

Uptake of Chronic Kidney Disease Preventive Measures among Diabetic and Hypertensive Patients at the Nyeri County Referral Hospital, Kenya

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Abstract: The rise in chronic kidney disease (CKD) prevalence worldwide is alarming. It is associated with substantial mortality and morbidity, thus demanding special consideration as one of the increasing public health concerns. Hypertension and diabetes pose the highest risk for CKD development. The study objective was to establish the factors that influence CKD preventive practices among diabetic and hypertensive patients at Nyeri County Referral Hospital (NCRH). Data was obtained from 190 participants by the use of a questionnaire. Data was analyzed using SPSS and presented using descriptive statistics. Chi-square was used to test for association among variables while multiple regression analysis was used to test for the predictors of CKD prevention uptake. The findings revealed that 84.2% of the participants had good CKD prevention uptake. Gender $\chi^2 (1) = 6.243$, $p = .012$ age $\chi^2 (4) = 13.146$, $p = .011$, and income $\chi^2 (4) = 25.467$, $p < 0.001$ were significantly associated with CKD preventive practice uptake. Health care provider communicating to DM/HTN patients in a language they could understand $\chi^2 (2) = 18.102$, $p < 0.001$, accessing all the laboratory services within the hospital $\chi^2 (2) = 8.469$, $p = .014$ and being able to obtain the prescribed drugs from the hospital pharmacy $\chi^2 (2) = 6.361$, $p = .043$ were significantly associated with CKD prevention uptake. The predictors for CKD prevention uptake included gender, income, age, and being well informed about the disease condition. In conclusion 84.2% of the participants had good CKD prevention uptake and this was influenced by factors stated above. The study recommends that health care providers in Nyeri County Referral Hospital should provide CKD prevention health education program especially to the at-risk population. The health care services should also be made available, accessible and affordable to diabetic and hypertensive patients.

Keywords: Chronic kidney disease, Diabetes mellitus, CKD prevention, Hypertension.

1. Introduction

The rise in chronic kidney disease (CKD) prevalence worldwide is alarming. It is associated with noteworthy mortality and morbidity, thus demanding special consideration as one of the increasing public health concerns. A study on the global burden of disease conducted in 2015 indicated CKD as

the 17th top cause of worldwide years loss of life and a key cause of deaths rising at a fast rate, having increased by 31.7% from 2005 to 2015 (Luyckx et al., 2018). In the general population, CKD prevalence is approximately 13.4% globally, with diabetes mellitus (DM) and hypertension (HTN) accounting for 45% and 23.3% of total cases, respectively, as the primary cause (Neuen et al., 2017).

HTN and DM pose the highest risk of developing chronic kidney disease. Conventional projections for developing nations anticipate a dramatic increase in diabetes, and hypertension, raising fears of a rapid CKD increase (Kaze et al., 2018). Globally, 415 million adults have diabetes mellitus, with 1.4 billion having hypertension (Luyckx et al., 2018). Currently, CKD causes in Africa is dominated by hypertension and diabetes mellitus. Research done by Kaze et al. in 2018 established that CKD is also prevalent in Africa and sub-Saharan Africa, with a prevalence of 15.8% and 17.7%, respectively, in the general population. Moreover, the researchers ascertained that in Africa, 24.7% of HTN patients and 16.6% of DM patients have CKD. Another study by Abd ElHafeez et al. (2018) found out that in Africa, East African regions have the highest prevalence of CKD among DM and HTN patients with 46.9% and 39.5%, respectively. According to Muiro et al. (2020), the estimated prevalence of CKD in East Africa is 6.8%, with most of the patients having diabetes and hypertension as comorbidities.

Hsiao (2018) asserts that preventive measures can be implemented to improve patient outcomes in people at risk of CKD, especially diabetic and hypertensive patients. To effectively implement these strategies, these individuals need to know how diabetes and hypertension predispose them to CKD and how CKD can be prevented. Screening for renal dysfunction clinical indicators, i.e., urinalysis and serum creatinine to estimate glomerular filtration rate (eGFR), is essential for the timely detection of CKD in at-risk patients. Furthermore, it is likewise vital to increase patients' knowledge to adjust their lifestyle towards CKD incidence prevention

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(Hsiao, 2018).

A systematic review and meta-analysis done by Kelly *et al.* (2020) on modifiable lifestyle factors for primary prevention of CKD revealed that lifestyle modifications including low-salt, lo-fat diet, more exercise, quitting smoking, less alcohol consumption, less salt consumption reduced the risk of CKD by between 14-22%. In a study to find out the association between changes in lifestyle behaviors and the incidence of chronic kidney disease, Michishita *et al.* (2017) established that having an unhealthy lifestyle lead to in a significantly higher odds ratio for the CKD incidence than maintaining a healthy lifestyle. Dunkler *et al.* (2015) also stated that healthy lifestyle e.g., regular physical activity decreased the risk of CKD significantly. The application by patients of these practices of CKD prevention is dependent on several factors. Hence, the current study aims to assess the practice of CKD preventive measures among DM and HTN patients and evaluate the factors that influence these practices.

In Kenya, many diabetic and hypertensive patients present to the hospital with advanced CKD stages with the limited information that they were at risk of CKD and thus not practicing preventive measures. Therefore, this study targets hypertensive and diabetic patients at Nyeri county referral hospital to identify their level of adherence to CKD preventive measures and the factors that influence their CKD prevention.

