Knowledge and Risk Perception of Kidney Disease among Childbearing Women in Lagos State, Nigeria

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Research

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Abstract

Background

In spite of kidney disease (KD) as one of the eight leading causes of death in women and a chronic public health concern, little is known about women's knowledge and risk perception of KD. We assessed knowledge and perception of KD risk among childbearing women in Lagos State, Nigeria.

Methods

Administering a pre-tested, structured questionnaire among 825 women aged 15-49 years, we conducted a cross-sectional descriptive study to evaluate self-reported KD knowledge and risk perception among women of childbearing age in urban and semi-urban communities in Lagos State, Nigeria. We employed binary and multinomial logistic regression to assess KD knowledge and risk perception. We used descriptive statistics (mean, frequencies and percentages) to assess socio-demographic factors influencing knowledge and risk perception of KD risk factors.

Results

Four hundred and forty-four (53.8%) out of 825 individuals reported being knowledgeable of KD with significant proportion found in the younger adults’ age group (15-29 years), with mean age of 33.5±11.5 years. High prevalence of self-reported KD risk factors were pica craving, poor diets (junk foods and high in salt), hypertension and urinary tract infection. Multivariate analysis confirmed that the following factors increased the likelihood of knowledge and risk perception of KD: high education, high income and family history of KD. Perception of KD risk at age 40-49 years (OR = 1.22, CI= 1.02-1.63, p = 0.00) and diabetes (OR = 1.40, CI= 1.59-1.18, p = 0.00) were significantly perceived as predictors of an increased risk for KD development.

Conclusion

Our study reveals high knowledge of KD but low perception of KD risk factors and its ailments. In view of this, this calls for urgent measures to create sensitization and provide public KD behavioural health interventions as well as easy communication strategies for women to secure better access to pre- and post-natal healthcare services.

Background

Kidney disease (KD) is one of the eight leading causes of death in women worldwide. It causes 600,000 deaths annually and as such KD diagnosis, either acute or chronic is on the rise among women [1, 2]. KD is not just an epidemic health problem of increasing incidence and prevalence, but an enormous burden on healthcare system due to the psychological distress that it poses on the patients and their families [3–6]. It is pertinent to note that women are highly susceptible to kidney diseases (KDs) due to their anatomy which is biologically/physiologically for child-bearing [2].
Women have certain risks for KD such as urinary tract infections (UTIs) and kidney infections (pyelonephritis), which are more common and slightly higher in women than in men — 14% women versus 12% in men [7]. This situation has necessitated the need to raise awareness of KD risks and how to lower these risks among women. Risks increase during pregnancy and an autoimmune disorder (systemic lupus erythematosus (SLE) appears mostly during women's reproductive years [8, 9]. Women with KD ailments are prone to more problems during pregnancy and birth as a result of other health problems, such as preeclampsia and increased blood pressure. Furthermore, other risk factors such as obesity, increases lifetime risk of end-stage KD [10] and maternal obesity accompanies adverse outcomes in pregnancy, [11, 12] including gestational diabetes and preterm births. All of which increase the risk of chronic kidney disease (CKD) in both mother and child.

In Nigeria, medical professional have raised concern over the rising cases of KD and the disease burden among women of child-bearing age [11, 12]. Empirical studies have shown that 17,000 new cases of KD are diagnosed annually and about thirty-eight million persons suffer from various stages of the disease [10–12]. Women often exhibit KD symptoms at advanced stages, especially when confronted with pregnancy-related complications, such as preeclampsia and other maternal disease. Many of these women already have kidney damage [13–15]. This is as a result of not having prior information of their medical histories and risk factors with explicit signs and chronic symptoms [6, 2]. The cost of KD treatment and renal replacement therapy in Nigeria is also high, and many patients cannot afford them [16, 17]. Unfortunately, treatment of KD is not prioritized by the Nigerian government in the National Health Insurance Scheme (NHIS) [16, 17].

Adequate knowledge of KD risk factors will increase risk perception and readiness for lifestyle modification and medical screening for early diagnosis. This would prompt early treatment, reduce death and high health care expenses [18–20]. In Nigeria, community-based studies on knowledge and risk perception of KD among women in their childbearing age are scanty. Previous studies largely focused on clinical symptoms of KD among women, [10, 11, 13] neglecting their prior knowledge and risk perception of KD as important factors in early diagnosis and treatments. Consequently, this study focuses on design and promote KD awareness design and promotion towards prevention and screening services, while targeting women of childbearing age using multiple media facilities.

Based on this background, this community-based cross-sectional survey filled an important knowledge gap in the literature by examining knowledge and risk perception of KD development among women in their childbearing age. In year 2018, Lagos State resident nephrologists raised apprehension on increasing cases of KD among women during prenatal period, [11] thus, Lagos State was selected for this study.

**Methods**

**Study settings**
Data for our study was collected from three senatorial districts in Lagos State, located in south western region of Nigeria. Lagos State comprises of twenty Local Government Areas (LGAs), grouped into three zones known as senatorial districts: Lagos Central, Lagos West and Lagos East [21]. The Lagos Central senatorial district has five urban LGAs (Lagos Island, Lagos Mainland, Surulere, Apapa and Eti-Osa) and Lagos West senatorial district has ten urban LGAS (Agege, Ifako-Ijaiye, Alimosho, Badagry, Ojo, Ajeromi Ifelodun, Amuwo-Odofin, Oshodi/Isolo, Ikeja and Mushin), as well as Lagos East senatorial district which consists of 5 semi-urban LGAs (Shomolu, Kosofe, Epe, Ibeju-Lekki and Ikorodu) [21]. Urban communities are centred in Lagos Central and Lagos West while semi-urban communities are found within Lagos East senatorial district. Lagos State, also called the world’s next ‘mega-city’ due to its increasing urban population growth and economic development, has an estimated population growth of 25 million with increasing poverty rate. The Oxford Poverty and Human Development Initiative (OPHI) in 2019 reported that 20% of Lagos population are vulnerable to poverty, as well as the intensity of economic deprivation in Lagos State stands at 41.1%, living below the national poverty line of 69% [22]. Lagos State health system exhibit medical diversity in Nigeria, which harmonize public, private and tradomedical facilities [23]. Though, Lagos State Monitoring and Accreditation Agency for healthcare facilities reported that state government are putting in place policies that will bring quality healthcare to all residents of Lagos State. Still, the public healthcare facilities are not well stocked, not well managed and have short staff shortages as well as many of the facilities are run down [23]. Women do not have access to adequate healthcare, as a lot of public hospitals are substandard and private hospitals are unaffordable [23]. The public healthcare provides services at the primary, secondary and tertiary levels and women receives ante- and post-natal care from both primary and secondary healthcare.

**Sampling**

Data was collected from a household survey of 1850 households conducted in September–November 2018. It was a baseline survey for an upcoming kidney health interventions. This purpose of the survey was to sensitize the public about kidney risk factors and its ailments as well as referring persons with kidney symptoms within the communities in the senatorial districts where the interventions and health facilities was presumed to be initiated. The justifications for purposive sampling were determined by the urgent needs of the upcoming health intervention and sensitization programmes for women in their reproductive age, especially those with high risk factors. Multi-stage, stratified and equal sampling techniques were applied to identify the households to be included in the survey. A mixture of random and purposive selection techniques were applied at each stage of sampling (Fig. 1). First, three senatorial districts by urban and semi-urban stratification were purposively selected in the survey: Lagos West and Lagos Central (urban) as well as Lagos East (semi-urban). These three senatorial districts were selected as Lagos State Ministry of Health have proposed health intervention coverage scheme within the communities in these senatorial districts for easier dissemination of health information on kidney and its risk factors among women population. The three senatorial districts has twenty local government areas (LGAs): Agege, Ajeromi Ifelodun, Alimosho, Amuwo Odofin, Apapa, Badagry, Kosofe, Mushin, Oshodi Isolo, Ojo, Ikorodu, Surulere, Ifako-Ijaye, Shomolu, Lagos Mainland, Ikeja, Eti-osa, Lagos Island, Epe, and Ibeju Lekki. Second, the 2006 National Population Census figures did not include wards in the LGAs; however,
the 1991 National Population Census contained the number of wards (246) in the 20 LGAs. Within the 20 LGAs in the three senatorial districts, 113 wards/constituency were randomly selected from 246 wards according to urban and semi-urban stratification. Third, in each ward, we randomly selected 24 wards out of 113 wards at 40% by proportional allocation techniques [24], as health community workers are positioned in those selected wards by Lagos State Ministry of Health for the health intervention projects. Fourteen communities were randomly selected from the 24 wards as they fit the criteria of being urban and semi-urban. Ten urban communities were randomly selected from Lagos West and Lagos Central senatorial districts (Okekoto, Keke, Alapere, Awodi-ora, Oko-oba, Agbarawu-Obadina, Oju-oto, Epete, Iwaya, and Igbobi) while four semi-urban communities were randomly selected from Lagos East senatorial district (Etita, Erodo, Ilara and Ijede) [21]. Fourth, the estimated number of households in the selected ten urban and four semi-urban communities in Lagos State population census figures was 119,452 using the projection formula [25].

