Data analysis report of health campaigns conducted by IYA Foundation in Cameroon from 2019 - 2021

Projects titles: xxx

Investigators: xxx

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List of abbreviations

CKD: Chronic Kidney Disease

ml/min: Milliliters per minute

eGFR: Estimated Glomerular Filtration Rate

ACR: Albumin - Creatinine Ratio

LMCIC: Low and Middle Class Income Countries

HIV: Human Immunodeficiency Virus

SPSS: Statistical Package for the Social Sciences

TIF: The IYA Foundation

RAF: Risk Assessment Form

PAF: Post Assessment form

ONY: Okala-Nkolbega-Yaounde

OSC: Out Station Screening

GC: Green Campaign

BP: Blood Pressure

SBP: Systolic Blood Pressure

DBP: Diastolic Blood Pressure

BMI: Body Mass Index

HTN: Hypertension

WC: Waist Circumference

Abstract

Introduction: Chronic renal disease is defined as problems in kidney function and structure that last longer than three months and have a negative impact on other parts of the body. Diabetes, hypertension, and obesity have all been linked to the main causes of CKD. Family history, age, ethnicity/race, glomerulonephritis, and medication toxicity are among the other possible reasons. CKD does not have any symptoms at the start of the disease, and symptoms only appear later on. As a result, early detection and therapy are critical for preventing the disease from progressing to more advanced stages and preventing it from disseminating.

Methodology: This is a compilation of a number of cross-sectional community-based research conducted throughout numerous Cameroonian regions between 2019 and 2021. Data was gathered through the use of questionnaires and screening campaigns. Data was gathered and analyzed using Microsoft Excel 2016 and SPSS 26.0 for Windows. The Chi-square test and the Fisher's Exact test were two of the statistical tests used. The level of significance was fixed at 5%.

Results/Interpretation: Our findings revealed that 6.1 % of the population had a BMI in the Grade III stage (180/110), with a frequency of 40.1 %. Increases in age and body mass index tend to increase the likelihood of developing hypertension: from 16.7% between 10-20 years to 56.4 % between 70-80 years with a p0.0001; also, 19 % for BMI 18.5 to 68.9% for BMI 40kg/m2 with a p<0.0001; and 19 % for BMI 18.5 to 68.9% for BMI 40kg/m2 with a p<0.0001. Diabetes was found to be prevalent in 9.4% of the population. Following a BMI assessment, 32 percent of the population was classified as overweight, while 47 percent was classified as obese. Proteinuria, glucosuria, and hematuria were found in 19.3 percent, 3.6 percent, and 1.8 percent of the population, respectively.

Conclusion: A larger scale study in the population, particularly in rural areas across the country, is needed to paint a clearer picture of the risk factors for CKD in these settings, as well as the use of urinalysis to determine kidney function with possible laboratory confirmation using Creatinine and Urea to accurately identify individuals who are suffering from gradual renal damage.

Background

Chronic kidney disease is defined as abnormalities with kidney function and structure that persist for more than 3 months with secondary health implications. It is characterized by a decrease in glomerular filtration by less than 60 ml/min per 1.73 m2 [**1**][**2**]. The leading cause of CKD has been associated with Diabetes, Hypertension and Obesity. Other causes include: family history, age, ethnicity/race [**3**], glomerulonephritis, drug toxicity [**1**]. CKD has no symptoms at the onset of the disease and as such symptoms only portray at advanced stages of the disease. Therefore, early detection and management is crucial for the prevention of the disease and its progression to more advanced stages. There are five stages of CKD (Stage 1-5). Stage 1 (eGFR >90 ml/min per 1.73 m2 and ACR >30 mg/g), stage 2 (eGFR 60–89 + ACR >30), stage 3 (eGFR 30–59), stage 4 (eGFR 29–15), stage 5 (eGFR <15). Common markers of kidney damage include albuminuria, urine sediment abnormalities, electrolyte, or other abnormalities due to tubular disorders, histology abnormalities, and structure abnormalities by imaging [**1**].

The current prevalence of CKD (stage 1-5) globally stands at 13.4% [**1**][**2**] with a prevalence amongst the risk population being 36.1% [**2**]. The prevalence of CKD by stages is represented as: stage 1 (3.5%), stage 2 (3.9%), Stage3 (7.6%), stage 4 (0.4%), stage 5 (0.1%) [**1**]. CKD is rated the 12th common cause of death accounting for the 1.1 million deaths worldwide [**2**]. Compared to other continents, African has a higher prevalence and progression rate of CKD with a prevalence of 15.4%. Within Africa, the Central African region has the second highest prevalence after West Africa ranging from 10 - 14.1% [**4**]. The prevalence of CKD in adults in Cameroon is between 11 - 14.2%. This high prevalence could be backed by the low awareness of CKD and the challenges in accessing adequate and proper health care thereby contributing to the rapid progression of CKD to end-stage kidney disease requiring renal replacement therapy. Of the many who suffer from this, only about 1.5% can access this therapy of which dialysis is the main therapy option [**4**].

Overall, the leading cause of CKD worldwide is Diabetes, Hypertension and Obesity. This image is well painted in the developed world where there is a high incidence of metabolic diseases. In countries in Asia and sub-saharan Africa Glomerulonephritis and unknown are most common. Albeit this, there is a steady increase in CKD due to non-communicable diseases such as diabetes and hypertension which could be attributed to poorly controlled diabetes (prevalence of 6% in Cameroon), hypertension (prevalence of 31% in Cameroon) and Obesity (prevalence of 15% in Cameroon) in low- and middle-class countries due to lack of awareness and proper health care [**2**]. In low-income to middle-income countries infectious diseases such as HIV, schistosomiasis, and leishmaniasis, also contributing to CKD, are highly prevalent [**1**]. Studies have suggested that CKD of unknown causes can be attributed to nephrotoxic agents which could be gotten from contaminated water or food [**1**] or herbal medications [**2**].