A. Broad Objective

To establish factors that influence uptake of chronic kidney disease preventive practices among diabetic and hypertensive patients at Nyeri County Referral Hospital, Kenya

B. Specific Objectives

1. To determine CKD preventive measures adopted by Diabetic and Hypertensive patients at Nyeri County Referral Hospital.
2. To assess the patient related factors that influence the uptake of CKD prevention practices among diabetic and hypertensive patients at Nyeri County and Referral Hospital.
3. To find out the health care provider factors that influence the uptake of CKD prevention practices among diabetic and hypertensive patients at Nyeri County Referral Hospital.
4. To find out the health system factors that influence the uptake of CKD prevention practices among diabetic and hypertensive patients at Nyeri County Referral Hospital.
5. To identify the predictors of CKD prevention uptake among DM/HTN patients at the Nyeri County Referral Hospital.

2. Methodology

A. Study Design

This was a descriptive correlational research design that examined the relationship between CKD prevention practices and other variables like patient related factors, health care provider, and health system factors.

B. Study Area and Study population

The study was carried out in Nyeri County Teaching and Referral Hospital in Kenya. The population of interest was adult patients diagnosed with diabetes or hypertension attending the outpatient clinic at the hospital.

C. Sampling and sample size determination

Stratified random sampling in consideration of gender was used to recruit the participants. Cochran's single population proportion formula was utilized to determine sample size. A sample size of 201 participants were selected from the study population.

D. Inclusion and Exclusion criteria

Patients diagnosed with either diabetes or hypertension aged above 18 years and consented for participation. Participants who were already been diagnosed with CKD and patients who were very sick were excluded.

E. Data Collection Method

The self-administered structured questionnaires were used.

F. Validity and Reliability of Study Tool

The questionnaire content and face validity were established through expert opinion and pretesting. On the other hand, Cronbach's alpha test was used to determine the questionnaire's reliability which generated a reliable score of 0.8.

G. Study Variables

The dependent variable was the uptake of CKD prevention practices. The independent variables were patient related factors, health care provider factors, and health system-related factors.

H. Data Collection Method

The researcher used self-administered questionnaires among the selected diabetic and hypertensive patients attending the medical clinics between August and September 2022 at Nyeri County Referral Hospital. Data was collected from 190 participants.

I. Data Management and Analysis

The collected data was cleaned, sorted, coded and entered in the Statistical Package for Social Scientists (SSPS) for analysis. It was analyzed by the use of descriptive and inferential statistics. Continuous variables were summarized by their standard deviation (SD) and mean while the categorical variables as percentages and crude counts. Chi square test of association was used to test the association between categorical variables. Multiple logistic regression analysis was done to determine the predictors of CKD prevention practices.

J. Ethical Consideration

Ethical approval to carry out this research was sought from the Research Ethics Committees of Kenyatta University, National Council of Science, Technology Innovation (NACOSTI) and the Nyeri County Teaching and Referral hospital ethics committee. The consent forms were distributed to each respondent and signed after they fully understood the

study's objectives through verbal and written explanations.

3. Results

A. Socio-Demographic Characteristics

Table 1
Sociodemographic characteristics

Variable	Total, N= 190 (%)
Gender	
Male	81 (42.6)
Female	109 (57.4)
Age (years)	
18-25	21(11.1)
26-35	21(11.1)
36-45	32 (16.8)
46-55	49 (25.8)
>56	67 (35.3)
Marital status	
Single	38 (20)
Married	113 (59.5)
Widowed	29 (15.3)
Divorced	10 (5.3)
Monthly income (Ksh)	
0-10000	76 (40)
10000-25000	55 (28.9)
26000-45000	34 (17.9)
46000-100000	19 (10)
Above 100000	6 (3.2)
Education Level	
No education	14 (7.4)
Primary	56 (29.5)
Secondary	86 (45.3)
Tertiary	34 (17.9)
Diagnosis	
Diabetes	50 (26.3)
Hypertension	50 (26.3)
DM and HTN	90 (47.4)

A total of 190 participants were involved in the study whereby 57.4% (n=109) were females while the males were 42.6% (n=81). Majority of the participants, 35.3% (n=67) were aged above 56 years with 25.8% (n=49) aged between 46-55 years. The participants aged below 35 years accounted for 22.2% (n=42). Married participants accounted for 59.5% (n=113) while others were either single, divorced or widowed. Out of the 190 participants, 47.4% (n=90) were both diabetic and hypertensive, 26.3% (n=50) were hypertensive and 26.3% (n=50) were diabetic. The results are as depicted in the table 1.

B. CKD Prevention Practices among DM and HTN Patients

The findings revealed that 75.8% (n=144) participants always took their medications as prescribed. Moreover, 78.9% (n=150) reported that they do not smoke cigarette. Furthermore, 41.1% (n=78) participants reported that they exercise at least three days in a week while 41.1% (n=78) stated that they monitor their BP during their clinic visits only. In addition, 12.1% (n=23) of participants reported that they check their RBS twice daily while 18.4% (n=35) stated that they check their RBS during their clinic visits only.

The participants who reported to follow all their medical appointments always were 66.1% (n=117). The findings revealed that 66.8% (n=127) participants reported that they take low salt diet while 63.7% (n=121) stated that they take a low-fat diet. When asked if they use herbal medications, 77.9% (n=148) reported not to use herbal medications. Twenty-nine participants, 15.3% stated that they never reach out to their health care provider in case their BP or blood sugar levels are out of range. Table 2 shows the practices DM/HTN patients engaged in to prevent developing CKD.

