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RESEARCH ARTICLE

# Cardiovascular risk assessment of the general population at a community pharmacy setting

Uchenna I.H. Eze[1], Michael S.C. Eze[2], Chinonyerem O. Iheanacho[3], Patrick Igbinaduwa[2]

[1] Department of Clinical Pharmacy & Biopharmacy, Faculty of Pharmacy, Olabisi, Onabanjo University, Sagamu, Ogun State, Nigeria
[2] Faculty of Pharmacy, University of Benin, Benin City, Nigeria
[3] Department of Clinical Pharmacy & Public Health, Faculty of Pharmacy, University of Calabar, Calabar, Nigeria

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**Correspondence**
Chinonyerem O. Iheanacho
Department of Clinical Pharmacy and Public Health
Faculty of Pharmacy
University of Calabar
Calabar
Nigeria
*nonye2m@yahoo.com*

## Abstract

**Background:** The increasing burden of cardiovascular diseases (CVDs) suggests the need for early detection of risks. This study assessed the outcomes of community pharmacy-based screening for CVD risks and the association of sociodemographic characteristics with health parameters. **Methods:** A cross-sectional study was conducted among healthy consumers of community pharmacy services aged 18 and above. Interventions included the measurement of blood pressure, waist-to-hip ratio, height/weight, visceral fat, and CVD risks. Study endpoints were outcomes of community pharmacy-based screenings and the association of sociodemographics with health parameters. **Results:** A high prevalence of elevated blood pressure 212 (53.1%), high visceral fat 167 (41.8%), high waist-to-hip ratio 176 (44.1%), and high body mass index (BMI) 251 (62.9%) were observed among the 400 study participants. Of the 152 (38.0%) with CVD risks, 84 (55.3%) had a medium risk. Age was statistically significant for CVD risks, blood pressure, heart rate, and BMI. Occupation was statistically significant for CVD risks and heart rate. Marital status was significantly associated with CVD risk. **Conclusion:** Several outcomes were observed, including a high prevalence of hypertension, high BMI, waist-to-hip ratio, and overall medium CVD risks. These findings suggest the need for increased and targeted educational interventions.

## Introduction

Cardiovascular diseases (CVDs) are a primary cause of global morbidity and mortality, with an upward trend across demographics (World Health Organisation, 2021). CVDs pose increasing health concerns and include all diseases of the heart and blood vessels (World Health Organisation, 2021). They result from several modifiable or non-modifiable factors, such as a sedentary lifestyle, misuse of medicines (Iheanacho & Adam, 2020), and an unhealthy diet. A high prevalence of CVDs is continuously observed in low- and middle-income African countries, including Nigeria (Ejim *et al.,* 2011; Adegoke *et al.,* 2018). A high prevalence of CVD risk factors, particularly obesity, hypertension, and coronary heart disease, is also increasingly recognised in Nigeria (Adeloye *et al.,* 2021; Iheanacho *et al.,* 2021). A previous study in India suggests a relationship between CVD risks and several sociodemographic characteristics, such as age, marital status, and sex, among others. Also, there was a higher prevalence of CVD-related out-of-hospital deaths in Nigeria among females (Adegoke *et al.,* 2018). Early detection of people at high risk of CVDs is essential for improved outcomes, including disease prevention and health protection.

Disease prevention and health protection are primary aspects of community pharmacy practice (Tekin, 2020) and are considered essential outcomes of community pharmacy-based screenings. Therefore, community pharmacies are plausible sites for screening for CVD risks, as noted in previous studies (Wallis *et al.,* 2014; Jahangard-Rafsanjani *et al.,* 2017; Fonseca *et al.,* 2021). As highly accessible skilled health professionals, community pharmacists are well-positioned to engage in early detection of people with risks of CVD, which is essential in curbing the growing trend of

cardiovascular-related deaths. Consistent with the expanding roles of community pharmacists, previous studies have shown that community pharmacists routinely engage in several public health activities in their pharmacies (Adje *et al.,* 2016; Iheanacho & Odili, 2021a), including point-of-care screening for chronic diseases, counselling, and health education for disease prevention and control. They also play a primary role in referring people at risk for CVDs. Hence, implementing community pharmacy-based screening programmes would contribute to reducing the disease burden.