The diagnosis of CKD is done through estimated glomerular filtration rate, Urine analysis, serum urea and creatine, kidney ultrasound and biopsy. These tests help to give a better picture on the state of one's kidney health [**5**]. The main treatment or management for CKD is Dialysis (either hemodialysis or peritoneal dialysis) and/or Kidney transplant [**5**]. Dialysis was introduced in Cameroon in the 1980s although only hemodialysis has been functional for the past 2 decades [**2**]. In the course of managing CKD, patients can often develop complications such as: gout, hyperkalemia, bone disease, anemia, heart disease, high calcium and fluid buildup. The severity of these complications depend on how adherent the patient is to his treatment, age and underlying cause of CKD [**5**].

Rational

The asymptomatic nature of CKD has made it one of the major non communicable diseases of global health importance. Taking into account the major role the kidney has to play in several crucial metabolic processes in the body, loss of function of these miraculous organs has devastating effects on the individual. The leading cause of death worldwide are diabetes and hypertension which are also chronic diseases and do not portray any symptoms at their onset. This burden is especially worrisome in low- and middle-class income countries (LMCIC) where many do not have access to proper health care and a host of them rely on traditional medication without diagnosis or proper dosage to solve their health problems. Unlike the developed countries where they are readily aware of their health conditions and have a strong healthcare system with coverage, in LMCIC such as Cameroon, such facilities are limited and well to do. With an abundance of rural areas in relation to urban areas, low awareness level on CKD and its causes, fewer health care facilities in relation to the population, large adherence to traditional medications, many individuals develop CKD without knowing and many progress to end stage kidney disease without being conscious that they have the condition. It is in this light that we sought to carry out a large-scale awareness and screening campaign amongst the general population to sensitize the population on CKD, its causes and also screen them for the leading causes of CKD as well as determine their Kidney health through urine analysis. This was done in an attempt to reduce the incidence of CKD which is currently 16% in Cameroon with 1 in 10 adults having CKD.

Objectives

General Objective

To evaluate the risk factors and exposure of the community in developing Chronic Kidney Disease (CKD).

Specific Objectives

1. To evaluate the level of awareness of the community on the causes and risk of developing CKD
2. To investigate the prevalence of diabetes, hypertension and Obesity amongst the community
3. To investigate the urine output in relation to kidney damage.

Methodology

Study Design

This is a combination of a series of cross-sectional community-based studies carried out across several regions in Cameroon within the time frame of 2019 to 2021.

Study Population

Inclusion criteria

- Men and women aged 18 and above.
- Individuals who consent to the procedure.

Sampling

The sampling method used was a random sampling.

Data Collection

Data was collected through questionnaire filling and screening campaigns. The data was inputted into an excel sheet.

Data Analysis

Data collected were entered into Microsoft Excel 2016 and analyzed with SPSS 26.0 for Windows. Categorical variables were described as numbers and frequencies. Quantitative variables were presented with mean ± standard deviation when the distribution was normal or the median (interquartile range) when the distribution was skewed. The association between the qualitative variables was assessed with the Chi-square test when the expected frequencies were greater than or equal to 5, or the Fisher's Exact test when at least one expected frequency was less than 5. The significance level was set at 5%.

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Results

Description of Study Population and Setting

Characteristics of campaigns

Data of six campaigns are described in this report, among which four datasets were from Green Campaigns and two were from risk and knowledge assessment surveys. Table 1 describes sample size, city and target population of those campaigns. Data was collected in 2019 for one campaign, 2020 for three campaigns and 2021 for two campaigns respectively.

Table 1. Description of characteristics of campaigns datasets included in this analysis

Campaigns	**City**	**Year**	**Sample size**	**Target population**
TIF Campaign	/	2019	196	Adults
Green Campaign	Limbe - Buea	2020	116	Children
Green Campaign	Okola – Nkolbega – Yaoundé	2020	191	Adults
Out station screening	Buea – Tiko – Douala – Limbe	2020	233	Adults
Risk assessment form	/	2021	573	Adults
Post assessment form	Buea – Limbe - Yaoundé	2021	532	Adults

Characteristics of the Study Population

A total of 1 841 individuals were included in campaigns data collection. Most represented cities were Buea, Limbe and Yaoundé with respectively 13.6%, 16.5% and 14.3 % of participants (Table 2).

Table 2. Description of Population According to Cities of Data Collection

Variables (Cities)	**Frequency**	**Percentage**
Buea	251	13.6
Douala	54	2.9
Limbe	303	16.5
Okola – Nkolbega – Yaoundé	191	10.4
Tiko	9	0.5
Yaoundé	264	14.3
Not specified	769	41.8
Total	1841	100

