RISK FACTORS ASSOCIATED WITH HIGH PREVALENCE OF CHRONIC KIDNEY DISEASE IN RURAL AND SEMI-URBAN COMMUNITIES IN SOUTHEAST NIGERIAN: A SYSTEMATIC REVIEW OF LITERATURE TOWARD SCREENING AWARENESS FOR PREVENTIVE MEASURES.

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Abstract

Aims: Chronic Kidney Disease (CKD) is a worldwide problem with increasing prevalence. End-stage renal disease accounts for 8% of all medical admissions and 42% of renal admissions in Nigeria. We review the literature on risk factors that might have impacted the prevalence and how awareness level of risk factors screening contributes to CKD. Design: Systematic literature review. Methods: A search was carried out on databases, PubMed, Medline and Google by means of (MeSH) terms, prevalence, demographics, risk factors, history of previous medical screening, age groups, income and education were indicators. Multivariate analyses were used to identify correlates. Reviewers screened 84 articles and 40 full texts were checked following inclusion criteria (1) publication between January 1985 and December 2018, (2) availability as full text in English (3) categorization as original research, review and meta-analysis. Results: A total of 7 articles were included. The hospital study with a total of 1574 patients were reviewed. A total of 908 with a mean age of 42.55±15.42 years were analyzed, prevalence (12.0%). One epidemiological study screened 2186 respondents, 1941 with a mean age of 43.7±13.2 were analyzed. Overall prevalence of 11.4% (semi-urban 11.7% and rural 11.1%) was observed. The glomerular filtration rate (GFR) was estimated using CKD-EPI equation. Another study screened 400 respondents, 328 with a mean of 54.8±13.2 were analyzed. The GFR used was MDRA equation with prevalence (7.8%). The observed risk factors; older age (P<0.001), hypertension (P<0.001), use of nephrotoxins (P<0.001), obesity (P<0.001), history of renal disease (P<0.001) were independent risk factors that influence the prevalence, diabetes mellitus (P<0.005), use soaps containing mercury (P<0.056) and use of bleaching cream (P=0.138) were not significant, low income and education were significantly prevalent among the population. Conclusion: The early onset of the risk factors among younger adults clearly underlines the need for early screening and intervention.

Review Criteria

A search was carried out on the different databases by means of the (MeSH) terms prevalence, risk factors, history of risk factor screening, demographics, income, education and preventions strategies. Reviewers screened 84 papers and 40 full text were checked. Following inclusion criteria: (1) publication between January 1985 and December 2018, (2) availability as full text in English, (3) categorization as original research, reviews, meta-analysis.

Message for the clinic

Risk factors of CKD are high in the communities reviewed. Routine screening of all patients for risk factors for CKD at any contact between the doctor and the patient is advocated to identify those who may benefit from preventive measures. Attitudinal change is a public message.

Acknowledgment

This is part of review from Department of Medical Laboratory Sciences, Chemical Pathology, Nephrology of University of Nigeria Enugu Campus to create awareness on the importance of screening of risk factors as a result of increasing prevalence of CKD in Nigeria.

Disclosure

The authors declared that they have no conflicts of interest.

Authors Contributions

All co-authors contributed to the study design and review drafts of the manuscript. The first author Okafor E.N screened all the article for inclusion in this review and appraised the study quality. Ugonabu M.C. and Ufele Silas screened a sample of those at title/abstract and full text. Okonkwo I.N. scored the quality of the sample of included articles. Chukwukelu E.E. drafted the manuscript. All authors read and approved the final version of the manuscript.

1.0 Introduction

Chronic kidney disease (CKD) has become a leading public health problem worldwide.[1] The global prevalence is estimated to be between 5% and 15%[2,3]. The National Kidney Foundation estimates that 20 million Americans have CKD and at least a further 20 million individuals have an increased risk[4,5]. CKD and its associated complications have a significant impact on patients' quality of life. The magnitudes of the effect are diverse. Provisional data suggests the occurrence of estimated 850,000 fatalities every year and 15,010,167 disability-adjusted life years[6].