Nigeria is faced with a double burden of communicable and non-communicable diseases, with the majority remaining undiagnosed until the onset of complications (Dokunmu *et al.,* 2018). Out-of-hospital cardiovascular-related deaths are also highly prevalent in the country (Adegoke *et al.,* 2018). Furthermore, few people have access to health facilities for routine cardiovascular health screening, warranting the exploration of community pharmacies as potential screening centres for CVD risks. Community pharmacies are usually the first point of contact and sometimes the only access to health services for many people in Nigeria, particularly in rural and sub-urban communities with low access to health facilities (Aluh & Norberg, 2020). The ease of access to community pharmacists at no extra cost would allow for a broader coverage of CVD risk screening in Nigerian community pharmacies. There is a dire need to explore these facilities as potential centres for CVD risk screening, as limited data exist in this regard. Although one study has previously explored cardiovascular risk screening in Nigerian community pharmacy settings (Amadi *et al.,* 2020), it is essential to have increased evidence in the country for more rational evaluations. Findings from this study will add to the body of existing knowledge on CVD risk screening, particularly in a medium-income country. This study aimed to assess the outcomes of a community pharmacy-based cardiovascular screening in a sub-urban region of Nigeria. It also sought to determine the association of sociodemographic characteristics with health parameters.

## Methods

### *Study design and population*

A cross-sectional study of the general public at Mic Elliot Pharmacy in Akute was conducted from March 2019 to September 2019. The screening of walk-in adults involved medical history, demographics, body mass index (BMI), blood pressure measurement, and cardiovascular risk factors. The inclusion criteria consisted of adults (18 years old and older) with no previous diagnosis of cardiovascular disease. Those with severe mental illness or prior diagnosis of a cardiovascular disease were excluded.

### *Study setting*

The study was conducted at Mic Elliot Pharmacy, located in Akute in the Ifo Local Government Area of Ogun State, Nigeria. This community pharmacy caters to the pharmaceutical needs of the residents of Akute and the surrounding area. The expanse of land in Akute attracts a large number of settlers, and its proximity to Lagos makes it one of the most commercially viable towns in the state. Residents are predominantly traders, artisans, civil servants, and company workers. Akute has one health centre, one missionary hospital, about 20 private hospitals, and 14 registered pharmacies.

### *Sample size and sampling technique*

Raosoft Sample Calculator (Raosoft Inc., n.d.) was used to calculate the sample size. Assuming a population of 20,000, a confidence interval of 95%, a margin of error of 5%, and a response distribution of 50%, the sample calculated size was 377. A round figure of 400 was adopted. Purposive sampling was used to recruit study participants over a period of six months.

### *Data collection*

The questionnaire used in this study was simple and consisted of sections related to sociodemographic characteristics and health parameters, respectively. Screening for health parameters was performed using approved methods and validated devices. Free Health Test flex banners were placed in strategic areas to create awareness about the study. People were also individually informed about the study and encouraged to come at their convenience. Those who accepted to participate in the study signed a consent form before they were administered the questionnaire. Pharmacists or trained assistants helped the participants complete the questionnaire. Participants were then allowed to rest for 5–10 minutes before the assessment tests. Tests were done in this order: blood pressure, pulse, BMI, visceral fat, body fat, and waist-to-hip ratio. Data were collected by two clinical pharmacists and two trained assistants.

#### *Blood pressure and pulse*

The American Heart Association (AHA) guidelines for determining blood pressure and pulse were adopted and applied using a clinically validated Omron M2 Intellisense Automatic Blood Pressure Monitor that also measures pulse (PK-HEM-7121-E-01-09/2013,

manufactured by Omron Healthcare Manufacturing Limited). The use of a digital blood pressure monitor was adopted for ease of measurement. Correct patient position and cuff selection were ensured, and three readings were performed to get an average blood pressure for each participant. Procedure for the test (Smith, 2005):

1. The participant sat comfortably still for 5 minutes with their back supported, legs uncrossed, and upper arm unbarred.

