University of Lethbridge

How Adults in Selected Urban and Rural Communities in Southwest Nigeria Perceive Cardiovascular Disease, Risk Factors, and Their Risk Status: A Critical Factor in Preventing and Managing Cardiovascular Disease

Study report from six selected communities in Southwest Nigeria

Sponsored by
The Prentice Institute for Global Population and Economy
and the Faculty of Health Sciences Research Fund
University of Lethbridge, Lethbridge, Alberta, Canada

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List of Acronyms

ARISE:	Alberta Research Information Services
ANOVA:	Analysis of Variance
CVD:	Cardiovascular Disease
DBP:	Diastolic Blood Pressure
FGD:	Focus Group Discussions
MD:	Mean Difference
NL-IHRS:	Non-Laboratory-Based INTERHEART Risk Score
PRHDS:	Perception of Risk of Heart Disease Scale
REBA:	Research Ethics Board of Alberta
SBP:	Systolic Blood Pressure
SD:	Standard Deviation
SPSS:	Statistical Package for Social Sciences
Uleth:	University of Lethbridge

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Funder

The Prentice Institute for Global Population and Economy, and the Faculty of Health Sciences, University of Lethbridge, Alberta, Canada.

Acknowledgment

We acknowledge the funding and goodwill from the Faculty of Health Sciences and the Prentice Institute for Global Population and Economy, University of Lethbridge, Lethbridge, Alberta, Canada. We thank the leaders of the selected religious centers for granting us access to their members and worship centers. Additionally, we appreciate the contributions of Mrs. Grace M. Emmanuel, the Deputy Director of Physiotherapy, and the Physiotherapy Interns – Miss Adetola C. Adebayo, Mr. Blessing S. Ige, and Mr. Nurudeen B. Sulaimon – at Olabisi Onabanjo University Teaching Hospital, Sagamu. Finally, we acknowledge the contributions of Miss Tolulope Odunaiya, Miss Titilope Odunaiya, Dr. Iyanuoluwa Odole, and Dr. Moyosooreoluwa Odole from the University of Ibadan Biorepository Laboratory, Psychology Department, Dentistry Faculty, and Clinical Science Faculty, respectively.

Ethical Approval

Ethical approval was independently obtained from the health research ethics committees of:

i. University of Alberta, (ARISE – REBA for the Uleth), Alberta, Canada.

ii. University of Ibadan/University College Hospital, Ibadan, Oyo State, Nigeria.

iii. Olabisi Onabanjo University Teaching Hospital, Sagamu, Ogun State, Nigeria.

iv. College of Medicine, University of Lagos, Lagos State, Nigeria.

Executive summary

Nigeria is reported to have a high cardiovascular disease-associated mortality rate, highlighting the need for prompt and all-encompassing public health interventions to curb cardiovascular disease prevalence. Literature suggests that the first step in preventing and managing cardiovascular disease is assessing people's perception and risk level to identify those with poor perception and moderate/high-risk levels, respectively. Previous studies in Nigeria have reported the prevalence of some risk factors, but no studies have reported a population cardiovascular disease risk level nor estimated the perception score.

We utilized a convergent parallel mixed-methods design involving simultaneous quantitative and qualitative data collection and analysis. Community-dwelling adults were included if they were 18 years and above, could communicate in English and/or Yoruba, had no history of diagnosed cardiovascular disease, and signed the informed consent. We recruited 1,493 and 53 participants for the quantitative and qualitative studies, respectively, from six centers across Oyo, Lagos, and Ogun states in Southwest Nigeria. The Perception of Risk of Heart Disease Scale and Non-Laboratory-Based INTERHEART Risk Score were used to collect the quantitative CVD perception and risk level data, respectively. We culturally adapted the instruments into the Yoruba language following the standard procedure. Focus group discussions were conducted using a bespoke focus guide for the qualitative study. Statistical analysis of the quantitative data was completed in SPSS version 29 using frequency, percentage, mean, standard deviation, independent sample t-test, one-way ANOVA, Cramer's V/Phi, multiple linear regression, exploratory factor analysis, and Cronbach's alpha with alpha level set at 0.05. Qualitative data analysis was completed in ATLAS.ti version 23 using thematic analysis.

The results showed that a few participants had poor CVD perception, while half had a moderate/high-risk level. There were sociodemographic variations in the perception scores, such that rural dwellers and Ogun state residents had significantly lower perception scores than their counterparts. There were also differences in risk scores, with males and Lagos state residents having significantly higher risk scores than their counterparts. Having a secondary education or below, living in rural areas, and living in Oyo and Ogun states significantly predicted having a low perception score. The significant predictors of high-risk scores were being male, increasing age, and residing in Lagos and Ogun State. The results of the focus group discussions showed that participants had good knowledge and perception of cardiovascular diseases as they correctly identified the risk factors and preventive measures. The qualitative results corroborated the quantitative results that showed participants' high perceptions. The proportion of participants with moderate/high-risk levels is concerning; therefore, we recommend that public health campaigns and medical outreaches be conducted regularly to sensitize people about the disease and promote its early diagnosis.

Introduction

Cardiovascular disease (CVD) is a group of diseases affecting the heart and blood vessels. It is a leading cause of death worldwide (World Health Organization, 2021), causing about 33% (18.6 million) of global deaths every year (World Heart Federation, 2021). The CVD-associated mortality rate is higher in low- and middle-income countries than in high-income countries (Amini et al., 2021; Qureshi et al., 2021; Roth et al., 2020). Nigeria is a low-income country with a reported high CVD-related mortality rate (Adegoke et al., 2018). The high mortality rate demonstrates the need for urgent and concerted public health measures to reduce CVD prevalence.

Current evidence suggests that exploring perception should precede CVD prevention and management campaigns (Ardahan & Topçu, 2023; Guo et al., 2023). It may be a costly assumption for health stakeholders to believe that the public perceives CVD the same way they do. Ammouri and Neuberger (2008) reported that CVD perception significantly correlates with health behavior as people who underestimate their risk of developing CVD may not take adequate preventive measures to protect themselves and others. Furthermore, a poor CVD perception can delay seeking early intervention even in the presence of symptoms (Ammouri et al., 2011) and reduce treatment adherence (Kalantarzadeh et al., 2022). There is a dearth of studies on the CVD perception of community-dwelling adults in Nigeria. Therefore, exploring the CVD risk perception of community-dwelling adults in Nigeria will help to change poor perception through targeted campaigns.

Estimating the CVD risk level is an important preceding step to reducing CVD burden as it allows early detection (National Institute for Health and Care Excellence, 2023). In Nigeria, previous studies have reported the prevalence of some CVD risk factors among adults and adolescents (Odunaiya et al., 2015; Oguoma et al., 2015; Dahiru & Ejembi, 2013; Oladapo et al., 2010), but

no studies have estimated a population CVD risk level. The population CVD risk level can be assessed using the non-laboratory-based method (McGorrian et al., 2011). Identifying those with a high CVD risk level will ensure early management and lifestyle modification to reduce the CVD mortality rate.

The burden of CVD can be reduced when its risk is known and rightly perceived among the target population. Therefore, we (1) determined the participants' CVD perception, risk level, and the prevalence of risk factors, (2) compared the CVD perception and risk score of community-dwelling adults between rural and urban, male and female and across three southwest states of Nigeria, (3) examined the association of sociodemographic characteristics with CVD perception and risk level, (4) explored the sociodemographic predictors of CVD perception and risk level, and (5) cross-culturally adapted the survey instruments into Yoruba language (most widely spoken language in southwest Nigeria) and tested the psychometric properties: construct validity and internal consistency. The outcome of this study would have policy implications.

Methods

Study Design

The study employed a convergent parallel mixed-methods design involving concurrent quantitative and qualitative data collection and analysis. The approach provides a means to cross-verify findings of either quantitative or qualitative methods (Schoonenboom & Johnson, 2017). Ethical approval was obtained from the University of Alberta (ARISE – REBA for the Uleth), University of Ibadan/University College Hospital Health Research Ethics Committee, University of Lagos (College of Medicine) Ethics Committee, and Olabisi Onabanjo University Teaching

Hospital Ethics Committee (Appendix A). Participants signed the informed consent (Appendix B) after receiving and understanding the detailed study protocol.

Study Participants

The participants were community-dwelling adults who were included if they were 18 years and above, could communicate in English and/or Yoruba, and had no history of diagnosed cardiovascular disease. Pregnant women were excluded from the study because their abdominal size would compromise waist-hip ratio measurement. We employed a multi-stage sampling technique by selecting three states in southwest Nigeria, two communities (one urban and one rural) in each state, and five churches and two mosques at random in each community. Readily available adults who met the eligibility criteria and signed the informed consent were recruited. A total of 1,493 participants were recruited for the quantitative part, while 53 were recruited for the qualitative aspect using a maximum variation sampling. Those who participated in the quantitative part did not participate in the qualitative study.

Study Location

The study was conducted in Nigeria's three southwest states: Oyo, Lagos, and Ogun. The two selected communities were (1) Oluyole and Egbeda in Oyo State, (2) Lagos Island and Mojoda in Lagos State, and (3) Sagamu and Iperu in Ogun State. The urban areas are Oluyole, Lagos Island, and Sagamu, while Egbeda, Mojoda, and Iperu are rural.

Instrument

A biodata form was used to collect participants' sociodemographic variables for quantitative and qualitative methods. The obtained sociodemographic variables were age, sex, marital status, level of education, area of residence, and state of residence.

The Perception of Risk of Heart Disease Scale (PRHDS) and Non-Laboratory-Based INTERHEART Risk Score (NL-IHRS) were used for quantitative data collection. The participants' CVD perception was obtained using the PRHDS (Ammouri & Neuberger, 2008). The PRHDS (Appendix C) is a 20-item instrument scored on a 4-point Likert scale (1 – 4) with eleven reversed-scored items. The total score ranges from 20 to 80, with a higher score signifying good perception. The PRHDS has an excellent Cronbach alpha of 0.8 (Ammouri & Neuberger, 2008).

The participants' CVD risk level was measured using the NL-IHRS (McGorrian et al., 2011). The NL-IHRS (Appendix D) contained 15 questions covering ten risk factors: age, smoking, second-hand smoking, diabetes, high blood pressure, family history of heart attack, waist-hip ratio, psychosocial factors, dietary factors, and physical activity. The psychosocial and dietary factors had two and five questions, respectively, while the remaining risk factors had one question each. We measured the participants' waist-hip ratio to pick the correct response option for the waist-hip risk factor. The questions have heterogeneous response categories with a score of zero assigned to the base response (i.e., a response that depicts the absence of the risk). The scale developers derived the scores assigned to other responses from a multivariate regression model (McGorrian et al., 2011). All questions must be answered to obtain a total score ranging from zero to 48, with a higher score indicating a higher risk level. The score can be categorized into low (≤9), middle (9-15), and high tertiles (≥16) (McGorrian et al., 2011). The NL-IHRS has a discriminative ability ranging from 0.64 to 0.74 for incident CVD across seven major world geographic regions, including Africa (Joseph et al., 2018).

Focus group discussions (FGD) for qualitative data collection were conducted using a face- and content-validated focus guide (Appendix E), a digital audio recorder, pens, and researchers' field

notes (Krueger & Casey, 2015). The focus guide, which contained five open-ended questions, served only as a guide as the moderators asked other probing questions about the discussion.