Table 2
CKD prevention practices among Diabetic and Hypertensive patients

Statement	Response	n (%)
How often do you take your medications as prescribed	Always	144 (75.8)
	Sometimes	46 (24.2)
	Never	0
Do you smoke cigarette	Yes	40 (21.1)
	No	150 (78.9)
Do you exercise at least 3 days in a week (jogging, walking, running etc.)?	Always	78 (41.1)
	Sometimes	81 (42.6)
	Never	31 (16.3)
	During my clinic visits only	78 (41.1)
How often do you check your BP reading?	Weekly	52 (27.4)
	Once daily	56 (29.5)
	Twice daily	4 (2.1)
	During my clinic visits only	35 (18.4)
How often do you check your RBS reading?	Weekly	44 (23.2)
	Once daily	37 (19.5)
	Twice daily	23 (12.1)
	Not applicable	51 (26.8)
	Always	117 (61.6)
Do you follow all your medical appointments?	Sometimes	70 (36.8)
	Never	3 (1.6)
	Yes	127 (66.8)
Do you take low salt diet?	No	63 (33.2)
Do you take low fat diet?	Yes	121 (63.7)
	No	69 (36.3)
Do you use herbal medications?	Yes	42 (22.1)
	No	148 (77.9)
I reach out to my health care provider in case my BP or blood sugar levels are out of range	Always	66 (34.7)
	Sometimes	95 (50)
	Never	29 (15.3)

C. Factors that Influence Uptake of CKD Preventive Measures

1) Patient factors

From the findings, 53.2% (n=101) participants agreed that they could easily access the hospital, while 36.8% (n=70) agreed that they could afford to buy all the prescribed medications. Moreover, 51.1% of the participant (n=97) agreed that they could easily communicate with the health care providers when need arises. Also, 61.6% (n=117) agreed that they are well informed about their disease condition. On the other hand, 63.2% (n=120) participants agreed that they always find time to attend to their medical appointments despite the family engagements. From the findings, 82.6% (n=157) participants stated that they have active NHIF cards whereas 50% (n=95) stated that NHIF does not cover all their medical expenses. The participants who agreed that they get adequate support from their family members in regards to their current medical condition was 62.1% (n=118). Table 3 shows the patient related factors that influence uptake of CKD preventive practices.

2) Health care provider factors

The findings revealed that 52.1% (n=99) respondents agreed that the health care provider has explained to them that uncontrolled high blood pressure and blood sugars can lead to chronic kidney failure. On the other hand, 71.1% (n=135) of the participants agreed that the HCP usually orders laboratory tests to check their kidney functions. Moreover, 54.7% (n=104) of the participants agreed that their health care provider considers their input when discussing about their health while 66.3% (n=126) of the participants agreed that the health care provider communicates to them in a language that they can understand. Sixty percent (n=114) of the participants responded ‘yes’ to the statement that they were well informed about the complications of their disease condition. Table 4 depicts the HCP factors.

3) Health system related factors

In regards to health system related factors, the results indicated that 46.3% (n=88) of the participants disagreed to the statement that they are able to obtain the prescribed drugs from the hospital pharmacy while 45.3% (n=86) disagreed that they can access all the laboratory services within the hospital. On the

Table 3
Patient related factors influencing uptake of CKD prevention practices

	Response	n (%)
I can easily access the hospital	Agree	101(53.20)
	Neither agree nor disagree	41(21.6)
	Disagree	48(25.3)
I can afford to buy all the prescribed medications	Agree	70(36.8)
	Neither agree nor disagree	35(18.4)
	Disagree	85(44.7)
I am well informed about my disease condition	Agree	117(61.1)
	Neither agree nor disagree	55(28.9)
	Disagree	18(9.5)
I am able to communicate with my health care provider when need arises	Agree	97(51.1)
	Neither agree nor disagree	44(23.2)
	Disagree	49(25.8)
I always find time to attend to my medical appointments despite the family engagements	Agree	120(63.2)
	Neither agree nor disagree	45(23.7)
	Disagree	25(13.2)
Do you have an active NHIF card?	Yes	157(82.6)
	No	33(17.4)
	Yes	62(32.6)
Does NHIF covers for all your medical expenses?	No	95(50.0)
	Not Applicable	33 (17.4)
	Agree	118(62.1)
I get adequate support from my family members in regards to my medical condition	Neither agree nor disagree	39(20.5)
	Disagree	33(17.4)

Table 4
Health care provider related factors influencing uptake of CKD prevention practices

	Response	n (%)
On a regular basis, my doctor orders for laboratory test to check the state of my kidneys	Agree	135(71.1)
	Neither agree nor disagree	15(7.9)
	Disagree	40(21.1)
My healthcare provider has explained to me on how to control my blood pressure or blood sugar from going beyond normal ranges	Agree	105(55.3)
	Neither agree nor disagree	55(28.9)
	Disagree	30(15.8)
My healthcare provider has explained to me that uncontrolled high blood pressure and blood sugars can lead to kidney failure	Agree	99(52.1)
	Neither agree nor disagree	36(18.9)
	Disagree	55(28.9)
My health care provider communicates to me in a language that I can understand	Agree	126(66.3)
	Neither agree nor disagree	23(12.1)
	Disagree	41(21.6)
My health care provider considers my input when discussing about my health	Agree	120(63.2)
	Neither agree nor disagree	30(15.8)
	Disagree	56(29.5)
Are you well informed about your disease condition complications?	Yes	114(60)
	No	76(40)

Table 5
Health system related factors influencing uptake of CKD prevention practices