2. No alcohol was consumed before the test.

3. The bladder was emptied before the test.

4. The arm was supported at the heart level.

5. The cuff was placed on the brachial artery on the upper arm.

6. The cuff bladder encircled 80% of the participant's arm circumference with an appropriately sized BP monitor cuff.

7. The power indicator of the BP and pulse monitor was then turned on for measurements.

8. Three readings were taken with a one-minute interval between them, and the average of the measurements was recorded for analysis.

*Cardiovascular risks (BMI, visceral fat, body fat, and waist-to-hip ratio)*

Participants' BMI, visceral fat, body fat, and body muscle were measured using a validated Omron Full Body Sensor, Body Composition Monitor, and Scale (Model HBF-516, a product of Omron Healthcare Inc., USA). The model measures the whole body (arm to foot), providing a clinically demonstrated, accurate profile. It estimates the fat percentage by the bioelectrical impedance method, taking advantage of the different electrical conductivity of body fat and water.

1. The body composition monitor was turned on.

2. The display unit was lifted out of its holder when the value of 0.0 lb appeared.

3. The guest mode was selected, and the participant's age, height, and gender were entered.

4. The participant stood on the measurement platform with his feet on the foot electrodes while firmly holding the hand electrodes.

5. The weight result was first displayed, and when the weight value blinked twice, a "Start" directive appeared.

6. When "Start" appeared, the participant was directed to extend his hands at a 90° angle to the body while still firmly holding the hand electrodes. The indicators in the measurement progress bar at the bottom of the display window gradually appeared from left to right based on the measurements taken.

7. The display of the weight value for the second time signalled the completion of the measurement, and the participant stepped down.

8. Appropriate buttons were pressed to check the measurement results for weight, BMI, % visceral fat, % body fat, and % body muscle.

9. Outcomes measured were recorded for analysis.

10. Waist and hip measurements to determine the waist-to-hip ratio were done with a calibrated height metre by STADIOMETER, England, and a tape rule by Singer, China.

***Documentation approach of collected data***

Each participant's data was entered in a numbered questionnaire and transferred on the same day to a Microsoft Excel sheet formatted with a cell bearing the same number on the questionnaire.

***Benefits to participants***

Pharmacists educated participants in small groups on lifestyle measures to promote cardiovascular health. Individuals found to be at risk of CVDs received counselling on reducing salt intake and were referred to hospitals for medical care. Their over-the-counter medicines were also reviewed to ensure safety.

***Outcome measures***

The outcomes measured included the prevalence of hypertension, the proportion of screened participants identified as having CVD risks, and the association of the observed risks with sociodemographic characteristics.

Cardiovascular risk is the probability of developing a cardiovascular disease within a specific period.

***Data analysis***

All collated data were entered into an Excel sheet and analysed using SPSS version 21. Descriptive statistics were performed, and an ANOVA was used to determine the significance of each sociodemographic variable, i.e., age, marital status, occupation, educational level, and sex. A value of $p < 0.05$ was considered significant.

***Ethical considerations***

The Ethics Committee of the Federal Medical Centre, Abeokuta, granted ethical approval (FMCA/470/HREC/01/2019/16).

## Results

All 400 eligible participants completed the study. As shown in Table I, nearly half were between 20 and 39 years old (n = 195, 49.9%), over half were female (n = 212, 53.9%), and the majority engaged in aerobic exercise (n = 231, 57.7%). Most participants were married (n = 301, 75.3%), self-employed (n = 284, 71.0%), did not consume alcohol daily (n = 291, 72.8%), had education beyond the primary level (n = 331, 82.6%), and did not smoke (n = 393, 98.3%).

Of the total sample, 37.0% (n = 148) had normal blood pressure, and 20.5% (n = 82) had pre-hypertension. Also, 53.1% (n = 212) had varying high blood pressure degrees. Most participants (n = 366, 91.5%) had a normal heart rate (Table II).

A high prevalence of visceral fat was observed in 167 participants (41.8%), while normal levels were seen in over half (n = 233, 58.3%). About a quarter of females had normal (n = 105, 26.3%) and high (n = 107, 26.8%) waist-to-hip ratio, respectively, while 69 men (17.3%) had high waist-to-hip ratio. The overall prevalence of high waist-to-hip ratio was 44.1% (n = 176). High BMI levels, with varying degrees, were found among 62.9% (n = 251) of the participants, while normal BMI was measured in one-third (n = 145, 36.3%) (Table III).