\[
P_n = E \times (1 + \frac{GR^n}{100})
\]

where \( E \) = 2006 population; \( GR \) = Growth rate of 3.2%; \( n \) = number of years (1991 to 2018). While the sampling frame for this study was obtained by factoring in the 2016 projected population of the selected communities by the average household size of 6.5 [21], which gave a total of 18,377 including male and female population. The pre-census list was used to determine 1850 households containing childbearing women in the selected urban and semi-urban areas to avoid bias as well as to ensure equal chance of selection. A maximum of two respondents were recruited from each household obtained from a complete list of the 2006 enumeration areas (EAs) of the selected communities. Finally, a total of 850 childbearing women and resident in Lagos State for at least 5 years and aged between 15 and 49 years were purposively and equally selected from the sampled households. Besides, the purposive sampling technique was adopted from studies that have used this technique in selection of respondents and kidney diseases [26–28].

**Data Collection**

A pre-test structured questionnaire was deployed to collect information on socio-demographic factors, as well as knowledge and risk perceptions of KD as well as its risk factors. The initial draft of the knowledge and risk perception of KD questionnaire was generated through literature review of existing public [28–30] and related modified version of questionnaires [31–32]. The questionnaire was reviewed for content and face validity by medical sociologists (\( n = 2 \)), demographers (\( n = 3 \)), nephrologists (\( n = 3 \)), and public health practitioners (\( n = 2 \)). Internal consistency of the instrument was verified by the use of Cronbach’s alpha (\( \alpha \)) and was evaluated only between the risk perception questions, which had a uniform pattern of responses, based on the Likert scale as well as the instrument’s heterogeneity of responses [33, 34]. The higher the \( \alpha \) coefficient, the more consistent is the questionnaire items in measuring the variables under study [33, 35]. The Cronbach \( \alpha \) was set at 0.5 for this current study.
The questionnaire instrument comprises 4 sections: the first section included the socio-demographic status and the second section consists of self-reporting of medical/biomedical factors such as personal and family health history. The third section involves the lifestyle factors, which were documented among study respondents. The fourth section included the history of nephrotoxic medications intake (herbal supplement and herbal drink ingestion) which was assessed through self-reporting by the study respondents as well as anthropometric measurements (weight and obesity) were self-reported with clinical proof.

Research assistants were trained for data collection in August 2018 and data was collected in the randomly selected ten urban and four semi-urban communities across the three senatorial districts of Lagos state. Copies of the questionnaire were administered both in English and in the major local language in the selected study community (the Yoruba ethnic group). Permission to carry out the study in the selected communities was received from opinion and community (Baale) leaders. Data were collected on site during house-to-house visits that were conducted between 7am and 12 pm or at the nearest community public ground when respondents did not live far away from this facility as agreed upon by the study respondents. Data was collected from 850 respondents, and 825 questionnaires were included in the final sample as they were completely filled as well as having adequate data for analysis. The University of Ibadan Social Sciences and Humanities Research Ethics Committee (SSHEC), Nigeria (UI/SSHEC/14/0003), approved the study.

**Definition of Terms**

The definition of terms used in this study were adapted from previous studies. For instance, self-reported history of hypertension with clinical proof was defined as past medical history of hypertension, and/or the use of antihypertensive medication in the past three months prior to the study [36]. Obesity, measured by a body mass index, BMI $\geq 30$ kg/m$^2$ [37], was also self-reported with clinical proof. KD Family history was self-reported with clinical proof; as it relates to having one or more family members with KD, dialysis, kidney transplant, or inherited disease (polycystic kidney disease) [38]. Diabetes was obtained from self-reported history, with the clinical proof use of insulin or an oral hypoglycemic agent [39]. Physical inactivity was defined as less than 30 minutes of moderate activity per week or less than 20 minutes of vigorous activity three times per week, or the equivalent [40]. Personal history of pica craving in pregnancy was defined as craving of substances with little or no nutritional value [41]. Kidney stone was self-reported, with clinical proof as a condition with clumps of mineral (calcium salts) in the kidney or lower down in the urinary tract [42]. Self-reported history of urinary tract infection (UTI) with clinical proof was defined as an infection that affects the lower urinary tract [43].

**Measures**

The outcome and independent variables were self-reported and were converted into categories for appropriate interpretation. Based on the fact that perception/risk perception is the outcome of interest in this study, perception was dichotomized into low and high value by series of 40 multiple-choice questions, which were generated from risk factors. This was done using the KD Risk Prediction Model.
with some modifications [44]. Similarly risk perception of KD was categorized as low (≤ 19), moderate (20–30) or high (≥ 30). Respondents with high risk perception were coded ‘2’, those with moderate risk perception were coded as ‘1’ and those with low risk perception were coded ‘0’. As the main predictor variable, KD knowledge generated a positive response to a series of knowledge questions generated from previous KD knowledge surveys and its risk factors [3, 4]. KD knowledge and beliefs were assessed by asking about the types of KD, how people get kidney problem, knowledge of the risk factors, as well as KD signs and symptoms. Knowledge of respondents was scored poor or good based on the proportion of the total score [3, 4]. The total score was 40 and < 20 was poor, while ≥ 20 was good knowledge. Other control explanatory variables were socio-economic characteristics (education and income) and medical/biomedical risk factors (hypertension, diabetes, obesity, family history of KD and poor nutrition during pregnancy). Lifestyles and medical/biomedical risk factors were dichotomized as “yes” (present) and “no” (absent). In this study, age was divided into three categories (in complete years), (younger adults (15–29), young adults (30–39) and middle-aged adults (40–49) [45].

**Data analysis**

Statistical analyses were performed with SPSS version 25. Data were presented as mean ± standard deviation. While categorical variables were computed using percentages and frequencies, the comparisons of proportions were analysed using Pearson’s Chi-square test among rural and urban study respondents. Binary and multinomial logistic regressions were employed to estimate the independent association between KD knowledge, KD risk perception as well as socio-demographic factors. In addition, younger adults (15–29) and middle-aged adults (40–49) were employed in the multivariate analyses. Previous studies have shown that there exists inverse relationship between estimated glomerular filtration rate (eGFR) and older age groups. In the same vein, increased eGFR correlates positively with lower age groups [46, 47]. This is because of creatinine generation through muscle mass, diet as well as some medications inhibiting the secretion of creatinine [47, 48]. The level of significance was set at p ≤ 0.05.

