PATTERN OF DISTRIBUTION OF THE RISK FACTORS OF CHRONIC KIDNEY DISEASE AMONG ADULTS IN OWERRI, IMO-STATE, NIGERIA

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Abstract:

Chronic kidney disease is a global public health concern and its associated risk factors vary between climes. The rising prevalence of this non-communicable disease calls for serious attention to the risk factors of this disease. This study to ascertain the pattern of distribution of the risk factors of chronic kidney disease was carried out on 750 participants with males being 244 and females 506. About 484 (64.5%) of the participants had hypertension (males 152 (62.2%), females 332 (65.6%). With respect to diabetes, 76 (10.1%) of the participants had diabetes (males 36 (14.8%) and females 40 (7.9%). Obesity was recorded in 145 (19.3%) of the study participants, out of which 17 (7.0%) and 128 (25.3%) of the males and females had obesity respectively. More so, 33 (13.5%) of the males and 7 (1.4%) of the females currently smoke and overall percentage prevalence of 40 (5.3%) was recorded for cigarette smoking. Alcohol use was found in 258 (34.4%) of the participants, with males and females recording 144 (59.0%) and 114 (22.5%) respectively. Co-morbidity of hypertension and diabetes was found to be 56 (7.5%), while 207 (27.6%) and 14 (1.9%) of the participants were not aware they had hypertension and diabetes respectively. Hypertension was found to be more prevalent among the study participants. Screening people from time to time will help to detect these risk factors on time, thereby aiding the prevention and control of chronic kidney disease (CKD). It is also imperative that prevention and control be focused on lifestyle changes which form the bedrock of primary level of prevention.

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1. Introduction

Non-communicable diseases or in other words chronic diseases are diseases of long duration and generally slow progression. They are predominantly the leading cause of death globally with about 63% of the deaths recorded annually being attributable to them and, they result from a combination of environmental, genetic, behavioural and physiological factors (WHO, 2013; WHO 2018). They are of great concern not only because of their individual impact but rather because of how they can serve as predisposing factor to one another. A case in point is the relationship between hypertension and chronic kidney disease. As documented by WHO (2013), Nigeria is one of the many developing countries where the health services have greatly focused on treating infectious diseases, with non-communicable disease conditions becoming an increasing problem.

Chronic kidney disease as one of the non-communicable diseases has become a global issue with its risk factors differing between climes (Ulasi & Ijoma, 2010; Asemoh, 2014). The kidneys control fluid, electrolyte and acid-base balance of the body thereby creating a stable condition for the metabolic processes of tissues and cells to take place. This aspect of the kidney function is vital for life and is achieved by balancing solutes and water transport, excreting metabolic waste products, conserving nutrients, and regulating acid-base balance in the body (Ephraim, 2010). Once the kidneys are partly or completely damaged, all these functions become greatly impaired. Of note is the fact that many modifiable risk factors such as hypertension, diabetes, obesity, alcohol use and smoking have been implicated in varying degrees between countries and races, among others.

Chronic kidney disease describes a gradual loss of kidney function over months or years and that explains why the impending danger is not usually observed until a significant amount of kidney function is lost. That is, the disease is usually asymptomatic at the earliest stages of the disease and so the symptoms become noticeable from the stage 3 of the disease, thereby causing a significant proportion of the kidney function to be lost before the problem is detected (United States preventive services task force-USPSTF 2012; National institute of diabetes and digestive and kidney diseases, 2017). This disease is progressive and irreversible in nature; and eventually culminates into cardiovascular disease or end-stage renal disease (ESRD) as the case may be.

In 2002, the American National Kidney Foundation/Kidney Disease Outcome Quality Initiative (NKF/KDOQI) defined chronic kidney disease as "*the presence of kidney damage or decreased level of kidney function maintained for 3 months or more, irrespective of the primary diagnosis or cause*" (NKF/KDOQI, 2002). Therefore, CKD is established in the presence of kidney damage evidenced by albuminuria or decreased

kidney function as shown by reduced glomerular filtration rate (GFR) of less than 60 ml/min/1·73 m² for three months or more, irrespective of clinical diagnosis (Levey & Coresh, 2012).

