Original Research Article

Changing trends in cardiovascular risk factors among adults in southern Nigeria

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ABSTRACT

Background: Globally, cardiovascular diseases (CVDs) cause 17.9 million deaths yearly. In nations like Nigeria, diabetes, hypertension, and obesity, coupled with modifiable behaviors such as physical inactivity, unhealthy diet, smoking, and alcohol use, are rising. This study focused on assessing the evolving prevalence and distribution of CVD risk factors among adults in southern Nigeria.
Methods: This cross-sectional study, conducted in Port Harcourt, Rivers state, was part of world heart day celebrations over three years (September 2019-September 2023). 309 adults participated, undergoing screening for blood pressure, fasting blood glucose, lipid profile, and body mass index calculated from weight and height measurements.
Results: Over three years, 309 subjects (mean age 46.63±12.03) were studied, with 53.40% females and 46.28% males. Most cardiovascular risk factors occurred in the 41-50 age group. Hypertension rose from 65.63% (2019) to 75.29% (2023), dipping to 64.79% (2022). Obesity decreased from 29.69% (2019) to 24.71% (2023), rising to 30.99% (2022). Diabetes increased from 23.44% (2019) to 27.59% (2023), decreasing to 19.71% (2022). Total cholesterol rose from 1.56% (2019) to 2.9% (2023). High LDL increased from 3.12% (2019) to 12.7% (2023). Low HDL and high TRIG decreased from 2019 to 2023.
Conclusions: From 2019 to 2023, cardiovascular risk factors like hypertension, obesity, diabetes, and dyslipidemia increased, with a slight fluctuation in 2022. Heightened awareness and preventive measures against adult CVD risk factors are imperative. National education on risk factors is vital for individuals to monitor their blood pressure, weight, cholesterol, and blood sugar levels.

Keywords: Cardiac centre, Cardiovascular diseases, Diabetes mellitus, Dyslipidemia

INTRODUCTION

Cardiovascular diseases (CVDs) are responsible for the highest number of deaths worldwide, with 17.9 million deaths occurring annually.[1-3] The World Health Organization reported that CVDs account for 31% of all deaths and are predicted to increase from 16.7 million deaths in 2010 to 23.3 million by 2030. Clinical risk factors such as diabetes, hypertension, and obesity, as well as modifiable risk behaviors like insufficient physical activity, poor diet, smoking, and alcohol consumption, are on the rise in developing nations like Nigeria, and these factors account for over 80% of all CVD deaths in low- and middle-income countries and affect both men and women equally.[1,4]

Cardiovascular diseases (CVDs) such as ischemic heart disease and stroke together accounted for 12.9 million

deaths in 2010 or one in four deaths worldwide. Of the leading causes of deaths, diabetes mellitus (DM) is the fastest growing globally, responsible for 1.3 million deaths in 2010. Approximately 9.4 million (16.5% of all) deaths can be attributed to hypertension, these include 51% of deaths due to stroke and 45% of deaths due to coronary artery disease.[5] Non-communicable diseases accounted for 66.7% of death worldwide, with CVD contributing 43% to the global mortality figure. The total global burden of CVD in terms of disability-adjusted life years (DALYs) stood at 15% in 2010.[6-8]

The increase in CVD burden in developing countries is largely the result of an increase in the prevalence of risk factors due to the combined effects of industrialization, rural-urban population drift, urbanization, and associated effects on the levels of cardiovascular risk factors as well as the relative lack of access to the modern medical interventions measures.[5,6] In sub-Saharan Africa, reported prevalence of cardiovascular diseases has risen and is increasingly being recognized as a significant cause of morbidity and mortality. In Nigeria, as a result of increasing rural-urban drift and socio-economic changes, there is a rising trend in cardiovascular disease burden. With an increasingly high emergence of ischemic heart disease as an important cause of morbidity and mortality in the population.[9,10]

A study in the USA amongst population of diverse backgrounds in 2012 reported prevalence of major CVDs risk factors as hypertension 25.4%, obesity 36.5%, diabetes 16.7%, smoking 25.7% and dyslipidemia 51.7%.[11] A community-based survey study in the Southern Nigeria in 2016 reported prevalence of major CVDs risk factors as hypertension (26.4%), obesity (11.3%), diabetes (9%), alcohol abuse (12.1%), family history of stroke (8.1%), smoking (6.9%) and previous stroke (2.7%).[10] As with many high-income countries during the past century, low-and middle-income countries, including Nigeria, are now experiencing an accelerating increase in CVD. The above studies show that the prevalence, morbidity and mortality of CVDs and their risk factors are high.

