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Original article

Risk factors for chronic kidney disease in the community: A decade of outreach in Kenya

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ABSTRACT

Problem Considered: Burden of chronic kidney disease (CKD) is increasing globally. We present chart analysis of data obtained during community screening for kidney disease between 2011-2021 in various parts of Kenya with objectives to document and stratify risks for kidney disease in the community.

Methods: This was a descriptive analysis charts. Age, sex, individuals' data on smoking, diabetes, hypertension, body mass index (BMI), systolic blood pressure (SBP), diastolic blood pressure (DBP), random blood sugar (RBS), dipstick urinalysis, as well as family history of CKD, hypertension and diabetes were analysed. Continuous variables had mean, standard deviation (SD), median and interquartile range (IQR) while frequencies for categorical variables were calculated.

Results: About 10,675 individuals were analysed. Median age was 41 years (25 – 53). Females were 6,092 (57.1%). Known hypertensive, diabetic and smokers were 2,028(19.0%), 881(8.3%) and 523(4.9%) respectively. Family history of hypertension, diabetes and CKD was reported by 3,810(35.7%), 2,751(25.8%) and 978(9.2%) respectively. In 10,121(94.8%) RBS was tested. About 470(4.6%) had RBS $<$ 4.0 mmol/L, 9,298(91.9%) 4.0-11.0 mmol/L while 368(3.6%) was $>$ 11.0 mmol/L. Incidental hyperglycemia was in129 (1.2%). Median SBP and DBP was 128 mmHg (116-143) and 78 mmHg (70 – 87) respectively. Mean BMI was 25.96±5.27 kg/m2. Subgroups with diabetes and hypertension had higher mean age, SBP, DBP and RBS, family history of hypertension, diabetes and CKD.

Conclusion: Burden of risks for CKD in the community high. Blood sugar and blood pressure controls were suboptimal. There was concordance in the findings of hypotensive, diabetic and family history of similar conditions.

1. Introduction

Kidney disease is an increasing global problem that has high individual and societal costs.[1] Chronic kidney disease (CKD) refers to abnormalities of kidney structure and function over time with implications for health.[2] It is a progressive condition and has been classified into five stages by a global initiative called Kidney Disease: Improving Global Outcomes (KDIGO).[3] According to the American Society of Nephrology, European Renal Association and the International Society of Nephrology, by 2021, more than 850 million people in the world suffered from some form of kidney disease.[3] In 2017, Global Burden of Disease project reported that almost 700 million cases of all stages of CKD and a global prevalence between 8.5 and 9.8 %.[4] In Africa, pooled prevalence of CKD in general and high risk populations has been estimated to be between 10.1 % and 15.8 % with regional variations in the prevalence rates. North Africa region has the lowest while West Africa region has the highest pooled prevalence of CKD.[5] The prevalence of CKD has been estimated to be almost 14 % in the sub-Saharan Africa.[6] The exact prevalence of CKD in Kenya is not known.

There are several social, environmental and economic threats that increase the global risk of kidney disease. These include diabetes, cigarette smoking, hypertension, obesity and aging population.[1] Hypertension and diabetes are the most common causes of CKD.[7] Both diabetes and hypertension have familial tendencies. In some areas of the

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world with especially high burdens of CKD, the cause remains unknown.[8]

Chronic kidney disease is asymptomatic in early stages. This underscores the need for active screening for the disease. Early identification of CKD in people at risk would be beneficial in the community and primary care settings.[9] Early detection and treatment of diabetes, hypertension and CKD is possible using readily available, often inexpensive tools and treatments. Despite the availability of such interventions, the burden of CKD and its related risk factors remains understudied in many areas of the world especially in the developing countries like Kenya. Even in countries with available data, disease awareness is low among both the general public and health-care authorities.[10] Literature supports community-based health programmes strategy to promote awareness of a health condition and identify individuals at risk.[11–13] The need to increase awareness of kidney disease in the community in Kenya has made the Kenya Renal Association and Kenya Nephrology Nurses Association carry out annual activities to provide basic screening and awareness of kidney diseases to people in the community (outreaches) from the year 2011. In these outreaches, individuals are screened for risks of kidney disease by history and basic tests and anthropometric measurements. Parameters captured include age, sex, individuals' history on smoking, diabetes and hypertension as well as family history of CKD, hypertension and diabetes. We present chart analysis of the data obtained during the outreaches between the year 2011 and 2021 with objectives to document and stratify the risks of kidney disease in the community. The findings of this analysis add to the data on kidney disease in the community in our setting. The findings can also inform areas of programming in the effort to reduce the burden of kidney disease and its tributaries.