Varying degrees of cardiovascular risk were found in 152 participants (38.0%), with 84 (55.3%) being at medium risk and 28 (23.3%) at high risk (Table IV).

Table V shows an association between participants' socio-demographics and health parameters. Age group was significantly correlated to CVD risk ($p = 0.000$), blood pressure ($p = 0.000$), heart rate ($p = 0.009$), and BMI ($p = 0.000$). Occupation was also significantly associated with CVD risk ($p = 0.000$) and heart rate ($p = 0.000$). Marital status was significantly linked to CVD risk ($p = 0.000$).

**Table I: Sociodemographic characteristics of the study participants**

| Variables | Frequency (n=400) | Percentage (%) |
|---|---|---|
| **Age (in years)** | | |
| 20 – 39 | 195 | 48.8 |
| 40 – 59 | 165 | 41.3 |
| 60 – 79 | 40 | 10.1 |
| **Gender** | | |
| Male | 188 | 47.0 |
| Female | 212 | 53.0 |
| **Marital status** | | |
| Single/divorced | 99 | 24.8 |
| Married | 301 | 75.2 |
| **Educational level** | | |
| Primary | 31 | 7.8 |
| Secondary | 161 | 40.3 |
| Tertiary | 170 | 42.5 |
| Others | 38 | 9.6 |
| **Occupation** | | |
| Student | 35 | 8.8 |
| Civil Servant | 50 | 12.5 |
| Self-employed | 284 | 71.0 |
| Not employed | 13 | 3.3 |
| Retired | 18 | 4.5 |
| **Daily sticks of cigarette** | | |
| 0 | 393 | 98.3 |
| 1 | 4 | 1.0 |
| 2 | 1 | 0.3 |
| < 2 | 2 | 0.5 |
| **Daily number of beer bottles** | | |
| 0 | 291 | 72.8 |
| 1 | 82 | 20.5 |
| 2 | 22 | 5.0 |
| < 2 | 4 | 1.0 |
| **Type of exercise** | | |
| Aerobic | 231 | 57.7 |
| Resistance | 19 | 4.8 |
| None | 150 | 37.5 |

**Table II: Classification and distribution of blood pressure and heart rates of participants**

| Blood pressure systolic | Blood pressure diastolic | WHO / ISH classification | Frequency (n=400) | Percentage (%) |
|---|---|---|---|---|
| <90 | <60 | Low BP (hypotension) | 40 | 10.0 |
| 90-120 | 60-80 | Normal BP | 148 | 37.0 |
| 120-129 | 80-84 | High normal | 60 | 15.0 |
| 130-139 | 85-89 | Pre-hypertension | 82 | 20.5 |
| 140-159 | 90-99 | HBP Grade 1 | 29 | 7.3 |
| 160-179 | 100-109 | HBP Grade 2 | 16 | 4.0 |
| ≥180 | ≥110 | HBP Grade 3 | 6 | 1.5 |
| ≥140 | ≤90 | Systolic BP | 19 | 4.8 |
| **Heart Rate** | **Classification** | **Frequency (n=400)** | **Percentage (%)** | |
| <60 | Slow | 25 | 6.3 | |
| 60-100 | Normal | 366 | 91.5 | |
| >100 | Rapid | 9 | 2.3 | |