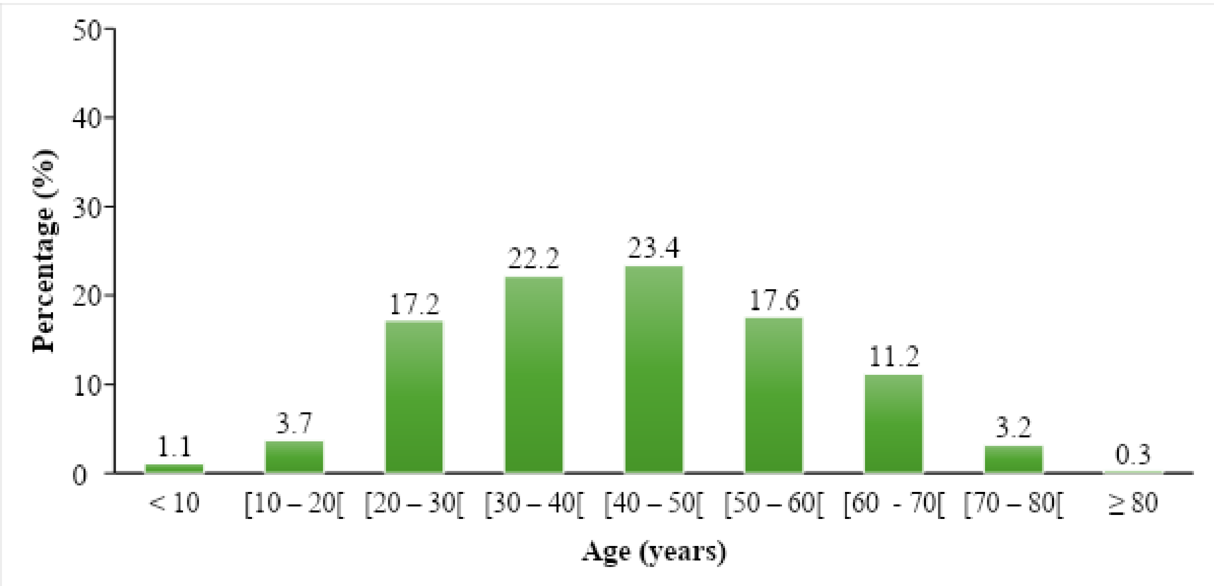

Figure 1. Age Distribution of Study Population (n = 1841)

The mean age of the population was 38.9 ± 19.4 years, ranging from 1 year to 97 years. Most of the participants were young adults aged between 30 and 60 years (Figure 1).

Table 3 describes age distribution according to each campaign. Pediatric population (less than 20 years) was most represented in PAF, RAF, ONY and OSC. Furthermore, elderly people (greater than 60 years) were most represented in TIF and ONY with more than 15% of the population above 60 years old.

Table 3. Age of Study Population According to Each Campaign

Age ranges (years)	GC 2020	PAF 2021	RAF 2021	ONY 2020	OSC 2020	TIF 2019
< 10	0 (0)	8 (1.5)	10 (1.7)	0 (0)	1 (0.4)	0 (0)
[10 – 20[	1 (0.9)	17 (3.2)	15 (2.6)	8 (4.2)	14 (6.0)	1 (0.5)
[20 – 30[	14 (12.1)	99 (18.6)	104 (18.2)	5 (2.6)	44 (18.9)	33 (16.8)
[30 – 40[	32 (27.6)	103 (19.4)	112 (19.5)	79 (41.1)	43 (18.5)	38 (19.4)
[40 – 50[	33 (28.4)	127 (23.9)	145 (25.3)	21 (11)	65 (27.9)	37 (18.9)
[50 – 60[	36 (31.0)	100 (18.8)	108 (18.8)	43 (22.5)	33 (14.2)	40 (20.4)
[60 – 70[	0 (0)	56 (10.5)	58 (10.1)	29 (15.2)	30 (12.9)	34 (17.3)
[70 – 80[	0 (0)	20 (3.8)	20 (3.5)	4 (2.1)	3 (1.3)	12 (6.1)
≥ 80	0 (0)	2 (0.4)	1 (0.2)	2 (1.0)	0 (0)	1 (0.5)
Total	**116 (100)**	**532 (100)**	**573 (100)**	**191 (100)**	**233 (100)**	**196 (100)**

GC: Green Campaign; PAF: Post assessment form; RAF: Risk assessment form; ONY: Okola - Nkolbega – Yaoundé; OSC: Out station screening; TIF: The Iya Foundation

Females were most represented in all campaigns where gender was recorded, with a proportion of 54.3% in GC, 63.5% in RAF and 66.5% in TIF (Table 4). Overall, female participants were 63.1% of the study population.

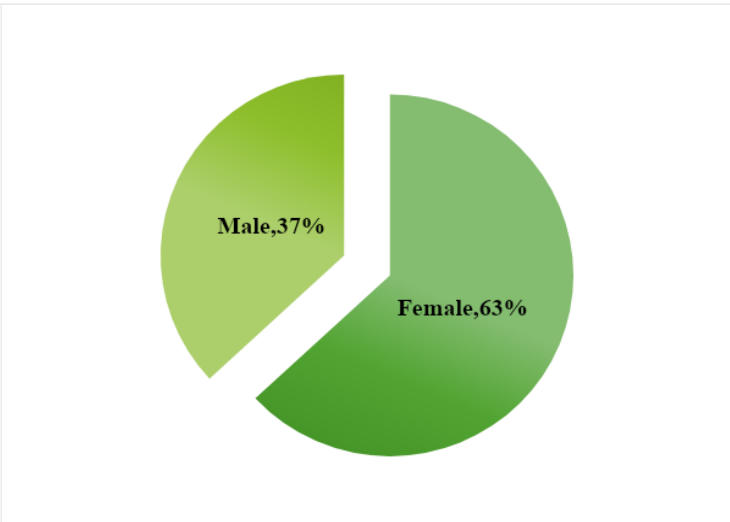

Figure 2: Description of gender in the study population (n = 922)

Table 4. Gender of Study Population According to Each Campaign

Gender	GC 2020	PAF 2021	RAF 2021	ONY 2020	OSC 2020	TIF 2019
Male	53 (45.7)	0 (0)	209 (36.5)	0 (0)	78 (33.5)	0 (0)
Female	63 (54.3)	0 (0)	364 (63.5)	0 (0)	155 (66.5)	0 (0)
Not specified	0 (0)	532 (100)	0 (0)	191 (100)	0 (0)	196 (100)
Total	**116 (100)**	**532 (100)**	**573 (100)**	**191 (100)**	**233 (100)**	**196 (100)**

GC: Green Campaign; PAF: Post assessment form; RAF: Risk assessment form; ONY: Okola - Nkolbega – Yaoundé; OSC: Out station screening; TIF: The Iya Foundation

Past History and Practices Concerning CKD and Its Risk Factors

Past Medical History on CKD and Risk Factors

Past medical history of participants were recorded during the RAF campaign which included 573 participants. Hypertension was the most frequent risk factor in past medical history, affecting 96 participants (16.8%). CKD, kidney stones and any other kidney disease were found respectively in 28 (4.9%), 26 (4.5%) and 29 (5.1%) participants (Table 5).