2. Methodology

This was charts analysis of data of individuals screened in the community during medical outreaches by the Kenya Renal Association (the professional association for nephrologists in Kenya) and the Kenya Nephrology Nurses Association (the professional association for nephrology nurses in Kenya) at various parts of Kenya between 2011 and 2021.

The outreaches were undertaken in various settings which included market places, public parks, private and public hospitals. Screening was performed to any person who attended the outreach voluntarily free of cost to the attendees.

The outreaches were carried out by teams of health professionals which were led by nephrologists and nephrology nurses. Members of the teams included health records and information officers, counselors, nutritionists, medical laboratory technologists and support staff for logistics. The outreach entailed setting up tents as consultation stations and mobile toilets in open places where there no such amenities or using the amenities present if the outreaches were carried out in places with such amenities. Any person who presented was eligible for screening.

The flow of the person for screening included registration and issuance of a duplicate screening form by the health records information officers, taking the history of personal and family history of kidney disease and risk factors and measurement of blood pressure and blood sugar by nurses. Blood sugar was measured using glucometers and utilized capillary blood from fingers pricks and reported in millimoles per litre (mmol/L). The blood pressure was measured with the individual seated using digital blood pressure machines with appropriate size of cuff applied in the mid-arm. This was followed by measurement of height and weight. Weight was measured to the nearest 0.1 kg using a digital scale placed on a firm flat surface after the participants had removed heavy outer garments, shoes and emptied their pockets. The weighing scale was calibrated daily. The height was taken using a stadiometer and employed a standard protocol. Two measurements were taken and the average of the two readings recorded to the nearest centimetre. Body mass index (BMI) was calculated by dividing the weight in kilogram by the square of height in metres by the nutritionists who also provided nutritional counseling. Body mass index for individual aged 18 years and above was classified as underweight for BMI <18.5 kg/m^2, normal for BMI of 18.5–24.9 kg/m^2, pre-obese for BMI of 25.0–29.9 kg/m^2 and obese for BMI of ≥ 30.0 kg/m^2.[14] The individuals proceeded to the station where urine bottles and tissue paper were issued and instructions on how to collect urine samples given. They returned the urine samples to that station where dipstick urine analysis was performed by the medical laboratory technologists and results documented on the form. The dipstick test parameters of interest included leucocytes, blood, protein and glucose which were recorded as negative, +1 to +4. The last station was for review by clinicians where the individuals were informed of the findings and their significance. More individualized health education was offered. For those who required referral for further medical follow up, this was documented in the form. The patient was given the original form and the duplicate form was retained by the clinician and advised to present the form at a health facility of choice for further follow up.

This analysis included all the available forms for the period between 2011 and 2021. No consent was required for this analysis. It was approved by Kenyatta National Hospital-University of Nairobi Ethics and Research Committee reference number P505/07/2018. The variables of interest included age, sex, individuals' history on current smoking, diabetes and hypertension, blood pressure, blood sugar as well as family history of CKD, hypertension and diabetes. Based on history of diabetes, a category of known diabetic was noted. Based on the measured blood sugar categories of newly diagnosed diabetic (RBS >11.0 mmol/L in individuals who had no history of diabetes) hypoglycemic (RBS<4.0 mmol/L), euglycemic (RBS 4.0–11.0 mmol/L) and hyperglycemic (RBS >11.0 mmol/L) based on references by Pagana et al.[15]

The data were entered in electronic spreadsheet which was updated regularly. Analyses were performed using the Statistical Package for the Social Sciences (SPSS) (IBM SPSS Statistics for Windows, Version 20. Armonk, NY: IBM Corp). Continuous variables had measures of central tendencies like mean, standard deviation (SD), median, interquartile range (IQR) and mode calculated. For normally distributed continuous variables, mean $\pm$ SD were used while for the skewed data, median and IQR were used. Frequencies of categorical variables were calculated as numbers and percentages. Significance testings were performed with chi-square and student t-test for categorical and continuous data respectively. Between groups comparison was performed using paired T-test and Mann-Whitney U tests. The level of significance was <0.05 at 95 % confidence.