**Results**

**Demographics**

While the mean age of the respondents was 33.5 ± 11.5 years; the mean age in the urban communities was 30.2 ± 10.9 and that of the semi-urban communities was 43.7 ± 6.3 years (range 15–49 years). Most participants were less than 30 years old. Compared to semi-urban population, respondents from urban communities were younger and more educated, and had higher income in indicated in Table 1.
Table 1  
Characteristics of study participants (Data are expressed as mean ± standard deviation, number, percentage and Chi-square)

| Characteristics                        | Urban, n (%) | Semi-urban, n (%) | N = 825 All n (%) |
|----------------------------------------|-------------|-------------------|-------------------|
| Total Mean age:                         | 30.2 ± 10.9 | 43.7 ± 6.3        | 33.5 ± 11.5       |
| Age                                    |             |                   |                   |
| Younger aged adults (15–29 years)      | 280 (44.9)  | 74 (36.8)         | 354 (42.9)        |
| Young aged adults (30–39 years)        | 195 (31.3)  | 73 (36.3)         | 268 (32.5)        |
| Middle aged adults (40–49 years)       | 149 (23.9)  | 54 (26.9)         | 203 (24.6)        |
| Education                              |             |                   |                   |
| No Education                           | 18 (2.9)    | 190 (94.5)        | 208 (25.2)        |
| Low                                    | 44 (7.1)    | 9 (4.5)           | 53 (6.4)          |
| High Education                         | 562 (90.1)  | 2 (0.1)           | 564 (68.4)        |
| Marital status                         |             |                   |                   |
| Single                                 | 352 (56.4)  | 89 (44.2)         | 441 (53.5)        |
| Married                                | 230 (36.9)  | 96 (47.8)         | 326 (39.5)        |
| Previously married                     | 42 (6.7)    | 16 (8.0)          | 58 (7.0)          |
| Religion                               |             |                   |                   |
| Christianity                           | 469 (75.2)  | 134 (66.7)        | 603 (73.1)        |
| Islam                                  | 143 (22.9)  | 50 (24.9)         | 193 (23.4)        |
| Traditional                            | 12 (1.9)    | 17 (8.4)          | 29 (3.5)          |
| Income                                 |             |                   |                   |
| Low                                    | 381 (61.1)  | 141 (70.1)        | 522 (63.3)        |
| High                                   | 243 (38.9)  | 60 (29.9)         | 303 (36.7)        |
| Other sources of income                |             |                   |                   |
| Yes                                    | 188 (30.1)  | 87 (43.3)         | 275 (33.3)        |
| No                                     | 436 (69.9)  | 114 (56.7)        | 550 (66.67)       |
| Ethnic group                           |             |                   |                   |
| Yoruba                                 | 323 (51.8)  | 109 (54.2)        | 432 (52.4)        |
## Characteristics

| Characteristics | Urban, n (%) | Semi-urban, n (%) | N = 825 |
|-----------------|-------------|-------------------|---------|
|                 | n = 624     | n = 201           |         |
| Non-Yoruba      | 301 (48.2)  | 92 (45.8)         | 393 (47.6) |

*p < 0.05 significant

### Participants’ knowledge of kidney disease by location

Table 2 showed respondents’ knowledge by location and over-half of the respondents from urban communities had heard of KD (65.5%), having better knowledge of lifestyle risk factors (37.8%) and medical/biomedical risk factors (39.5%) as well as signs and symptoms of KD (48.5%) [Table 2].
Table 2
Participants’ knowledge of kidney disease by location (Data are expressed as number, percentage and Chi-square)

| Questions                                                                 | Urban, n (%) | Rural, n (%) | p    |
|---------------------------------------------------------------------------|--------------|--------------|------|
| Have you heard about kidney disease? (yes)                                | 409 (65.5%)  | 135 (24.8%)  | 0.02* |
| Where is the kidney located? (close to spine, abdominal cavity and liver) | 496 (79.5%)  | 164 (24.8%)  | 0.07* |
| What are the types of kidney disease? (acute and chronic)                 | 209 (33.5%)  | 21 (9.1%)    | 0.10  |
| Which of the gender are more susceptible to KD? (both male and female)    | 247 (39.6%)  | 134 (25.2%)  | 0.04* |
| How do people get kidney problem? (unhealthy lifestyles)                  | 376 (60.3%)  | 137 (26.7%)  | 0.03* |

**Lifestyles risk factors**: Do these habits make one at risk of KD?

| Lifestyles risk factors                                      | Urban, n (%) | Rural, n (%) | p    |
|-------------------------------------------------------------|--------------|--------------|------|
| Sedentary living (yes)                                      | 211 (33.8%)  | 29 (12.1%)   | 0.07 |
| Poor diet (e.g. high in salt) (yes)                         | 225 (36.1%)  | 32 (12.5%)   | 0.00*|
| Alcohol (yes)                                               | 225 (36.1%)  | 34 (13.1%)   | 0.00*|
| Cigarette smoking (yes)                                     | 225 (36.1%)  | 45 (16.7%)   | 0.06 |
| Poor nutrition during pregnancy (yes)                       | 239 (38.3%)  | 38 (13.7%)   | 0.03*|
| Herbal supplement medication (yes)                          | 250 (40.1%)  | 60 (29.9%)   | 0.02*|
| Herbal drink ingestion (yes)                                | 241 (38.6%)  | 37 (13.3%)   | 0.00*|
| Misuse of analgesic (yes)                                   | 267 (42.8%)  | 49 (15.5%)   | 0.02*|
| Physical inactivity (yes)                                   | 241 (38.6%)  | 37 (13.3%)   | 0.06*|
| Misuse of contraceptives (yes)                              | 243 (38.9%)  | 49 (16.8%)   | 0.06 |
| Misuse of prescription medicines (yes)                      | 218 (34.9%)  | 40 (15.5%)   | 0.04*|
| Long time exposure to environmental factors (pollution, lead)| 244 (39.1%)  | 52 (17.6%)   | 0.10 |

**Medical/bio-medical risk factors**: Do these ailments make one at risk of KD?

| Medical/bio-medical risk factors | Urban, n (%) | Rural, n (%) | p    |
|----------------------------------|--------------|--------------|------|
| Diabetes (yes)                   | 253 (40.5%)  | 42 (14.2%)   | 0.00*|
| Hypertension (yes)               | 236 (37.8%)  | 40 (14.5%)   | 0.00*|
| High cholesterol (yes)           | 238 (38.1%)  | 38 (13.8%)   | 0.04*|
| Family history of kidney disease (yes) | 240 (38.5%) | 40 (14.3%) | 0.00* |
### Questions

| Questions                                      | Urban, n (%) | Rural, n (%) | p     |
|------------------------------------------------|--------------|--------------|-------|
| Blockages in the blood vessels (yes)           | 249 (39.9%)  | 38 (13.2%)   | 0.07  |
| Heart disease (cardiovascular disease) (yes)   | 240 (38.5%)  | 40 (14.5%)   | 0.05* |
| Liver disease (yes)                            | 243 (38.9%)  | 47 (16.2%)   | 0.06  |
| Obesity (yes)                                  | 273 (43.8%)  | 51 (15.7%)   | 0.06  |

### Signs and Symptoms: Do these signs or symptoms show KD presence?

| Signs and Symptoms                                      | Urban, n (%) | Rural, n (%) | p     |
|----------------------------------------------------------|--------------|--------------|-------|
| Bloody and frothy urine (yes)                            | 249 (39.9%)  | 72 (22.4%)   | 0.02* |
| Body swelling (yes)                                      | 310 (49.7%)  | 84 (21.3%)   | 0.01* |
| Shortness of breath (yes)                               | 306 (49.0%)  | 84 (21.5%)   | 0.06  |
| Tiredness (yes)                                          | 305 (48.9%)  | 84 (21.6%)   | 0.08  |
| Nausea/vomiting (yes)                                   | 311 (49.8%)  | 84 (21.3%)   | 0.06  |
| Loss of appetite (yes)                                  | 313 (50.2%)  | 84 (21.2%)   | 0.07  |
| Sleep problems (yes)                                    | 315 (50.5%)  | 84 (21.1%)   | 0.12  |
| Chest pain (yes)                                         | 305 (48.9%)  | 84 (21.6%)   | 0.20  |
| Seizures or coma in severe cases (yes)                  | 310 (49.7%)  | 84 (21.3%)   | 0.10  |

*p < 0.05 significant

### Source: Authors’ computation

Similarly, findings revealed that urban respondents had better knowledge of lifestyles risk factors than their semi-urban counterparts. Lifestyles risk factors such as poor diet high in salt (p < 0.00), alcohol (p < 0.00), poor nutrition during pregnancy (p < 0.03), and herbal drink ingestion (p < 0.00) were acknowledged in more than 50% of the urban respondents. Urban respondents compared to their semi-urban counterparts revealed that persons with medical/ biomedical factors such as diabetes (p < 0.00), family history of KD (p < 0.00), and hypertension (p < 0.00) are at risk of having KD [Table 2]. As regards signs and symptoms, both urban and semi-urban respondents mentioned bloody/frothy urine (p < 0.02) and body swelling (p < 0.01) as possible signs and symptoms of having KD ailments [Table 2]. Generally, 53.8% of the respondents had good knowledge of KD as against 46.2% of them with poor knowledge of KD [Fig. 1].