In Nigeria, the peak prevalence of CKD is between the third and fifth decade of life, thus contributing to manpower and economic waste[7]. In a report by Ulasi and Ijoma[8], highlighting on the magnitude of CKD in Nigeria with the situation in University of Nigeria Teaching Hospital (UNTH) Enugu, Southeast Nigeria, they documented that end stage renal disease (ESRD) cases accounted for over 8% of all medical admissions and 42% of renal admissions.

Table 1: The burden of CKD from patient, outpatient attendance, admission/death by sex in South East Nigeria[8].

		Number (%) **Male** **Female**	Number (%) **Male** **Female**	Number (%) **Male** **Female**	Number (%) **Male** **Female**	Number (%) **Male** **Female**
Medical outpatient: New Cases Old cases	Medical outpatient: New Cases Old cases	19,661(54.5) 85,322(48.3)	19,661(54.5) 85,322(48.3)	19,661(54.5) 85,322(48.3)	16,436(45.5) 91,254(51.7)	16,436(45.5) 91,254(51.7)

		Number (%) **Male Female**	Number (%) **Male Female**	Number (%) **Male Female**	Number (%) **Male Female**	Number (%) **Male Female**
Renal outpatient:	Renal outpatient:	6065(55.8) 32,218(46.7)	6065(55.8) 32,218(46.7)	6065(55.8) 32,218(46.7)	4813(44.3) 36,766(53.3)	4813(44.3) 36,766(53.3)
New cases	New cases	11430(59.2)	11430(59.2)	11430(59.2)	7887(40.8)	7887(40.8)
Old cases	Old cases	2229(60.4)	2229(60.4)	2229(60.4)	1460(39.6)	1460(39.6)
Medical Admissions	Medical Admissions	1001(65.1) 593(65.3)	1001(65.1) 593(65.3)	1001(65.1) 593(65.3)	537(34.9) 315(34.7)	537(34.9) 315(34.7)
Renal Admissions	Renal Admissions	3258(63.6) 746(66.1)	3258(63.6) 746(66.1)	3258(63.6) 746(66.1)	1862(36.4) 382(33.9)	1862(36.4) 382(33.9)
ESRD Admissions	ESRD Admissions					
Patients on dialysis	Patients on dialysis					
Medical Deaths	Medical Deaths					
Renal Deaths	Renal Deaths					
Age group of patients by disease	**Age group of patients by disease**	**Age group of patients by disease**	**Age group of patients by disease**	**Age group of patients by disease**	**Age group of patients by disease**	**Age group of patients by disease**
Primary renal disease	12-35	12-35	Age groups number (%) 36-60	[?]61	[?]61	Total
Uncertain causes	375(24.4)	375(24.4)	340(22.1)	79(5.1)	79(5.1)	794(51.6)
CGN	149(9.7)	149(9.7)	67(4.35)	10(0.65)	10(0.65)	226(14.8)
Hypertension	8(0.5)	8(0.5)	210(13.65)	47(3.05)	47(3.05)	265(17.2)
Diabetes Mellitus	13(0.8)	13(0.8)	115(7.5)	54(3.5)	54(3.5)	182(11.8)
Others	18(1.15)	18(1.15)	35(2.3)	18(1.15)	18(1.15)	71(4.6)
Total	**563(36.6)**	**563(36.6)**	**767(49.9)**	**208(13.5)**	**208(13.5)**	**1538(100)**

ESRD: end-stage renal disease *Others sickle cell nephropathy -2 (2.8%), ADPKD -5 (7.0%), toxic nephropathy -22 (31.0%), obstructive uropathy -20 (28.2%), chronic pyelonephritis -22 (31.0%)

This may be a huge underestimation of the true situation in rural and semi-urban communities. Patients often present late and a good number of them may not visit the healthcare facilities for several reasons including high cost of healthcare services as well as the use of alternative treatments such as herbal remedies, spiritual healing and traditional native healers[9]. The cost of management of ESRD and affordability is a concern where renal replacement therapy (RRT) is available. There is little or no social security system including appropriate healthcare insurance scheme and so patients pay out of their pockets.