3. Results

We present data of 10,675 individuals who were screened between the years 2011 and 2021. The median age was 41 years (IQR 25–53). There were 6092(57.1 %) females. About 523(4.9%) gave a current history of cigarette smoking. There were 2028(19.0 %) individuals who were known to suffer from high blood pressure while 881(8.3 %) were known to suffer from diabetes. (Table 1).

Blood pressure was measured in 10,299(96.5 %) individuals. The median systolic blood pressure (SBP) was 128 mmHg (IQR 116–143) and the median diastolic blood pressure (DBP) was 78 mmHg (IQR 70–87). About 9450(88.5 %) individuals had their body weight taken and the median body weight was 68 kg (IQR 58–78). A total of 9398 (88.0 %) individuals had their height measured. The median height was 163 cm (IQR 157–170). Among 8984 individuals who were aged 18 years and above, their mean BMI was 25.96 ± 5.27 kg/m^2. Among 8984 individuals aged 18 years and above, 440(4.9 %) had BMI <18.5 kg/m^2 (underweight), 3792(42.2 %) had BMI of 18.5–24.9 kg/m^2 (normal weight), 2866(31.9 %) had BMI of 25.0–29.9 kg/m^2 (pre-obese) while 1886(21.0 %) were obese with BMI of ≥ 30.0 kg/m^2.

Family history of hypertension was reported by 3810(35.7 %),

Table 1
Distribution of screened individuals by sex, history of smoking, diabetes and hypertension as well as familial history of chronic kidney disease, hypertension and diabetes mellitus.

Description	2011	2012	2013	2014	2016	2018	2019	2020	2021	Total n(%)
Number	383 (3.6)	347(3.3)	1557 (14.6)	1050 (9.8)	1127 (10.6)	295(2.8)	2409 (22.6)	2625 (24.6)	882(8.3)	10675 (100.0)
Male n(%)	265 (69.2)	105 (30.3)	882(56.6)	450 (42.9)	410(36.4)	92(31.2)	966(40.1)	1046 (39.8)	367 (41.6)	**4583(42.9)**
Female n(%)	118 (30.8)	242 (69.7)	675(43.4)	600 (57.1)	717(63.6)	203 (68.8)	1443 (59.9)	1579 (60.2)	515 (58.4)	**6092(57.1)**
Smokers n(%)	26(6.8)	3(0.9)	96(6.2)	57(5.4)	39(3.5)	14(4.7)	77(3.2)	162(6.2)	49(5.6)	**523(4.9)**
Diabetes n(%)	22(5.7)	43(12.4)	99(6.4)	91(8.7)	92(8.2)	33(11.2)	222(9.2)	181(6.9)	98(11.1)	**881(8.3)**
Hypertension n(%)	38(9.9)	70(20.2)	225(14.5)	106 (10.1)	286(25.4)	75(25.4)	521(21.6)	520(19.8)	187 (21.2)	**2028(19.0)**
Family history of diabetes n(%)	98(25.6)	53(15.3)	457(29.4)	117 (11.1)	245(21.7)	85(28.8)	678(28.1)	745(28.4)	273 (31.0)	**2751(25.8)**
Family history of hypertension n(%)	128 (33.4)	43(12.4)	225(14.5)	116 (11.0)	336(39.8)	145 (49.2)	996(41.3)	1092 (41.6)	365 (41.4)	**3810(35.7)**
Family history of chronic of kidney disease n(%)	39(10.2)	10(2.9)	155(10.0)	50(4.8)	59(5.2)	18(6.1)	331(13.7)	223(8.5)	93(10.5	**978(9.2)**

n number.

family history of diabetes by 2751(25.8 %) while family history of CKD was reported by 978(9.2 %). (Table 1).

