to HD [13].

**Table 1: Socio-Demographic Characteristics**

Characteristic	Frequency (%)
Age (Years)	Mean (55.6) SD (14.2)
Gender	
Male	18(66.7)
Female	9(33.3)
Marital status	
Married	21(77.8)
Single	1(3.7)
Divorced	1(3.7)
Separated	2(7.4)
Widowed	2(7.4)
Level of education	
Primary	6(22.2)
Secondary	7(25.9)
College/university	14(51.9)
SD, standard deviation	



This may be attributed to more developed infrastructure and economic endowment in these countries that ensure dialysis units are closer to the patient. This eases the distance patients have to travel for dialysis.

The results showed that there was a significant association between cramping and adherence to HD. This implies that cramping during HD is more likely to affect adherence to HD and result in early disconnection. These findings are congruent with findings by Meira in Brazil who also found that muscle cramps were associated with early disconnection from HD treatment. He also attributed the cramping to the volume of ultrafiltration removed during

an HD session. Meira also concluded that recurrent muscle cramps usually lead to poor adherence to HD treatment and impact the health-related quality of life of ESKD patients [15].

Among the healthcare-related factors examined in this study, distance to the hospital was significantly associated with poor adherence to HD. This is supported by findings by Fink which showed that availability of RRT and especially HD is not easy. This is because some of the patients reside far from existing HD centres and have to commute long distances to receive dialysis which in turn leads to HD inadequacy [16].

**Table 2: Adherence to HD Scores among the Participants**

Level of adherence according to scale	Frequency (%)
Low (<70%)	3(11.1)
Moderate (70-79%)	10(37.0)
High (80-100%)	14(51.9)

**Table 3: Therapy and Healthcare-Related Factors and Association with Adherence to HD**

Variable	Adherence			Inferential statistic		
	High	Moderate	Low	Chi-square	Df	P-value
<b>Distance to hospital</b>						
Yes n(%)	6 (42.9)	10 (100)	3 (100)	9.927	2	<b>0.005</b>
No n(%)	8 (57.1)	0 (0)	0 (0)			
<b>Cost of haemodialysis</b>						
Yes n(%)	0 (0)	1 (10)	1 (33.3)	2.211	2	0.335
No n(%)	14 (100)	9 (90)	2 (66.7)			
<b>Cramping</b>						
Yes n(%)	14 (77.8)	3 (16.7)	1 (5.6)	14.204	2	<b>&lt;0.001</b>
No n(%)	0 (0)	6 (75)	2 (25)			
<b>Poor blood flow</b>						
Yes n(%)	0 (0)	0 (0)	1 (100)	3.933	2	0.148
No n(%)	14 (53.8)	2 (7.7)	10 (38.5)			
<b>Restlessness</b>						
Yes n(%)	2 (50)	2 (50)	0 (0)	0.630	2	1.000
No n(%)	12 (52.2)	8 (34.8)	3 (13)			
<b>Clotting dialyzer</b>						
Yes n(%)	0 (0)	1 (100)	0 (0)	2.233	2	0.481
No n(%)	14 (53.8)	9 (34.6)	3 (11.5)			
<b>Intradialytic hypotension</b>						
Yes n(%)	1 (100)	0 (0)	0 (0)	1.561	2	1.000
No n(%)	13 (50)	10 (38.5)	3 (11.5)			
<b>Machine malfunction</b>						
Yes n(%)	0 (0)	1 (50)	1 (50)	3.858	2	0.094
No n(%)	14 (56)	9 (36)	2 (8)			

**Key: n, number, Df, degree of freedom**

**Table 4: Logistic Regression Analysis for Factors Associated with Adherence to HD**

Variable	B	Std. Err	Wald	Df	EXP (B) 95% C.I. for EXP(B)	95% confidence interval		P-value
						Lower	Upper	
Distance to hospital	-0.645	0.907	0.507	1	0.525	0.089	3.100	0.477
Cramping	-3.597	1.223	8.659	1	0.027	0.002	0.301	<b>0.003</b>

B, estimate, Std. Err, standard error, Df, degree of freedom, C.I., Confidence interval, EXP (B), odds ratio

This results in poor compliance with the treatment regimen. The results of this study and those of Fink, are similar to findings by Sayed in Egypt where he found that transport problems were the most common cause of absenteeism to scheduled HD sessions and also late appearances to HD sessions [17].

## Conclusion

This study aimed to establish the level of adherence to HD and the factors affecting adherence to HD among patients with ESKD at Avenue hospital using a modified (ESRD-AQ) questionnaire and overall based on the results, the study concluded that cramping and distance to hospital significantly affected adherence to HD. The level of adherence to maintenance HD was low with close to half of the patients being non-adherent. There is a need for healthcare professionals to consistently remind ESKD patients about the importance of not missing HD sessions, staying for the entire HD session and adhering to prescribed HD days.