Most of the prevalence studies in Nigeria were hospital based[8, 10-11,] and of ESRD, with figure ranging from 8% to 12%. The epidemiological community based studies identified in Southeast Nigeria, however, looked at various stages of CKD in rural and semi-urban communities. One of the study documented that the overall age and sex adjusted prevalence was 11.4%, respondents [?] 60 years was 27.8% in rural and the highest prevalence of 32.9% was observed in semi urban area[12].

Table 2: characteristics of epidemiological community based study in south east Nigeria (A total of 2182 respondents were screened, 1941 had analyzable data)[12]

Variables	**All (1941)**	**Semi-urban (1330)**	**Rural (611)**	Fix[2]
Men (%)	36.6	40.8	27.6	
Mean age ± S.D. (years)	43.68±13.15	41.87+12.84	47.61+12.99	*82.96*
Age group (%)				
25-34 years	27.9	34.5	20.3	-
35-44 years	19.8	21.2	16.9	-
45-54 years	23.5	23.9	22.7	
55-64 years	26.7	20.5	40.1	-
Waist circumference (cm)	Waist circumference (cm)	Waist circumference (cm)	Waist circumference (cm)	Waist circu
80 for females	56.0	64.8	40.5	*67.6*
94 for males	14.5	16.6	7.7	*8.1*
Waist hip ratio				
> 0.85 for females	51.3	53.3	47.8	*0.34*
> 0.90 for males	30.8	31.5	28.6	*3.4*
No of years in school (%)	No of years in school (%)	No of years in school (%)	No of years in school (%)	No of years
No schooling	-	-	-	-
6 years	28.9	14.2	60.6	-
7-12	22.6	23.2	21.2	*4.96*
>12	27.7	33.5	17.2	-
-	20.9	29.1	3.3	-
Occupation (1168)[b]	Occupation (1168)[b]	Occupation (1168)[b]	Occupation (1168)[b]	Occupation
Farmers	-	-	-	-
Traders/artisans	297/1168	23/297	274/297	-
Others	398/1168	282/398	116/398	*537.15*
-	473/1168	423/473	50/473	-

[a] age and sex adjusted [b] a total of 1168 had occupation documented *p-value significant

Table 3: Age-and sex-adjusted prevalence of risk factors of CKD and CKD by community and gender in south east Nigeria[12]

Variables	**All**	**Semi-urban**	**Rural (**	x^2	**P-value**
Prevalence of risk factors for CKD	-	-	-	-	-
Hypertension	26.1	30.1	18.9	*5.52*	<0.001
Male	28.1	30.8	23.1	*2.03*	<0.05
Female	24.3	29.5	15.4	*14.4*	<0.001
Dyslipidaemia	44.9	48.5	38.5	*4.11*	<0.001
Male	41.7	43.4	38.6	*1.11*	>0.10
Female	47.7	53.2	38.4	5.03	<0.001
	5.9	5.7	6.2	0.41	>0.5
	6.8	6.8	6.9	0.043	>0.5
	5.1	4.7	5.8	0.78	>0.1
Metabolic syndrome	10.4	12.3	7.0	2.79	<0.001
Male	6.6	7.5	5.1	1.18	>0.1
Female	13.6	16.4	8.7	4.14	<0.001
Proteinuria	3.7	4.4	2.6	2.44	<0.05
Male	5.0	5.3	4.4	0.48	>0.5
Female	2.6	3.5	1.1	2.90	<0.01
Prevalence of CKD	11.4	11.7	11.1	0.37	>0.5
Male	13.1	13.7	12.0	0.06	>0.5

Variables	All	Semi-urban	Rural (	x^2	P-value
Female	10.0	9.8	10.4	0.33	>0.5

Abbreviation: CKD, chronic kidney disease *p-value is significant

Table 4: correlation and multiple regression analysis of CKD with other risk factors in Community study south east[12]