Among the 2,028(19.0%) individuals who reported to be known to suffer from hypertension, more than a half had family history of hypertension; more than a third had family history of diabetes while more than 10 % reported to have family history of CKD. The mean age of this subgroup was 53.1 ± 14.5 years, mean SBP was 147 ± 25 mmHg and mean DBP was 87 ± 15 mmHg. Their average random blood sugar (RBS) was 6.7 ± 3.4 mmol/L, and almost 8 % among them had RBS of >11.0 mmol/l. Among the known hypertensive individuals, about a third were males and about 4 % were active cigarettes smokers. A quarter of the known hypertensive individuals were known diabetic too. (Table 2).

Among the 881(8.3 %) individuals who reported to be known to suffer from diabetes, more than half reported to have family history of diabetes. About 50 % had family history of hypertension while 111(12.6 %) among them had family history of CKD. The mean age of this subgroup was 54.1 ± 14.6 years; mean SBP was 143 ± 25 mmHg while mean DBP was 83 ± 13 mmHg. Their mean RBS was 9.1 ± 5.3 mmol/lL and 224(25.4 %) among them had RBS>11.0 mmol/L. About 60(7.0 %) of this subgroup were smokers while 512(58.1 %) were known hypertensive. (Table 2).

In 10,121/(94.8 %) individuals, RBS screening was done. The median RBS was 5.30 mmol/L (IQR 4.70–6.20). There were 470(4.6 %) who had RBS <4.0 mmol/L (hypoglycemia), 9298(91.9 %) RBS of 4.0–11.0 mmol/L (euglycemic) while 368(3.6 %) had RBS >11.0 mmol/L (hyperglycemia). When comparison among the three blood sugar strata was done, patients who had RBS >11.0 mmol/l were older with mean age of 54.1 ± 13.5 years. They had significantly higher SBP and DBP. History of diabetes mellitus, family history of diabetes mellitus, hypertension and family history of hypertension were significantly associated with RBS >11.0 mmol/l ($p < 0.001$). Sex and family history of CKD did not seem to have significant influence on glycemic strata ($p = 0.371$ and $p = 0.586$ respectively). (Table 3). Among the respondents, about 129(1.2 %) of all the individuals screened were not known to have diabetes though they had RBS >11.0 mmol/l. In these 129(1.2 %) respondents who were incidentally noted to have RBS>11.0 mmol/l, their average age was 53 ± 14 years, their mean RBS was 17.1 ± 5.3 mmol/L and 36(27.9 %) reported family history of diabetes.

Urinalysis by the standard dipstick method was performed for 5261 (49.3 %) persons. Majority 4755(90.4 %) of patients had urinalysis negative for proteinuria, glycosuria, haematuria and leukocyturia. Proteinuria of +2 had the highest number, while that of +4 had the least number. (Table 4).

Table 2
Characteristics individuals who were known diabetic and known hypertensive.

Description	Known Diabetic	Known Hypertensive
Number	881	2028
Male n(%)	403(45.7)	709(35.0)
Age (year) Mean ± SD	54.1 ± 14.6	53.1 ± 14.5
Systolic blood pressure (mmHg) Mean ± SD	143 ± 25	147 ± 25
Diastolic blood pressure (mmHg) Mean ± SD	83 ± 13	87 ± 15
Random blood sugar (mmol/L) Mean ± SD	9.1 ± 5.3	6.7 ± 3.4
Random blood sugar >11.0 mmol/L n(%)	224(25.4)	157(7.7)
Smokers n(%)	60(6.8)	80(3.9)
Diabetes n(%)	881(100.0)	512(25.2)
Hypertension n(%)	512(58.1)	2028(100.0)
Family history of diabetes n(%)	479(54.5)	716(35.3)
Family history of hypertension n(%)	435(49.4)	1144(56.4)
Family history chronic kidney disease n (%)	111(12.6)	244(12.0)

n number, SD standard deviation.