Similarly, younger adult respondents (15–29 years) had better knowledge (22.4%) of lifestyles and medical/biomedical risk factors compared to young adults (30–39 years) and middle-aged adults respectively [Figure 2].
Prevalence of self-reported risk-inducing factors among participants

Table 3 shows the most identified self-reported lifestyle risk factors and they were herbal supplement medication (OR = 1.56; CI: 0.42–5.84; p = 0.03), herbal drink ingestion (OR = 1.36; CI: 1.02–1.82; p = 0.01), and pica craving in pregnancy (OR = 2.23; CI: 0.13–2.39; p = 0.05). The results further revealed that about one-quarter of the respondents had been diagnosed with medical/biomedical risk factors, which were all statistically significant in the following order based on p value: hypertension (OR = 4.69; CI: 2.45–8.98; p = 0.00), kidney stones (OR = 1.23; CI: 0.13–1.40; p = 0.03) and urinary tract infection (OR = 2.21; CI: 0.14–2.38; p = 0.04) [Table 3].
### Table 3
Prevalence of self-reported risk-inducing factors among participants (Data are expressed as number, percentage and Odds Ratio)

| Lifestyles risk factors                  | Yes, n (%) | No, n (%) | Total, N (%) | OR (95% CI) | p     |
|-----------------------------------------|------------|-----------|--------------|-------------|-------|
| Physical inactivity                     | 206 (35.2) | 379 (64.8) | 585 (100%)   | 0.84 (0.61–1.15) | 0.23  |
| Misuse of prescribed medicine           | 4 (44.4)   | 5 (56.6)  | 9 (100%)     | 0.69 (0.49–0.98) | 0.50  |
| Misuse of analgesic                     | 86 (39.3)  | 133 (60.7) | 219 (100%)   | 1.05 (0.77–1.42) | 0.05* |
| Herbal supplement medication            | 225 (36.0) | 400 (64.0) | 625 (100%)   | 1.56 (0.42–5.84) | 0.03* |
| Herbal drink ingestion                  | 128 (38.2) | 207 (61.8) | 325 (100%)   | 1.36 (1.02–1.82) | 0.01* |
| Alcohol                                 | 76 (43.2)  | 100 (56.8) | 176 (100%)   | 0.24 (0.14–0.43) | 0.43  |
| Cigarette smoking                       | 31 (68.9)  | 14 (31.1)  | 45 (100%)    | 0.19 (0.11–0.34) | 0.10  |
| Sugar-sweetened beverages and/or colas  | 133 (24.5) | 410 (75.5) | 543 (100%)   | 0.29 (0.22–0.40) | 0.30  |
| Sedentary living                        | 96 (34.8)  | 180 (65.2) | 276 (100%)   | 0.73 (0.53–1.01) | 0.76  |
| Poor diet (e.g. junk foods and high in salt) | 114 (48.1) | 123 (51.9) | 237 (100%)   | 2.34 (1.71–3.19) | 0.00* |
| Misuse of contraceptives                | 64 (24.8)  | 194 (75.2) | 258 (100%)   | 0.24 (0.14–0.40) | 0.20  |
| Pica craving in pregnancy               | 69 (25.0)  | 207 (75.0) | 276 (100%)   | 2.23 (1.31–3.69) | 0.05* |

| Medical/bio-medical risk factors        | Yes, n (%) | No, n (%) | Total, N (%) | OR (95% CI) | p     |
|-----------------------------------------|------------|-----------|--------------|-------------|-------|
| Diabetes                                | 68 (23.1)  | 227 (76.9) | 295 (100%)   | 1.65 (1.17–2.32) | 0.02* |
| Hypertension                            | 69 (25.0)  | 207 (75.0) | 276 (100%)   | 4.69 (2.45–8.98) | 0.00* |
| Family history of kidney disease        | 66 (23.0)  | 210 (76.1) | 276 (100%)   | 0.24 (0.14–0.41) | 0.10  |

*p < 0.05 significant
| Lifestyles risk factors       | Yes, n (%) | No, n (%) | Total, N (%) | OR (95% CI)           | p     |
|------------------------------|------------|-----------|--------------|-----------------------|-------|
| Kidney stones                | 67 (23.9)  | 213 (76.1)| 280 (100%)   | 1.23 (0.13–1.40)      | 0.03* |
| Urinary tract infection      | 69 (23.8)  | 221 (76.2)| 290 (100%)   | 2.21 (0.14–2.38)      | 0.04* |
| Obesity                      | 75 (24.5)  | 231 (75.5)| 306 (100%)   | 0.22 (0.13–0.39)      | 0.07  |

*p < 0.05 significant

**Perception of kidney disease as well as its risk factors among participants**

Table 4 shows that most of the respondents had low perception about their likelihood of developing KD (OR = 0.17; p = 0.20), especially among women with lifestyle risk factors, as regular consumption of herbal drink (OR = 1.17; p = 0.02), ingestion of herbal medications (OR = 1.12; p = 0.01) and misuse of prescribed medicines (OR = 1.57; p = 0.05). However, findings revealed that women who have experiences of medical/biomedical risk factors of hypertension (OR = 2.40; p = 0.00), diabetes (OR = 1.42; p = 0.02), kidney stones (OR = 2.45; p = 0.04) and urinary tract infection (OR = 1.37; p = 0.00) were seen to have a high perception to KD development [Table 4].
Table 4  
Perception of kidney disease as well as its risk factors among participants (Data are expressed as number, percentage and Odds Ratio)

| Perceptions questions | Agree, n (%) | Disagree, n (%) | Total, N (%) | OR (95% CI) | P |
|-----------------------|--------------|----------------|--------------|-------------|---|
| **Individuals’ perceptions about KD** | | | | | |
| I can never develop KD | 16 (5.0) | 301 (95.0) | 317 (100%) | 0.17 (0.52–2.63) | 0.71 |
| KD do not occur among younger adults (15–29 years) | 07 (3.9) | 172 (96.1) | 179 (100%) | 0.61 (0.66–3.91) | 0.29 |
| KD do not occur among young adults (30–39 years) | 09 (3.3) | 266 (96.7) | 275 (100%) | 0.56 (1.12–5.87) | 0.22* |
| KD frequently affects middle aged adults (40–49 years) | 09 (3.5) | 251 (96.5) | 260 (100%) | 2.25 (0.98–5.15) | 0.05* |
| **Perceptions of lifestyle risk factors for KD** | | | | | |
| Women drinking excessive alcohol | 46 (9.4) | 442 (90.6) | 498 (100%) | 0.84 (0.32–2.21) | 0.28 |
| Women smoking cigarette | 46 (9.3) | 449 (90.7) | 495 (100%) | 0.98 (0.37–2.57) | 0.61 |
| Women eating food high in fats and salt | 43 (8.7) | 449 (91.3) | 492 (100%) | 1.67 (0.74–3.75) | 0.21 |
| Women with sedentary living | 44 (8.9) | 448 (91.1) | 492 (100%) | 1.40 (0.59–3.29) | 0.43 |
| Women with physical inactivity (lack of exercise) | 45 (9.1) | 450 (90.9) | 495 (100%) | 1.22 (0.49–3.02) | 0.65 |
| Women taking herbal drink | 45 (9.1) | 448 (90.9) | 493 (100%) | 1.17 (0.48–2.88) | 0.02* |
| Women taking herbal supplement medications | 45 (9.2) | 446 (90.8) | 491 (100%) | 1.12 (0.46–2.76) | 0.01* |
| Women misusing prescription medicines | 43 (13.2) | 448 (89.2) | 489 (100%) | 1.57 (0.70–3.51) | 0.05* |
| **Perceptions of medical/bio-medical risk factors for KD** | | | | | |
| Hypertensive women are susceptible to KD risk | 47 (15.9) | 248 (94.1) | 295 (100%) | 2.40 (0.23–2.71) | 0.00* |
| Diabetic women are susceptible to KD risk | 46 (15.9) | 244 (84.1) | 290 (100%) | 1.42 (0.24–1.74) | 0.02* |
| Perceptions questions                                                                 | Agree, n (%) | Disagree, n (%) | Total, N (%) | OR (95% CI)     | P     |
|-------------------------------------------------------------------------------------|--------------|----------------|--------------|----------------|-------|
| Women with kidney stones are susceptible to KD                                       | 45 (15.6)    | 244 (84.4)     | 289 (100%)   | 2.45 (0.26–2.79)| 0.04* |
| Women with urinary tract infection are susceptible to KD                             | 48 (16.2)    | 246 (83.7)     | 294 (100%)   | 1.37 (0.21–1.66)| 0.00* |