There is need for regular community-based studies in order to keep abreast of the current burden of CVD risk factors. This study was set to identify and understand the factors contributing to the changing trend of cardiovascular risk factors. To determine the prevalence and distribution of cardiovascular risk factors among different demographic groups. Hence, this study therefore aimed to investigate and analyze the shifts and pattern in the prevalence and distribution of risk factors associated with cardiovascular disease among the adult population in southern Nigeria.

METHODS

A cross-sectional descriptive study was carried out in Rivers state southern Nigeria. Nigeria, is the most populous country in Africa with an estimated population of around 219 million individuals in 2022.[12] The country is made up of 6 geo-political zones with a total of 36 States and the Federal Capital Territory in Abuja. The south-south zone is comprised of 6 states (Edo, Delta, Bayelsa, Rivers, Akwa Ibom and Cross River). The current study was carried out in GoodHeart Medical Consultants Hospital, Port Harcourt, Rivers state as part of activities of the world Heart day celebration for three years (September 2019, September 2022 to September 2023) by GoodHeart and Life Support Initiative.

A total of 309 adults were screened during the period. The participants were patients who volunteered for the exercise between the age of 18 years and above with both known and unknown medical and treatment history.

The following measurement and data collection were carried out: blood pressure (BP), fasting blood glucose (FBG), lipid profile (total cholesterol =TC, high-density lipoprotein =HDL, low-density lipoprotein =LDL, triglyceride =TRIG) and weight and height to calculate body mass index (BMI) by a team of doctors, nurses, laboratory scientist and research assistants. Participants were counseled and those identified to have CVD risk factors were referred for further evaluation.

Table 1: International classification of lipid profile.

Classification	TC (mmol/l)	LDL (mmol/l)	HDL (mmol/l)	TG (mmol/l)
Desirable	<5.17	<3.36	>1.55	<2.26
Borderline	5.17-6.18	3.36-4.11	0.91-1.53	2.26-4.50
High	>6.21	>4.14	-	>4.50
Low	-	-	<0.91	-

HDL=High-density lipoprotein, LDL=Low-density lipoprotein, TG=Triglyceride, TC=Total cholesterol

Height was measured to the nearest centimeter and body weight to the nearest 0.1 kg. Body mass index (BMI) was calculated as weight in kilograms divided by height in meters squared and obesity was defined as a BMI of 30.0 or greater.[10] Blood pressure (BP) was measured on the left arm with a mercury sphygmomanometer, with the subjects relaxed and in sitting position. Hypertension was a systolic blood pressure 140 mmHg or greater, diastolic blood pressure 90 mmHg or greater and Accu-Chek active glucometer was used to measure the blood glucose level with a fasting glucose range as desirable <6.11, borderline 6.11-6.94, high >6.94.[13-15]
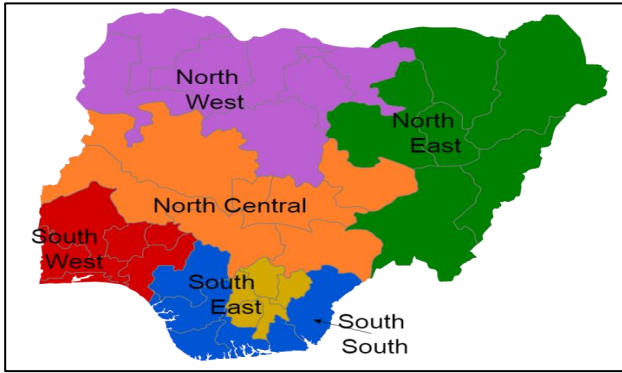
Figure 1: Map of the six geopolitical zones in Nigeria.[17]

Figure 2: Map showing the south-south state.[17]

The World Health Organization and the American National Cholesterol Education Program recommended blood lipid concentrations shown in Table 1 were used as reference cut-off points.[15,16] Data collected was analyzed using SPSS version 22.

Exclusion criteria

Individuals under the age of 18 were excluded from the study. Additionally, subjects who were disabled or paralyzed and unable to measure their weight and height were also excluded from the study criteria.

Statement of ethical approval

Ethical approval of this study was obtained from the University of Port Harcourt teaching Hospital ethical committee.

RESULTS

The general characteristics of the participants are shown in Table 2. The study examined 309 adults, with 165 (53.40%) females and 143 (46.28%) males that participated in this part of the screening in 2019, 2022, and 2023 ranging in age from 18 to 91 years old. The age group between 41-50. 93(30.10%) were more in number and the age group >70 were less in number 11 (3.56%).