Procedure

The PRHDS and NL-IHRS were cross-culturally adapted into the Yoruba language (Appendices F & G) following the procedure described by Beaton et al. (2000). Briefly, the procedure involved (1) forward translation into the Yoruba language by two translators; one translator was aware of the concepts while the other was uninformed, (2) synthesis of the translations into one, (3) back translation into the English language by two other translators, (4) expert committee review of the consensus translation, back translations, and the original version to produce a pre-final version, (5) pre-testing the version among target populations and cognitive debriefing, and (6) expert committee review of pre-testing and cognitive debriefing results and back translation to produce a final version.

Trained research assistants distributed the English and Yoruba versions of the questionnaires to participants according to their language fluency at their respective places of worship in the morning. The research assistants measured participants' waist and hip circumferences and calculated and filled out the waist-hip ratio item of NL-IHRS before giving the questionnaires to the participants. Waist and hip circumferences were measured around the abdomen at the umbilicus level and the widest circumference over the greater trochanters, respectively. Both measurements were taken with minimal clothing in a standing position at the end of gentle expiration using an inextensible measuring tape (Vatier et al., 2014).

The questionnaires were self-administered; however, the research assistants provided further explanation or assistance to those who needed it. Upon returning the questionnaire, health

professionals measured the participant's body mass index, blood pressure, and random blood glucose and provided health advice. This procedure ensured a high return rate. Data from the completed questionnaires were extracted and transferred to each state's coded Statistical Package for Social Sciences (SPSS) spreadsheet. The questionnaires were stored in a big envelope and locked in secure drawers of each state co-investigator's office. Individual datasets were merged into a final anonymized dataset and analyzed by a statistician.

FGD was conducted in each community simultaneously with the quantitative data collection. Participants were informed about the date, time, and venue in advance, allowing them to prepare. Participants' sociodemographic details, such as sex, age, area of residence, and state were collected upon arrival. The FGD was conducted in a circular sitting arrangement to allow participants to see, listen to, and engage each other during the discussion and was moderated by the state's co-investigators, who are experts in qualitative interviewing. The moderators asked questions using the focus guide and elicited further responses through probing, prompting, and redirecting. The participants were anonymized by giving them numbers 1, 2, 3, and above, allowing them to talk freely and spontaneously as the discussion reached saturation. The audio records were transcribed, merged into a single file, and analyzed by a qualitative analyst.

Data analysis

Quantitative data were analyzed using the SPSS version 29. The PRHDS and NL-IHRS with complete item scores were summed in a separate column. The total PRHDS score had 14.1% missing values; hence, the multiple imputation method was employed to replace missing items. The PRHDS and NL-IHRS scores were tested for normality, homogeneity of variance, linearity, and univariate outliers using skewness analysis, Levene's test, scatter plot, and standardized Z scores, respectively (Tabachnick & Fidell, 2013; Garson, 2012). The multivariate outliers and

multicollinearity were determined using Mahalanobis and the tolerance factor, respectively (Tabachnick & Fidell, 2013; Garson, 2012). The PRHDS score was dichotomized into poor perception (≤40) and good perception (≥41), while the NL-IHRS score was categorized into the low-risk level (≤9), moderate risk level (9-15), and high-risk level (≥16). Each NL-IHRS item was dichotomized into the absence of risk (i.e., the base response) and the presence of risk (i.e., other responses).

The participants' characteristics and first objective were summarized using the frequency, percentage, mean, and standard deviation. Independent samples t-test and one-way analysis of variance (ANOVA) were completed for the second objective. The t-test result under "equal variances not assumed" was reported where Levene's test was significant. Tukey post hoc result of ANOVA was reported where Levene's test was not significant; otherwise, Games Howell post hoc result was reported. The third and fourth objectives were analyzed using Cramer's V/Phi and simultaneous entry multiple linear regression, respectively. Exploratory factor analysis (maximum likelihood with varimax rotation) and Cronbach's alpha were completed for the fifth objective. The alpha level was set at 0.05.

Qualitative data was analyzed using ATLAS.ti (version 23), a sophisticated computer-aided qualitative data analysis software. The transcripts were checked for accuracy against audio records, imported into the software, and analyzed using a thematic analysis approach. The data were inductively organized into codes by identifying important quotations/ data extracts. The generated codes were systematically grouped into categories, sub-themes, and themes and reviewed for proper fit. Code trees (figures) and direct participant quotations authenticated the study findings.

Results

Quantitative Analyses

Participants characteristics

Table 1 shows that most participants were female (n = 931, 62.4%), middle-aged adults (n = 670, 44.9%), married (n = 987, 66.1%), had tertiary education (n = 725, 48.6%), and resided in the urban area (n = 784, 52.5%). The participants' level of education gives credence to the fact that the adults in southwest Nigeria are educated. The establishment of the first university and the high number of universities in the southwest region may have provided opportunities for people to have tertiary education. The distribution of the participants across the three states is even; however, the highest number of participants were recruited from the Egbeda study center (Figure 1). Table 2 shows that the majority had normal blood pressure (n = 843, 56.8%), weight (n =725, 48.8%), waist circumference (n = 1017, 69.3%), and random blood sugar (n = 1459, 98.3%). Few participants had poor perception (n = 418, 28.0%), while half had moderate/high CVD risk levels (n = 751, 50.6%). The mean ± SD perception, risk scores, and age were 44.40 ± 8.07, 10.28 ± 5.22, and 46.90 ± 15.65, respectively.

Table 1. Participants' sociodemographic characteristics (n = 1493)

Parameter	Frequency	Percentage
Gender		
Male	560	37.5
Female	931	62.4
Chose not to say	2	0.1
Age group		
Young adults (<40 years)	484	32.4
Middle-aged adults (40-59 years)	670	44.9
Older adults (≥ 60 years)	338	22.6
Chose not to say	1	0.1
Marital status		
Single	293	19.6
Married	987	66.1
Divorced	31	2.1
Widowed	164	11.0
Chose not to say	18	1.2
Education		
No formal	97	6.5
Primary	243	16.3
Secondary	411	27.5
Tertiary	725	48.6
Chose not to say	17	1.1
Area of residence		
Rural	784	52.5
Urban	709	47.5
State		
Oyo	474	31.7
Lagos	499	33.4
Ogun	520	34.8

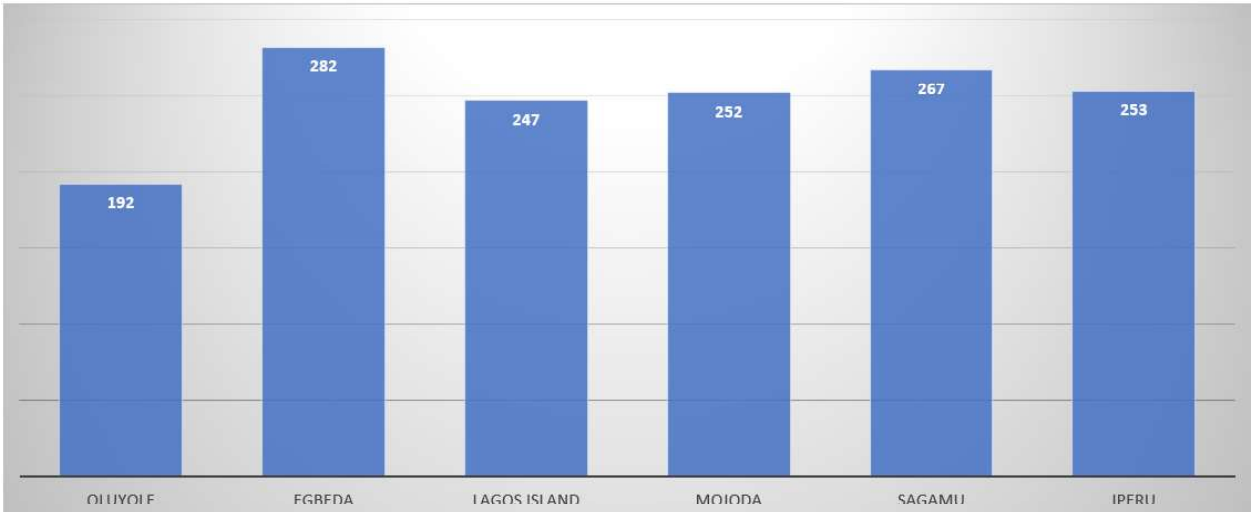

Figure 1: Participants' distribution across study centers (n =1493)

Table 2. Participants' health indicators, perception, and risk level

Variable	Frequency	Percentage
Blood pressure (mmHg)		
Normal (SBP: <130 and DBP: <85)	843	56.8
High-normal (SBP: 130-139 and/or DBP: 85-89)	240	16.2
Grade 1 hypertension (SBP: 140-159 and/or DBP: 90-99)	240	16.2
Grade 2 hypertension (SBP: ≥160 and/or DBP: ≥100)	160	10.8
Body mass index (kg/m^2)		
Underweight (<18.5)	121	8.1
Normal weight (18.5 – 24.9)	725	48.8
Overweight (25.0 – 29.9)	384	25.8
Obesity class I (30.0 – 34.9)	181	12.2
Obesity class II (35.0 – 39.9)	59	4.0
Obesity class III (≥40.0)	17	1.1
Waist circumference (cm)		
Normal	1017	69.3
Abnormal (≥102 for men or ≥88 for women)	450	30.7
Waist-hip ratio		
Normal	732	49.9
Abnormal (>0.90 for men or >0.85 for women)	735	50.1
Random blood sugar (mg/dl)		
Normal	1459	98.3
Abnormal (≥200)	25	1.7
Perception		
Poor	418	28.0
Good	1075	72.0
Risk level		
Low	734	49.4
Moderate	514	34.6
High	237	16.0

SBP = Systolic Blood Pressure. DBP = Diastolic Blood Pressure.

Response distributions on PRHDS and prevalence of risk factors

Table 3 shows that most participants strongly disagreed with these PRHDS statements: there is a possibility of having heart disease (n = 932, 62.4%), there is a good chance I will get heart disease in the next ten years (n = 964, 64.6%), a person who gets heart disease has no chance of being cured (n = 686, 45.9%), I have a high chance of getting heart disease because of my past behaviors (n = 928, 62.2%), I feel sure that I will get heart disease (n = 1011, 67.7%), I will likely get heart diseases (n = 971, 65.0%), I am at risk for getting heart disease (n = 925, 62.0%), I may get heart disease (n = 938, 62.8%), healthy lifestyle habits are unattainable (n = 762, 51.0%), no matter what I do, if I am going to get heart disease, I will get it (n = 639, 42.8%), and the causes of heart disease are unknown (n = 457, 30.6%). The majority of the participants agreed that they were not doing anything now that is unhealthy to their heart (n = 564, 37.8%), very healthy so their body can fight off heart disease (n = 585, 39.2%), not worried they might get heart disease (n = 529, 35.4%), and their lifestyle habits do not put them at risk for heart disease (n = 618, 41.4%). Few participants strongly agreed that they are too young to have heart disease (n = 231, 15.5%), people like them do not get heart disease (n = 217, 14.5%), and people of their age are too young to get heart disease (n = 190, 12.7%).