*p < 0.05 significant

Figure 3 shows an overall risk perception of the respondents in relation to KD development. Overall, a majority of women had low risk perception towards having KD as well as its related ailments (61.3%) as indicated in Fig. 3.

Risk Factors Associated with Participants’ Knowledge and Risk Perception

The independent predictors of KD risk, based on the respondents’ knowledge of KD and risk perception of KD, are presented in Table 5A and 5B. As revealed by the multivariate analysis, younger adults (15–29), high level of education, high income, participants with medical diagnosis of hypertension, diabetes and having family history of KD independently positively influenced knowledge of kidney disease [Table 5A]. Similarly, middle-aged adults (40–49 years) and having hypertension independently predicted high-risk perception of KD development (Table 5B).
Table 5
A & B: Binary and Multinomial logistic regression analyses of independent predictors associated with participants’ knowledge and risk perception (Data are expressed as Odds Ratio)

| A. Binary logistic regression analysis of independent predictors associated with participants’ knowledge |
|--------------------------------------------------------------------------------------------------------|
| **Factors likely to influence knowledge of KD**                                                       |
| **B** | **SE** | **P**  | **Odds ratio (OR)** |
| Age (15–29 years) | 0.156 | 0.145 | 0.02 | 1.17 (0.88 – 1.56) |
| High education | 0.894 | 0.462 | 0.05 | 2.45 (0.99 – 6.05) |
| High income | 0.607 | 0.154 | 0.00 | 1.84 (1.36 – 2.48) |
| Hypertension | 0.394 | 0.236 | 0.01 | 1.47 (0.92 – 2.33) |
| Diabetes | 0.495 | 0.236 | 0.03 | 1.64 (1.03 – 2.60) |
| Family history of KD | 0.475 | 0.237 | 0.04 | 1.61 (1.01 – 2.56) |

| B. Multinomial logistic regression analysis of independent predictors associated with participants’ risk perception |
|---------------------------------------------------------------------------------------------------------------|
| **Predictors of perception to KD Risks**                                                                     |
| **B** | **SE** | **P** | **Odds ratio (OR)** |
| Age (40–49 years) | 0.202 | 0.147 | 0.00 | 1.22 (1.02 – 1.63) |
| Hypertension | -0.203 | 0.173 | 0.00 | 1.28 (1.82 – 2.15) |
| Diabetes | -0.177 | 0.174 | 0.00 | 1.40 (1.59 – 1.18) |

*p < 0.05 significant

Selected Issues And Discussion

The results of this study showed an inadequate knowledge of the link between risk factors and KD as well as low perception of KD risk among women aged 15–49 years in Lagos State, Nigeria. The major self-reported lifestyle risk factors were misuse of analgesic, regular intake of herbal supplement and herbal ingestion. The medical/biomedical risk factors reported by the respondents were diabetes, hypertension, kidney stones and urinary tract infection. This is similar to the findings in other global population-based studies [49–52] and Nigerian studies [11, 12] of the same reported lifestyle and medical/biomedical risk factors conducted among female population in their reproductive age. Several studies has documented that chronic diseases such as hypertension, diabetes and urinary tract infection are the leading causes of KD among women during pregnancy [37, 43]. However, other clinical studies have reported genetic causes as one of the medical/biomedical risk factors, that increases the chances of KD risk among women in their childbearing years or in pregnancy condition [53, 54].
In addition, more than half of the studied respondents were not certain that misuse of prescribed medicine and analgesic could adversely affect the kidneys. Similarly, majority of the respondents have confidence that herbal supplements and herbal drinks are better remedies for chronic ailments such as diabetes and hypertension. Clinical studies in Nigeria have documented that herbal supplement and drink ingestion is a major causes of acute kidney injury, which has over the years increased CKD morbidity and mortality of individuals [55–57]. Health information on the adverse effect of the use of herbs in treatment of chronic ailments should be tailored to towards individuals who are involved in such practices especially in grassroots’ communities. This will further enlighten them and make them to adopt good health seeking behaviour and take on healthy lifestyles.

Increased knowledge and awareness of KD risk were found among educated younger adult women (15–29 years) more than their counterparts with low education. Limited literacy encourages misconception, ‘denial of medical reality’ of chronic ailments, delayed diagnosis, poor lifestyle modifications, increased morbidity and mortality in end-stage renal disease [58, 18]. Adequate knowledge and awareness of health tips will encourage one adopting lifestyle modifications and better management of risk factors [17, 19]. Therefore, early identification and treatment of KD will reduce the rate of progression as well as burden of the disease complications, therefore enhancing the quality of life of women. Studies have shown that poor medical/biomedical knowledge of KD risk factors is much higher among the age cohort of 40–49 years in Nigeria [4, 59] and in the female gender in an African-American population in their childbearing years in the United States of America [60–61]. Women in this age cohort (40–49 years) should be targeted for regular and comprehensive health education.

The study findings also revealed that risk factors were more predominant among respondents with better KD knowledge and its contribution to kidney ailments. This may be assumed from ‘denial of medical reality’ that they are not susceptible to any chronic ailments. This could stem from their indifferent attitude of upbringing, cultural and religious beliefs of not allied with life-threatening diseases [62]. Most individuals do not want to come to terms with chronic ailments even if their lifestyles are pointing to health risks [62–63]. Therefore, knowledge and risk perception is becoming an increasingly important feature of health promotion of the prevention of chronic diseases such as KD [64–65]. Although, previous studies [66, 67], have suggested a divergence between how individuals with KD risk factors perceive and understand their risk as well as the risk information provided to them by health workers. Appropriate health literacy and in-depth understanding of the risks associated with living unhealthy lifestyles will influence and significantly stimulate positive responsiveness to have different assertiveness towards KD risk [65].

The respondents showed poor perception of KD risk factors. The most identified risk causes were lifestyle risk factors. About 61.3% of the respondents had low perception of not being susceptible to KD risk even though their self-reported risk factors pointed to KD risk. Women’s poor perception could be linked to poor attitude towards KD risks: that is, it is not likely for them to have KD ailments despite their lifestyles. As a result of this, they may not take any KD cautionary measures leading to KD prevention. Hence, risk perception may be a strong motivating factor for behavioural change, particularly in ‘high risk’ individuals
with prevalent risk factors to ensure perceived control over their actions and embrace behaviour modifications [68].

Women who exhibited low risk KD perception could have arisen from the fact that they lacked confidence with regard to health information to understand KD lifestyle and its risk factors, which are a great concern to health stakeholders and professionals [69]. Women seem to believe that they are invincible and invulnerable to any disease development, which habitually leads to poor perception as they are susceptible to KD development [70]. That is, they often underestimate the risks associated with their behaviour (lifestyle and medical/biomedical risk factors). Health literacy interventions aimed at changing misconception and improving attitudes enhance better-adopted approaches in dealing with chronic illness.