Table 2: Gender and age distribution.

Age range	Female (%)	Male (%)	Total (%)
<30	26 (8.41)	16 (5.20)	42 (13.59)
31-40	33 (10.68)	37 (11.80)	70 (22.65)
41-50	47 (15.21)	45 (14.56)	93 (30.10)
51-60	32 (10.36)	24 (7.77)	56 (18.12)
61-70	21 (6.80)	16 (5.18)	37 (11.97)
> 70	6 (1.94)	5 (1.62)	11 (3.56)
Grand total	165 (53.40)	143 (46.28)	309 (100)

Table 3: Mean and standard deviation for cardiovascular risk factors parameters.

Parameters	2019 mean±SD	2022 mean±SD	2023 mean±SD	Grand mean±SD
Age	46.63±12.03	47.498±14.47	45.47±14.42	46.18±13.93
BMI	27.46±5.40	27.81±5.79	26.78±5.49	24.48±6.02
Systolic	132.20±23.90	131.95±19.17	137.19±22.20	133.07±23.91
Diastolic	84.27±17.23	82.91±14.67	85.06±14.21	84.42±14.95
FBG	5.98±3.1	5.54±2.77	5.43±1.44	5.62±2.35
High (TC)	3.42±1.19	4.44±0.83	3.98±1.47	3.96±1.37
High TRIG	1.24±0.57	1.12±0.48	1.04±0.38	1.08±0.43
Low (HDL)	1.29±1.13	1.49±0.51	1.19±0.47	1.26±0.63
High (LDL)	1.93±1.18	2.45±0.73	2.48±1.23	2.38±1.17

BMI= body mass index, FBG= fasting blood glucose, HDL= high-density-lipoprotein, LDL= low-density lipoprotein, TC= total cholesterol

Table 4: The pool prevalence of cardiovascular risk factor by gender over the years.

CVD risk factors	Female (%)	Male (%)	Total (%)
Hypertension	104 (33.66)	115 (37.22)	219 (70.87)
Obesity	61 (19.74)	22 (7.12)	83 (26.86)

Continued.

CVD risk factors	Female (%)	Male (%)	Total (%)
Diabetes	41 (13.27)	36 (11.65)	77 (24.92)
High (TC)	4 (1.29)	2 (0.65)	6 (1.94)
Low (HDL)	7 (2.27)	13 (4.21)	20 (6.47)
High (LDL)	14 (4.53)	10 (3.24)	24 (7.76)
High triglyceride	1 (0.32)	0 (0.00)	1 (0.32)

Table 5: Prevalence of cardiovascular risk factor by gender across the years.

Year	Cardiovascular risk factors						
	Hypertension	Obesity	Diabetes	High TC	High TRIG	Low HDL	High LDL
2019							
Female (n=36) (%)	20 (31.25)	14 (21.87)	8 (12.50)	1 (1.56)	1 (1.56)	2 (3.12)	2 (3.12)
Male (n=28) (%)	22 (34.37)	5 (7.81)	7 (10.94)	0 (0.00)	0 (0.00)	4 (6.25)	0 (0.00)
Total (n=64)	42 (65.63)	19 (29.69)	15 (23.44)	1 (1.56)	1 (1.56)	6 (9.38)	2 (3.12)
2022							
Female (n=41) (%)	25 (35.21)	17 (23.94)	9 (12.68)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
Male (n=30) (%)	21 (29.58)	5 (7.04)	5 (7.04)	0 (0.00)	0 (0.00)	0 (0.00)	1 (1.41)
Total (n=71) (%)	46 (64.79)	22 (30.99)	14 (19.71)	0 (0.00)	0 (0.00)	0 (0.00)	1 (1.41)
2023							
Female (n=88) (%)	59 (33.91)	31 (17.81)	24 (13.79)	3 (1.72)	0 (0.00)	5 (2.87)	13 (7.47)
Male (n=86) (%)	72 (41.38)	12 (6.90)	24 (13.79)	2 (1.15)	0 (0.00)	9 (5.17)	9 (5.17)
Total (n=174) (%)	131 (75.29)	43 (24.71)	48 (27.59)	5 (2.90)	0 (0.00)	14 (8.05)	22 (12.64)