**Table III: Distribution of some cardiovascular risk factors among participants**

| Variables | Classification | Frequency (n=400) | Percentage (%) |
|---|---|---|---|
| **Visceral fat** | | | |
| ≤ 9 | Normal | 233 | 58.3 |
| 10-14 | High | 127 | 31.8 |
| ≥ 15 | Very high | 40 | 10.0 |
| **Waist-to-hip ratio** | | | |
| Men ≤ 0.9 | Healthy men | 119 | 29.8 |
| Men ≥ 0.9 | Obese men | 69 | 17.3 |
| Women ≤ 0.85 | Healthy women | 105 | 26.3 |
| Women ≥ 0.85 | Obese women | 107 | 26.8 |
| **Body mass index mg/ml (WHO/ISH)** | **Risk of comorbidity** | | |
| < 18.5 | Underweight (Low risk) | 4 | 1.0 |
| 18.5 – 24.9 | Normal weight (Average risk) | 145 | 36.3 |
| 25.0 – 29.9 | Overweight (Mildly increased risk) | 115 | 28.8 |
| 30.0 – 34.9 | Class 1 obesity (Moderate risk) | 83 | 20.8 |
| 35.0 – 39.9 | Class 2 obesity (Severe risk) | 36 | 9.0 |
| > 40.0 | Class 3 obesity (Very severe risk) | 17 | 4.3 |

**Table IV: WHO/ISH quantification of WHO/ISH cardiovascular risks to quantify prognosis**

| Stratification of CV risks (WHO/ISH) | Frequency (n = 120) | Percentage (%) |
|---|---|---|
| **Low CV risk** | | |
| Systolic BP of 140 – 159 OR diastolic BP of 90 – 99 without other cardiovascular risks. | 40 | 33.3 |
| **Medium CV risk** | | |
| A) Systolic BP of 140 – 159 or diastolic BP of 90 without other cardiovascular risks<br>B) Systolic BP of 160 -179 or diastolic BP of 100 – 109 without other cardiovascular risks.<br>C) Systolic BP of 160 -179 or diastolic BP of 100 -109 with 1 or 2 other cardiovascular risks. | 84 | 55.3 |
| **High CV risk** | | |
| A) Systolic BP of ≥ 180 or diastolic BP ≥ 100 with or without other cardiovascular risks.<br>B) Systolic BP of 140 – 159 or diastolic BP of 90 – 99 with ≥ 3 other cardiovascular risks.<br>C) Systolic BP of 160 – 179 or diastolic BP of 100 – 109 with ≥ 3 other cardiovascular risks. | 28 | 23.3 |

**Table V: Association between sociodemographic characteristics and health parameters**

| Sociodemographic factors | Health parameters | ANOVA results |
|---|---|---|
| **Age group** | Cardiovascular risks | $F = 6.426$, df = 3, $P = 0.000$ |
| | Blood pressure | $F = 3.449$, df = 3, $P = 0.000$ |
| | Heart rate | $F = 14.431$, df = 3, $P = 0.009$ |
| | Body mass index | $F = 8.631$, df =3, $P = 0.000$ |
| **Occupation** | Cardiovascular risks | $F = 17.917$, df = 3, $P = 0.000$ |
| | Heart rate status | $F = 4.939$, df = 3, $P = 0.000$ |
| **Marital status** | Cardiovascular risks | F = 19.571, df = 3, $P = 0.000$ |

## Discussion

High levels of high blood pressure were seen in a substantial proportion of participants, although most had a normal heart rate. The majority had high visceral fat and high waist-to-hip ratios across both sexes. Most participants had a high BMI, and more than one-third were at risk for CVD, with most being medium-risk. Sociodemographics were associated with several health parameters.

This study found varying degrees of elevated blood pressure among the participants, corroborating findings from a previous study in Nigeria, which identified a significant number of previously unknown cases of hypertension during a community pharmacy-based screening (Dokunmu *et al.,* 2018). Hypertension directly increases the risk of heart attack, heart failure, renal impairment, stroke, and other microvascular and microvascular complications. It is prevalent in Nigeria and was shown to be the primary cause of out-of-hospital deaths (Adje *et al.,* 2016), raising the need for improved vigilance through screening for previously unknown cases. This practice allows for early detection, prompt referral, and timely management. Community pharmacies, which are highly accessible to the public, can serve as centres for detecting and subsequently preventing cardiovascular-related deaths through appropriate screening and referrals (Wallis *et al.,* 2014; Jahangard-Rafsanjani *et al.,* 2017).