Age (15–29 years), high level of education, high income and medical/biomedical risk factors (hypertension, diabetes and family history of KD) were associated with increased level of knowledge of KD. Similarly, age (40–49 years), and medical/biomedical risk factors (hypertension and diabetes) were independently associated with greater odds of respondents’ KD risk perception. This is similar to the report of other studies [3, 4]. Emphasis should, therefore, be placed on health educational intervention programmes that will be geared toward improving women’s responsiveness and understanding towards KD as well as its risk factors. This will also assist to educate young and middle-aged women (≥ 30 years) on the various risk factors and the increased tendency towards developing KD on account of biological changes that are usually associated with increasing age of women during childbearing period.

Regular health check-ups are known to be effective in detecting and treating chronic diseases at an early stage. The findings of this study showed that women were less likely to perceive the usefulness of regular health assessments as an effective KD preventive measure due to low perception of the association between risk factors and kidney ailments. This indication requires the need to increase efforts to reach out to women to educate them on the benefits of regular medical check-ups and screening. In addition, some myths contribute to KD neglect in women. One of such is the persistent interpretation of health issues related to women through their reproductive capacity. As a result of this, misperception often occurs in risk factors associated with males, with KD perceived as disease of men. Diagnosed KD women are always identified among women with lifestyle choices residents in high-income countries [2, 71]. In view of this, targeted policy programmes and health interventions among women should be highlighted and considered to meet the specific needs and context of women in relation to non-communicable diseases, such as KD.

Conclusion

KD knowledge and its risk factors among women of childbearing age is quite high in Nigeria. Many of the respondents among the young and middle age cohorts had low risk perception towards KD development, with more prevalent lifestyle and medical/biomedical risk factors, which has severe health implications. Despite the respondents’ knowledge on kidney disease and its risk factors, it could be deduced that
respondents do not have appropriate information on the adverse effects of risk factors on kidney organ. It is pertinent to infer that respondents do not perceived that they are prone to KD and its associated ailments. Therefore, it is imperative that women should be provided an adequate knowledge and clarification that being a female has higher chances of being at KD risk as a result of their anatomy. This recommendation could be achieved through sensitization, timely diagnosis and proper follow-up of women during public enlightenment programmes. In order to pose a positive impact on KD reduction among generations of women, KD advocacy programmes should be implemented across all levels of government. Furthermore, health demographers, sociologist as well as community health workers should strategize and design health intervention programmes that will assist and accommodate ‘high risk’ childbearing women in KD-related health facilities with chronic ailments. Women in the grassroots’ communities should be targeted for KD screening programme and other chronic ailments as they do not have full access to health facilities in their various communities. Nigerian government should also intensify to provide a public KD health policy that supports behavioural interventions for women population in regard to their overall health.

Policy Recommendations, Study Limitations And Future Research Ideas

Knowledge of kidney risk was quite high among younger adult women aged 15–29 years and with their self-reported lifestyle risk factors, their perception towards kidney disease risk was low generally among the respondents. Younger women’s predisposition to KD were 22% greater than young (19%) and middle-aged women (13%). Most clinical studies only provided a gender-specific prevalence of CKD, which was greater in females. Based on the outcome of this study, we recommend that women’s health should be made a priority in health policies in order to improve a well-structured health programmes that will address the health needs of women, especially in the areas of non-communicable diseases. Urgent attention needs to be paid to preventive measures and intervention to slow women’s involvement in unhealthy lifestyles.

Community health workers should be motivated to carry out awareness health programmes to discuss lifestyle and biomedical factors that predispose women to KD development during childbearing age. Screening programmes and treatment facilities should be provided during awareness talks, especially in communities with high-risk populations for KD. Women who are diagnosed with KD before or during pregnancy should be given special medical attention and government should make a special medical insurance that will carter for such women with KD needs. Most of all, women in grassroots’ communities should be targeted for KD related and other preventive health programmes.

This study had several strengths and limitations. The strength of our study, however, was a combination of multi-stage, stratified and equal sampling method, and to a large extent a good coverage of urban and semi-urban communities where the study was carried out. The sample of the respondents who participated in the survey is large and allows for a robust analysis of the research problem. The study found a connection between KD knowledge and its risk perception among women of childbearing age.
from Lagos State of Nigeria. Based on the authors’ knowledge, this study is the first non-clinical study of its kind to address women-related KD as a topical, which has a reflective effect in urging women to know their medical history before prenatal periods.

One of the few shortcomings of this study is the adoption of cross-sectional research design which seems to provide a limited view of respondents’ risk factors over time. In other words, the study did not include medical diagnosis of the diseases while detailed self-reporting was adopted for those diagnosed with other common chronic diseases. The knowledge and risk perception issues that the researchers looked at were based on social matters and were measured with psychological scale of measurements [5, 17, 21, 24]. The KD knowledge and its risk factors were self-reported, thereby making the concern of recall bias of importance. The determination of lifestyle and medical/biomedical risk factors did not involve the length of time they had such risk factors and such information was got during the research. In view of the cross-sectional nature of this study, we suggest that longitudinal studies on the causation between KD knowledge and its ailment progression should be considered in future health and demography surveillances sites or surveys.

Although the knowledge and medically scientific analysis of the causes of KD within a population has significantly been improved in the recent times, the specific opportunities for future research focus on key awareness disparities which occur in the developing countries, particularly in Africa. In spite of the fact that women are highly susceptible to KD development as a result of their biological and physiological make-up for child bearing, as well as addressing the knowledge and perception gaps among KD victims, women in their childbearing age remain one of the most crucial research areas that is continually being neglected. Research intervention and policy frameworks should be provided to stimulate thought and interests for future research among KD research community and health demographers. Consequently, this will improve the understanding of specific KD policy interventions that will maximize health benefits and minimize risks among women populations.

**Declarations**

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ME, study design, drafting and editing of the manuscript as well as statistical analyses. CO read the entire manuscript. All authors provided substantive comments to earlier drafts and have approved the final manuscript.
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References

1. Global Burden Disease (GBD). GBD 2015 Disease and Injury Incidence and Prevalence Collaborators. Global, regional, and national incidence, prevalence, and years lived with disability for 310 diseases and injuries, 1990–2015: a systematic analysis for the Global Burden of Disease Study 2015. Lancet. 2016 Oct;388(10053):1545–602.

2. Piccoli GB, Al Rukhaimi M, Zhi-Hong Liu, Zakharova E, Levin A, on behalf of the World Kidney Day Steering Committee. What we do and do not know about women and kidney diseases; Questions unanswered and answers unquestioned: Reflection on World Kidney Day and International Woman’s Day. Braz J Med Biol Res. 2018 May;51(7):e7315.

3. Iyalomhe GBS, Iyalomhe SI. Hypertension-related knowledge, attitudes and lifestyle practices among hypertensive patients in a sub-urban Nigerian community. J Pub Health Epi 2010 Jul; 2(4): 71–77.

4. Ulasi II, Ijoma CK, Onodugo OD, Arodiwe EB, Ifebunandu NA, Okoye JU. Towards prevention of chronic kidney disease in Nigeria: a community-based study in South east Nigeria. Kidney International Supplements 2013 May; 3(2): 195–201.

5. United States Renal Data System (USRDS). 2016 USRDS annual data report: Epidemiology of kidney disease in the United States. National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases, Bethesda, MD, 2016.

6. Liyanage T, Ninomiya T, Jha V, Neal B, Patrice HM, Okpechi I, Zhao MH, Lv J, Garg AX, Knight J, Rodgers A, Gallagher M, Kotwai S, Cass A, Perkovic V. Worldwide access to treatment: for end-stage
kidney disease: a systematic review. Lancet. 2015 May;385(9981):1975–82.

7. Kaplowitz ET, Ferguson S, Guerra M, Laskin CA, Buyon JP, Petri M, Lockshin MD, Sammaritano LR, Branch DW, Merrill JT, Katz P, Salmon JE. Contribution of socioeconomic status to racial/ethnic disparities in adverse pregnancy outcomes among women with systemic lupus erythematosus. Arthritis Care Res (Hoboken). 2018 Feb;70(2):230–5.