The prevalence of risk factors was obtained from the dichotomized NL-IHRS items. Table 4 shows that the three most prevalent risk factors were eating salty food (63.7%), not eating vegetables (60.9%), and being sedentary (53.7%). Conversely, the three least prevalent risk factors were diabetes (5%), family history of heart attack (5.4%), and smoking (6.4%). The result corroborated the low prevalence of diabetes and smoking in southwest Nigeria reported by Oladapo et al. (2010).

Table 3. Response distribution on Perception of Risk of Heart Disease Scale

	Item	SD (1) f (%)	D (2) f (%)	A (3) f (%)	SA (4) f (%)	Median	Mean
1.	There is a possibility that I have heart disease	932 (62.4)	408 (27.3)	117 (7.8)	36 (2.4)	1	1.50
2.	There is a good chance I will get heart disease in the next ten years	964 (64.6)	433 (29.0)	63 (4.2)	33 (2.2)	1	1.44
3.	A person who gets heart disease has no chance of being cured	686 (45.9)	583 (39.0)	159 (10.6)	65 (4.4)	2	1.73
4.	I have a high chance of getting heart disease because of my past behaviors	928 (62.2)	433 (29.0)	105 (7.0)	27 (1.8)	1	1.48
5.	I feel sure that I will get heart disease	1011 (67.7)	406 (27.2)	50 (3.3)	26 (1.7)	1	1.39
7.	It is likely that I will get heart diseases	971 (65.0)	429 (28.7)	71 (4.8)	22 (1.5)	1	1.43
8.	I am at risk for getting heart disease	925 (62.0)	437 (29.3)	98 (6.6)	33 (2.2)	1	1.49
9.	It is possible that I will get heart disease	938 (62.8)	438 (29.3)	89 (6.0)	28 (1.9)	1	1.47
		4	**3**	**2**	**1**		
*6.	Healthy lifestyle habits are unattainable	762 (51.0)	479 (32.1)	170 (11.4)	82 (5.5)	4	3.29
*10.	I am not doing anything now that is unhealthy to my heart	337 (22.6)	288 (19.3)	564 (37.8)	304 (20.4)	2	2.44
*11.	I am too young to have heart disease	436 (29.2)	432 (28.9)	394 (26.4)	231 (15.5)	3	2.72
*12.	People like me do not get heart disease	419 (28.1)	476 (31.9)	381 (25.5)	217 (14.5)	3	2.73
*13.	I am very healthy so my body can fight off heart disease	274 (18.4)	333 (22.3)	585 (39.2)	301 (20.2)	2	2.39
*14.	I am not worried that I might get heart disease	328 (22.0)	341 (22.8)	529 (35.4)	295 (19.8)	2	2.47
*15.	People of my age are too young to get heart disease	494 (33.1)	491 (32.9)	318 (21.3)	190 (12.7)	3	2.86
*16.	People of my age do not get heart disease	522 (35.0)	517 (34.6)	276 (18.5)	178 (11.9)	3	2.93
*17.	My lifestyle habits do not put me at risk for heart disease	270 (18.1)	258 (17.3)	618 (41.4)	347 (23.2)	2	2.30
*18.	No matter what I do, if I am going to get heart disease, I will get it	639 (42.8)	470 (31.5)	259 (17.3)	125 (8.4)	3	3.09
*19.	People who don't get heart disease are just plain lucky	367 (24.6)	333 (22.3)	505 (33.8)	288 (19.3)	2	2.52
*20.	The causes of heart disease are unknown	457 (30.6)	407 (27.3)	383 (25.7)	246 (16.5)	3	2.72

* = reverse-coded items. SD = Strongly Disagree. D = Disagree. A = agree. SA = Strongly Agree

Table 4. Prevalence of CVD risk factors in Southwest Nigeria

Risk factors	Prevalence (%)
Age	
Men younger than 55 years/women younger than 65 years	78.3
Men 55 years or older/women 65 years or older	21.7*
Smoking	
No	93.5
Yes	6.5*
Second-hand smoking in the past 12 months	
No	91.9
Yes	8.1*
Diabetes	
No or unsure	95.0
Yes	5.0*
High blood pressure	
No or unsure	79.3
Yes	20.7*
Family history of heart attack	
No or unsure	94.6
Yes	5.4*
Waist-hip ratio	
<0.873	52.6
≥0.873	47.4*
Work or home life stress in the last one year	
Never or some periods	60.2
Several periods	39.8*
Depression or sad for two or more weeks in a row in the last one year	
No	57.1
Yes	42.9*
Eat salty food one or more times daily	
No	36.3
Yes	63.7*
Eat fried or fast food three more times a week	
No	50.8
Yes	49.2*
Eat fruit one or more times daily	
Yes	51.9
No	48.1*
Eat vegetables one or more times daily	
Yes	39.1
No	60.9*
Eat meat or poultry two or more times daily	
No	50.8
Yes	49.2*
Physical activity level in leisure time	
Moderate or strenuous	46.3
Sedentary or mild exercise	53.7*

* = prevalence of the risk category

Comparison of CVD perception score and risk score

Rural residents generally had a significantly lower perception score than their urban counterparts (Mean difference [*MD*] = -3.16, t = -7.813, $p < 0.001$) (Table 5). The within-state comparison showed that rural dwellers had a significantly lower perception score than urban dwellers in Oyo (*MD* = -2.57, t = -4.423, $p < 0.001$) and Ogun states (*MD* = -6.27, t = -7.592, $p < 0.001$). Table 6 shows that rural dwellers had a significantly higher risk score than urban dwellers in Lagos (*MD* = 1.16, t = 2.337, p = 0.020) and Ogun states (*MD* = 1.17, t = 2.700, p = 0.007). Conversely, those residing in rural areas had a significantly lower risk score than their urban counterparts in Oyo state (*MD* = -1.35, t = -2.895, p = 0.004).

Table 7 shows a significant difference in perception scores across the states (F [2, 1490] = 30.523, $p < 0.001$). Post hoc test showed a significant difference for Lagos vs. Ogun [MD = 3.75, p < 0.001]), Lagos vs. Oyo (MD = 1.07, p = 0.033), and Oyo vs. Ogun (*MD* = 2.68, $p < 0.001$). There was also a significant difference in perception scores across the states' rural dwellers (F [2, 781] = 41.829, $p < 0.001$) and a significant post hoc difference for Lagos vs. Ogun rural dwellers (*MD* = 6.53, $p < 0.001$), Lagos vs Oyo rural dwellers (*MD* = 1.67, p = 0.016), and Oyo vs Ogun rural dwellers (*MD* = 4.86, $p < 0.001$). Risk score differed significantly across the states (F [2, 1482] = 25.190, $p < 0.001$) (Table 8) with a significant post hoc difference for Lagos vs. Ogun [*MD* = 1.09, p = 0.002]), Lagos vs Oyo (*MD* = 2.35, $p < 0.001$), and Ogun vs Oyo (*MD* = 1.26, $p < 0.001$). The comparison of risk scores across the states' rural dwellers (F [2, 777] = 33.381, $p < 0.001$) and urban dwellers (F [2, 702] = 3.164, p = 0.043) was significant. While the post hoc test was not significant for urban dwellers, there was a significant difference for Lagos vs Oyo rural dwellers (MD = 3.47, p = 0.016) and Ogun vs Oyo rural dwellers (*MD* = 2.40, $p < 0.001$).

Table 9 shows that males had a significantly higher perception score than females in Oyo (MD = 1.25, t = 2.009, p = 0.045) and Lagos states (MD = 1.60, t = 2.554, p = 0.011). For risk score, males generally had a significantly higher risk score than females (MD = 1.40, t = 5.026, $p < 0.001$) (Table 10). The within-state comparison showed that males had a significantly higher risk score than females in Oyo (MD = 2.49, t = 5.579, $p < 0.001$) and Lagos (MD = 1.58, t = 2.956, p = 0.003).

Perception scores significantly differed across the states' male participants (F [2, 557] = 21.403, $p < 0.001$) with a significant post hoc difference for males in Oyo vs. Ogun (MD = 3.64, $p < 0.001$) and Lagos vs Ogun (MD = 5.00, $p < 0.001$) (Table 11). There was a significant difference in perception scores across the states' female participants (F [2, 928] = 12.147, $p < 0.001$). Post hoc analysis showed a significant difference for females in Lagos vs Ogun (MD = 3.06, $p < 0.001$) and Oyo vs Ogun (MD = 2.06, p = 0.008). Table 12 shows that the comparison of risk scores across the states' male participants was significant (F [2, 555] = 7.633, p = 0.001). Post hoc results showed a significant difference for males in Lagos vs Ogun (MD = 1.80, p = 0.003) and Lagos vs Oyo (MD = 1.89, p = 0.003). There was a significant difference in risk score across the states' female participants (F [2, 922] = 24.451, $p < 0.001$) and a significant post hoc difference for females in Ogun vs Oyo (MD = 2.04, $p < 0.001$) and Lagos vs Oyo (MD = 2.80, $p < 0.001$).

Table 5. Comparison of CVD perception between rural- and urban-dwelling participants

State	Rural		Urban				
	N	Mean ± SD	N	Mean ± SD	MD	*t*-value	*p*-value
Oyo	281	43.93 ± 7.15	193	46.50 ± 5.46	-2.57	-4.423	<0.001*
Lagos	250	45.60 ± 6.77	249	46.49 ± 6.55	-0.89	-1.486	0.138
Ogun	253	39.07 ± 10.69	267	45.34 ± 7.86	-6.27	-7.592	<0.001*
All sample	784	42.90 ± 8.78	709	46.06 ± 6.83	-3.16	-7.813	<0.001*

*Independent samples t-test was significant at p<0.05 (2-tailed). MD = Mean difference. SD = Standard deviation.

Table 6. Comparison of CVD risk score between rural- and urban-dwelling participants

State	Rural		Urban				
	N	Mean ± SD	N	Mean ± SD	MD	*t*-value	*p*-value
Oyo	279	8.51 ± 4.58	190	9.85 ± 5.18	-1.35	-2.895	0.004*
Lagos	250	11.98 ± 5.48	248	10.81 ± 5.61	1.16	2.337	0.020*
Ogun	251	10.91 ± 5.04	267	9.74 ± 4.79	1.17	2.700	0.007*
All sample	780	10.39 ± 5.23	705	10.15 ± 5.21	0.24	0.892	0.372

*Independent samples t-test was significant at $p<0.05$ (2-tailed). MD = Mean difference. SD = Standard deviation.

Table 7. Comparison of CVD perception among participants across the states

Residence Area	Oyo		Lagos		Ogun			
	N	Mean ± SD	N	Mean ± SD	N	Mean ± SD	*F* (df_1, df_2)	*p*-value
Rural	281	43.93 ± 7.15	250	45.60 ± 6.77	253	39.07 ± 10.69	41.829 (2, 781)	<0.001*
Urban	193	46.50 ± 5.46	249	46.49 ± 6.55	267	45.34 ± 7.86	2.365 (2, 706)	0.095
All sample	474	44.98 ± 6.62	499	46.05 ± 6.67	520	42.29 ± 9.85	30.523 (2, 1490)	<0.001*

*One-way ANOVA test was significant at $p<0.05$. SD = Standard deviation.