Statement	Response	n (%)
I am able to obtain the prescribed drugs from the hospital pharmacy	Agree	58(30.5)
	Neither agree nor disagree	44(23.2)
	Disagree	88(46.3)
All my medical concerns are addressed in one clinic	Agree	119(62.6)
	Neither agree nor disagree	11(5.8)
	Disagree	60(31.6)
I can visit the hospital any day when I need to be checked	Agree	110(57.9)
	Neither agree nor disagree	24(12.6)
	Disagree	56(29.5)
I can access all the laboratory services within the hospital	Agree	67(35.3)
	Neither agree nor disagree	37(19.5)
	Disagree	86(45.3)
I can afford all the health services required	Agree	74(38.9)
	Neither agree nor disagree	39(20.5)
	Disagree	77(40.5)
I always have enough time with my health care provider to address all my concerns during my medical visits	Agree	88(46.3)
	Neither agree nor disagree	58(30.5)
	Disagree	44(23.2)
I don't have to queue for long hours before I see the doctor	Agree	43(23.6)
	Neither agree nor disagree	59(31.1)
	Disagree	88(46.3)
The hospital is located where I can easily access it from my home	Agree	113(59.5)
	Neither agree nor disagree	27(14.2)
	Disagree	49(25.8)

other hand, 62.6% (n=119) agreed that all their medical concerns were addressed in one clinic. Furthermore, 59.5% (n=113) agreed that the hospital is located where they can easily access it from their home. The participants who disagreed with the statement that they can afford all the health services required were 40.5% (n=77). Moreover, 46.3% (n=88) disagreed with the statement that they don't have to queue for long hours before they see the doctor. Table 5 summarizes the respondents concerning health system factors.

D. Uptake of CKD Prevention Practices Among Diabetic and Hypertensive Patients

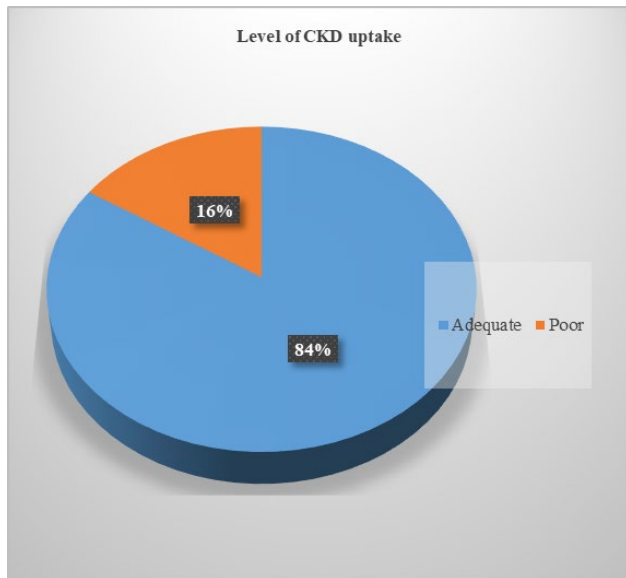


Fig. 1. Uptake of CKD preventive practices

The participants were asked how frequent they practiced the CKD preventive measures. A score of 2 was assigned for every "always/yes" response, while a score of 1 was assigned to every "sometimes" response. Furthermore, a score of 0 was assigned

to ever "never/no" response. The total score was then summed up to give total prevention score. Participants who scored above 50% were considered as having adequate CKD preventive practices whereas those who scored <50% were considered as having poor practice. The mean score for CKD prevention practices was 70.47% ± 18.78. Thirty participants, i.e., 15.8% had poor practices on CKD prevention with a score of <50%, while 84.2% (n=160) of participants had adequate CKD prevention practices, scoring above 50% as shown in the figure 1.

E. Socio-Demographic Factors Associated with CKD Preventive Practice Uptake Among DM/HTN Patients at Nyeri County Referral Hospital – Kenya

A Chi square test for association was conducted to investigate socio-demographic factors associated with CKD preventive practice among DM/HTN patients. The findings revealed that, gender $\chi^2 (1) = 6.243, p = .012$ age $\chi^2 (4) = 13.146, p = .011$, and income $\chi^2 (4) = 25.467, p < .001$ were significantly associated with CKD preventive practice uptake as shown in Table 6.

F. Association Between Patients' Factors and CKD Preventive Practice Uptake Among DM/HTN Patients

Chi square test for association revealed that, easy accessibility to hospital services, $\chi^2 (2) = 17.105, p < 0.001$, being well informed about the disease condition, $\chi^2 (2) = 9.40, p = 0.009$, and being able to communicate with HCP when need arises, $\chi^2 (2) = 13.788, p = 0.001$, were significantly associated with CKD prevention practice uptake as indicated in the table 7.

G. Association between Health Care Provider Factors and CKD Preventive Practice Uptake Among DM/HTN Factors

Chi square test for association established that, HCP communicating to DM/HTN patients in a language they can understand was significantly associated with CKD preventive

uptake $\chi^2 (2) = 18.102, p < 0.001$. All other HCP related factors did not have significant association with CKD preventive practice uptake as shown in table 8.

H. Association between Health System Factors and CKD Preventive Practice Uptake Among DM/HTN factors

Chi square test for association established that, accessing all

the laboratory services within the hospital $\chi^2 (2) = 8.469, p = .014$ and being able to obtain the prescribed drugs from the hospital pharmacy $\chi^2 (2) = 6.361, p = .043$ were significantly associated with CKD prevention uptake as shown in Table 9.