Many factors have been implicated as risk factors for this disease of great public health importance, and they include but are not limited to ethnicity of origin, cigarette smoking, obesity, hypercholesterolemia, types 1 & 2 diabetes, narrowing of the artery that supplies the kidney, kidney cancer, bladder cancer, kidney stones, kidney infection, lupus, vasculitis, and vesicoureteral reflux (where urine flows back into the kidney), obstructive kidney disease including bladder obstruction caused by benign prostatic hyperplasia, atherosclerosis, liver cirrhosis and failure, hypertension and autoimmune diseases, among others (Orth, 2004; Hunley, Ma, & Kon, 2010; National Kidney foundation, 2015b; Ejerbland, Fored, Lindbland, & Fryzek, 2006; Asemoh, 2014; Schaeffner *et al.*, 2003). It must also be noted that the risk of CKD becomes higher when there is a family history of CKD and as age increases, particularly above age 65 (National Institute of Diabetes and Digestive and kidney diseases, 2014; Baumgarten, 2011).

The course of the disease is such that it exerts a significant burden on health care resources (El-Nahas and Bello, 2005). More so, management of kidney failure is very exorbitant, time consuming and affects the individual, his family and society. This is as a result of the costs associated with renal replacement therapy (RRT) itself together with the management of co-morbidities, such as coronary artery disease and peripheral vascular disease, amongst others. CKD is fast becoming a challenging issue to the society as the incidence of the disease increases at an annual rate of 8%, and consumes up to 2% of the global health expenditure (Lopez-Novoa, Martinez-Salgado, Rotriguez-Pena, & Lopez-Hernandez, 2010). According to Afolabi *et al.*, (2009) the cost of care in CKD is quite prohibitive, and this prohibitive cost was also emphasized by Ulasi & Ijoma (2010) after a work which they carried out in one South Eastern Hospital in Nigeria. Of great concern also is the fact that most patients with chronic kidney failure in sub-Saharan Africa do not have access to renal replacement therapy because of the associated high cost.

Nevertheless, the prevalence of CKD has been given as 10.7% (Afolabi *et al.*, 2009); 26.8% (Ulasi, Ijoma, Arodiwe, and Okoye, 2009); 7.8% (Egbi *et al.*, 2014) and between 19-30% (Asemoh, 2014) in different studies in Nigeria. According to Chen *et al.*, 2011 the prevalence of CKD ranges from 5-15% among the adult population in the Western societies (United States of America, Britain and some parts of Asia).

In other to avoid this gruesome ordeal, it is imperative that the risk factors of CKD are identified and managed on time and where possible lifestyle changes are made. Prevention at both the primary and secondary level cannot be overemphasized.

2. Materials and Methods

2.1 Study Population
The study was conducted in four of the nine Local Government Areas of Owerri Senatorial zone of Imo-state Nigeria, and the participants were adults 18 years and above who were selected from various households using multi-stage sampling technique that involved simple random and systematic random sampling at various stages of the selection. Those selected gave their written informed consent and met the inclusion criteria for the study which include: subjects 18 years and above; those who gave their informed consent and women who are not menstruating or pregnant.

2.2 Variables of Interest
The risk factors of interest in this study were hypertension, diabetes, obesity, smoking, and alcohol use and they were operationally defined as described below:

- **Hypertension:** A person is considered as hypertensive if the systolic blood pressure is ≥ 140 mmHg; diastolic blood pressure ≥ 90 mmHg and/or in cases of isolated hypertension. People already on anti-hypertensives are also considered as hypertensive.
- **Diabetes:** Diabetes is defined by a fasting blood sugar of ≥126 mg/dl or a random blood sugar ≥ 200mg/dl. Persons who are already on management were considered as diabetics as well.
- **Obesity:** Pre-obesity is given as BMI (Body Mass Index) between 25.0 and 29.99, whereas obesity (classes 1-3) is given as BMI ≥ 30.
- **Smoking and Alcohol Use:** Any participant who currently smokes cigarette and/or drinks alcohol will be considered a smoker and/or alcohol user.