Table 8. Comparison of CVD risk score among participants across the state

Residence Area	Oyo		Lagos		Ogun			
	N	Mean ± SD	N	Mean ± SD	N	Mean ± SD	*F* (df_1, df_2)	*p*-value
Rural	279	8.51 ± 4.58	250	11.98 ± 5.48	251	10.91 ± 5.04	33.381 (2, 777)	<0.001*
Urban	190	9.85 ± 5.18	248	10.81 ± 5.61	267	9.74 ± 4.79	3.164 (2, 702)	0.043*
All sample	469	9.05 ± 4.87	498	11.40 ± 5.57	518	10.31 ± 4.94	25.190 (2, 1482)	<0.001*

*One-way ANOVA test was significant at $p<0.05$. SD = Standard deviation.

Table 9. Comparison of CVD perception between male and female participants

State	Male		Female				
	N	Mean ± SD	N	Mean ± SD	MD	*t*-value	*p*-value
Oyo	188	45.73 ± 6.16	286	44.48 ± 6.88	1.25	2.009	0.045*
Lagos	169	47.09 ± 6.24	328	45.48 ± 6.83	1.60	2.554	0.011*
Ogun	203	42.09 ± 9.80	317	42.42 ± 9.89	-0.33	-0.377	0.706
All sample	560	44.82 ± 7.98	931	44.13 ± 8.11	0.69	1.590	0.112

*Independent samples t-test was significant at $p<0.05$ (2-tailed). MD = Mean difference. SD = Standard deviation.

Table 10. Comparison of CVD risk score between male and female participants

State	Male		Female				
	N	Mean ± SD	N	Mean ± SD	MD	*t*-value	*p*-value
Oyo	187	10.55 ± 5.07	282	8.06 ± 4.48	2.49	5.579	<0.001*
Lagos	168	12.43 ± 5.73	328	10.86 ± 5.42	1.58	2.956	0.003*
Ogun	203	10.63 ± 4.63	315	10.10 ± 5.13	0.52	1.206	0.228
All sample	558	11.14 ± 5.19	925	9.75 ± 5.17	1.40	5.026	<0.001*

*Independent samples t-test was significant at $p<0.05$ (2-tailed test). MD = Mean difference. SD = Standard deviation.

Table 11. Comparison of CVD perception across the states' male and female participants

Sex	Oyo		Lagos		Ogun			
	N	Mean ± SD	N	Mean ± SD	N	Mean ± SD	*F* (df_1, df_2)	*p*-value
Male	188	45.73 ± 6.16	169	47.09 ± 6.23	203	42.09 ± 9.80	21.403 (2, 557)	<0.001*
Female	286	44.48 ± 6.88	328	45.48 ± 6.83	317	42.42 ± 9.89	12.147 (2, 928)	<0.001*

*One-way ANOVA test was significant at $p<0.05$. SD = Standard deviation.

Table 12. Comparison of CVD risk score across the states' male and female participants

Sex	Oyo		Lagos		Ogun			
	N	Mean ± SD	N	Mean ± SD	N	Mean ± SD	F (df_1, df_2)	p-value
Male	187	10.55 ± 5.07	168	12.43 ± 5.73	203	10.63 ± 4.63	7.633 (2, 555)	0.001*
Female	282	8.06 ± 4.48	328	10.86 ± 5.42	315	10.10 ± 5.13	24.451 (2, 922)	<0.001*

*One-way ANOVA test was significant at $p<0.05$. SD = Standard deviation.

Association of sociodemographic characteristics with CVD perception and risk level

Table 13 shows that CVD perception was significantly and inversely associated with sex (Phi [Φ] = -0.07, $p = 0.012$), significantly and positively associated with education (Cramer's V [V] = 0.18, $p < 0.001$), area of residence (Φ = 0.15, $p < 0.001$), and state (V = 0.21, $p < 0.001$). There was a significantly positive association of risk level with sex (V = 0.11, $p < 0.001$), age group (V = 0.23, $p < 0.001$), education (V = 0.13, $p < 0.001$), and state (V = 0.13, $p < 0.001$) (Table 14).

Table 13. Association of sociodemographic characteristics with CVD perception

Variable	Perception		Phi	*p*-value
	Poor	Good		
	n (%)	**n (%)**		
Sex			-0.07	0.012*
Male	136 (32.5)	424 (39.5)		
Female	282 (67.5)	649 (60.5)		
† Age group			0.03	0.514
Young adults (18-39 years)	131 (31.3)	353 (32.9)		
Middle-aged adults (40-59 years)	184 (44.0)	486 (45.3)		
Older adults (≥ 60 years)	103 (24.6)	235 (21.9)		
Marital status			0.02	0.433
Do not have a partner	143 (34.6)	345 (32.5)		
Have a partner	270 (65.4)	717 (67.5)		
† Education			0.18	<0.001*
Primary or no formal	135 (32.4)	205 (19.4)		
Secondary	134 (32.1)	277 (26.2)		
Above secondary	148 (35.5)	577 (54.5)		
Area of residence			0.15	<0.001*
Rural	269 (64.4)	515 (47.9)		
Urban	149 (35.6)	560 (52.1)		
† State			0.21	<0.001*
Oyo	106 (25.4)	368 (34.2)		
Lagos	99 (23.7)	400 (37.2)		
Ogun	213 (51.0)	307 (28.6)		

† = Cramer's V statistic was reported. *Phi/Cramer's V is significant at $p < 0.05$.

Table 14. Association of sociodemographic characteristics with CVD risk level

Variable	Risk level			Cramer's V	*p*-value
	Low	Moderate	High		
	n (%)	n (%)	n (%)		
Sex				0.11	<0.001*
Male	238 (32.5)	211 (41.1)	109 (46.2)		
Female	495 (67.5)	303 (58.9)	127 (53.8)		
Age group				0.23	<0.001*
Young adults (18-39 years)	291 (39.6)	165 (32.2)	26 (11.0)		
Middle-aged adults (40-59 years)	347 (47.3)	227 (44.2)	93 (39.2)		
Older adults (≥ 60 years)	96 (13.1)	121 (23.6)	118 (49.8)		
Marital status				0.03	0.551
Do not have a partner	245 (33.7)	171 (33.7)	70 (30.0)		
Have a partner	481 (66.3)	337 (66.3)	163 (70.0)		
Education					
Primary or no formal	122 (16.9)	132 (25.9)	84 (35.7)	0.12	<0.001*
Secondary	223 (30.8)	123 (24.2)	63 (26.8)		
Above secondary	379 (52.3)	254 (49.9)	88 (37.4)		
Area of residence				0.03	0.484
Rural	375 (51.1)	274 (53.3)	131 (55.3)		
Urban	359 (48.9)	240 (46.7)	106 (44.7)		
State				0.13	<0.001*
Oyo	279 (38.0)	141 (27.4)	49 (20.7)		
Lagos	211 (28.7)	168 (32.7)	119 (50.2)		
Ogun	244 (33.2)	205 (39.9)	69 (29.1)		

*Cramer's V is significant at $p < 0.05$.

Sociodemographic predictors of CVD perception score and risk score

Having tertiary education (standardized regression coefficient [β] = 0.100, $p < 0.001$), living in urban areas (β = 0.174, $p < 0.001$), and living in Lagos (β = 0.074, $p = 0.013$) and in Oyo other than Ogun state (β = -0.156, $p < 0.001$) significantly predicted having a high perception score (Table 15). This means that having a secondary education or below, living in rural areas, and living in Oyo and Ogun states significantly predicted low perception scores. The model was significant, F (7, 1450) = 22.392, $p < 0.001$. However, it could only predict 9.3% of perception score (adjusted R square = 0.093).

The significant predictors of the high-risk score were being a male (β = -0.137, $p < 0.001$), increase in age (β = 0.336, $p < 0.001$), and residing in Lagos (β = 0.177, $p < 0.001$) and Ogun (β = 0.110, $p < 0.001$) (Table 16). The model was significant, F (7, 1442) = 39.262, $p < 0.001$, but could account for only 15.6% of the variance (adjusted R square = 0.156).

Table 15. Sociodemographic predictors of CVD perception score

Parameter	**Regression Coefficient (B)**	**Standardized Regression Coefficients (β)**	***p*-value**	**Tolerance**
Sex (reference = male)	-0.590	-0.035	0.162	0.979
Age (unit increase) years	-0.026	-0.051	0.055	0.890
Marital status (reference = do not have a partner)	0.436	0.025	0.327	0.936
Education (reference = secondary and below)	1.628	0.100	<0.001*	0.839
Residence (reference = rural)	2.825	0.174	<0.001*	0.907
Lagos state (reference = Oyo state)	1.282	0.074	0.013*	0.698
Ogun state (reference = Oyo state)	-2.647	-0.156	<0.001*	0.699
Constant	44.051	-	<0.001*	-

Approach: simultaneous entry. * = *p*-value < 0.05 is significant.
Model Summary: F (7, 1450) = 22.392, $p < 0.001$; R = 0.098; adjusted R square = 0.093.

Table 16. Multiple linear regression: sociodemographic predictors of CVD risk score.

Parameter	Regression Coefficients (B)	Standardized Regression Coefficients (β)	*p*-value	Tolerance
Sex (reference = male)	-1.476	-0.137	<0.001*	0.979
Age (unit increase) years	0.112	0.336	<0.001*	0.888
Marital status (reference = do not have a partner)	-0.321	-0.029	0.247	0.934
Education (reference = secondary and below)	-0.025	-0.002	0.929	0.839
Residence (reference = rural)	-0.097	-0.009	0.713	0.905
Lagos state (reference = Oyo state)	1.964	0.177	<0.001*	0.695
Ogun state (reference = Oyo state)	1.196	0.110	<0.001*	0.697
Constant	5.172	-	<0.001*	-

Approach: simultaneous entry. * = p-value < 0.05 is significant.
Model Summary: F (7, 1442) = 39.262, p < 0.001; R = 0.160; adjusted R square = 0.156.

Psychometric properties of the culturally adapted Yoruba PRHDS and NL-IHRS

Table 17 shows that most participants were female (n = 362, 68%), middle-aged adults (n = 227, 42.7%), married (n = 333, 62.6%), had secondary education (n = 177, 33.3%), lived in rural areas (n =423, 79.5%) and Ogun state (n =258, 48.5%). The exploratory factor analysis of the PRHDS extracted 17 items within two factors (domains): risk possibility and risk unlikely when coefficients less than 0.45 were suppressed (Table 18). The scree plot shows that the eigenvalues for the two factors were above four (Figure 2). The NL-IHRS instrument has items with varied and unequal response intervals and scores; hence, the exploratory factor analysis produced abnormal results. Therefore, we dropped testing its psychometric properties.