Table 6
Sociodemographic characteristics association with CKD prevention uptake

Sociodemographic factors	CKD preventive practice uptake		Df	χ^2	P-value
	Poor (n)	Good (n)			
Gender	19	62			
Male	11	98	1	6.243	.012
Female					
Age in years					
18-25	1	20	4	13.146	.011
26-35	5	16			
36-45	11	21			
46 – 55	5	44			
56 and above	8	59			
Level of education					
No education	1	13	3	6.234	.101
Primary level	4	52			
Secondary	18	68			
Tertiary	7	27			
Marital status					
Single	4	34	3	5.936	.115
Married	19	94			
Divorced	4	6			
Widowed	3	26			
Income in Ksh					
Below 10,000	6	70	4	25.467	<.001
10,000 - 25,000	6	49			
26,000 – 45,000	15	19			
46,000-100,000	2	17			
Above 1,000,000	1	5			

Table 7
Association between patients' factors and CKD prevention practices uptake

Patient related factors	CKD prevention uptake		Df	χ^2	P-value
	Poor (N)	Good (n)			
I can easily access the hospital services					
Agree	6	95	2	17.105	<.001
Neither agree nor disagree	13	28			
Disagree	11	37			
I can buy all the prescribed medications					
Agree	12	58	2	0.627	.731
Neither agree nor disagree	4	31			
Disagree	14	71			
I am well informed about my disease condition					
Agree	11	106	2	9.40	.009
Neither agree nor disagree	14	41			
Disagree	5	13			
I am able to communicate with HCP when need arises					
Agree	6	91	2	13.788	.001
Neither agree nor disagree	11	33			
Disagree	13	36			
I always find time to attend my medical appointments despite the family engagements					
Agree	15	105	2	13.14	.141
Neither agree nor disagree	8	37			
Disagree	7	18			
I always get adequate support from my family members in regards to my medical condition					
Agree	15	73	2	2.751	.253
Neither agree nor disagree	7	32			
Disagree	8	25			
Do you have an active NHIF card?					
Yes	22	135	1	2.146	.143
No	8	25			
Does your NHIF cater for all your medical expenses?					
Yes	9	53	2	2.482	.289
No	13	83			
Not applicable	8	24			

Table 8
Association between health care provider factors and CKD prevention uptake

Health care provider related factors	CKD prevention practice uptake				
	Poor (N)	Good (n)	Df	χ^2	P-value
On a regular basis, my doctor orders for laboratory test to check the state of my kidneys					
Agree	22	113	2	.522	.759
Neither agree nor disagree	3	12			
Disagree	5	35			
My healthcare provider has explained to me on how to control my blood pressure or blood sugar from going beyond normal ranges					
Agree	15	90	2	1.527	.466
Neither agree nor disagree	8	47			
Disagree	7	23			
My healthcare provider has explained to me that uncontrolled high blood pressure and blood sugars can lead to kidney failure					
Agree	17	82	2	0.304	.859
Neither agree nor disagree	5	31			
Disagree	8	47			
My health care provider communicates to me in a language that I can understand					
Agree	11	115	2	18.102	<.001
Neither agree nor disagree	4	19			
Disagree	15	26			
My health care provider considers my input when discussing about my health					
Agree	14	90	2	3.189	.203
Neither agree nor disagree	8	22			
Disagree	8	48			
Are you well informed about your disease condition complications?					
Yes	17	95	1	.077	.467
No	13	65			

Table 9
Association between health system related factors and CKD prevention uptake

Health system related factors	CKD prevention practice uptake				
	Poor (N)	Good (n)	Df	χ^2	P-value
I am able to obtain the prescribed drugs from the hospital pharmacy					
Agree	4	54	2	6.361	.043
Neither agree nor disagree	11	33			
Disagree	15	73			
All my medical concerns are addressed in one clinic					
Agree	15	104	2	2.514	.285
Neither agree nor disagree	2	9			
Disagree	13	47			
I can visit the hospital any day when I need to be checked					
Agree	13	97	2	3.640	.162
Neither agree nor disagree	4	20			
Disagree	13	43			
I can access all the laboratory services within the hospital					
Agree	4	63	2	8.469	.014
Neither agree nor disagree	6	31			
Disagree	20	66			
I can afford all the health services required					
Agree	9	65	2	2.433	.296
Neither agree nor disagree	5	34			
Disagree	16	61			
I always have enough time with my health care provider to address all my concerns during my medical visits					
Agree	14	74	2	0.246	.884
Neither agree nor disagree	10	48			
Disagree	6	38			
I don't have to queue for long hours before I see the doctor					
Agree	6	37	2	0.226	.893
Neither agree nor disagree	9	50			
Disagree	15	73			
The hospital is located where I can easily access it from my home					
Agree	15	98	2	2.742	.254
Neither agree nor disagree	7	20			
Disagree	7	42			

Table 10
Predictors for CKD prevention practice uptake among DM/HTN patients

Variable	aOR	95% CI (Lower-Upper)	P value
Gender			
Male	Ref		
Female	4.314	1.725-28.127	0.012
Age (years)			
18-25	0.542	0.275-1.071	0.861
26-35	0.941	0.07-12.91	0.962
36-45	1.341	0.583- 3.045	0.049
46-55	0.501	0.03-7.582	0.621
>56	Ref		
Monthly income (Ksh)			
0-10000	Ref		
10000-25000	1.312	0.467-4.108	0.427
26000-45000	0.674	0.044-10.298	0.859
46000 and above	3.379	1.126-10.740	0.014
I can easily access the hospital			
Disagree	Ref		
Neither agree nor disagree	1.314	0.378-1.147	0.670
Agree	0.542	0.271-1.081	0.780
I am well informed about my disease condition			
Disagree	Ref		
Neither agree nor disagree	0.849	0.448-1.608	0.616
Agree	2.25	1.336 - 5.047	0.038
I am able to communicate with my health care provider when need arises			
Disagree	Ref		
Neither agree nor disagree	0.936	0.498 – 1.759	0.838
Agree	0.593	0.336 - 1.047	0.562
My health care provider communicates to me in a language that I can understand			
Disagree	Ref		
Neither agree nor disagree	2.210	0.09-52.59	0.627
Agree	0.709	0.386 - 1.304	0.269
I am able to obtain the prescribed drugs from the hospital pharmacy			
Disagree	Ref		
Neither agree nor disagree	0.11	0.020 -1.56	0.711
Agree	0.561	0.211-0.81	0.784
I can access all the laboratory services within the hospital			
Disagree	Ref		
Neither agree nor disagree	0.709	0.386-1.304	0.269
Agree	0.936	0.498 -1.759	0.838