Table 3
Characteristics individuals after stratification by random blood sugar categories.

Description	RBS <4.0 mmol/L	RBS 4.0–11.0 mmol/L	RBS >11.0 mmol/L	p-value
Number n(%)	470(4.6)	9298(91.9)	368(3.6)	
Age (years) Mean ± SD	40.9 ± 15.3	41.7 ± 16.0	54.1 ± 13.5	<0.001 (10.7–14.0)†
Sex Male n(%)	217 (46.2)	3988(42.9)	159 (43.2)	0.371‡
Systolic blood pressure (mmHg) mean ± SD	129.9 ± 21.2	130.8 ± 22.0	146.0 ± 26.1	<0.001 (13.4–18.0)†
Diastolic blood pressure (mmHg) mean ± SD	80.2 ± 13.8	79.2 ± 13.2	84.9 ± 13.8	<0.001 (4.4–7.2)†
Diabetes n(%)	37(7.9)	596(6.4)	232 (63.0)	<0.001‡
Hypertension n(%)	66(14.0)	1721(18.5)	164 (44.6)	<0.001‡
Family history of diabetes n(%)	97(20.6)	2366(25.4)	185 (50.3)	<0.001‡
Family history of hypertension n(%)	142 (30.2)	3343(36.0)	166 (45.1)	<0.001‡
Family history of chronic kidney disease	46(9.8)	856(9.2)	39(10.7)	0.586‡

n number, RBS random blood sugar, SD standard deviation, † Independent Samples T-test at 95 % Confidence Interval, ‡Chi square Kruskal Wallis Test.

Table 4
Dipstick urinalysis showing protein, glucose, blood and leucocytes.

Result	Protein n(%)	Glucose n(%)	Blood n(%)	Leukocyte n(%)
Negative	4755(90.4)	4754(90.4)	4755(90.4)	4754(90.4)
+	176(3.3)	464(8.8)	495(9.4)	501(9.5)
++	204(3.9)	10(0.2)	4(0.1)	0(0.0)
+++	100(0.9)	9(0.2)	3(0.1)	4(0.1)
++++	26(0.2)	24(0.5)	4(0.1)	2(0.0)
Total	5261	5261	5261	5261

Blood + 10 cell/uL, blood ++ 25 cells/uL, blood +++ 80 cells/uL, blood ++++ ≥200 cells/uL. Glucose +15 mmol/L, glucose ++ 30 mmol/L, glucose +++ 60 mmol/L, glucose ++++ ≥110 mmol/L. Leucocytes +15 cell/uL, leucocytes ++ 75 cells/uL, leucocytes +++ 125 cells/uL, leucocytes ++++ ≥500 cells/uL. Protein+ 0.3 g/L, protein ++ 1.0 g/L, protein +++ 3.0 g/L, protein ++++ ≥20 g/L n number.

4. Discussion and conclusions

The centrality of prioritization of kidney health to aid in attainment of health-related targets in sustainable development goals and universal health coverage has been clearly articulated in the international consensus about CKD as a global public health agenda by nephrology societies and associations of the world.[1] The disability-adjusted life--years rate for impaired kidney function is higher than that for drug use, unsafe sanitation, low physical activity, second-hand smoke, and several dietary risk factors.[16] Fewer than 10 % of patients with CKD are aware of their disease, both in developing[17] and developed[18] countries. Early kidney disease detection programmes and implementation of nephroprotective treatment as well as appropriate treatment of CKD risk factors like hypertension and diabetes are key in slowing the rise of the burden of ESKD.[7] Screening for CKD, interwoven with risk stratification and treatment are cost-effective in people with diabetes and hypertension, the two most common causes of CKD worldwide.[9,19]

Identification of factors which predispose an individual to CKD is essential in terms of personal and community health. This is because some risk factors can be modified to prevent or slow down progression of CKD to end stage kidney disease (ESKD). Education regarding early CKD recognition may help to delay disease progression especially in patients with risk factors like diabetes and hypertension.[20]