The Cronbach's alpha of the PRHDS was 0.863, with values of 0.900 and 0.887 for risk possibility and risk unlikely domains, respectively (Table 19). The item-total statistics for the risk possibility domain showed that deleting an item will not produce a Cronbach's alpha higher than the domain's alpha of 0.900 (Table 20). The item-total correlation (between 0.64 and 0.76) and squared multiple correlation (between 0.52 and 0.61) were modest, suggesting that each item is essential for the domain's construct. Similarly, the item-total statistics for the risk unlikely domain showed that deleting an item will not produce a Cronbach's alpha higher than the domain's overall alpha of 0.877 (Table 21). The item-total correlation (between 0.54 and 0.68) and squared multiple correlation (between 0.38 and 0.58) were also modest. The item-total statistics for the total instrument showed that deleting an item will not produce a Cronbach's alpha higher than the instrument's overall alpha of 0.863 (Table 22). The item-total correlation (between 0.35 and 0.67) and squared multiple correlation (between 0.44 and 0.61) were modest, indicating that no item is weak and redundant in measuring the construct.

Table 17. Participants' sociodemographic characteristics for the psychometric testing (n = 532)

Parameter	Frequency	Percentage
Gender		
Male	170	32.0
Female	362	68.0
Age group		
Young adults (18-39 years)	146	27.4
Middle-aged adults (40 -59 years)	227	42.7
Older adults (≥ 60 years)	158	29.7
Chose not to say	1	0.2
Marital status		
Single	80	15.0
Married	333	62.6
Divorced	19	3.6
Widowed	93	17.5
Chose not to say	7	1.3
Education		
No formal	67	12.6
Primary	140	26.3
Secondary	177	33.3
Tertiary	143	26.9
Chose not to say	5	0.9
Area of residence		
Rural	423	79.5
Urban	109	20.5
State		
Oyo	110	20.7
Lagos	164	30.8
Ogun	258	48.5

Table 18. Factor loadings (rotated factor matrix) of the Yoruba version of PRHDS

	Items	Factor 1 (Risk possibility)	Factor 2 (Risk unlikely)
1.	Ó ṣeé ṣe kí ó jẹ́ pé mo ní àìsàn ọkàn	.665	
2.	Ó ṣeé ṣe dáadáa pé mo máa ni àìsàn ọkàn ní bí ọdún mẹ́wàá sí ìsinyìí	.742	
3.	Ẹni tó ní àìsàn ọkàn kò ní ìrètí ìwòsàn rárá		
4.	Ó ṣeé ṣe púpọ̀ fún mi láti ní àìsàn ọkàn torí àwọn ìṣe mi àtẹ̀yìnwá	.806	
5.	Mo mọ̀ dájú pé mo máa ni àìsàn ọkàn	.746	
*6.	Ìgbéayé ní ìlànà ìlera tó péye kò ṣeé ṣe		
7.	Ó ṣee é ṣe pé mo máa ní àìsàn ọkàn	.802	
8.	Mo wà nínú ewu àti ní àìsàn ọkàn	.770	
9.	Ó ṣeé ṣe kí n ní àìsàn ọkàn lọ́jọ́ iwájú	.725	
*10.	Mi ò ṣe ohunkóhun báyìí tí ó lè ṣe àkóbá fún ọkàn mi		.587
*11.	Mo kéré lọ́jọ́ orí láti ní àìsàn ọkàn		.678
*12.	Àwọn èèyàn bí tèmi kì í ní àìsàn ọkàn		.671
*13.	Mo wà ní ìlera tó péye, nítorí náà, ara mi lè gbógùn ti àìsàn ọkàn.		.735
*14.	Mi ò páyà pé mo lè ní àìsàn ọkàn		.741
*15.	Àwọn èèyàn tó wà ní ọjọ́-orí mi ti kéré jù láti ní àìsàn ọkàn		.670
*16.	Àwọn èèyàn tó wà ní ọjọ́-orí mi kì í ní àìsàn ọkàn		.633
*17.	Ìṣe ìgbéayé mi kò fimí sínú ewu àtiní àìsàn ọkàn		.721
*18.	Ohunkóhun tí n ó báa ṣe, bí n ó bá ní àìsàn ọkàn, n ó ni.		
*19.	Àwọn èèyàn tí kò ní àìsàn ọkàn kàn ṣoríire ni		.587
*20.	A kò mọ àwọn nǹkan tí ó ń ṣòkùnfà àìsàn ọkàn		.600

* = reverse-coded items. Extraction Method: Maximum Likelihood. Rotation Method: Varimax with Kaiser Normalization. Coefficient suppression value: < .45

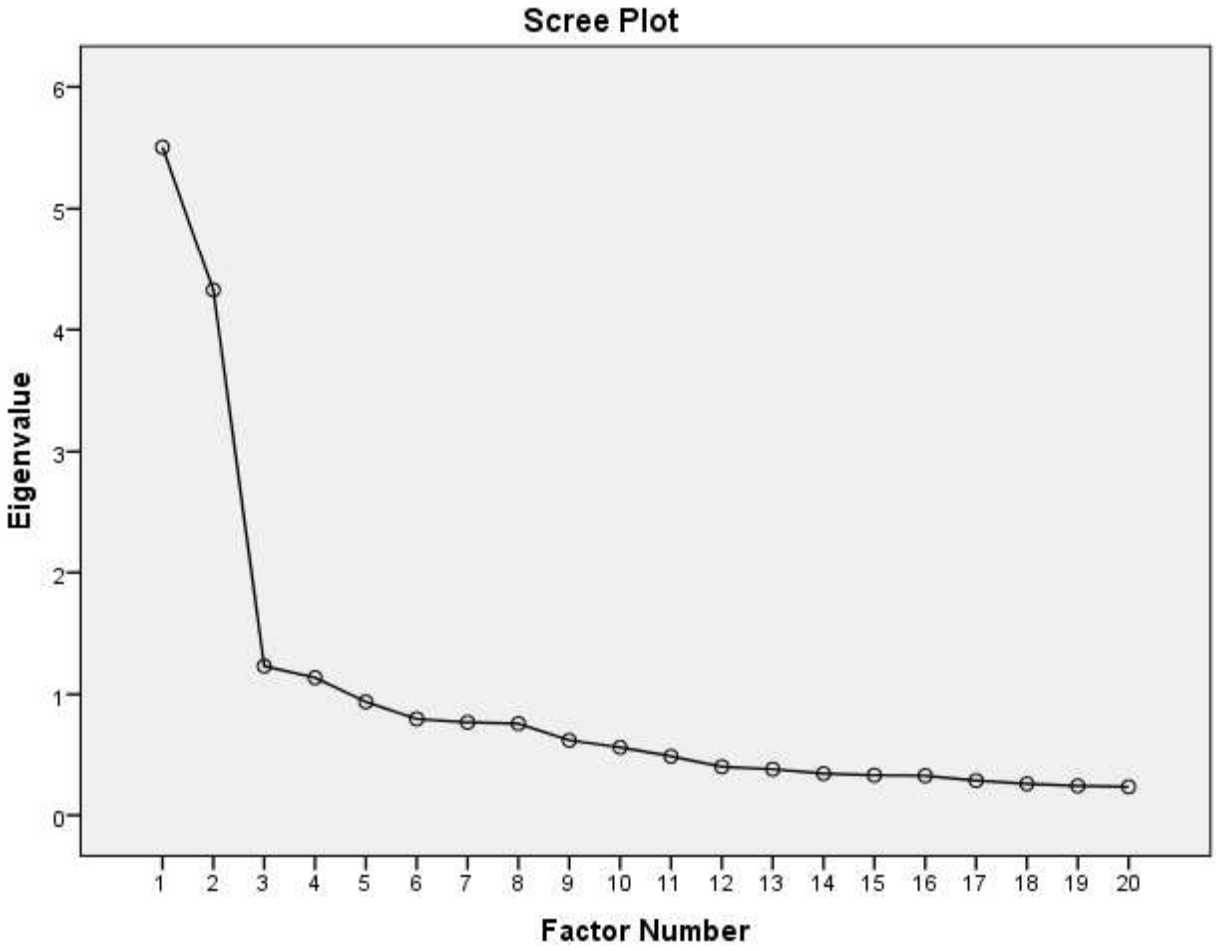

Figure 2. Scree plot of the eigenvalue and factors

Table 19. PRHDS statistics and reliability

Domain	Number of items	Mean ± SD	Cronbach's alpha
Risk possibility	7	9.74 ± 3.83	0.900
Risk unlikely	10	24.23 ± 7.86	0.887
All	17	33.97 ± 9.19	0.863

Table 20. Item-total statistics for risk possibility domain

	Item	Mean if item deleted	Corrected item-total correlation	Squared multiple correlation	Cronbach's alpha if item deleted
1.	Ó ṣeé ṣe kí ó jẹ́ pé mo ní àìsàn ọkàn	8.30	0.64	0.52	0.895
2.	Ó ṣeé ṣe dáadáa pé mo máa ni àìsàn ọkàn ní bí ọdún mẹ́wàá sí ìsinyìí	8.38	0.72	0.61	0.884
3.	Ó ṣeé ṣe púpọ̀ fún mi láti ní àìsàn ọkàn torí àwọn ìṣe mi àtẹ̀yìnwá	8.29	0.76	0.59	0.879
4.	Mo mọ̀ dájú pé mo máa ni àìsàn ọkàn	8.41	0.70	0.54	0.886
5.	Ó ṣee é ṣe pé mo máa ní àìsàn ọkàn	8.40	0.74	0.58	0.882
6.	Mo wà nínú ewu àti ní àìsàn ọkàn	8.35	0.73	0.60	0.883
7.	Ó ṣeé ṣe kí n ní àìsàn ọkàn lọ́jọ́ iwájú	8.33	0.68	0.53	0.889

Table 21. Item-total statistics for risk unlikely domain

	Item	Mean if item deleted	Corrected item-total correlation	Squared multiple correlation	Cronbach's alpha if item deleted
1.	Mi ò ṣe ohunkóhun báyìí tí ó lè ṣe àkóbá fún ọkàn mi	21.90	0.54	0.38	0.882
2.	Mo kéré lọ́jọ́ orí láti ní àìsàn ọkàn	21.61	0.64	0.48	0.875
3.	Àwọn èèyàn bí tèmi kì í ní àìsàn ọkàn	21.64	0.63	0.50	0.875
4.	Mo wà ní ìlera tó péye, nítorí náà, ara mi lè gbógùn ti àìsàn ọkàn.	21.96	0.68	0.55	0.872
5.	Mi ò páyà pé mo lè ní àìsàn ọkàn	22.00	0.68	0.58	0.871
6.	Àwọn èèyàn tó wà ní ọjọ́-orí mi ti kéré jù láti ní àìsàn ọkàn	21.53	0.64	0.57	0.875
7.	Àwọn èèyàn tó wà ní ọjọ́-orí mi kì í ní àìsàn ọkàn	21.44	0.60	0.52	0.877
8.	Ìṣe ìgbéayé mi kò fimí sínú ewu àtiní àìsàn ọkàn	22.06	0.69	0.54	0.871
9.	Àwọn èèyàn tí kò ní àìsàn ọkàn kàn ṣoríire ni	22.06	0.55	0.45	0.880
10.	A kò mọ àwọn nǹkan tí ó ń ṣòkùnfà àìsàn ọkàn	21.86	0.57	0.44	0.880