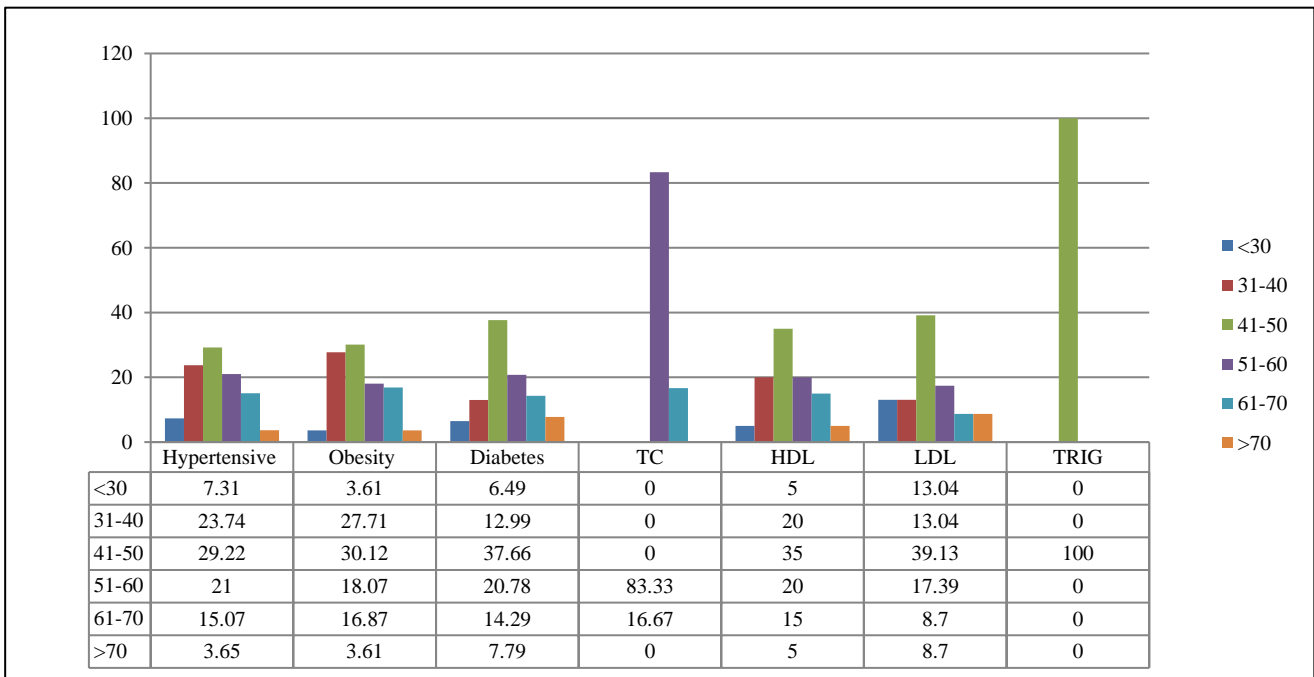|	Hypertensive	Obesity	Diabetes	TC	HDL	LDL	TRIG
<30	7.31	3.61	6.49	0	5	13.04	0
31-40	23.74	27.71	12.99	0	20	13.04	0
41-50	29.22	30.12	37.66	0	35	39.13	100
51-60	21	18.07	20.78	83.33	20	17.39	0
61-70	15.07	16.87	14.29	16.67	15	8.7	0
>70	3.65	3.61	7.79	0	5	8.7	0

Figure 3: The pool prevalence of cardiovascular risk factors by age group across the year.

Table 3 shows the mean and standard deviation for BMI, systolic, diastolic, fasting blood glucose, total cholesterol, HDL cholesterol, LDL cholesterol and triglyceride of the three years. The overall mean age for each year was 46.63±12.03, 47.48±14.47 and 45.46±14.42 years respectively. Majority 93 (30.10%) were within the age range of 41 and 50 years.

Table 4 shows the pool prevalence of cardiovascular risk factors. It ranged from as low as 1 (0.32%) (for elevated triglyceride) to as high as 219 (70.87%) for hypertension (diastole and or systole). The pool prevalence of hypertension and low HDL were more in male and obesity, diabetes, total cholesterol, high LDL and TRIG more prevalent in female.

Table 5 shows the prevalence of cardiovascular risk factor by gender across the years. Cardiovascular risk factors were more prevalent in 2023 with 75.29% hypertensive, 27.59% diabetics, 2.9% high TC and 12.07% high LDL, as to compared 2022 which showed high prevalence of obesity 30.99% and 2019 with high prevalence with low HDL 9.38% and TRIG 1.56%. Figure 3 shows the pool prevalence of cardiovascular risk factors by age group over the year. Participant in age group 41-50 showed high prevalence of the cardiovascular risk factors with 29.22% hypertensive, 30.12% obesity, 37.66% diabetic, 35% low HDL and 39.13% high LDL and participant in the above 70 years shows less prevalence of the cardiovascular risk factor.