CKD Risk Factors	Correlation coefficient	P-value
Sex	0.024	0.052
Age	0.211	<0.001*
Occupation	-0.127	<0.001*
Year spent in school	-0.135	<0.001*
Use of tobacco as snuff	-0.008	<0.735
Use of tobacco as cigarette	-0.025	0.310
Consumption of alcohol	0.021	0.418
Use of traditional medication	0.107	<0.001*
Use of bleaching cream	-0.037	0.138
Use of mercury-containing soaps	-0.48	<0.056
Activity	-0.071	0.003*
Past medical history of hypertension	0.047	0.043*
Hypertension	0.12	<0.001*
Diabetes mellitus	-0.069	0.005*
Body mass index	-0.019	<0.419
Waist circumference	0.027	<0.244
Hip circumference	-0.029	0.210
Waist hip ratio	-0.088	<0.001*
Mean systolic blood pressure	0.135	<0.001*
Mean diastolic blood pressure	0.100	<0.001*
Hemoglobin	0.068	<0.004*

*P-value is significant

Table 5: Cross tabulation of stages of Chronic Kidney Disease by Proteinuria in the Communities[12].

	Chronic Kidney Disease Stages (%)	Chronic Kidney Disease Stages (%)	Chronic Kidn
Community	**Proteinuria**	**1**	**2**
Semi-urban (1223)	Absent	95.9	95.0
	Present	4.1	5.0
Rural (601)	Absent	98.8	97.7
	Present	1.2	2.3
All (1824)	Absent	96.7	96.0
	Present	3.3	4.0

Number with compete data for analysis

Prevalence of CKD reported in developed and developing countries range from 2.5% to as high as 35.8% in

elderly population[13]. The prevalence of CKD 11.7% versus 11.1% in semi urban and rural populations compares well with the prevalence of 12.4% in Kinshasa (Urban) and 13.0%, Muando (Rural) in the Democratic Republic of Congo[14]. The overall age and sex prevalence of 7.8% was observed in another semi urban community study highlighting the prevalence of CKD and its risk factors among adults in Umuahia Southeast Nigeria[15]. These figures are alarming compared to North Central Nigeria were Ebene *et al* [16] documented a prevalence of 2.5% during 2003 world kidney day screening activities.

The impact of this high prevalence on patients' quality of life is enormous. There is need for a renewed interest in the scale of risk factors which have not been clearly elucidated. It was observed that by 2010, and 2013 that the overall age and sex adjusted prevalence of CKD was 12%[8], and 11.4% (11.7% in semi-urban and 11.1% in rural)[12]. This high prevalence may create opportunity for CKD associated complications. The most common and bothersome complication is ESRD which account for 42% of renal admissions in Nigeria. This may have irreversible changes to the kidney function leading to more fatalities. This however, may not signify improved renal care and control of risk factors for CKD. Therefore, screening for risk factors facilitates early detection and evaluation for better prognosis thus helps stem the rising tide of CKD.

We document the risk factors that might have impacted the high prevalence and how awareness level of risk factors screening across the population contribute to the disease and preventive measures.

2.0 Methods

2.1 Searching Process

The databases PubMed, Medline and Google were searched using medical subject heading (MeSH) to screen and filter articles of interest on hospital and population based studies on prevalence and risk factors of CKD in Nigeria with emphasis on studies in rural and semi-urban communities Southeast Nigeria. The MeSH terms were internally validated by the coauthors. Articles in the review needed to be published (1) December 2018 and after January 1985(2). Available as full text in English (3) categorized as original research, reviews and metal-analysis. Titles and abstracts were reviewed to verify these criteria.

2.2 Data Extraction

The data extracted from studies that met the inclusion criteria included the location of the study, the year of the study, sample size, mean age of the respondents, GFR-formular used, prevalence and risk factors, (in studies that carried out multiple logistic regression). In case the full text revealed that not all requirements were present, the paper was excluded. Additional literature was obtained through searching references in the manuscript (snowball method). An individual paper was categorized into different areas. The review was further elaborated by addressing each area separately and rereading all article that were relevant for that area.