Table 5. Description of past medical history of participants about CKD and risk factors

Variables	Frequency	Percentages
Past diagnosis of CKD		
Yes	28	4.9
No	545	95.1
Past diagnosis of any other kidney disease		
Yes	29	5.1
No	544	94.9
Past diagnosis of hypertension or diabetes		
Both	16	2.8
Diabetes alone	28	4.9
Hypertension alone	80	14.0
None	449	78.4
Past history of kidney stones		
Yes	26	4.5
No	547	95.5

Past history of drug regiment		
Yes	90	15.7
No	483	84.3

About 1 in 2 participants had a first degree relative with hypertension or diabetes, while only 48 participants (8.4%) had a first degree relative with CKD or on dialysis (Table 6).

Table 6. Description of family past medical history about CKD and risk factors

Variables	**Frequency**	**Percentages**
Any first degree relative with CKD or on dialysis		
Yes	48	8.4
No	525	91.6
Any first degree relative with hypertension or diabetes		
Yes	267	46.6
No	306	53.4

Practices Influencing the Risk of Kidney Disease

Practices which are known as risk of kidney disease including no physical exercise and cigarette smoking were found respectively in 110 participants (19.2%) and 55 participants (10%). Moreover, about 30% of participants have participated in previous screening campaigns.

Table 7. Description of physical exercise, cigarette smoking and participation to screening campaigns in the general population

Variables	**Frequency**	**Percentages**
How often do you do physical exercise		
Always	173	30.2
Sometimes	290	50.6
Never	110	19.2
Any history of cigarette smoking?		
Yes	28	4.9
Before	29	5.1
No	516	90.1
Previous participation to a screening campaign for diabetes or hypertension		

Yes	160	27.9
No	413	72.1

High Blood Pressure and Overweight in the Study Population

Blood pressure assessment

Blood pressure was measured during 05 campaigns. Table 5 describes the blood pressure ranges for each campaign. The proportion of participants with high blood pressure (BP greater than 140/90 mmHg) was highest in GC (56.3%), OSC (63.6%), and TIF (42.3%).

Table 8. Description of Blood Pressure of Study Population according to Campaigns

Blood pressure	**GC 2020**	**PAF 2021**	**ONY 2020**	**OSC 2020**	**TIF 2019**
SBP					
Mean ± SD	128.9 ±18.2	127.4 ± 20.1	129.6 ± 21.2	137.8 ± 25.6	134 ± 21.2
Min – Max	97 - 174	87 - 206	92 - 195	84 - 229	91 - 203
DBP					
Mean ± SD	78.8 ± 9.6	81.0 ± 13.6	81.5 ± 13.9	85.5 ± 13.6	81.4 ± 12.7
Min – Max	64 - 100	43 – 196	48 -154	55 - 127	57 - 121
BP ranges					
< 120 / 80	13 (11.2)	176 (33.1)	65 (34.0)	31 (13.3)	54 (27.6)
[120 / 80 – 140/90[	40 (35.4)	199 (37.4)	68 (35.6)	54 (23.2)	59 (30.1)
[140/90 – 160/100[	39 (33.6)	102 (19.2)	33 (17.3)	60 (25.8)	57 (29.1)
[160/100 – 180/110[	24 (20.7)	37 (7.0)	14 (7.3)	52 (22.3)	14 (7.1)
≥ 180/110	0 (0)	18 (3.4)	11 (5.8)	36 (15.5)	12 (6.1)
Total	**116 (100)**	**532 (100)**	**191 (100)**	**233 (100)**	**196 (100)**