Figure 4 shows the trend of cardiovascular risk factor across the years. Risk factors were on a rise from 2019 to 2023 with a drop in 2022 in hypertension, obesity, diabetes and lipid profile.
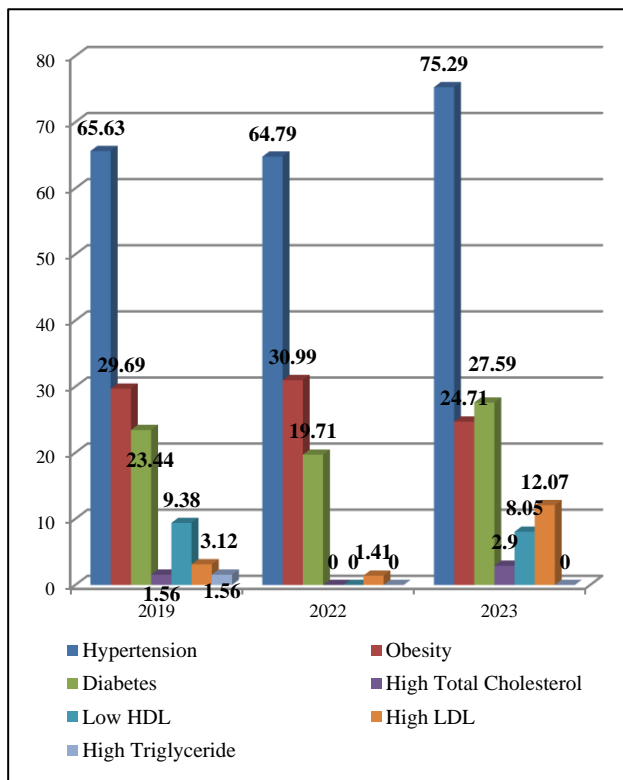

Figure 4: Trend of cardiovascular risk factors across the years.

DISCUSSION

Hypertension, obesity, diabetes mellitus, and dyslipidemia (total cholesterol, HDL, LDL, and triglyceride) are considered some of the most important risk factors for CVD. Estimates from this study show that 219 (70.87%) hypertensive, 83 (26.86%) obese, 77 (24.92%) diabetic, 6 (1.94%) with high total cholesterol, 20 (6.47%) with low HDL, 24 (7.76%) with high LDL, and 1 (0.32%) with high triglyceride over the three years (Table 4).

The prevalence of hypertension across the years under consideration was 42 (65.63%), 46 (64.79%), 131 (75.29%) respectively. This is similar to 47.2%, 46.4% and 43.9% prevalence reported in the studies carried out in semi-urban communities in southwest, among middle age and the general outpatient clinic study, respectively, all in Nigeria.[5,18,19] However, it is higher than the prevalence reported in other regions in Nigeria.[10,15] Compared with females, males had the overall higher prevalence of hypertension, this high prevalence in male is similar to other studies.[20,21] This could probably be due to the fact that men are mainly active workers such as farmers, laborers, artisans in this location.[10] The high prevalence of hypertension in this study highlights the high risk and enormous burden of cardiovascular diseases in Nigeria.

The study population had an obesity prevalence rate of 19 (29.69%), 22 (30.99%) and 43 (24.71%) across the years with an unequal distribution between both genders. The current study is in line with 30% reported among middle and elderly age and 24.4% reported by a country analysis of the Africa and Middle East cardiovascular epidemiological, but higher than the rate of 11.3%, 8.5%, 8.4% and 7.0% reported in Nigeria and the south west Ethiopia.[10,15,18,19,22]

Women had a significantly higher prevalence of obesity than men, this could be due to the sedentary types of occupation like petty trading which encourages weight gain compared with men who are mainly involved in occupations that require mobility (farming, artisan, laborers etc.).[23,24] It may also be due to the fact that obesity is still "fashionable" among women.[5] Obesity remains more common in female Nigerian subjects perhaps pointing to inadequate post-natal exercise in Nigerian women.[18]

Diabetes mellitus had a prevalence rate of 15 (23.44%), 14 (19.71%), 48 (27.59%) respectively across the years with little difference in proportion between genders, and a pooled prevalence of 77 (24.92%) of the overall study population affected, which is similar to 21.4% reported in 2017 and higher than the 8.5-8.8% and 6.8% reported in previous studies.[5,18,25] The prevalence of diabetes in Nigeria has steadily increased and this might be attributed to western lifestyle changes, dietary habits, and urbanization influence.