I. Predictors for CKD Prevention Uptake Among DM/HTN Patients at Nyeri County Referral Hospital Kenya

A multiple logistic regression was carried out on the factors that had shown significant associations with the dependent variable. The analysis revealed that female participants had 4.3 times more likely to have good CKD prevention practice uptake than the males, aOR =4.314, 95% CI: 1.725, 28.127, p=.012. The respondents who reported to earn above Ksh.46,000 were 3.37 times more likely to have good CKD prevention uptake as compared to those earning below Ksh.10,000, aOR =3.379, 95% CI: 1.126-10.740, p=0.014. Moreover, the respondents aged 36-45 years were 1.34 times more likely to have good CKD prevention uptake as compared to those aged >56 years, aOR =1.34, 95% CI: 0.583- 3.045, p=0.049. Additionally, the participants that agreed with the statement that they were well informed about their disease condition were 2.25 times more likely to have good CKD prevention practice uptake as compared to those who disagreed with the statement, aOR =2.25, 95% CI: 1.336, 5.047, p=0.038. Table 10 displays the predictors of CKD prevention practices uptake.

4. Discussion

The study population comprised 190 participants, mostly female, i.e., 57.4%. This may be attributed to the reason that in females, at the inception of menopause, there is a two-fold

likelihood of increased risk for hypertension which is also attributed to estrogen deficiency. Moreover, research has shown that females are more likely to seek professional health care than males. The findings differ from a similar study carried out in Fiji to find out determinants of knowledge, attitude, and practice in CKD at-risk patients that revealed that the males and females were almost equal (Zibran & Mohammadnezhad, 2019). The present study also revealed that most participants, i.e., 61.1%, were aged above 46 years. This might be attributed to the onset of type 2 diabetes at 45 years. Moreover, age is a non-modifiable risk factor for HTN, which explains why most participants are above 46 years old. The results are similar to a study done in a tertiary training hospital in Malaysia to find out the knowledge attitude and practice towards CKD whereby the majority were aged above 40 years (Yusoff, Yusof & Kueh., 2016). Even though having DM/HTN may impact the quality and later the working capability of the patients, the study found that 46.8% of the respondents could still engage in income-generating activities and earned between Ksh 10,000 and Ksh. 45,000.

Of the study participants, 84.2% had good practice towards CKD prevention. This finding was similar to the studies conducted in Malaysia's tertiary teaching hospital, which reported good practice scores in more than 88.3% of participants (Yusoff & Kueh, 2016). On the other hand, the

current study's findings differed from a study done in North West Ethiopia, whereby only 48.4% of the participants had good scores in CKD prevention (Asmelash *et al.*, 2020). This may be because the current study's respondents have regular follow-up and have health education opportunities during their clinics.

The current findings revealed that age, gender, and income were significantly associated with the uptake of CKD prevention practice. The findings are similar to a study that revealed that female participants were more likely to observe CKD prevention guidelines than males (Kim *et al.*, 2015). In contrast, another similar study in Palestine revealed that male participants had higher CKD prevention scores than females (Sa'adeh *et al.*, 2018). It is presumed that females seek professional health care more and thus engage in healthy behaviors compared to men.

Additionally, the results illustrated that participants aged 36-45 had better CKD prevention practice scores than those aged 56 years and above. The results agree with the findings by Kim *et al.* (2015), that reported that older participants were more likely to have poor CKD prevention practices. Nevertheless, this finding differed from the research done in Jordan, which showed that being older is associated with a better CKD prevention practice score (Khalil & Abdalrahim, 2014). Moreso, Yusoff, *et al.* (2016) found no association between age and CKD prevention practice. This may be due to differences in sample size and socio-demographic characteristics of the study respondents.

The research findings revealed that the respondents who reported earnings above Ksh.46,000 were 3.37 times more likely to have good CKD prevention uptake than those earning below Ksh.10,000. From the finding, high income is associated with good CKD prevention scores. This finding is consistent with three other studies (Yusoff *et al.*, 2016; Sa'adeh *et al.*, 2018; Khalil & Abdalrahim, 2014). On the other hand, Kim *et al.* (2015) did not find any noteworthy association between income and the level of CKD prevention uptake score. The findings can be attributed to the fact that an individual's behavior is limited by their social-economic status (Fiscella, 2016). Individual health-seeking behavior can be better if their access to resources is enhanced. CKD prevention practices like medications purchase and regular medical visits all have financial implications for the participants (Chen & Harris, 2015)

There was no association between participants' level of education and CKD prevention uptake. This finding is dissimilar from those done by Yusoff *et al.* (2016) and Sa'adeh *et al.* (2018), that revealed that participants with higher educational levels had higher CKD prevention scores. Even though it is presumed that people with higher education achievements have access to information from different journals and other information sources, they may not practice what they know hence the inconsistencies.