2.3 Screening Protocol

2.3.1 Measurement of Blood Pressure
Mercury sphygmomanometer and stethoscope were used to measure the blood pressure. The subject was first of all allowed to rest for not less than 5 minutes. After which, the subject was made to sit on a chair with the back supported, legs uncrossed, and feet on the floor. With the sleeve rolled up to bare the arm, the arm to be used for measurement was supported so that the upper arm is at the heart level. This was followed by snugly wrapping the blood pressure cuff around the upper arm with the lower edge of the cuff being an inch above the bend of the elbow. As the cuff was being inflated quickly by pumping the squeeze bulb a feeling of tightness around the arm is felt. The valve of the cuff was then opened slightly, to allow the pressure fall slowly, and as the pressure falls, the reading when the sound of blood pulsing was first heard was recorded as the systolic pressure. As the air continues to be let out, the sounds will disappear. The point at which the sound stops was also recorded. This is the diastolic pressure. Measurements were obtained in duplicate, after which the average of the two

for each of the systolic blood pressure and diastolic blood pressure was determined. The unit of measurement is mmHg.

2.3.2 Blood Sugar Estimation

For blood sugar estimation, glucometer (accu-chek active), glucometer test strips, alcohol swab (pad), sterile lancet and lancing device were used. A fresh sterile lancet was inserted into the lancing device, and thereafter an alcohol pad was used to clean the fingertip of the subject. The lancing device was used to prick the cleaned fingertip in order to obtain a small drop of blood which was applied to the tip of the test strip in the glucometer. The results were displayed on the meter after several seconds. The unit of measurement is mg/dl.

2.3.3 Determination of Obesity Status using Body Mass Index

The obesity status of the participants was determined using their point-of-check weight and height. The bathroom scale for weight measurement, standard stadiometer for height measurement and calculator were used in determining the body mass index of the subjects. The subjects were advised to be on light wears and also remove shoes, bags, head gears, caps or other things which can add weight or height to the subject as the case may be. The weights of the subjects were obtained using the bathroom scale, and the value recorded in kilograms (kg), while their heights were measured with a standard stadiometer, and the value recorded in metres (m). Using the metric formula, the obtained height was multiplied by itself and the weight in kilograms divided by this new value generated from the height. The resulting value is the body mass index (BMI) which was recorded in kg/m^2.

$$BMI = \frac{Weight\ (in\ kilograms)}{Height^2\ (in\ metres)}$$

2.3.4 History of Smoking and Alcohol Use

Well-structured questionnaires were used to elicit information on the history of smoking and alcohol use of the subjects. The questionnaires were interviewer-administered.

2.4 Administration of Questionnaires

The well-structured questionnaires were also used to elicit information on the socio-demographic characteristics of the participants.

2.5 Statistical Analysis

Simple percentages were used to analyze the generated data.

3. Results

Table 1 shows the total number of males and females that participated in the study and their distribution within different age intervals. From the table, 244 (32.5%) of the participants were males while 506 (67.5%) were females. The various age brackets and the associated number of males and females are also shown in Table 1 alongside their percentages.

Table 1: Percentage distribution of participants by age and sex

Age interval	Males	Number of Females	Total for both sexes
	Number (%)	Number (%)	Number (%)
18-29	16 (6.6)	46 (9.1)	62 (8.3)
30-39	30 (12.3)	59 (11.7)	89 (11.9)
40-49	33 (13.5)	89 (17.6)	122 (16.3)
50-59	36 (14.8)	102 (20.2)	138 (18.4)
60-69	39 (16.0)	92 (18.2)	131 (17.5)
70-79	63 (25.8)	89 (17.6)	152 (20.3)
≥80	27 (11.0)	29 (5.7)	56 (7.5)
Total	244 (32.5%)	506 (67.5%)	750