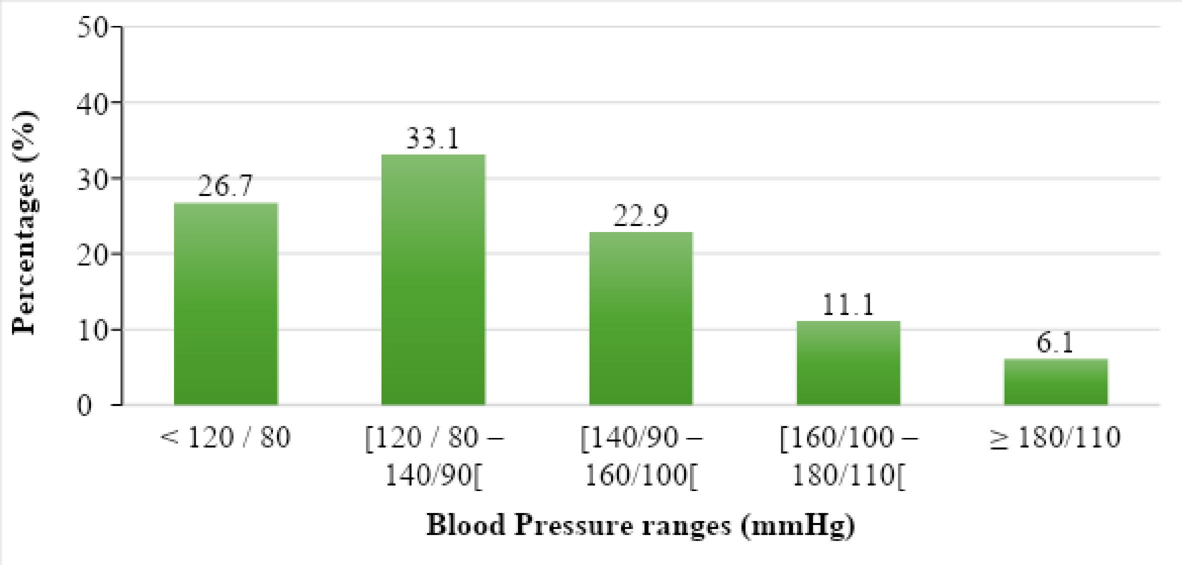

Figure 3. Blood pressure ranges in the population (n = 1268)

The mean systolic and diastolic blood pressure were 130.5 ± 21.6 mmHg and 81.7 ± 13.6 mmHg respectively, data collected from 1268 subjects. Grade I(140/90-160/100), Grade II(160/100-180/110) and Grade III(≥180/110) high blood pressure represented 22.9%, 11.1% and 6.1% of all the participants (Figure 2).

Body Mass Index(BMI)

Body mass index was recorded for 1224 subjects. Obesity was most frequent in GC, OSC and TIF, with respective proportions of 43.1%, 49.3%, and 37.8% (Table 6).

Table 9. Description of Body Mass Index of the Study Population According to Campaigns

BMI	**GC 2020**	**PAF 2021**	**ONY 2020**	**OSC 2020**	**TIF 2019**
Mean ± SD	28.8 ± 5.2	28.8 ± 5.9	25.0 ± 4.5	30.2 ± 6.1	28.6 ± 6.0
Min – Max	15.9 – 48.4	14.1 – 52.6	14.6 – 50.8	15.9 – 58.1	17.2 – 50.8
BMI ranges					
< 18.5	2 (1.7)	8 (1.6)	6 (3.1)	3 (1.3)	2 (1.0)
[18.5 – 25[	30 (25.9)	121 (24.8)	106 (55.5)	45 (19.3)	57 (29.1)
[25 – 30[	33 (28.4)	178 (36.5)	47 (24.6)	70 (30.0)	63 (32.1)
[30 – 35[	37 (31.9)	120 (24.6)	27 (14.1)	69 (29.6)	46 (23.5)
[35 – 40[	13 (11.2)	40 (8.2)	4 (2.1)	35 (15)	17 (8.7)
≥ 40	1 (0.9)	21 (4.3)	1 (0.5)	11 (4.7)	11 (5.6)
Total	**116 (100)**	**488 (100)**	**191 (100)**	**233 (100)**	**196 (100)**

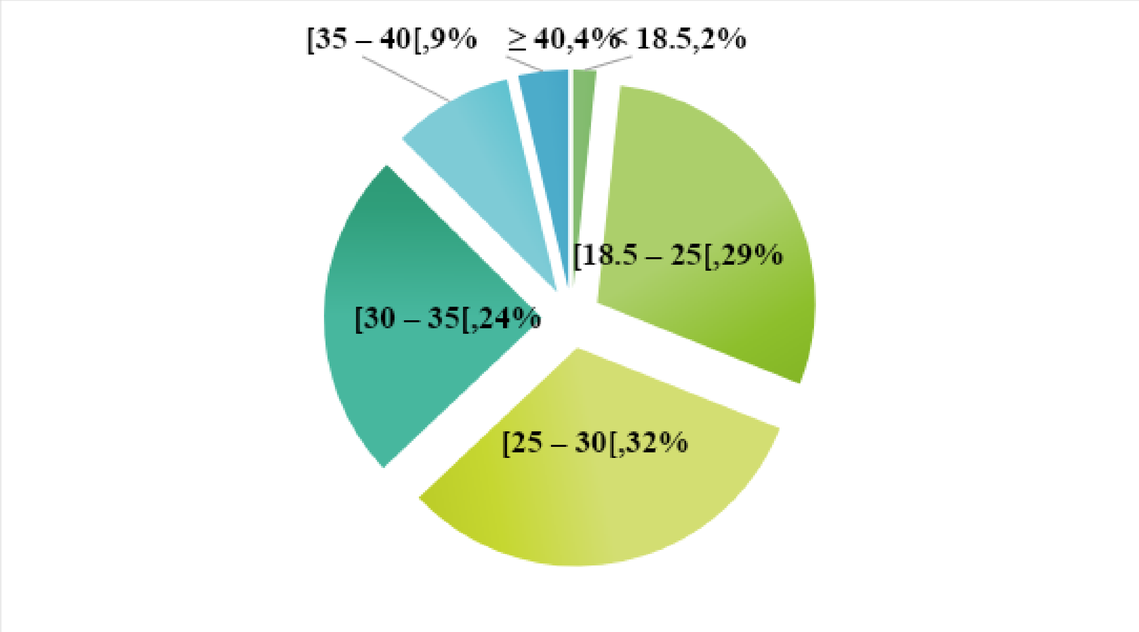

Figure 4. Body mass index in the study population (n = 1224)

Figure 3 shows that more than half of study population was either overweight or obese. Grade 1 obesity was found in 24%, grade 2 in 8.9% and grade 3 in 3.7% of participants. BMI varies from 14.2 Kg/m2 to 58.1 Kg/m2, with a mean of 28.4 ± 5.9 Kg/m2.

Blood Sugar

Random blood sugar was measured for 1247 participants with a mean value of 106.9 ± 45.8 mg/dl. Normal value, prediabetes and diabetes were found in 90.6%, 3.9% and 5.5% respectively. Table 7 describes the distribution of blood sugar value in different campaigns.