Even though other studies have shown a significant association between marital status and CKD prevention practice, the current research findings did not show any significant association. In other studies, the married

participants had good practices than unmarried ones towards CKD prevention (Kim *et al.*, 2015; Moura *et al.*, 2017). Mbabazi *et al.* (2022) also demonstrated significant association between marital status and CKD prevention practice.

The present study revealed that the participants who were well-informed about their disease condition and were more likely to have good CKD prevention practices than those who were not well informed. The result is consistent with similar studies by Asmelash *et al.* (2020) and Sa'adeh *et al.* (2018). Health literacy contributes to understanding the risks of CKD and how to modify them, hence better practice scores in participants who are well-informed about their medical condition.

The present study established that half of the respondents agreed that the healthcare provider had explained that they are at risk of developing chronic kidney failure as one of the DM/HTN complications. This finding is lower than two similar studies in North West Ethiopia (Asmelash *et al.*, 2020) and the Southeastern United States (Obadan *et al.*, 2017). On the other hand, the finding of this research is higher than that done in the Iranian community, whereby only 34.5% of the respondents reported that their physician had informed them about the risk of developing CKD (Roomizadeh *et al.*, 2014) as well as a study done by Hussain *et al.* (2019). The variations amid these studies may be attributed to the different levels of awareness among primary health care providers in these settings and the lack of health education that should be given to these patients by health care providers.

The research results revealed that only 71.1% of the participants had been screened for CKD through laboratory tests to check their kidney function tests. The finding is higher than that of Hussain *et al.* (2019) in India, whereby 44.27% of the participants had done kidney function tests to check their CKD status. Feakins *et al.* (2019) report that CKD screening is suboptimal even in countries with universal health coverage. Therefore, primary healthcare workers should be educated to improve suitable screening so that CKD may be discovered early (Luckyx *et al.*, 2020).

From the present research findings, HCP communicating to DM/HTN patients in a language they can understand was significantly associated with CKD preventive uptake. This is because patient treatment adherence is largely influenced by communication between the patient and the health care provider. There is a greater risk of non-adherence among patients attended by healthcare providers with poor communication skills, especially when the language barrier sets in (Meadors & Murray, 2015).

The current study established a significant association between CKD prevention uptake and accessing all the laboratory services within the hospital, and obtaining the prescribed drugs from the hospital pharmacy. The findings demonstrated that less than half of the participants could not afford all healthcare services. This finding is lower than a similar study that established that in South Africa, 52.1% found health services affordable (Stellenberg, 2015). The discrepancies between the two studies may be because of the national health insurance fund. Most of the participants that

reported having affordable health services had medical insurance. From the findings, although most participants have National Health Insurance Fund, half said that the fund did not cater to all their medical expenses. Moreover, 46.3% could not get prescribed drugs from the hospital pharmacy. This finding is similar to a study in Malawi, where drug availability was 48.5% (Khuluza & Haefele-Abah, 2019). Nevertheless, the finding differs from a study done in Rwanda, whereby approximately 80% of the participants could obtain the drugs from the hospital (Bizimana *et al.*, 2020).

The finding also revealed that the hospital is easily accessible to 59.5% of the participants. These findings are consistent with research done by Sperati *et al.* (2019) that established that scarce resources and inadequate clinical support hinders CKD prevention uptake. Moreover, the research findings are similar to a study in South Africa by Stellenberg (2015), which revealed that slightly over half of the participants could access healthcare services.

5. Conclusion

The majority of the diabetic and hypertensive patients had good practice toward the prevention of CKD. CKD prevention uptake was influenced by age, gender and income the ability of the HCP to communicate to patients in language the patient can comprehend and accessibility of health care services.

6. Recommendations

The study recommends that the health care providers in Nyeri County Referral Hospital should provide CKD prevention health education programs to DM and HTN patients with emphasis of lifestyle modifications including exercise. More emphasis on CKD prevention practices should be geared towards the males, elderly and those with low income. The national and county governments should ensure that hospital services are available, accessible, and affordable to DM/HTN patients. Primary health care providers (HCP) should be enlightened on the CKD screening and prevention guidelines for prompt detection and referral of patients.

7. Area for Further Research

Further study should be done to determine the knowledge and attitude on CKD and its prevention.