8. Luyckx VA, Tuttle KR, Garcia-Garcia G, Gharbi MB, Heerspink HJL, Johnson DW, Zhi-Hong Liu, Massy ZA, Moe O, Nelson RG, Sola L, Wheeler DC, White SL. Reducing major risk factors for chronic kidney disease. Kidney Int Suppl 2017 Oct; 7(2): 71–87.

9. Luyckx VA, Tonelli M, Stanifer JW. The global burden of kidney disease and the sustainable development goals. Bull World Health Organ. 2018 Jun;96(6):414–22D.

10. Obinna C. 17,000 kidney failure cases diagnosed annually in Nigeria. Vanguard 2016. Accessed on 14th March 2018 from https://www.vanguardngr.com/2016/03/17000-kidney-failure-cases-diagnosed-annually-in-nigeria/.

11. Okogba E, Olawale G. Pregnant-mother: Experts raise alarm over rising cases of kidney disease in pregnant women in Nigeria. Accessed on 22nd March 2018 from https://www.vanguardngr.com/2018/22/experts-raises-alarm-over-rising-cases-of-kidney-disease-in-pregnant-women-in-Nigeria/.

12. Osakwe F. 25 million Nigerians have kidney failure, says Nephrologists. Accessed on March 10th 2018 from https://www.guardian.ng/2018/10/25m-Nigerians-have-kidney-failure-says-Nephrologists/.

13. Wearne N. Pregnancy and the kidneys. South African Medical Journal 2014 Aug; 104(9): 642.

14. Fitzpatrick A, Mohammadi F, Jesudason S. Managing pregnancy in chronic kidney disease: improving outcomes for mother and baby. Int J Women’s Health 2016 Jul; 8: 273–285.

15. Piccoli GB, Cabiddu G, Attini R, Vigotti FN, Maxia S, Lepori N, Tuveri M, Massidda M, Marchi C, Mura S, Coscia A, Biolcati M, Gaglioti P, Michelatti M, Pibiri L, Chessa G, Pani A, Todros T. Risk of adverse pregnancy outcomes in women with CKD. J Am Soc Nephrol. 2015 Aug;26(8):2011–22.

16. Oviasu O, Rigby JE, Ballas D. Chronic kidney disease in Nigeria: an evaluation of the spatial accessibility to healthcare for diagnosed cases in Edo State. Journal of Public Health in Africa 2015 Mar; 6(1): 394.

17. Akokuwebe ME, Odimegwu C. Socioeconomic determinants of knowledge of kidney disease among residents in Nigerian communities in Lagos State, Nigeria. Oman Medical Journal 2019 Feb; 34(5): 444–455.

18. Ajayi S, Raji Y, Bello T, Jinadu L, Salako B. Unaffordability of renal replacement therapy in Nigeria. Hong Kong Journal of Nephrology 2016 Apr. 2016;18:15–9.

19. Boulware LE, Carson KA, Troll MU, Powe NR, Cooper LA. Perceived susceptibility to chronic kidney disease among high-risk patients seen in primary care practices. J Gen Intern Med. 2009 Oct;24(10):1123–9.
20. Narva AS, Norton JM, Boulware LE. Educating patients about CKD: The path to self-management and patient-centered care. Clin J Am Soc Nephrol. 2016 Apr;11(4):694–703.

21. National Population Commission (NPC). Population distribution by sex, state, LGAs and Senatorial district: 2006 Census Priority Tables (Vol. 3). 2006. National Population Commission, Abuja: Accessed January 3rd. 2019 from .

22. Oxford Poverty and Human Development Initiative. (2019). “Nigeria Country Briefing”, Multidimensional Poverty Index Data Bank. Oxford Poverty and Human Development Initiative, University of Oxford. Accessed on May 14th, 2020 from https://www.ophi.org.uk/ multidimensional-poverty-index/mpi-country-briefings/.

23. Ayeni T. 2020. Nigeria Lagos states healthcare ‘mission impossible’. Accessed on May 19th, 2020 from https://www.theafricareport.com/25632/nigeria-lagos-states-healthcare-mission-impossible/.

24. Akokuwebe ME. Perceived susceptibility, morbidity and treatment patterns of kidney diseases among residents of Lagos State, Nigeria. A PhD thesis submitted to the Faculty of the Social Sciences, The University of Ibadan, Nigeria. 2017 Apr; 171–184.

25. Ayeni AO. Increasing population, urbanization and climatic factors in Lagos State, Nigeria: The nexus and implications on water demand and supply. Journal of Global Initiatives. Policy, Pedagogy, Perspectives 2017 Apr; 11(2): 69–87.

26. Kurella TM, Anand S, Li S, Chen SC, Whaley-Connell AT, Stevens LA, Norris KC. Comparison of CKD awareness in a screening population using the modification of diet in renal disease (MDRD) study and CKD epidemiology collaboration (CKD-EPI) equations. Am J Kidney Dis. 2011 Mar;57(3 Suppl 2):17–23.

27. Lantta T, Anttila M, Kontio R, Adams CE, Valimaki M. Violent events, ward climate and ideas for violence prevention among nurses in psychiatric wards: a focus group study. International Journal of Mental Health Systems 2016 Apr; 10 (27): 1–5.

28. Oluyombo R, Ayodele OE, Akinwusi PO, Okunola OO, Gbadegesin BA, Soje MO, Akinsola A. Awareness, knowledge and perception of chronic kidney disease in a rural community of South-West Nigeria. Nigerian Journal of Clinical Practice 2016 Mar-Apr; 19(2): 161–169.

29. Stanifer JW, Turner EL, Egger JR, Thielman N, Karia F, Maro V, Kilonzo K, Patel UD, Yeates K. Knowledge, attitudes, and practise associated with chronic kidney disease in Northern Tanzania: A community-based study. PLOS ONE. 2016 Jun;11(6):e0156336.

30. Yann C, Lee ZS, Goh KS. Cross-sectional study on knowledge of chronic kidney disease among medical outpatient clinic patients. Med J Malaysia. 2016 Jun;71(3):99–104.

31. Moe S, Drueke T, Cunningham J, Goodman W, Martin K, Olgaard K, Ott S, Sprague S, Lameire N, Eknoyan G. Definition, evaluation, and classification of renal osteodystrophy: A position statement from kidney disease: Improving Global Outcomes (KDIGO). Kidney Int. 2006 Apr;69:1945–53.