In this study among the participants from general population, the well-known risk factors for kidney disease which include diabetes, hypertension and history of CKD were analysed. A fifth of the participants were known to suffer from hypertension, 8.3 % were known diabetic while almost 5 % were current active smokers. More than a third had family history of hypertension and a quarter had family history of diabetes. It is therefore not surprising that almost 10 % of the participants reported to have a family history of overt CKD. Comparable findings were reported among adults in Hawaii by Kataoka-Yahiro et al. where over a period of 10 years, almost 40 % were hypertensive and almost 20 % were diabetic. However there were three times more smokers than those we found in our study.[21] In Australian community, among the individual at risk of CKD, smokers were found to constitute about 12 %.[22] The likely reason why smokers were more in these studies might be because they considered both present and past smokers while our study considered current active smokers. The other plausible reason is that there are likely more cigarette smokers in other parts of the world than in our setting. Cigarette smoking is a well-documented preventable risk factor for the development and progression of CKD in community.[23,24] The risk of CKD in smokers is mediated by proinflammatory state, oxidative stress, endothelial dysfunction, glomerulosclerosis and tubular atrophy.[25] More health education in the community is needed to enlighten the communities about the dangers of tobacco smoking. Even among the diabetic and hypertensive individuals, there were current active smokers among them despite the known dangers smoking poses.

Among the hypertensive individuals, 10 % were diabetic, 60 % had family history of hypertension and 25 % had family history of diabetes. The average blood pressure of the individuals who were known hypertensive was significantly higher than the recommended blood pressure targets.[26] Among the diabetic individuals, almost 60 % were hypertensive, about 50 % had family history of diabetes and 25 % had random blood sugar of >11.0 mmol/L. More than 1 % of individuals were incidentally noted to have hyperglycemia with no previous history of diabetes. In 12 countries from low- and middle-income countries in six regions, more than 30 % individuals had diabetes and they were unaware that they were diabetic.[17] More than 10 % of patients who were diabetic reported family history of overt CKD. We found hypertension and diabetes comorbidities in one in every four participants. There is evidence of poor blood pressure control among the known hypertensive and poor blood sugar control among the known diabetic individuals in our study. Similar findings have been reported in community based screening programmes among Somoans and Australians.[22,27]

Concordant family history hypertension among the hypertensive and family history of diabetes among the diabetics was demonstrated in the current study and this points to the familial tendencies of these medical conditions.[28] This finding may be utilized in our setting in risk-stratifications delete of in the community, where a family member has diabetes or hypertension, other members of the same family can be scored as high risk. The main drivers for CKD are diabetes and hypertension. Comorbidities of diabetes and hypertension place the individuals at a higher risk for CKD. This analysis shows a substantial burden of risks of CKD in the general population similar to the ones reported in systematic review in sub-Saharan Africa.[6]

Public health crisis in kidney disease is made worse by rising prevalence and simultaneous low public awareness of CKD.[29] Progression and adverse outcomes of CKD can be prevented or delayed by detecting and treating the disease in its initial stages.[30] However, lack of symptoms in early stages of CKD makes it difficult to diagnose the disease in its initial stages.[31] Nevertheless, profiling individuals risks for CKD may be beneficial in detection of those who are likely to suffer from CKD.

Dipstick test is well-known as the most feasible method for screening urine in community settings; although there is evidence that "false positive" and "false negative" results are quite common.[32,33] Urinalysis by dipstick method showed that, among the individuals who were tested, more than nine in every 10 returned negative results for protein, glucose, blood and leucocytes. Our study could not ascertain which results could have been false negative or positive as it was cross-sectional. Other studies have reported more urine abnormalities than those found in our study. In community-based screening programme among Somoan cohort, Tafuna'i M et al. reported proteinuria in 8.3 % and haematuria in 9.4 % of participants by dipstick method.[27] In Australia, screening for CKD in the community and workplace, proteinuria (one plus or more by dipstick) was found in 13 % of participants, and haematuria in 13 %.[22] The prevalence of micro-albuminuria in general population in Egypt has been reported to be more than 10 %, and even higher subjects with diabetes, hypertension, obesity, or cardiovascular disease.[34]