The screening revealed high visceral fat and waist-to-hip ratios across both sexes, consistent with previous findings from Indonesia and Nigeria showing a high prevalence of visceral fat (Ijezie *et al.,* 2013; Smith *et al.,* 2021). High visceral fat is associated with the development of comorbidities due to its atherogenic effects. It poses higher risks for CVDs, presenting threats to health and economic burdens (Aparecida Silveira *et al.,* 2020). Therefore, it is a critical health concern that requires strategic and awareness campaigns for CVD prevention and risk reduction. Again, community pharmacists are well-positioned to facilitate screening, early detection, and risk reduction through effective patient counselling and education on lifestyle and diet changes (Alfadl *et al.,* 2018).

Most participants had high BMI at varying degrees, consistent with findings from Nigerian and Indian studies (Adeloye *et al.,* 2021; Gupta *et al.,* 2023). High BMI levels may be due to the predominant high-fat meals in the country. Additionally, high BMI and overweight are significantly associated with all-cause and specific-cause CVD mortality (Katzmarzyk *et al.,* 2012; Staiano *et al.,* 2012). Higher BMI is also strongly associated with the incidence of heart failure and an increased risk of developing CVD at an early age (Khan *et al.,* 2018), which may result in an increased financial burden on patients and the healthcare system. Findings from a previous study suggest that BMI may not accurately show actual risks for CVD compared to waist circumference (Ejim *et al.,* 2011). However, CVDs are recognised to be associated with BMI, and effective screening in a community pharmacy would facilitate early identification and control.

A medium cardiovascular risk was found among participants identified as being at risk for CVDs. Studies have reported high CV risks among previously undiagnosed people in Iranian and Portuguese community pharmacy settings (Jahangard-Rafsanjani *et al.,* 2017; Fonseca *et al.,* 2021). These findings suggest that a community pharmacy-based screening programme has great potential to identify patients at risk for CVDs. Means to establish and strengthen this practice should be explored, particularly in low- and middle-income countries with a rising burden of CVDs. A previous study in Lagos, Nigeria, reported a high number of cardiovascular-related deaths, accounting for over half of out-of-hospital deaths (Adegoke *et al.,* 2018). Early detection of people at risk is a mainstay for prompt control and prevention of complications. Previously observed high job satisfaction of community pharmacists in Nigeria may be a motivator for the enhanced practice of expanded roles of pharmacists, including health promotion (Iheanacho & Odili, 2021b).

Participants' sociodemographic characteristics were found to be significantly associated with CV risks, heart rate, BMI, and blood pressure. These associations were demonstrated for age, occupation, and marital status. A previous study in Nigeria found that sex was a primary predictor of overweight and obesity (Adeloye *et al.,* 2021). Insufficient fruit and vegetable intake was also associated with hypertension in Nigeria (Chukwu *et al.,* 2021). Similarly, age, education, and ethnicity were independent risk factors for increased CV risks in Malaysia (Ghazali *et al.,* 2015). Age was also a significant predictor of coronary heart disease in Dhaka (Rahman *et al.,* 2019). In India, Gupta and colleagues (2023) demonstrated that older age, higher education, female gender, and being married increased the odds of obesity. Therefore, sociodemographic variables are critical predictors of obesity, requiring closer attention in public health interventions. These findings underscore the importance of targeted interventions for effective prevention and control of CV risks. These interventions may include counselling on specific variable-associated lifestyle modifications, such as dietary and physical activity plans. However, since age and sex are non-modifiable risk factors for abdominal obesity, women and older individuals may be targeted in obesity-related awareness campaigns.

***Limitations***

This study has added to the body of evidence, demonstrating the feasibility of screening for CVD risks in a community pharmacy. It has also raised awareness of CVD risks in Nigeria, which may be extrapolated to other resource-limited settings. However, this study was conducted in a single community pharmacy, which may limit the generalisation of the observed CVD risks. Further, almost half of the participants were less than 40 years of age, which may have affected the findings. It is also important to state that the presence of comorbidities was not assessed during this study.

## Conclusion

Several outcomes were observed, including a high prevalence of hypertension, high BMIs, high waist-to-hip ratios, and overall medium risks for CVD. Age, occupation, and marital status were also significantly associated with various health parameters. These findings suggest the need for strategic and targeted educational interventions.

## Conflict of interest

The authors declare no conflict of interest.

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