Furthermore, Table 2 represents the number as well as the percentages of the participants for both males and females respectively who were implicated in the various risk factors of interest. For instance, out of the 244 males that participated, 152 (62.3%) had hypertension, 36 (14.8%) had diabetes; 17 (7.0%) were obese, 33 (13.5%) were cigarette smokers, and 144 (59.0%) use alcohol; whereas out of the 506 females that participated in the study, 332 (65.6%) had hypertension, 40 (7.9%) had diabetes; 128 (25.3%) were obese, 7 (1.4%) were cigarette smokers, and 114 (22.5%) use alcohol. But in all, out of the 750 participants, 484 (64.5%) were hypertensive; 76 (10.1%) were diabetic, 145 (19.3%) were obese; 40 (5.3%) smoke cigarettes; while 258 (34.4%) use alcohol.

Table 2: Percentage distribution of the risk factors by sex

Risk Factors	Hypertension	Diabetes	Obesity	Smoking	Alcohol Use
Males	152 (62.3%)	36 (14.8%)	17 (7.0%)	33 (13.5%)	144 (59.0%)
Females	332 (65.6%)	40 (7.9%)	128 (25.3%)	7 (1.4%)	114 (22.5%)
Total for both sexes	484 (64.5%)	76 (10.1%)	145 (19.3%)	40 (5.3%)	258 (34.4%)

Table 3 shows the percentage distribution of the various risk factors within the varying age brackets. For the participants who were diagnosed with hypertension, a greater percentage was found among those aged between 70 and 79 who were 119 (24.6%) in number while the lowest percentage was found within the age range of 18-29 who were 13 (2.7%). Those between ages 50-59; 60-69 & 70-79 had the highest percentage for diabetes i.e. 20 (26.3%) each. The lowest for diabetes was recorded within ages 18-29 who didn't record any case at all. Obesity was found more among those aged 40-49 while the least percentage with respect to obesity was found in participants ≥80 years of

age. Participants within the age range of 30-39; 50-59 and 60-69 had the highest percentage with respect to smoking which is 25% each while the lowest percentage was found in participants ≥80 years i.e. 0%. With respect to alcohol use, the highest percentage (21.7%) was found among those aged 70-79 whereas the lowest percentage (6.2%) was found among those aged ≥80 years.

Table 3: Percentage distribution of the risk factors by age

Risk Factors	Hypertension	Diabetes	Obesity	Smoking	Alcohol use
18-29	13 (2.7%)	0 (0%)	10 (6.9%)	0 (0%)	20 (7.8%)
30-39	33 (6.8%)	3 (3.9%)	26 (17.9%)	10 (25%)	39 (15.1%)
40-49	82 (16.9%)	10 (13.2%)	36 (24.8%)	3 (7.5%)	49 (19.0%)
50-59	92 (19.0%)	20 (26.3%)	33 (22.8%)	10 (25%)	39 (15.1%)
60-69	99 (20.5%)	20 (26.3%)	20 (13.8%)	10 (25%)	39 (15.1%)
70-79	119 (24.6%)	20 (26.3%)	17 (11.7%)	7 (17.5%)	56 (21.7%)
≥80	46 (9.5%)	3 (3.9%)	3 (2.1%)	0 (0%)	16 (6.2%)
Total	484	76	145	40	258

Out of the 750 participants screened, a co-morbidity of hypertension and diabetes was found in 56(7.5%) of them. About 207 (27.6%) of the participants were not aware that they have hypertension until the time of screening, whereas 14 (1.9%) of them were not aware that they have diabetes until they were screened.