Table 10. Description of random blood sugar in study population

Blood sugar (mg/dl)	**GC 2020**	**PAF 2021**	**ONY 2020**	**OSC 2020**	**TIF 2019**
Mean ± SD	123.1 ± 56.6	101.0 41.5	102.4 ± 26.9	114.3 ± 26.9	108.3 ± 46.1
Min – Max	81 – 300	11 – 457	37.1 – 275.0	70.0 – 479.0	62 - 363
Ranges					
< 140	97 (83.6)	488 (93.8)	165 (90.7)	207 (88.8)	173 (88.3)
[140 – 200[	0 (0)	18 (3.5)	15 (8.2)	2 (0.9)	14 (7.1)
≥ 200	19 (16.4)	14 (2.7)	2 (1.1)	24 (10.3)	9 (4.6)
Total	**116 (100)**	**520 (100)**	**182 (100)**	**233 (100)**	**196 (100)**

Urinalysis Results

Urinalysis was performed during three campaigns: GC, OSC, and TIF, with a total of 544 people tested. Leucocytes were positive for 97 participants (17.8%), with 8 participants (1.5%) who had severe proteinuria (three +). Ketones were positive for 11 participants (2%). There were three participants (0.6%) positive to nitrites, two in OSC and one in GC. Table 8 gives more details on the results of each campaign for leukocytes and ketones.

Table 11. Description of leukocytes and ketones at urinalysis in the study population

Urinalysis	**GC 2020**	**OSC 2020**	**TIF 2019**	**Total**
Leucocytes				
Negative	93 (80.2)	184 (79.3)	167 (85.2)	444 (81.6)
Trace	0 (0)	3 (1.3)	0 (0)	3 (0.6)
+	14 (12.1)	22 (9.5)	21 (10.7)	57 (10.5)
++	8 (6.9)	16 (6.9)	8 (4.1)	32 (5.9)
+++	1 (0.9)	7 (3.0)	0 (0)	8 (1.5)
Ketones				
Negative	91 (78.4)	205 (88.4)	191 (97.4)	487 (89.5)
Trace	23 (19.8)	23 (9.9)	0 (0)	46 (8.5)
+	2 (1.7)	3 (1.3)	5 (2.6)	10 (1.8)
++	0 (0)	1 (0.4)	0 (0)	1 (0.2)
Total	**116 (100)**	**232 (100)**	**196 (100)**	**544 (100)**

Proteinuria was found in 105 participants (19.3%), with respective proportions of 13.8%, 12.1% and 31.1% for GC, OSC, and TIF. Glucosuria and hematuria were found respectively in 20 participants (3.6 %) and 10 participants (1.8%). More details are described in table 9.

Table 12. Description of Proteins, Glucose and Blood at Urinalysis in the Study Population

Urinalysis	**GC 2020**	**OSC 2020**	**TIF 2019**	**Total**
Protein				
Negative	22 (19.0)	80 (34.5)	135 (68.9)	237 (43.6)
Trace	78 (67.2)	124 (53.4)	0 (0)	202 (37.1)
+	16 (13.8)	20 (8.6)	51 (26.0)	87 (16.0)
++	0 (0)	6 (2.6)	4 (2.0)	10 (1.8)
+++	0 (0)	2 (0.9)	6 (3.1)	8 (1.5)
Glucose				
Negative	111 (95.7)	220 (94.8)	187 (95.4)	518 (95.2)
Trace	0 (0)	1 (0.4)	0 (0)	1 (0.2)
+	0 (0)	2 (0.9)	0 (0)	5 (0.9)
++	2 (1.7)	3 (1.3)	0 (0)	5 (0.9)
+++	3 (2.6)	6 (2.6)	6 (3.1)	15 (2.8)
Blood				
Negative	113 (97.4)	224 (96.6)	196 (100)	533 (98.0)
Trace	0 (0)	1 (0.4)	0 (0)	1 (0.2)
+	3 (2.6)	3 (1.3)	0 (0)	6 (1.1)
++	0 (0)	2 (0.9)	0 (0)	2 (0.4)
+++	0 (0)	2 (0.9)	0 (0)	2 (0.4)
Total	**116 (100)**	**232 (100)**	**196 (100)**	**544 (100)**

Assessment of Knowledge and Practices Concerning Kidney Disease

Knowledge on IYA Foundation

Knowledge on IYA Foundation was asked only during the Post assessment form (PAF) campaign with 532 participants. About 70% had never heard about IYA Foundation (Figure 4).