2.3 Site, Sample size, frame, design and selection

The hospital based study used[8] in the paper was carried out by the Renal Unit of the Department of medicine UNTH Enugu Southeast Nigeria. The UNTH is a 760 – bed hospital that serve about 1/3 of Nigeria population approximately 128 million (2005 estimate)[17]. The study was carried out from the data generated from the inception of dialysis programme May 1990 to December 2003. It was observed that patients seen either in rural outpost or admitted with CKD were recruited but only ESRD patient as defined by Kidney Disease Improving Global Outcome (KDIGO) were analyzed. The sample size was 908 aged [?]18 years stratified by age and sex[8]**.** One population based study[12] was carried out in Ujodo Nike Local Government Development Centre in Enugu North Local Government Area of Enugu State, Emene Nike and Mbulu Ujodo respectively and were randomly selected as the semi urban and rural. About 2182 respondents were screened, 1941 respondents aged 25-64 years stratified by sex and 10 year age group according to the WHO STEPS[18] surveillance were analyzable data. Another population based study[15] was carried out at Umuahia Local Government Southeast, selected as semi-urban Southeast Nigeria. About 400 respondents were screened, 328 respondents aged [?]18 stratified by age and sex were analyzable data conducted according to the WHO STEPS[18]. These populations were Igbo speaking of southeast.

2.4 Previous History of Medical Checkup/Screening and awareness

It was observed that respondent's accessibility to CKD risk screening/awareness was reported during the face to face interview. Respondents were asked whether or not they have had the knowledge to CKD risk factors or screened by a doctor or other health care workers. Responses were recorded in the questionnaire. It was observed that the questionnaire and the consent form were reviewed and approved by the University of Nigeria Teaching Hospital Enugu, Ethics Review Committee.

2.5 Definition of Terms

Chronic Renal Disease was defined as creatinine clearance or GFR<60 ml/min/1.73^{m2} [13]

Hypertension was defined as systolic blood pressure (SBP)[?]140 mmHg and or diastolic blood pressure (DBP)[?]90 mmHg or both or concomitant use of antihypertensive medications[19]**.** Obesity was assessed as defined by WHO[7] using BMI>30kg/m^2 Diabetes mellitus was defined as fasting plasma glucose [?]7.0mmol/L (126mg/dl) or 2-hmmol/L (200mg/dl) as recommended by WHO[20]**.** The metabolic syndrome and dylipidaemia were evaluated using the metabolic syndrome – National Cholesterol Evaluation Programme Adult Treatment Panel III (MS- NCEP ATP III)[21]**.** Proteinuria was present if 1^+ and above was considered significant using urine strips. Glomerular filtration rate was estimated using Kidney Disease Improving Global Outcomes definition and classification ie kidney damage for [?]3 months manifested as functional or structural abnormality of the kidney[1]. The glomerular filtration rate was estimated using the CKD-EPI formualr[22] and MDRD[23]. Hemoglobin levels <12/g/dl for female subjects and <13g/dl for male subjects were considered to indicate anemia[24].

3.0 Results

The results of the search process are summarized in figure 1. Out of 84 papers selected, 44 duplicates were removed. 40 papers were screened and 25 remained in full text screening. Finally, 7 papers were included in the review. Three of the seven papers were from the south east[8,12, 15] hospital based study[8]and community based studies[12,15]. Those who took part in the hospital study were male and female patients aged[?] 18 years with sample size 908 (593 males and 315 females). The total mean age was 42.55± 15.43 years. Male (43.66±15.38 years) and female (40.48±15.31 years) (P<0.001). 86.5% were less than 60 years of age (Table 3). The study recorded a prevalence of 12%. It was observed that the population based study were adults aged 25-64 years[12], recorded overall age and sex prevalence of 11.4%. The sample size was 1941 respondents. The mean age of all respondents was 43.7±13.20 years. Male (44.1± 14.1 years) and female (43.4±12.6 years). Semi urban (41.9±12.8 years) and rural population (47.6±13.0 years). Another population based study[15] recorded age and sex prevalence of 7.8%. The sample 328 respondents aged[?] 18 years. The total mean age of 54.8+- 12.8 years in semi-urban. The two population studies[12,15] used convenience sampling technique. Univariate binary logistic analyses were used in the studies to determine the relationship between CKD and various variables. This was followed by multiple logistic regressions using the variables from univariate binary logistic analysis that were significantly associated with CKD in order to determine the risk factors of CKD. The observed risk factors was old age [12,15]obesity[15], diabetes mellitus[12], hypertension[12],[15] history of renal disease[15], low income occupation[12]. Use of traditional medication[12,15]haemoglobin[12], central obesity[12,15], glomerularnephrities[8], bleaching cream and soap containing mercury[12].