References

- [1] Abd ElHafeez, S., Bolignano, D., D'Arrigo, G., Dounousi, E., Tripepi, G., & Zoccali, C. (2018). Prevalence and burden of chronic kidney disease among the general population and high-risk groups in Africa: a systematic review. *BMJ Open*, 8(1), e015069.
- [2] Asmelash, D., Chane, E., Desalegn, G., Assefa, S., Aynalem, G. L., & Fasil, A. (2020). "Knowledge and Practices towards Prevention and Early Detection of Chronic Kidney Disease and Associated Factors among Hypertensive Patients in Gondar Town, North West Ethiopia", *International Journal of Hypertension*, vol. 2020, Article ID 2860143, 8 pages, 2020.
- [3] Chen, T., & Harris, D. C. (2015). Challenges of chronic kidney disease prevention. *Medical Journal of Australia*, 203(5), 209-210.
- [4] Dunkler, D., Kohl, M., Heinze, G., Teo, K. K., Rosengren, A., Pogue, J., Gao, P., Gerstein, H., Yusuf, S., Oberbauer, R., Mann, J. F., & For the ONTARGET Investigators. (2015). Modifiable lifestyle and social factors affect chronic kidney disease in high-risk individuals with type 2 diabetes mellitus. *Kidney International*, 87(4), 784-791.
- [5] Feakins, B., Oke, J., McFadden, E., Aronson, J., Lasserson, D., O'Callaghan, C., Taylor, C., Hill, N., Stevens, R., & Perera, R. (2019). Trends in kidney function testing in UK primary care since the introduction of the quality and outcomes framework: a retrospective cohort study using CPRD. *BMJ Open*, 9(6), e028062.
- [6] Fiscella, K. (2016). Relationships between income, health behaviors, and life expectancy. *JAMA*, 316(8), 880.
- [7] Hsiao, L. (2018). Raising awareness, screening, and prevention of chronic kidney disease: It takes more than a village. *Nephrology*, 23, 107-111.
- [8] Kaze, A. D., Ilori, T., Jaar, B. G., & Echouffo-Tcheugui, J. B. (2018). The burden of chronic kidney disease on the African continent: a systematic review and meta-analysis. *BMC Nephrology*, 19(1).
- [9] Kelly, J. T., Su, G., Zhang, L., Qin, X., Marshall, S., González-Ortiz, A., Clase, C. M., Campbell, K. L., Xu, H., & Carrero, J. (2020). Modifiable lifestyle factors for primary prevention of CKD: A systematic review and meta-analysis. *Journal of the American Society of Nephrology*, 32(1), 239-253.
- [10] Khalil, A., & Abdalrahim, M. (2014). Knowledge, attitudes, and practices towards prevention and early detection of chronic kidney disease. *International Nursing Review*, 61(2), 237-245.
- [11] Khuluza, F., & Haefele-Abah, C. (2019). The availability, prices and affordability of essential medicines in Malawi: A cross-sectional study. *PLOS ONE*, 14(2), e0212125.
- [12] Kim, T. H., Lee, M., Yoo, K., Han, E., & Choi, J. (2015). Association of demographic and socioeconomic factors with risk factors for chronic kidney disease. *Journal of Preventive Medicine and Public Health*, 48(3), 170-177.
- [13] Luyckx, V. A., Cherney, D. Z., & Bello, A. K. (2020). Preventing CKD in developed countries. *Kidney International Reports*, 5(3), 263-277.
- [14] Luyckx, V. A., Tonelli, M., & Stanifer, J. W. (2018). The global burden of kidney disease and the sustainable development goals. *Bulletin of the World Health Organization*, 96(6), 414-422D.
- [15] Meadors, J. D., & Murray, C. B. (2015). Doctor-patient interaction in the west: Psychosocial aspects. *International Encyclopedia of the Social & Behavioral Sciences*, 613-619.
- [16] Michishita, R., Matsuda, T., Kawakami, S., Tanaka, S., Kiyonaga, A., Tanaka, H., Morito, N., & Higaki, Y. (2017). The association between changes in lifestyle behaviors and the incidence of chronic kidney disease (CKD) in middle-aged and older men. *Journal of Epidemiology*, 27(8), 389-397.
- [17] Moura, E. C., Barbosa, J. B., & Marinho, P. É. (2017). Knowledge regarding the prevention of chronic kidney disease in hypertensive and diabetic patients: A cross-sectional study. *Fisioterapia em Movimento*, 30(suppl 1), 55-62.
- [18] Muiru, A. N., Charlebois, E. D., Balzer, L. B., Kwarisiima, D., Elly, A., Black, D., Okiror, S., Kabami, J., Atukunda, M., Snyman, K., Petersen, M., Kamya, M., Havlir, D., Estrella, M. M., & Hsu, C. (2020). The epidemiology of chronic kidney disease (CKD) in rural East Africa: A population-based study. *PLOS ONE*, 15(3), e0229649.
- [19] Neuen, B., Chadban, S., Demajo, A., Johnson, D., and Perkovic, V. (2017). Chronic kidney disease and the global NCDs agenda. *BMJ Global Health*, 2(2), p.e000380.
- [20] Obadan, N. O., Walker, R. J., & Egede, L. E. (2017). Independent correlates of chronic kidney disease awareness among adults with type 2 diabetes. *Journal of Diabetes and its Complications*, 31(6), 988-991.
- [21] Roomizadeh, P., Taheri, D., Abedini, A., Mortazavi, M., Larry, M., Mehdikhani, B., Mousavi, S., Hosseini, F., Parnia, A., & Nakhjavani, M. (2014). Limited knowledge of chronic kidney disease and its main risk factors among Iranian community: An appeal for promoting national public health education programs. *International Journal of Health Policy and Management*, 2(4), 161-166.
- [22] Sa'adeh, H. H., Darwazeh, R. N., Khalil, A. A., & Zyoud, S. H. (2018). Knowledge, attitudes and practices of hypertensive patients towards prevention and early detection of chronic kidney disease: A cross sectional study from Palestine. *Clinical Hypertension*, 24(1).
- [23] Sperati CJ, Soman S, Agrawal V, Liu Y, Abdel-Kader K, Diamantidis CJ, *et al.* (2019) Primary care physicians' perceptions of barriers and facilitators to the management of chronic kidney disease: A mixed-methods study. *PLoS ONE* 14(8): e0221325.
- [24] Stellenberg, E. L. (2015). Accessibility, affordability and use of health services in an urban area in South Africa. *Curatiosis*, 38(1).
- [25] Yusoff DM, Yusof J, & Kueh YC. (2016). Knowledge, Attitude and Practices of the Risk for Chronic Kidney Disease among Patients in a

- Tertiary Teaching Hospital. *The Malaysian Journal of Nursing*, 5(1), 1349-1352.
- [26] Zibran, M. A., & Mohammadnezhad, M. (2019). Determinants of knowledge, attitude and practice in patients with both type 2 diabetes and chronic kidney disease in Fiji. *F1000Research*, 8, 239.