Table 22. Item-total statistics for the total PRHDS

	Item	Mean if item deleted	Corrected item-total correlation	Squared multiple correlation	Cronbach's alpha if item deleted
1.	Ó ṣeé ṣe kí ó jẹ́ pé mo ní àìsàn ọkàn	32.53	0.35	0.53	0.861
2.	Ó ṣeé ṣe dáadáa pé mo máa ni àìsàn ọkàn ní bí ọdún mẹ́wàá sí ìsinyìí	32.61	0.39	0.62	0.860
3.	Ó ṣeé ṣe púpọ̀ fún mi láti ní àìsàn ọkàn torí àwọn ìṣe mi àtẹ̀yìnwá	32.52	0.36	0.59	0.861
4.	Mo mọ̀ dájú pé mo máa ni àìsàn ọkàn	32.64	0.35	0.55	0.861
5.	Ó ṣee é ṣe pé mo máa ní àìsàn ọkàn	32.63	0.37	0.59	0.861
6.	Mo wà nínú ewu àti ní àìsàn ọkàn	32.58	0.37	0.61	0.860
7.	Ó ṣeé ṣe kí n ní àìsàn ọkàn lọ́jọ́ iwájú	32.56	0.30	0.55	0.863
8.	Mi ò ṣe ohunkóhun báyìí tí ó lè ṣe àkóbá fún ọkàn mi	31.64	0.49	0.39	0.856
9.	Mo kéré lọ́jọ́ orí láti ní àìsàn ọkàn	31.35	0.53	0.48	0.854
10.	Àwọn èèyàn bí tèmi kì í ní àìsàn ọkàn	31.38	0.57	0.52	0.852
11.	Mo wà ní ìlera tó péye, nítorí náà, ara mi lè gbógùn ti àìsàn ọkàn.	31.71	0.66	0.57	0.847
12.	Mi ò páyà pé mo lè ní àìsàn ọkàn	31.74	0.61	0.59	0.850
13.	Àwọn èèyàn tó wà ní ọjọ́-orí mi ti kéré jù láti ní àìsàn ọkàn	31.27	0.56	0.57	0.852
14.	Àwọn èèyàn tó wà ní ọjọ́-orí mi kì í ní àìsàn ọkàn	31.18	0.57	0.53	0.852
15.	Ìṣe ìgbéayé mi kò fimí sínú ewu àtiní àìsàn ọkàn	31.80	0.67	0.57	0.846
16.	Àwọn èèyàn tí kò ní àìsàn ọkàn kàn ṣoríire ni	31.81	0.49	0.46	0.856
17.	A kò mọ àwọn nǹkan tí ó ń ṣòkùnfà àìsàn ọkàn	31.60	0.48	0.44	0.857

Qualitative Analysis

The participants' age range was 22 – 80 years, with a mean ± SD age of 50.10 ± 13.5 years. Table 23 shows that approximately equal participants were recruited based on gender, area of residence, and state.

Theme one- KNOWLEDGE ABOUT CARDIOVASCULAR DISEASE

Sub-themes 1: Participants' knowledge status

General knowledge about cardiovascular disease

Participants exhibited a range of awareness regarding cardiovascular diseases. Basic recognition of cardiovascular diseases as a serious ailment was noted, as seen in responses like *"It is disease na." (FGD 1/LOCATION 1/URBAN).*

Participants associating cardiovascular diseases with the heart demonstrated a slightly more nuanced understanding, with comments like

> *"I think the major part of the body… in fact, the part of the body that this disease affects is the heart." (FGD 1/LOCATION 1/URBAN)*

A participant had this to say:

> *"What I understand about cardiovascular disease is that disease affecting the heart, basically high blood pressure and what we take in that digests into our system that can cause cholesterol in our body, and it will affect our health, our heart rather." (FGD 2/LOCATION 2/URBAN)*

Other participants demonstrated a varied understanding of cardiovascular diseases. A participant highlighted the potential fatality of heart-related illnesses, stating,

> *"Cardiovascular disease is a disease of the heart that ehm… maybe when somebody has a disease that ehm… any disease of the heart ehm… it can cause death." (FGD 1/LOCATION*

3/URBAN).

One of the participants showcased a detailed comprehension, recognizing cardiovascular diseases as a compound term involving the heart, blood vessels, and the circulatory system:

> *"It is not only the heart. If you look at it, cardiovascular. It is a medical term that is ah… a compound word. We have the heart, cardio, and we have the blood vessels, vascular, and it has to do with the heart per se and all the blood vessels, in company of the blood, the circulatory system, and it enhances the free flow of this functioning and without which a man cannot be said to be in good health" (FGD 1/LOCATION 3/URBAN).*

However, challenges with technical language were evident, as expressed in the comment, *"The grammar is very high, but I know that it is a disease." (FGD 1/LOCATION 1/URBAN)*

Lack of knowledge about cardiovascular disease

However, some of the participants from rural areas admitted to a lack of knowledge, with responses such as *"No"* and *"I haven't even heard about it. I don't even know anything about it" (FGD 3/LOCATION 1/RURAL/PARTICIPANT 3)*

> *"I don't know anything about it. I just used to hear about it, but it has not happened to anyone close to me for me to know how it is." (FGD 3/LOCATION 1/RURAL/PARTICIPANT 5)*

Other rural participants expressed a significant lack of knowledge. *"I don't know anything about it" (FGD 1/LOCATION 2/RURAL)* and *"Ah… we don't know it oh. We don't know it oh. You are the one to tell us. God will not allow us to know it oh" (FGD 1/LOCATION 2/RURAL). "Cardiovascular disease? I have not heard it before" (FGD 2/LOCATION 3/RURAL)* and *"I don't even know what can cause it." (FGD 2/LOCATION 3/RURAL)*

Some participants associated cardiovascular disease with hypertension, showcasing a partial

understanding among a few individuals.

Sub-theme 2: Medium of knowledge acquisition about cardiovascular disease

- ***Knowledge through media***

Participants in this location shared insights into their knowledge about cardiovascular diseases through media, with one individual noting, *"I have heard about it very well. I heard about it on the radio." (FGD 2/LOCATION 1/RURAL)*

- ***Knowledge through other patients' experience***

Participants provided insights into their knowledge about cardiovascular diseases through the experiences of others. Responses such as *"I heard about it from those who had it and traveled for treatment after taking the test (FGD 2/LOCATION 1/RURAL/Participant 1)* and *I think one child that I know that had that kind of experience some years ago, they said he had a hole in the heart. They said it had a hole, and they traveled to go and get it treated, and God helped them to succeed (FGD 2/LOCATION 1/RURAL)"* suggests that personal experiences of individuals in the community contribute significantly to awareness about cardiovascular diseases.

- **Knowledge through personal experience**

Participants in this location shared insights into their knowledge about cardiovascular diseases through personal experience, with one individual stating, *"I have heard about it, and I have encountered it only once in my life." (FGD 3/LOCATION 1/RURAL)*

Table 23. Participants' sociodemographic characteristics for the qualitative study (n = 53)

Parameter	Frequency	Percentage
Gender		
Male	25	47.2
Female	28	52.8
Area of residence		
Rural	25	47.2
Urban	28	52.8
State		
Oyo	18	34.0
Lagos	17	32.0
Ogun	18	34.0

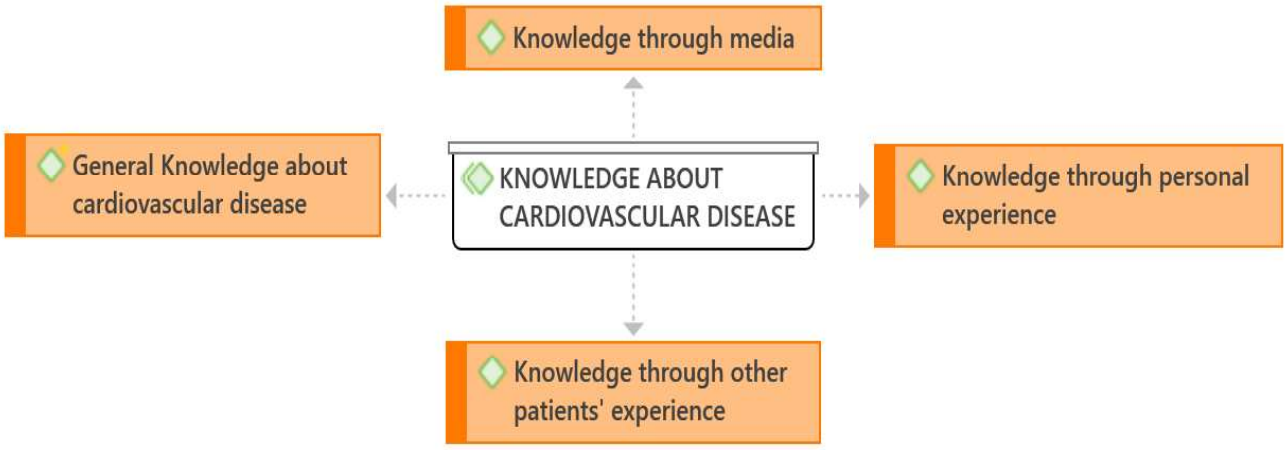

Figure 3: Knowledge about cardiovascular disease

Theme two - CARDIOVASCULAR DISEASE RISK FACTORS

Sub-themes 1: Risk factors of cardiovascular disease

The participants also shared their knowledge of cardiovascular disease risk factors, such as diet-related factors, emotion-related factors, and others.

Diet-related factors

- ***Alcoholic drinks***

Participants shared their understanding of cardiovascular disease risk factors associated with alcoholic drinks. Their responses, including mentions of *"Things like maggi or soft drinks or alcoholic drinks or such things" (FGD 2/LOCATION 1/RURAL), "Like taking alcohol or cigarette or those that use snuff," (FGD 2/LOCATION 1/RURAL)*; *"taking too much alcohol, or taking alcohol also causes heart disease." (FGD 2/LOCATION 2/URBAN)* and *"taking too much of alcoholic ehn… thing can also cause that," (FGD 1/LOCATION 3/URBAN)* suggest that the community associates alcohol consumption with cardiovascular health concerns.

- ***Excess intake of salt/food seasoning***

Participants shared their understanding of risk factors for cardiovascular diseases related to excessive salt or food seasoning intake. Their responses, such as *"Maybe when salt is too much in food" (FGD 3/LOCATION 1/RURAL), "excessive maggi" (FGD 3/LOCATION 1/RURAL)*, and *"eating too much salt can also cause the problem we are talking about." (FGD 2/LOCATION 2/URBAN)* highlight the community's acknowledgment that an abundance of salt or food seasoning might be associated with cardiovascular health concerns.

- ***Unhealthy eating habits/wrong diet***

A participant believed that what they eat could significantly contribute to cardiovascular diseases. Participant's expression that *"These things we eat can cause it. I think what we eat is what causes*

it mostly" (FGD 2/LOCATION 1/RURAL) and *"Like food that is not properly cooked. Or foods that do not go down well with a person's body, like some foods can affect someone and the leg will begin to have problems. Things like maggi" (FGD 2/LOCATION 1/RURAL)* underscore the perception that improper eating habits and food choices, including contaminated or improperly prepared foods, may be linked to cardiovascular health issues. The mention of eating junk food and consuming food without knowledge of its preparation further emphasizes the role of dietary practices in their understanding of cardiovascular risk.