4. Discussion

This paper seeks to portray the pattern of distribution of some risk factors which are implicated in chronic kidney disease. Out of the various risk factors whose relationship with chronic kidney disease has been established by previous studies, hypertension, diabetes, obesity, smoking and alcohol use were of interest to the researcher. From this study it was observed that about 64.5% of the participants were hypertensive, out of which, about 62.3% of the male participants had hypertension while about 65.6% of their female counterparts had hypertension as well. Many studies in recent times have reported very high prevalence rates for hypertension as was observed in this study, one of which is the study by Raheem, Taiwo, and Oye (2017) where the overall prevalence of hypertension for that study was given as 62.2%, males 70.1% and females 61.4%. High prevalence rates though slightly lower than what was observed in this study have also been recorded in other studies such as that by Ajayi, Sowemimo, Akpa, & Ossai (2016) where they recorded an overall prevalence of 33.1%, males 36.8% and females 31.1%. According to the World Health Organization bulletin of 2013, lifestyle changes, changing social and environmental factors explain in part the high prevalence of hypertension being observed. As said earlier about 207 (27.6%) of the participants were not aware that they had hypertension until the time of screening and this is quite worrisome seeing that the lack of awareness will not make room for prompt management thereby giving room for degeneration of the condition to more terrible conditions such as chronic kidney disease. Raheem, Taiwo, and Oye (2017) reported

that about 78% of the subjects who participated in their study were not previously aware of the presence of hypertension. It was also observed as shown in Table 3 that as the age of the participants increased, the percentage prevalence of hypertension increased, even though a sharp decline was observed at age ≥80years, thereby underscoring the fact that age plays a fundamental role in the development of hypertension. According to Pinto (2007), hypertension has been considered as an inevitable consequence of ageing as structural changes in the arteries and more especially large artery stiffness are observed as people age naturally.

Considering existing body of literature, the prevalence of hypertension has been shown to be less in women than men until the age of 45years when the prevalence becomes the same for both genders. After the age of 65 years the prevalence becomes higher in women than men (Rigaud & Forette, 2001; National Center for Health Statistics (US) Health, 2007; Anker *et al.*, 2018). Looking at the subjects encountered among the "very older adults", i.e. those ≥ 80years, it will be observed that a greater percentage of men than women were found within this age group and that can also explain the drop in the percentage prevalence of hypertension as shown in the results above.

As documented by Ogbera & Ekpebegh (2014), the prevalence rates for diabetes in Nigeria has been shown to be generally low considering past studies carried out between 1960 & 2000. They however gave the current estimate as between 8.0 & 10.0%. According to a Nigerian minister of health, Nigeria contributes a quarter of 15 million cases of diabetes in Africa, with about 5 million diabetes cases and diabetes-related deaths annually. This study yielded an overall prevalence rate of 10.1% for diabetes with 14.8% of the males and 7.9% of the females being affected. This tends to agree with the estimate given by Ogbera & Ekpebegh (2014) and that of Dahiru, Aliyu & Shehu (2016) who reviewed population-based studies on diabetes in Nigeria. Participants in this study between the ages of 50 and 79 were found to have the highest prevalence of 26.3% for diabetes. Shittu *et al.*, (2017) posit that the risk of developing diabetes increases 3 to 4 times after the age of 44 years in Nigeria and their study recorded higher prevalence among people 60 years and above. However, 14 (1.9%) of the participants were not aware that they had diabetes until after the screening.

Another risk factor assessed is obesity. Being overweight or obese is known to contribute significantly to morbidity and mortality rates in various countries around the globe (Chukwuonye *et al*, 2013). This study yielded an overall prevalence of 145 (19.3%) with 17(7.0%) of the males and 128 (25.3%) of the females being obese. This wide gender difference could be associated with increased adiposity in women when compared to their male counterparts. The prevalence of obesity was also observed to increase as people aged, though a decline was observed from age 60 years and above, as shown in Table 3. The increase in the risk of obesity as one ages could be attributed to hormonal changes and progressive reduction in active lifestyles and consequent reduction in calorie metabolism by the body (Yusuf, 2013). Lending credence to the outcome of this study, Chukwuonye *et al*, (2013) documented a prevalence of 8.1-22.2% and further

noted that women are more likely to be obese than men. According to them, these values are of epidemic proportions. This obesity epidemic is growing faster in developing countries than in the developed world (WHO, 2000). Moreover, Iwuala *et al.*, (2015) noted a prevalence rate of 27.3% which according to them is higher than what was obtained in previous studies. The rising prevalence of obesity is a global public health concern because of its established association with conditions such as cardiovascular diseases and chronic kidney disease among others.