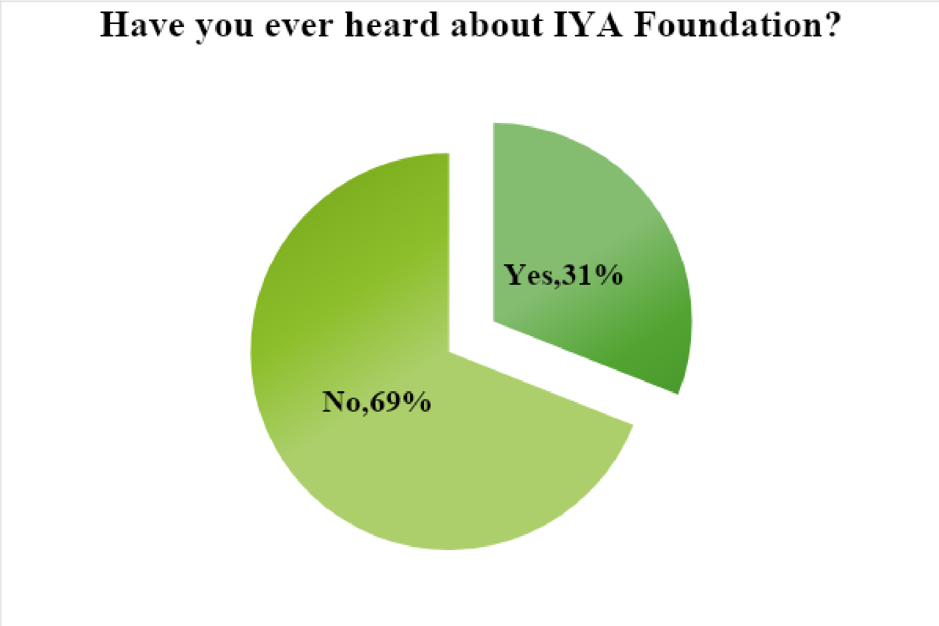

Figure 5. Description of knowledge about IYA foundation (n = 532)

Knowledge on Kidney Disease, Risk Factors and Prevention

Knowledge on risk factors of kidney disease and prevention of the disease were evaluated during two campaigns: PAF and RAF, with respectively 532 and 573 participants. Table 10 describes details on knowledge which were evaluated with results. Overall, more than 50% of participants had a good answer to the different questions assessing their knowledge. Best knowledge was observed for prevention of CKD through prevention and screening of risk factors, healthy diet and exercise, importance of sensitization and screening campaign, with more than 85% of participants who answered yes to these items.

Table 13. Description of knowledge of study population on kidney disease risk factors and prevention

Items	**Yes** *n (%)*	**No** *n (%)*	**I don't know** *n (%)*
PAF (n = 532)			
Chronic kidney disease is more common in elderly people	331 (62.2)	100 (18.8)	101 (19.0)
Hypertension and diabetes are most common risk factors	410 (77.1)	120 (22.6)	2 (0.4)
Do you know about kidney stones?	292 (54.9)	195 (36.7)	45 (8.5)
Do you think kidney stones are the same as kidney diseases?	158 (29.7)	374 (70.3)	0 (0)
Prevention and early screening for these risk factors can help prevent chronic kidney disease	472 (88.7)	19 (3.6)	41 (7.7)
Healthy diet and regular physical exercise prevent these risk factors?	478 (89.8)	14 (2.6)	40 (7.5)
The screening and sensitization program of today is a move to prevent kidney disease	525 (98.7)	7 (1.3)	0 (0)
RAF (n = 573)			
Did you know that hypertension or diabetes are risk factors of CKD?	285 (49.7)	288 (50.3)	0 (0)
Did you know that lifestyle modifications and physical exercise can help prevent these risk factors	391 (68.2)	175 (30.5)	7 (1.2)

Factors Associated with High Blood Pressure

Age, gender and BMI were significantly associated with high blood pressure. Indeed, the proportion of participants with high blood pressure significantly increased from 16.7% between 10 – 20 years to 56.4% between 70 – 80 years ($p < 0.001$). Similarly, the proportion of high blood pressure significantly increased from 19% for participants with BMI < 18.5 to 68.9% for participants with BMI ≥ 40 Kg/m^2 ($p < 0.001$). See Table 14 for more details on these associations.

Table 14. Factors associated with high blood pressure in the study population

Variables	**High blood pressure**		**P value**
	Yes	**No**	
Age ranges (years), n = 1268			**< 0.001**
< 10	0 (0)	10 (100)	
[10 – 20[	9 (16.7)	45 (83.3)	
[20 – 30[	59 (27.7)	154 (72.3)	
[30 – 40[	104 (35.1)	192 (64.9)	

[40 – 50[	139 (48.6)	147 (51.4)	
[50 – 60[	101 (46.8)	115 (53.2)	
[60 – 70[	74 (49.7)	75 (50.3)	
[70 – 80[	22 (56.4)	17 (43.6)	
≥ 80	1 (20)	4 (80)	
Gender, n = 349			**0.027**
Male	89 (67.9)	42 (32.1)	
Female	122 (56)	96 (44)	
BMI ranges, n = 1224			**< 0.001**
< 18.5	4 (19.0)	17 (81.0)	
[18.5 – 25[	96 (26.7)	263 (73.3)	
[25 – 30[	147 (37.6)	244 (62.4)	
[30 – 35[	152 (50.8)	147 (49.2)	
[35 – 40[	66 (60.6)	43 (39.4)	
≥ 40	31 (68.9)	14 (31.1)	

Factors Associated with High Blood Sugar

Age and gender were significantly associated with high blood sugar, with proportion increasing progressively from younger to older participants. Proportions of high blood sugar were also higher for obese participants as compared to normal BMI subjects (Table 15).

Table 15. Factors associated with high blood sugar in the study population

Variables	**High blood sugar**		**P value**
	Yes	**No**	
Age ranges (years), n = 1268 < 10	0 (0)	10 (100)	**0.010**
[10 – 20[	1 (1.9)	53 (98.1)	
[20 – 30[	12 (5.6)	201 (94.4)	
[30 – 40[	28 (9.5)	268 (90.5)	
[40 – 50[	28 (9.8)	258 (90.2)	
[50 – 60[	31 (14.4)	185 (85.6)	
[60 – 70[	17 (11.4)	132 (88.6)	
[70 – 80[	8 (20.5)	31 (79.5)	
≥ 80	0 (0)	5 (100)	
Gender, n = 349			**0.175**
Male	21 (16.0)	110 (84.0)	
Female	24 (11.0)	194 (89.0)	
BMI ranges, n = 1224			**0.007**
< 18.5	3 (14.3)	18 (85.7)	
[18.5 – 25[	24 (6.7)	335 (93.3)	
[25 – 30[	33 (8.4)	358 (91.6)	
[30 – 35[	45 (15.1)	254 (84.9)	
[35 – 40[	12 (11.0)	97 (89.0)	