Conversely, urban participants in this location associated cardiovascular disease risk factors with eating habits and dietary choices. Responses like *"The kind of eating habit like if you don't eat balanced eh… diet food or if you don't eat balanced diet food, it can cause it" (FGD 1/LOCATION 1/URBAN)* highlight the emphasis on balanced and nutritious diets. The urban participants also mentioned concerns about the food source, expressing caution about consuming items distributed during events or purchased outside, showcasing a consciousness about the quality and preparation of their meals. A participant had this to say:

"There are some programs that we will do, we distribute Gala… that we will eat, maybe they give you as a leader two two gala… I should not eat it again." (FGD 1/LOCATION 1/URBAN)

Also, a participant from location 2 said,

"when someone wants to eat something, he ought to grind it till it is smooth. If he doesn't grind it till it is smooth, some particles in it can block some intestines because the heart has intestines according to what we were taught in secondary school biology" (FGD 1/LOCATION 2/RURAL)

Similarly, participants from Location 3 asserted that unhealthy eating habits and poor diet are risk factors for cardiovascular disease. Statements such as *"I can say poor diet can cause it" (FGD 1/LOCATION 3/URBAN)* and *"Like not taking balanced diet, too much of ehm… carbohydrate,*

too much of ehm… soft drink or... That is what I mean by poor diet" (FGD 1/LOCATION 3/URBAN) indicate an awareness of the role of dietary choices in cardiovascular health. This suggests understanding the impact of imbalanced nutrition, excessive carbohydrates, and high soft drink consumption on the risk of developing cardiovascular issues.

- ***Smoking***

Participants also shared their awareness of risk factors for cardiovascular diseases associated with smoking or inhaling smoke. Expressions like *"those who take things like cigarettes" (FGD 2/LOCATION 1/RURAL),* "*Like taking alcohol or cigarette or those that use snuff" (FGD 2/LOCATION 1/RURAL),* and *"Smoke can cause it" (FGD 1/LOCATION 1/URBAN)* reveal the community's acknowledgment that activities such as smoking, including cigarette and snuff use, may be connected to cardiovascular health concerns. In Location 2, participants admitted that smoking is a risk factor. *"I want to talk about smoking also; it is also a bigger problem in this society" (FGD 2/LOCATION 2/URBAN)* and *"If you are a friend of a chain smoker...inhaling all the smoke" (FGD 2/LOCATION 2/URBAN)* underscore the community's recognition of the detrimental effects of smoking on heart health. The acknowledgment of smoking as a societal issue suggests an understanding of the broader impact of this behavior on cardiovascular well-being. Participants in Location 3 equally associated smoking, particularly substances like dust, wine, and marijuana, as diet-related risk factors for cardiovascular disease. The statements, *"Maybe someone that is smoking…dust…wine, if it is too much" (FGD 2/LOCATION 3/RURAL)* and *"Marijuana… if one is smoking marijuana…" (FGD 2/LOCATION 3/RURAL)* reflect an awareness of the potential negative impact of smoking various substances on heart health.

Emotion-related factors

- ***Malice***

Participants revealed their awareness of risk factors for cardiovascular diseases associated with malice. Statements like *"someone that does not express his mind and just stores everything he experiences in the memory card of his heart. Your husband committed an offense; you did not ask properly and kept it inside. This one offended you, landlord too offended you, you store it" (FGD 3/LOCATION 1/RURAL)* signify the community's acknowledgment that holding onto feelings of malice and suppressing emotions might be connected to cardiovascular health concerns.

- ***Stress***

Participants shared their understanding of cardiovascular disease risk factors associated with stress. Statements like *"when I got to the doctor, we were told that what can cause such disease is when one is thinking, when one is thinking about this, or overworking, overlabouring" (FGD 3/LOCATION 1/RURAL)*; *"what she has… which I know that can cause… hard labor can cause it as she said and that is what I believe also" (FGD 3/LOCATION 1/RURAL) "What I can add to it is lack of rest as well. When one is passing through a lot of stress, it can trigger cardiovascular disease," (FGD 2/LOCATION 2/URBAN)* reveal the community's awareness that elements such as excessive thinking, overworking, and hard labor might be connected to cardiovascular health concerns.

- ***Anger***

Participants provided insights into their awareness of cardiovascular disease risk factors associated with anger. The *response "Someone that gets angry easily, it can cause it" (FGD 3/LOCATION 1/RURAL)* indicates a recognition within the community that a propensity for frequent anger may be linked to cardiovascular health issues. A participant from Location 3 said

"Not only that, when you get anxious too easily. Small thing, little thing pissed you up, you get angry, and you can keep annoyance for a long period, it can also affect the heart and also cause that disease" (FGD 1/LOCATION 3/URBAN)

- ***Anxiety***

Participants equally provided insights into their awareness of cardiovascular disease risk factors associated with anxiety. Responses *"when I got to the doctor, we were told that what can cause such disease is when one is thinking, when one is thinking about this, or overworking, overlabouring" (FGD 3/LOCATION 1/RURAL) "thinking too much can cause cardiovascular disease and things like that" (FGD 1/LOCATION 2/RURAL)*; *"The problem that can cause eh… cardiovascular disease should be thinking, excessive thinking" (FGD 2/LOCATION 2/URBAN)* and *"Not only that, when you get anxious too easily. Small things, little things pissed you up, you get angry, and you can keep annoyance for a long period; it can also affect the heart and also cause that disease." (FGD 1/LOCATION 3/URBAN)* indicate a recognition within the community that factors such as overthinking and excessive work-related stress may be linked to cardiovascular health issues.

Other factors

- ***Overdose***

In addition, participants expressed awareness of cardiovascular disease risk factors associated with overdose, stating, *"Overdose of drugs also, I think can cause it. Damage the heart." (FGD 3/LOCATION 1/RURAL)* This response reflects a community recognition that excessive drug consumption may be linked to cardiovascular health issues, specifically highlighting the potential damage to the heart. A participant from Location 2 asserted that:

"When someone is sick and has medications prescribed and instead of taking two, he decides to

take four, that thing will cause a problem in his body" (FGD 2/LOCATION 2/URBAN)

- ***Obesity***

Participants in this location highlighted a potential risk factor for cardiovascular diseases by simply stating, *"Overweight." (FGD 1/LOCATION 1/URBAN).* Other participants equally shared that *"Excessive feeding is too much as well. At times, somebody is getting obese." (FGD 1/LOCATION 3/URBAN); "obesity too because the heart will try to pump to circulate… the work the body is doing… the heart will not be able to pump very well," (FGD 2/LOCATION 2/URBAN).*

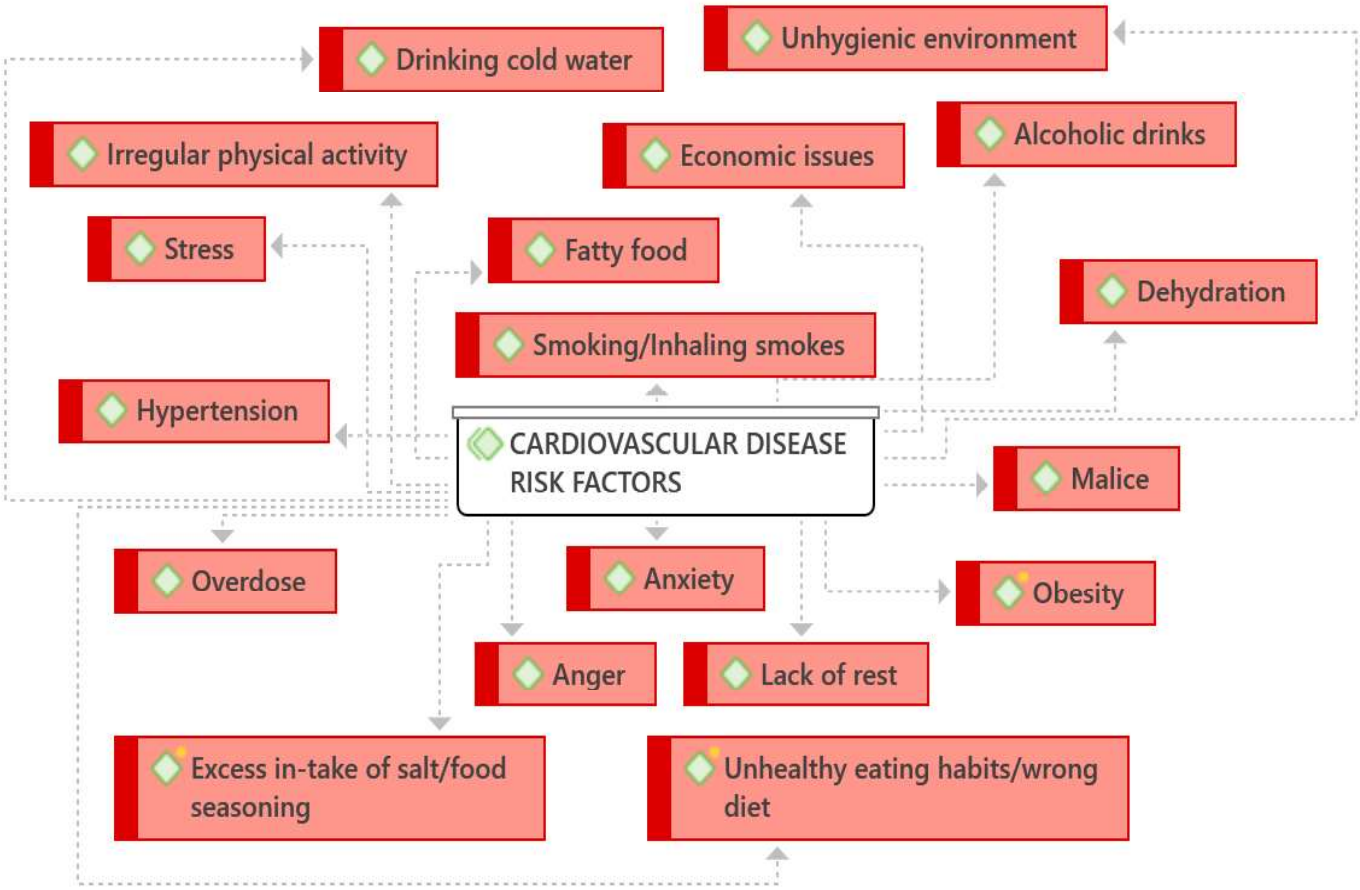

Figure 4: Cardiovascular disease risk factors

Sub-theme 2: Dangers of having cardiovascular disease.

The participants also identified the dangers of cardiovascular disease, as presented below.

- ***Heart failure***

Participants underscored the potential peril associated with cardiovascular disease, succinctly expressing, *"It leads to heart failure" (FGD 1/LOCATION 1/URBAN)* and *"It can lead to failure of the heart." (FGD 1/LOCATION 1/URBAN)* These responses emphasize the community's awareness of the severe consequences linked to cardiovascular health issues, particularly the risk of heart failure.