Obesity is a modifiable risk factor for ESKD.[35] The kidney injury in obesity may be contributed by inflammation, oxidative stress, and endothelial injury and adipokine derangements.[36] Most of our screening participants had body mass index within the normal range as per World Health Organization categorization.[14] In Australia a pilot study to screen for CKD in the community and work place reported obesity in 44 % of participants, and mean body mass index was 30.0 (±4.7) kg/m^2 for men and 28.5 (±6.1) kg/m^2 for women.[22]

A study to find out barriers and facilitators of community screening for kidney disease among Black Americans recommended partnering with trusted community members, selecting convenient locations for screening as the facilitators.[37] For our case, the screening was carried out by teams lead by nephrologists and nephrology nurses associations in various locations including market places. Despite availability of screening programmes in other parts of the world, people choose not to attend health-screening events for various reasons, such as lack of time and knowledge about the disease condition, fear of testing physicality,

and potentially serious diagnoses.[38,39]

Our analysis was limited by the cross-sectional observational nature with no follow up, in multiple locations in different years. Being a free of cost, voluntary screening, there is a possibility that more persons who were known to be sick attended.

In conclusion, this analysis brings outs high burden of risks of CKD in the community. The most common being hypertension and diabetes. A sizeable number of individuals reported family history of hypertension, diabetes and kidney disease. There was concordance in the findings of those who reported to be hypertensive, diabetes and family history of similar conditions. The control of blood sugar among the individuals who were known diabetic was poor. Similarly, the control of blood pressure among those who were known to be hypertensive was not satisfactory. Diabetes and hypertension co-morbidities were high in the community. From this analysis, it is reasonable to recommend specific screening for kidney disease in the community among individuals after performing risk stratification using history taking and specific risk factors like smoking, diabetes, hypertension, family history of diabetes, family history of hypertension as well as family history of CKD. This will select for the individuals who would undergo more testing for kidney disease which might be more expensive when done to the whole community like measurement of serum creatinine and urine albumin to creatinine ratio. More health education to the persons with diabetes and hypertension on the importance of control of these conditions is required in the community.

CRediT authorship contribution statement

S.K. Kabinga, Conception and design of the study, Acquisition of data, analysis and/or interpretation of data, Drafting the manuscript, Approval of the version of the manuscript to be published. S.O. McLigeyo, Conception and design of the study, Acquisition of data, analysis and/or interpretation of data, Drafting the manuscript, Approval of the version of the manuscript to be published. A. Twahir, Conception and design of the study, Acquisition of data, analysis and/or interpretation of data, Drafting the manuscript, Approval of the version of the manuscript to be published. J. N. Ndungu, Conception and design of the study, Acquisition of data, analysis and/or interpretation of data, Drafting the manuscript, Approval of the version of the manuscript to be published. N. N. Wang'ombe, Conception and design of the study, Acquisition of data, analysis and/or interpretation of data, Drafting the manuscript, Approval of the version of the manuscript to be published. D.K. Nyarera, Conception and design of the study, Acquisition of data, analysis and/or interpretation of data, Drafting the manuscript, Approval of the version of the manuscript to be published. G. W. Ngaruiya, Conception and design of the study, Acquisition of data, analysis and/or interpretation of data, Drafting the manuscript, Approval of the version of the manuscript to be published. R. K. Chege, Conception and design of the study, Acquisition of data, analysis and/or interpretation of data, Drafting the manuscript, Approval of the version of the manuscript to be published. P. S. Ochieng, Conception and design of the study, Acquisition of data, analysis and/or interpretation of data, Drafting the manuscript, Approval of the version of the manuscript to be published. M.O. Ogutu, Conception and design of the study, Acquisition of data, analysis and/or interpretation of data, Drafting the manuscript, Approval of the version of the manuscript to be published. G. M. Moturi, Conception and design of the study, Acquisition of data, analysis and/or interpretation of data, Drafting the manuscript, Approval of the version of the manuscript to be published.

Ethical compliance statement

The research was approved by the Kenyatta National Hospital—University of Nairobi Ethics Research Committee (P505/07/2018).

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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