≥ 40	7 (15.6)	38 (84.4)	

Discussion

Chronic kidney disease is currently ranked the 12th leading cause of death worldwide with an overall prevalence of 13.4% [**1**][**2**]. Compared to other continents, Africa has a higher prevalence and progression rate of CKD with a prevalence of 15.4% [**4**]. This high prevalence is attributed to the low awareness of CKD and inaccessibility to adequate and proper health care facilities. In order to raise awareness on CKD, several knowledge assessing and screening campaigns were organized across several regions involving about 1841 participants. In this study, most of the participants were young adults aged between 30 to 60 years with a mean age of 38.9 ± 19.4 years. The most represented gender of this population were females occupying 63% of the study population. Of these, more than 50% of the participants showed basic knowledge on kidney disease, especially knowledge in the preventive methods following their response from our kidney awareness questionnaires.

Cumulative data from the screening of 1268 participants on the different causes of CKD revealed that 22.9% of the population were Grade I hypertensives (140/90-160/100), 11.1% Grade II (160/100-180/110) and 6.1% Grade III (≥180/110): giving an overall prevalence of 40.1%. This is similar to a study carried out by **Arrey et al. (2016)** in Cameroon with a prevalence of 47.1% in urban milieu which depicts the areas of our study[**6**]**.** The prevalence of hypertensive tend to increase with an increase in age and BMI value: from 16.7% between 10-20yrs to 56.4% between 70-80yrs with a $p<0.0001$ also, 19% for BMI<18.5 to 68.9% for BMI ≥ 40kg/m² $p<0.0001$ which correlates with a study carried out by **Lin et al. (2019)** in Taiwan demonstrating a strong positive correlation between BMI and waist circumference in increasing the chances of developing Hypertension **[7]**. This study suggests that BMI and WC are both good predictors of HTN.

Among the population, 3.9% were prediabetic and 5.5% diabetic giving an overall prevalence for prediabetic and diabetic within 1247 participation 9.4%. This is similar to a study carried out by

Bigna et al. 2017 in Cameroon amongst healthy adults with a diabetic prevalence of 5.8% amongst 37,147 participants and prevalence for prediabetic being 7.1%. The difference in prevalence for the prediabetics could be explained due to our difference in sample size **[8]**.

Following the evaluation of the Body Mass Index, 32% of the population were recorded as overweight while 47% were identified as obese. Which identifies with a study carried out by Jobert et al 2019 [**9**] which presented an overall prevalence of Overweight to be 26.0% with a prevalence for Obesity being 15.1%. Although the difference between our obesity prevalence is almost double, this could be explained by the increased population of women in our sample population with the age group of 30 and above. Considering that the study carried by Jobert et al 2019 was before the pandemic, the increased prevalence could be as a result of the numerous lockdown and restrictions upholded during the Covid-19 pandemic which led to increased inactivity. However more study is to be carried out and on a larger sample size to determine by what factor the obesity prevalence has increased.

In an attempt to measure kidney function, urine analysis was done on 544 participants. Proteinuria, glucosuria and hematuria presented themselves in 19.3%, 3.6% and 1.8% respectively in the population. The finding of hematuria and proteinuria in the present study is instructive as it may suggest the presence of underlying renal disease in these subjects. This study concords with that carried out by Koduru et al 2018 where they used urine dipsticks in screening for renal abnormalities in school children, demonstrating a correlation between proteinuria, hematuria and/or glucosuria as possible indicators of renal abnormalities [**10**].

Conclusion and perspectives

Throughout these campaigns that spanned from 2019 to 2021, many people learnt of chronic kidney disease and its leading causes. The assessment of their knowledge on the subject matter revealed that many are still ignorant about this condition and its causative agents. Considering that these studies were carried out mostly in the urban areas it paints a bleak image of how this lack of knowledge could be in rural areas all across Cameroon. Bearing in mind that one of the major factors that promote the spread or increase progression of CKD amongst the population is ignorance of the conditions and lack of health facilities, especially in the rural setting who tend to reply on herbal medications from questionable sources to cure their day to day ailments: It is critical that a larger scale study be conducted in the population, particularly in rural areas throughout the country, in order to paint a clearer picture of the risk factors for CKD in these settings, as well as the use of urinalysis to determine kidney function with possible laboratory confirmation using Creatinine and Urea to accurately identify individuals who are experiencing gradual renal damage. This will go a long way toward assisting more people in becoming aware of their renal health and seeking out appropriate and competent health care professionals for follow-up in order to avoid progression of their underlying problems or kidney damage into a future stage of CKD. However, because this study had a small number of pediatric participants, additional efforts should be made to enroll children and teenagers in the study so that their kidney function may be assessed as a marker for early identification and management of CKD in the younger population.

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Appendices

Data collection forms

QUESTIONNAIRE FORM

PATIENT INFORMATION

NAME	
Phone No	
Email	
Age	
Sex	
Weight	
Height	
BMI	
Temperature	
Oxygen Level/PULSE	
Blood Pressure	
Blood Sugar (RBS/FBS)	

URINALYSIS RESULTS

PARAMETERS	RESULTS
Bilirubin (30 sec)	
Glucose (30 sec)	
Micro Albumin (30 sec)	
Ketone (40 sec)	
Ascorbate (40 sec)	
Specific Gravity (45 sec)	
Creatinine (60 sec)	
Blood (60 sec)	
Protein (60 sec)	
Nitrite (60 sec)	
Leukocytes (60 sec)	
pH (60 sec)	
Calcium (60 sec)	
Note:	
Referral	

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