32. Kidney Disease. Improving Global Outcomes (KDIGO) Hepatitis C Work Group. KDIGO 2018 Clinical Practice Guideline for the Prevention, Diagnosis, Evaluation, and Treatment of Hepatitis C in Chronic Kidney Disease. Kidney Int Suppl. 2018 Oct;8(3):91–165.
33. Reynaldo J, Santos A. Cronbach’s Alpha: A tool for assessing the reliability of scales. Journal of extension 1999 Apr; 37 (2): 1–3.
34. Quansah F. The use of Cronbach alpha reliability estimate in research among students in public universities in Ghana. Africa Journal of Teacher education. 2017 Nov;6(1):56–64.
35. Cronbach LJ. Coefficient alpha and the internal structure of tests. Psychometrika 1951 Sept; 16 (3): 297–334.
36. Lerner B, Desrochers S, Tangri N. Risk prediction models in CKD. Semin Nephrol. 2017 Mar;37(2):144–50.
37. Seely EW, Ecker J. Chronic hypertension in pregnancy. Circulation 2014 Mar; 129(11): 1254–1261.
38. Kent S, Jebb SA, Gray A, Green J, Reeves G, Beral V, Mihaylova B, Cairns BJ. on behalf of the Million Women Study Collaborators. Body mass index and use and costs of primary care services among women aged 55–79 years in England: a cohort and linked data study. Int J Obes (Lond) 2019 Dec; 43(9):1839–48.
39. McClellan W, Speckman R, Mc Clure L, Howard V, Campbell RC, Cushman M, Audhya P, Howard G, Warnock DG. Prevalence and characteristics of a family history of end-stage renal disease among adults in the United States Population: Reasons for geographic and racial differences in stroke (REGARDS) Renal cohort study. J Am Soc Nephrol. 2007 Apr;18(4):1344–52.
40. American Diabetes Association. 2. Classification and diagnosis of diabetes: Standards of Medical Care in diabetes – 2018. Diabetes Care. 2018 Jan; 41 (Supplement 1): S13-S27.
41. Oja P, Titze S. Physical activity recommendations for public health: development and policy context. EPMA J. 2011 Sept; 2(3): 253–259.
42. Lin J, Temple L, Trujiloc C, Mejia-Rodriquez F, Rosas LG, Fernald L, Young SL. Pica during pregnancy among Mexican-born women: a formative study. Matern Child Nutr. 2015 Oct;11(4):550–8.
43. Rowe TA, Juthani-Mehta M. Diagnosis and management of urinary tract infection in older adults. Infect Dis Clin North Am. 2014 Mar;28(1):75–89.
44. Pfau A, Knauf F. Update on Nephrolithiasis: Core Curriculum 2016. Am J Kidney Dis. 2016 Aug; 68(6): 973–985.
45. Talbot LA, Musiol RJ, Witham EK, Metter EJ. Falls in young, middle-aged and older community dwelling adults: perceived cause, environmental factors and injury. BMC Public Health 2005 Aug; 5:86.
46. Levey AS, Stevens LA. Estimating GFR using the CKD epidemiology collaboration (CKD_EPI) creatinine equation: more accurate GFR estimates, lower CKD prevalence estimates, and better risk predictions. American Journal of Kidney Diseases 2010 Apr; 55(4): 622–627.
47. Hallan SI, Matsushita K, Sang Y, Mahmoodi BK, Black C, Ishani A, Kleefstra N, Naimark D, Roderick P, Tonelli M, Wetzels JFM, Astor BC, Gansevoort RT, Levin A, Wen C-P, Coresh J. for the CKD Prognosis Consortium. Age and the association of kidney measures with mortality and end-stage renal disease. JAMA 2012 Dec; 308(22): 2349–60.
48. Naicker J. Glomerular filtration rate (GFR) and estimation of the GFR (eGFR) in adults. Continuing Medical Education. 2012;30(7):235–7. [S.I].

49. World Health Organization (WHO). Addressing gender within primary health care reforms. In: Gender, women and primary health care renewal: a discussion paper. World Health Library Cataloguing-in-Publication Data. 2017 July; 11–19. Accessed from: http://apps.who.int/iris/bitstream/10665/44430/1/9789241564038_eng.pdf.

50. Poon LC, Kametas NA, Chelemen T, Leal A, Nicolaides KH. Maternal risk factors for hypertensive disorders in pregnancy: a multivariate approach. J Hum Hypertens. 2010 Feb;24(2):104–10.

51. Tain Y-L, Luh H, Lin C-Y, Hsu C-N. Incidence and risks of congenital anomalies of kidney and urinary tract in newborns. Medicine. 2016 Feb;95(5):e2659.

52. Aggarwal R, Srivastava A, Jain SK, Sud R, Singh R. Renal stones: a clinical review. EMJ Urol. 2017 Mar;5(1):98–103.

53. Satko SG, Freedman BI, Moossavi S. Genetic factors in end-stage renal disease. Kidney International 2005 Apr; 67(94): S46-S49.

54. Lim ZX, Wong JL, Lim PY, Soon LK. Knowledge of nutrition during pregnancy and associated factors among antenatal mothers. International Journal of Public Health and Clinical Sciences 2018 Jan-Feb; 5(1), e-ISSN 2289–7577: 117–128.

55. Adelekun TA, Ekwere TR, Akinsola A. The pattern of acute toxic nephropathy in Ife, Nigeria. West Afr J Med 1999 Jan-Mar; 18(1): 60–63.

56. Kadiri S, Arijie A, Salako BL. Traditional herbal preparations and acute renal failure in south west Nigeria. Trop Doct. 1999 Oct;29(4):244–6.

57. Mintola R, De Nicola L, Mazzaglia G, Postorino M, Cricelli C, Mantovani LG, et al. Detection and awareness of moderate to advanced CKD by primary care practitioners: A cross-sectional study from Italy. Am J Kidney Dis 2008 Sep; 52(3): 444–453.

58. Ricardo AC, Yang W, Lora CM, Gordon EJ, Diamantidis CJ, Ford V, et al. Limited health literacy is associated with low glomerular filtration in the chronic renal insufficiency cohort (CRIC) study. Clin Nephrol 2014 Jan; 81(1): 30–37.

59. Oluyombo R, Ayodele OE, Akinwusi PO, Okunola OO, Akinsola A, Arogundade FA, Sanusi AA, Onayade A. A community study of the prevalence, risk factors and pattern of chronic kidney disease in Osun State, South West Nigeria. West Afr J Med 2013 Apr-Jun; 32(2): 85–92.

60. O·Hare AM, Choi AI, Bertenthal D, Bacchetti P, Garg AX, Kaufman JS, Walter LC, Mehta KM, Steinman MA, Allon M, McClellan WM, Landefeld CS. Age affects outcomes in chronic kidney disease. J Am Soc Nephrol. 2007 Oct;18(10):2758–65.

61. Brown LJ, Clark PC, Armstrong KA, Liping Z, Dunbar SB. Identification of modifiable chronic kidney disease risk factors by gender in an African-American metabolic syndrome cohort. Nephrol Nurs J 2010 Mar-Apr; 37(2): 133–141, 148; quiz 142.

62. Walter FA, Emery J. Coming down the line – Patients’ understanding of their family history common chronic disease. Ann Fam Med 2005 Sep; 3(5): 405–414.
63. Roomizadeh P, Taheri D, Abedini A, Mortazavi M, Larry M, Mehdikhani B, Mousavi S-M, Hosseini F-A, Parnia A, Nakhjavani M. Limited knowledge of chronic kidney disease and its main risk factors among Iranian community: an appeal for promoting national public health education programs. Int J Health policy Manag. 2014 May;2(4):161–6.

64. Kaltsouda A, Skapinakis P, Damigos D, Ikonomou M, Kalaitzidis R, Mavreas V, Siamopoulos KC. Defensive coping and health-related quality of life in chronic kidney disease: a cross-sectional study. BMC Nephrol. 2011 Jun;12:28.

65. Gagani A, Gemao J, Relojo D, Pilao SJ. The stages of denial and acceptance among patients with chronic kidney disease. Journal of Innovation in Psychology Education Didactics. 2016 Dec;20(2):113–24.

66. Mazzella A, Berkman CS. End stage renal disease and nonadherence to hemodialysis: evaluation of a psychodynamic intervention. National Kidney Foundation Journal of Nephrology Social Work 2013 Winter; 37:21–28.

67. Silva RAR, Souza VL, Oliveira GJN, Silva BCO, Rocha CCT, Holanda JRR. Coping strategies used by chronic renal failure patients on hemodialysis. ESC Anna Nery 2016 Dec; 20(1): 147–154.

68. Obiebi IP. Perception and screening practices for non-communicable diseases among Pentecostals in a semi-urban community: a divergence from paradigm. Glob J Res Rev 2018 Apr; 5(15): 1–7.

69. Hosseinpoor AR, Bergen N, Kunst A, Harper S, Guthold R, Rekwe D, d'Espaignet ET, Naidoo N, Chatterji S. Socioeconomic inequalities in risk factors for non-communicable diseases in low-income and middle-income countries: Results from the World Health Survey. BMC Public Health. 2012 Oct;12(1):912.

70. Killgore WDS, Kelley A, Balkin TJ. So you think you’re bulletproof: Development and validation of the Invincibility Belief Index (IBI). Mil Med 2010 Jul; 175(7):499–508.

71. Ojo A. Addressing the global burden of chronic kidney through clinical and translational research. Trans Am Clin Climatol Assoc. 2014;125:229–43. discussion 243–246.

Figures
Figure 1

Flow chart showing sampling techniques used to select survey households and the selection of the household heads that participated in the study.
Figure 2

Level of knowledge of KD among participants

Figure 3

Level of knowledge of KD risk factors among participants by age group
Figure 4

Level of perception of KD risk among participants