4.0 Discussion

This review indicates that Southeast Nigeria bear substantial risk factors. Report identified age, hypertension, obesity, history of diabetes mellitus, use of herbal medicines and prolonged use of non-steroidal anti-inflammatory analgesics as risk factors for CKD in Nigeria[10]. There are other emerging risk factors such as use of bleaching cream and use of soaps containing mercury[25] which were in significant proportions. This calls for a tailored programme to reduce the impact of these risk factors on patients' quality of life. A report showed that risk factors interventions (blood pressure control, glycenic control, education) may lower the risk of developing CKD[26]. However, strategies to improve the prevention and early detection of chronic diseases like CKD in low and middle income countries like Nigeria are not only hampered by eco-

nomic considerations, but also limited data emerging from these countries. These countries have experienced rapid deterioration of their chronic disease risk and mortality profiles[27]. Multivariate analysis revealed that CKD correlates with some risk factors such as hypertension, use of nephrotoxins, low level of education and low income occupation among others in these studied population. Age was significant in rural communities while DM, reduce activity and low hemoglobin were associated with CKD in semi-urban. The common risk factor (herbal remedies) is a common feature of most studies in Nigeria[9,12,15]. These could be explained by characteristics of Nigerian societies where herbal medications were embedded in their custom. This is important because, as most of these risk factors are modifiable, adequate blood pressure control and improved education of these populations will help reduce the prevalence of CKD.

Hypertension is the commonest cause of CKD especially in people of African descent[28]. Initially only malignant hypertension was identified as a significant cause of kidney damage, however, more recently poor managed long term benign essential hypertension has been established as a cause of CKD/ESRD[29]. Naieker[30] documented the characteristics of African Patient with CKD and noted that CKD affect mainly young adult aged 20 to 50 years and such patient present late with hypertension. In Nigeria, hypertension ranges from 20 to over 40% depending on the population studied[31]. It was observed that in a market population and slum dwellers, the prevalence of hypertension were about 40%[32] and 53%[33] respectively. A study recorded an overall age and sex adjusted prevalence of 26.1%, (30.1% in semi urban and 18.9% in rural)[12] and noted that 48% were aware of their disease and 89% of them were on treatment. The study documented that awareness in hypertensive respondents was higher in women (51%) than men (42%) and good control was achieved in only 36% of those on medication[12]. These figures are high underlying the risk of CKD if blood pressure is not controlled. A high prevalence of hypertension had been consistently reported in various populations in Nigeria[34,35]. Hypertension and cardiovascular diseases are currently noted to disproportionately affect people in low and middle income countries like Nigeria. About 17.5 million die each year from cardiovascular disease globally, 75% of the death occur in low and middle income countries like Nigeria[36]. The strong association between hypertension and CKD highlight the central role of endothelial dysfunction which is contributory to initiation and progression of cardiovascular disease. This gives an idea of significant risk to which many of our individual patients were subjected. Various studies have documented low awareness in southeast Nigeria[33,35]. It points to the important of early diagnosis, screening and intervention against CKD and its complication. However, this becomes alarming for settings were algorithms for early screening and detection of disease risk factor are under assessed. It is argued that the effect of blood pressure control can delay onset of complication of CKD but this can achieved in a society with effective health awareness and health seeking behaviour that may enhance the opportunity for early detection and intervention.