The use of tobacco particularly in the form of cigarette has been described as one of the major disasters of public health. About 40 (5.3%) of the entire participants in this study smoke cigarettes, and out of these 33 (13.5%) of the men are cigarette smokers whereas 7 (1.4%) of the women also smoke cigarettes. The lower rate of smoking observed among the female participants was similar to what has been previously reported in the general population. Many other studies have considered the rate of cigarette smoking and according to the work done among students by Fawibe & Shittu, (2011), the prevalence rates of current cigarette smoking were 7.7% for males and 2.0% for females with the overall prevalence rate given as 5.7%. A systematic review done by Oyewole, Arimasahun, & Chapman (2018) reveals that prevalence rates of tobacco smoking ranged from 0.2-32.5%; 2.2-10% among females and; 1.0-32.5% among the males. According to GATS (2012), the overall smoking prevalence rate in Nigeria is given as 5.6%, while males recorded a rate of 10.0% and the females 1.1%. The results of this study tend to agree with most of the available outcomes of previous studies. As documented in the tobacco atlas (third edition), Nigeria has the lowest smoking prevalence rates in the world. This study also showed an increased rate of smoking between ages 30 and 69years with sudden decline from 70years and above. Due to attendant implications of smoking-related conditions cum death, it is advisable that more stringent measures be put in place to regulate tobacco use in general and cigarette smoking in particular. With the low prevalence rate observed so far in Nigeria particularly among the female folks more enlightenment and dissuasion should be employed to keep the prevalence low perpetually.

Alcohol use is another issue of great concern with respect to health. Excessive alcohol use has been associated with chronic and debilitating conditions such as alcoholic liver disease and chronic kidney disease among others. This study recorded a prevalence of 34.4% for both sexes with respect to alcohol use; 59.0% and 22.5% for males and females respectively. All the age ranges considered in this study had a significant rate of alcohol use, even though the highest prevalence was observed among those aged 70-79 years. Alcohol use in this study also increased with increasing age. In the study carried out by Lasebikan & Ola, (2016), current alcohol use was given as 23.7%, increased with increasing age and commoner in males. A higher prevalence of 78.4% was obtained from the study carried out by Chikere & Mayowa (2011), although the study participants were only males. The prevalence in their study also increased with increasing age.

From the data generated from this study, hypertension appears to be the most prevalent risk factor among all the risk factors studied followed by alcohol use, obesity, diabetes and then smoking. Ulasi & Ijoma, (2010) as well as Asemoh, (2014) posit that hypertension and glomerulonephritis are the leading causes of CKD in Nigeria, unlike diabetes which is the leading cause of nephropathy in western countries. The co-morbidity of hypertension and diabetes which was found to be 7.5% is quite significant and therefore calls for prompt and adequate policies with their attendant strategies in curbing their increase in the general population seeing that these risk factors have also been implicated as aetiologic agents for not only chronic kidney disease but other chronic disease conditions.

5. Conclusion

Only a small proportion of people present themselves for routine medical check-ups to monitor these risk factors associated with non-communicable diseases, and Nigerians are not exempted from this attitude. It has also become a common knowledge that treating non-communicable diseases is costly, thus it is economically paramount that every country supports prevention campaigns geared towards enlightening the populace about the inherent dangers of these risk factors and how well to manage them in case they arise. It is not also a hidden fact that early detection coupled with prompt and appropriate management halts the progression of diseases. There is therefore need to put in place adequate policies to help curb the rising incidence and prevalence of these risk factors. Once a tab is kept on these risk factors of chronic kidney disease, its occurrence will be tremendously reduced.

Conflict of interest
None declared.

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