Several studies in Nigeria have shown the presence of dyslipidemia in patients with diabetes presenting with hypertension and in apparently normal health professionals.[26-29] Low HDL cholesterol had a high prevalence rate of 6 (9.38%), 14 (8.05%) in 2019 and 2023 with slight difference between genders, while high LDL cholesterol had a prevalence rate of 2 (3.12%), 1 (1.41), 21 (12.07%) with females having a higher rate than males. This study is lower compared to the study in south west Ethiopia.[22,30] The most frequent type of

dyslipidemia in our study was LDL 24 (7.76%), in close range was low HDL-C, 20 (6.47%).

The trends of cardiovascular risk factors; the prevalence of hypertension rose from 65.63% in 2019 to 75.29% in 2023, experiencing a decrease in 2022 to 64.79%. Obesity witnessed a decrease from 29.69% in 2019 to 24.71% in 2023, followed by a rise to 30.99% in 2022. Diabetes showed an upward trend, going from 23.44% in 2019 to 27.59% in 2023, with a decrease to 19.71% in the 2022. The percentage of Total cholesterol increased from 1.56% in 2019 to 2.9% in 2023, with a change occurring in 2022. High LDL experienced an increase from 3.12% in 2019 to 12.7% in 2023, but underwent a reduction in 2022. Low HDL and high TRIG exhibited a decrease from 2019 to 2023.

The prevalence of hypertension increased from 2019 to 2023, with a decrease in 2022. Obesity prevalence decreased from 2019, rose in 2022 and decreased in 2023, diabetes showed an upward trend from 2019 to 2023, with a decrease in 2022. High TC and high LDL both experienced an increase from 2019 to 2023, with a reduction in 2022 for LDL. Low HDL and high TRIG both decreased from 2019 to 2023. The overall drop in risk factor in 2022 is properly due to COVID-19 lockdown between 2020-2021 which aid the drop in hypertension due to sufficient rest, increase in obesity due to lack of physical activity and diabetes and lipid reduction due to proper diet plan.

Primary prevention, early detection, effective control as well as health promotion strategies are critical in the attempt to reverse the global burden of CVD.[31] Although the observations highlight the importance of urgent management of cardiovascular disease and the need for increased awareness for CVD risk factors among adults. The findings also suggest a need for targeted interventions aimed at reducing gender CVD risk factors such as hypertension and obesity.

The limitation of this study lies in its small sample size and inadequate details of participants. The study focused on hypertension, obesity, diabetes, dyslipidemia as the identifiable risk factors but fail to consider alcohol abuse, smoking, family history and previous history of stroke and physical inactivity as recorded in other study findings. The diagnosis of the risk factors was based on a mean of one sitting which may affect the overall prevalence of cardiovascular risk factors in the study.

The pandemic lockdown between 2020 to 2021 aid the gap in the trend flow and the increase in participant in 2023 was as a result of free movement after pandemic.

Health workers should consider measuring the above CVD risk factors during routine service provision.

CONCLUSION

Cardiovascular risk factors were highly prevalent in adults of this study population, with the highest prevalence in hypertension 70.87%, obesity 26.86%, diabetes 24.92%, LDL 7.76%, HDL 6.47%, TC 1.94%, TRIG 0.32%, in descending order of frequency. There was an increase prevalence from 2019 to 2023 in hypertension, diabetes, high TC and high LDL in the population while a decreased prevalence in obesity between 2019 and 2023. The trend in CVD risk factors increased across the years with little rise and drop in 2022 which can be due to after effect of COVID-19 lockdown. Obesity remains more common in female Nigerian subjects and hypertension was more prevalent in males in this study. Implementing targeted public health campaigns to raise awareness about the importance of maintaining a healthy lifestyle, together with a national exercise incentive program may aid reduction in the prevalence of CVD risk factors, targeting everywhere from homes to schools. Hence, it is suggested that better supervision and management of these risk factors are needed, especially within the age group of 31-60 years. In addition to working with healthcare providers to create individualized prevention and management plans for people at high risk of cardiovascular diseases, more research is required to fully comprehend the mechanisms and underlying causes of the shifting trends in cardiovascular risk factors.

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