DM is now the commonest cause of ESRD[20] in North America and Europe. It accounts for 54% of incident of cases as documented in the USA renal data system[37]. The two community studies documented that the age and sex adjusted prevalence of DM were 5.9%[12] and 7.9%[15] These references double that of 3.8% for Nigerian in the latest WHO prevalence for African Countries which studied population of similar age[38]. One of the studies reported that 75% were aware of their disease, while 88% of those aware were on treatment and 72% of those on treatment were controlled[12]. Although DM did not correlate with CKD in the latter studies, but this justifies the screening exercise as identification and proper management of the disease will assist in the reduction of the prevalence. This may be because the prevalence of this population is still quiet low, hence its impact on CKD as compared with hypertension is low.

The age and sex-adjusted prevalence of the metabolic syndrome in this paper was 10.5%[12]. although, this is much lower than in the developed world, where using the same National Cholesterol Education program's Adult Treatment Panel III (NCEP/ATP III) criteria, the prevalence of metabolic syndrome in the United States was found to be 34%[39]. It is a finding in our population that needs further surveillance.

The prevalence of markers of CKD (proteinuria) in one community study was 16.2% with the majority of them showing trace while 3.7% has significant proteinuria. Prevalence of proteinuria ([?]1+) increased from 3.3% in stage 1 to 100 percent in stage 5 CKD[12]. This pattern is expected as higher prevalence of proteinuria is noted in advanced CKD. The persistent significant proteinuria was 5.8%[15] in another community study. It

was observed that Okafor *et al* [40] highlighting the enormity of diabetic nephropathy in Enugu, documented that the prevalence of albuminuria was 61.2%. This is alarming compared to 30% in United Kingdom while Mexican American was 31%[41]. Moreover studies conducted in Asian countries reported variability in the prevalence of microalbuminuria ranging from 14.2% in Iran to 36.3% in India[42]. The prevalence of microalbuminuria in European countries was 26.9% in Hungary while microalbumuria was 16% in Italy as well as Sweden, 9% in Germany[43]. There is need for screening of microalbuminuria in diabetes. This may further prevent renal damage by correcting factors such as hyperglycemia, hyperlipidemia and hypertension.

The family history of kidney disease was reported as an independent risk factor of CKD[15]. Among those with positive family history of kidney disease, 38% were found to have CKD. This is higher than 14.6% reported from China[44] and 9.5% in KEAPS study conducted in Yorkshine Northern England[45]. These suggest that genetic factor may be contributing significantly in the prevalence of CKD in the southeast. This is not surprising because Ulasi et al[46] had earlier reported that APOLI Genetic risk variants are common in the Igbo population of south east Nigeria and also highly associated with non-diabetic CKD in the area. These APOLI risk variants have been shown to be strongly associated with increased risk for non diabetics kidney disease among African ancestry[46]

The toxicity of herbal medicine is related to the mixture of active components, their interaction with drugs, contaminations and adulterations. Some herbs that have aristolochic acid as a component have been associated with nephropathy in a Chinese herbal medicine[47]. In Nigeria, the use of nephrotoxins contributes to about 38% of acute kidney injury[9]. This is in agreement with the report documented in South African by Seedat et al[48] identifying herbal remedies and infection as common medical cause of Acute Kidney Injury (AKI). AKI is now an established cause of CKD[49]. In a study carried out in Emene Southeast Nigeria, it was observed that 53.5% in rural population used native medications while 36.5% in Semi urban admitted to the use of such medications[50]. Because of the kidney's anatomic features and physiological functions as the primary eliminator of exogenous drugs and toxins, the kidney is vulnerable to various forms of injury[51]. Regular use of nephrotoxic medication is an independent risk factor for CKD[52]. Traditional remedies in Africa rarely have been analyzed and the active nephrotoxic components have not been isolated nor characterized in most cases. Many of the herbs are believe to be harmless and are commonly use for self medication. Although regulation by The Food and Drug Administration is part of the solution, increasing public awareness and education are necessary to inform the public on the potential dangers of using adulterated medicinal herbs.