## Acknowledgement

We wish to thank the management and the renal unit staff of Avenue hospital for their support during the study and the patients who took the time to participate in this study.

## Author Contact Email

Gabriel Njuguna Kilonzo -  
gabrielkilonzo3@gmail.com

Albanus Mutisya Kyalo -  
amutisya@jkuat.ac.ke

Joan Shisoka - joanshisoka@jkuat.ac.ke

## References

1. **National Kidney Foundation.** Kidney Disease Quality Outcomes Initiative (K/DOQI). <http://www.kidney.org>
2. **Yuen S.K., Suen H.P., Kwok O.L., Yong S.P., and Tse M.W.** Advance care planning for 600 Chinese patients with end-stage renal disease. *Hong Kong Journal of Nephrology.* 2016; 19(2):19–27.
3. **Naalweh K.S., Barakat M.A., Sweileh L.A., Al-Jabi S.W., Sweileh W.L., and Zyoud S.H.** Treatment adherence and perception in patients on maintenance hemodialysis: A cross - Sectional study from Palestine. *BMC Nephrology.* 2017; 18(1):178.
4. **Thomas N. Renal Nursing. 4<sup>th</sup> Edition.** Chichester, West Sussex, PO19 8SQ, UK: *John Wiley and Sons Ltd-The Atrium*, Southern Gate; 2014.
5. **O'Reilly P., Tolwani A.** Renal replacement therapy III. IHD, CRRT, SLED. *Crit Care Clin.* (2005); 21:367–378.
6. **Jones, D. J., Harvey, K., Harris, J. P., Butler, L. T., & Vaux, E. C.** Understanding the impact of haemodialysis on UK National Health Service patients' well-being: A qualitative investigation. *Journal of clinical nursing.* 2018; 27(1-2):193–204. <https://doi.org/10.1111/jocn.13871>.
7. **Duong C.M., Olszyna D.P., Nguyen P.D., and McLaws M.L.** Challenges of hemodialysis in Vietnam: Experience from the first standardized district dialysis unit in Ho Chi Minh

- City. *BMC Nephrology*. 2015; 16(1):122.
8. **Chironda G. A., Manwere R., Nyamakura T., Chipfuwa M., and Bhengu B.** Perceived health status and adherence to haemodialysis by End Stage Renal Disease patients: A case of a Central hospital in Zimbabwe. *IOSR Journal of Nursing and Health Science*. 2014; 3(1):22–31.
  9. **Ministry of Health.** Government steps up fight against kidney diseases. 2017. Retrieved from [www.health.go.ke](http://www.health.go.ke).
  10. **Kim, Y.** The End-Stage Renal Disease Adherence Questionnaire (ESRD-AQ): Testing the Psychometric Properties in Patients Receiving In-Center Hemodialysis. *Nephrol Nurs*. 2011; 37(4):377–393.
  11. **Mukakarangwa M.C., Chironda G., Bhengu B., Katende G.,** Adherence to Hemodialysis and Associated Factors among End Stage Renal Disease Patients at Selected Nephrology Units in Rwanda: A Descriptive Cross-Sectional Study. *Nursing Research and Practice*. 2018; 2018:8.
  12. **O'Hare A.M., Choi A.I., Bertenthal D., Bacchetti P., Garg A.X., Kaufman J.S.** Age affects outcomes in chronic kidney disease. *J Am Soc Nephrol*. 2007; 10:58-65
  13. **Griva K., Lai A.Y., Lim H.A., Zhenli Yu Z., and Foo M.Y.Y.** Non-adherence in Patients on Peritoneal Dialysis: A Systematic Review. *PLoS ONE* 9. 2014;8900
  14. **Kammerer J., Garry G., Hartigan M., Carter B., and Erlich L.** Adherence in patients on dialysis: strategies for success. *Nephrology Nursing Journal*. 2007; 34(5):479–486.
  15. **Meira F.S., Figueiredo A.E., Zemiarki J., Pacheco J., Poli-de-Figueiredo E.** Two variable sodium haemodialysis: A randomized crossover study. *Ther Apheresis Dialysis*. 2010; 14:328-333.
  16. **Fink J.C.** Chronic kidney disease: the effect of CKD therapies on serum potassium levels. *Nature R Nephrol*. 2010; 6:633-634.
  17. **Sayed M., Abdelatty M., ElRawy B., Yasser M., Salman H.** Assessment of socio-economic burden of haemodialysis on ESRD patients in Suez Canal cities & Elarish. *Am J Res Comm*. 2014; 2:7.