The use of soaps containing mercury and bleaching creams is an emerging risk factor which was considered to be rare among Nigerians but the reverse is the case in present time. These agents have been long established to be bad for the kidneys. Report documented that the use of bleaching creams and soaps containing mercury was responsible for about half of the cases of nephritic syndrome[25]. This fills an important gap in the risk assessment of CKD as scanty population level data exist, particularly among patients with co-morbidities identified as vulnerable to CKD related complications. Other important nephrotoxic agents rampant in our environment are petroleum and petroleum products which are made up of hydrocarbons. Alasia *et al* [53] showed in a study in Port Harcourt that non-petroleum workers have high levels of hydrocarbon in their blood. This is indeed alarming. The companies should clear the environment of toxicants to safeguard the lives of rural dwellers.

The social economic factor across the study population show that majority of people are more disadvantaged in terms of income earning. The greater percentage of people is living in poverty. which the WHO define in absolute term as low income <$2/day. The minimum wage in Nigeria is N18,000/month which is approximately $108/ month and categorized as low income[54]. This may be the reason why the study population rely on alternative treatment such as spiritual healing and traditional native healers which are affordable. The cost of management of CKD in Nigeria is equal to $500 which is above the minimum wage of a Nigerian worker. The study identifies disparity in the accessibility of CKD risk screening awareness. This highlight the consequences of health disparity where more affluent in society have better access to health care. We noted that the respondents cite various reasons for not seeking health check including cost which does affect people's habit where they do not seek health check when they are apparently healthy therefore attitudinal

changes which impact positively on health outcome remains one of the public health messages that cannot be avoided.

Prevention:

Prevention should be targeted towards preventing the onset of specific diseases via risk reduction; altering behaviours or exposures that can lead to CKD, or by enhancing resistance to the effects of exposure to a disease agent like smoking cessation or alcohol in moderation and vaccination. Screening procedures to detect early abnormalities in kidney function such as risk factor detection-blood pressure, blood sugar, anthropometric measures, measurement of lipids, serum creatinine and urinalysis and also helps promote public awareness and education. Provision of safe pipe borne water, provision of good refuse disposal system, good funding of the health sector, funding of research programmes, enlightenment/awareness campaigns. Personal cleanliness and clean environment are important to avoid contracting infectious/contagious diseases like typhoid, cholera, sore-throat, gastroenteritis, COVID-19 in rural and semi-urban communities.

Strength and limitations of this review

This is review of literature on prevalence, risk factors and awareness screening in Southeast Nigeria providing an overview of this important topic. The identification of emerging risk factors has filled a gap in the assessment of risk factor of CKD. A major drawback in these studies is that the estimated GFR of those who were observed to have CKD was only assessed once. Ideally, the assessments should have been repeated 3 months later to find out if the values of the estimated GFR were still below 60 mL/min/10.73m^2 in those with CKD[1]. This would have given an accurate prevalence of CKD with creatinine equations. It is worth noting that one of the studies did repeat the GFR estimation 3 months later; estimated GFR<60mL/min/1.73m^2 was found in 7.8% respondents at the first assessment had persistently low GFR at reassessment 3 months later[15]. The sharp drop in the prevalence clearly shows that a good majority of the earlier captured subjects did not have CKD. A major limitation of the study that repeated the estimation of GFR 3 months later is that the sample size was small (328), and the value obtained is not likely to be the true prevalence of CKD in Nigeria. However, the prevalence of CKD is most likely to be below 10% and may be close to 4.6% using the MDRD and CKD-EPI creatinine equation.

Recommendation

It is important to lobby companies, educational institution, government and nongovernmental organizations to engage in health education programme to enhance awareness and health seeking behavior across the population. The Federal Ministry of health should have as its policy a programme to carry out five yearly to document the statistics on epidemiology of non-communicable diseases which will help to inform the health policy. Since world kidney is now celebrated worldwide. This platform can be used to our advantage.

5.0 Conclusion

The prevalence of CKD is high in South East Nigeria as observed in various hospital and community based studies. This review also showed that CKD is associated with age, hypertension, diabetes mellitus, herbal remedies, bleaching cream and soap containing mercury. Routine screening of all patients for risk factor for CKD at any contact between the doctor and patient is necessary. The discovery of emerging risk factors has filled a gap in the risk assessment of CKD in Southeastern Nigeria. The early onset of the risk factors among younger adults clearly underlines the need for early screening and intervention, thus help stem the rising tide of CKD

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