- ***Sudden Death***

Participants underscored the potential hazards associated with cardiovascular disease, expressing, *"If one has heart disease, it can lead to death" (FGD 2/LOCATION 1/RURAL)*; *"It is death" (FGD 2/LOCATION 3/RURAL)* and *"Uhm… It can lead to sudden death…" (FGD 1/LOCATION 3/URBAN)* underscore the community's awareness of the severe consequences of unmanaged cardiovascular issues. The mention of prolonged disease affecting the body and eventually leading to death suggests an understanding of the critical importance of addressing cardiovascular health promptly. In addition, a participant shared that:

"A person that has cardiovascular disease is not far from death if he does not have money to get treated or he has no supporter or anyone to rely on. He is not far from death." (FGD 2/LOCATION 1/RURAL)

The succinct mention of *"Death" (FGD 1/LOCATION 1/URBAN)* further emphasizes the community's recognition of the life-threatening consequences linked to cardiovascular health issues. A participant's reference to a pastor's sudden death due to breathing difficulties linked to cardiovascular disease further emphasizes the severity of the potential outcomes. According to the

participant,

"...a pastor that just died suddenly in the middle of the night because he was not breathing well, and this is due to this cardiovascular disease" (FGD 2/LOCATION 2/URBAN)

- ***Stroke***

Participants identified stroke as a potential danger associated with cardiovascular disease. Statements such as *"It can cause stroke" (FGD 2/LOCATION 2/RURAL)* and *"It could lead to stroke as we have said. It could lead to heart attack. It could also lead to diabetes. It could lead to CKD." (FGD 2/LOCATION 2/URBAN)* reflect an awareness of the connection between cardiovascular issues and the increased risk of stroke. The mention of hypertension as a risk factor further emphasizes the understanding that unmanaged cardiovascular conditions can contribute to more severe health outcomes, including stroke. A participant has this to say:

"it always involves hypertension, and hypertension is one of the risk factors for stroke. So, someone… if hypertension is not taken care of early, it could lead to stroke." (FGD 2/LOCATION 2/URBAN)

Participants in Location 3 similarly identified stroke as a potential danger associated with cardiovascular disease, stating:

"It can also lead to stroke" (FGD 1/LOCATION 3/URBAN)

"It can lead to stroke. It can lead to a heart attack" (FGD 1/LOCATION 3/URBAN).

Mentioning the connection between cardiovascular disease and the rise in blood pressure leading to partial paralysis. A participant had this to say:

"I think rise in blood pressure which leads to partial paralysis" (FGD 1/LOCATION 3/URBAN)

This demonstrates an awareness of the severe health consequences, particularly the risk of stroke, associated with unmanaged cardiovascular conditions.

- ***Dyspnea***

Participants equally identified dyspnea (difficulty in breathing) as a danger associated with cardiovascular disease. Statements such as *"The person will not be able to breathe well" (FGD 1/LOCATION 2/RURAL)*, *"a pastor that just died suddenly in the middle of the night because he was not breathing well and this is due to this cardiovascular disease" (FGD 2/LOCATION 2/URBAN)* and *"Maybe ehn… lack of, lack of breathing, the person cannot breathe properly," (FGD 1/LOCATION 3/URBAN)* indicate an awareness of the impact of cardiovascular issues on respiratory function.

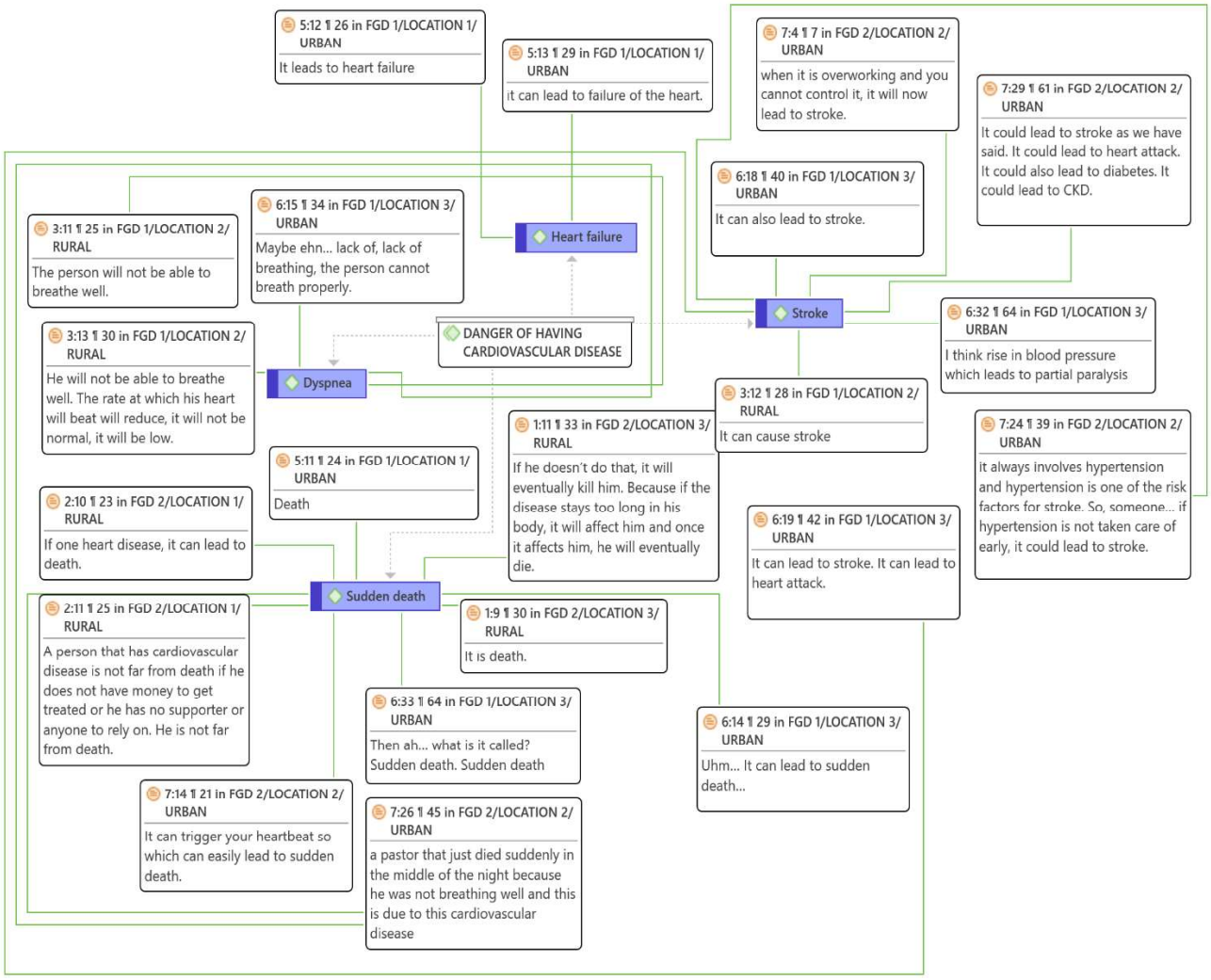

Figure 5: Dangers of having cardiovascular disease

Theme three: PREVENTION OF CARDIOVASCULAR DISEASE

Sub-themes 1: Perception of vulnerability to cardiovascular disease

- Participants expressed a particular perception of vulnerability to cardiovascular disease, stating:

"There is no one that cannot have it. There is nothing like a person cannot have it." (FGD 2/LOCATION 1/RURAL)

"There is no one that cannot have it in this Nigeria" (FGD 2/LOCATION 2/URBAN)

These responses reflect an understanding that cardiovascular disease is not exclusive to certain individuals; rather, everyone is perceived to have the potential to develop it. The statement emphasizes a collective recognition of the widespread risk and dispels the notion that certain people are immune to cardiovascular diseases.

In Location 3, Participants described cardiovascular disease as a *"silent killer,"* suggesting an understanding that many individuals may have the condition without being aware of it. A participant had this to say:

"the little I can say is that it is a silent killer. Many people are having it, and they don't know that they are victims of cardiovascular disease." (FGD 1/LOCATION 3/URBAN)

This perception highlights the community's awareness of the insidious nature of cardiovascular diseases, which can develop without noticeable symptoms. According to the participants, once something affects the body, it can impact the heart and the entire body, causing various problems.

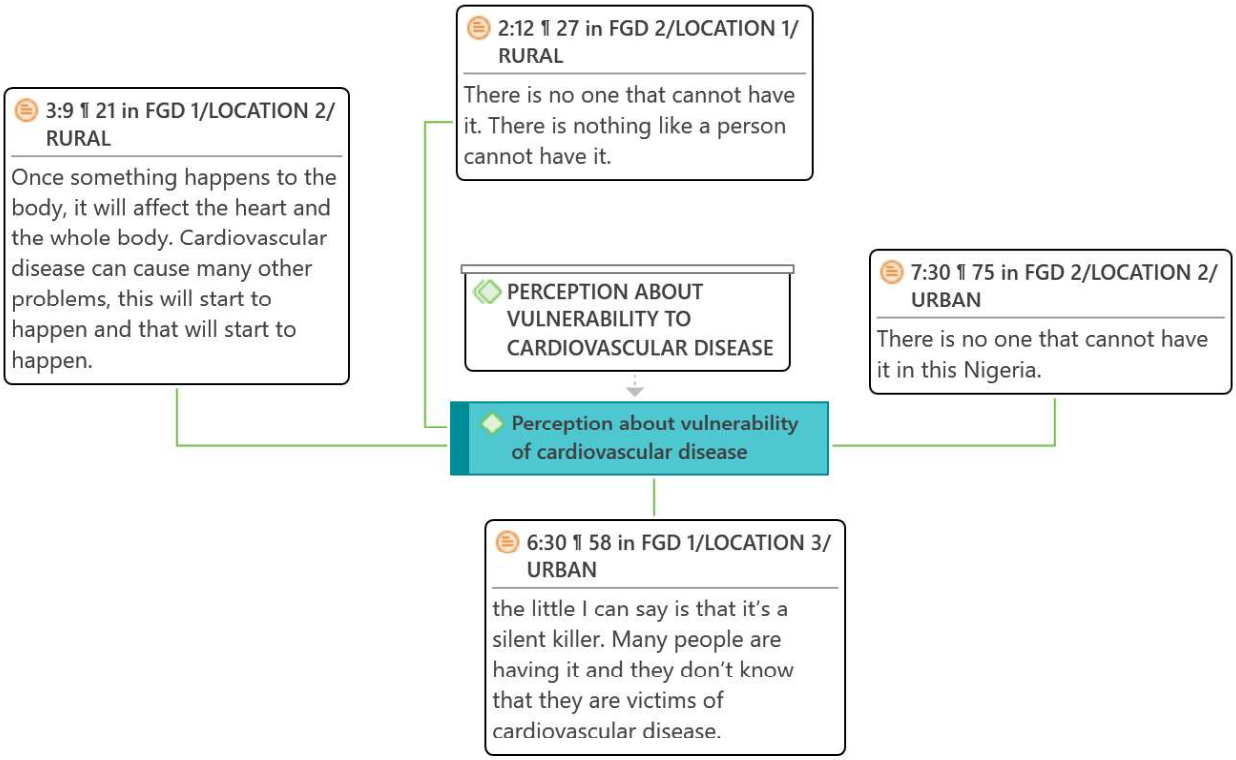

Figure 6: Perception of vulnerability to cardiovascular disease

Sub-themes 2: Identified steps to prevent cardiovascular disease.

In light of the foregoing, the participants shared how to prevent cardiovascular disease.

- ***Abstinence from cardiovascular disease causes***

The participants' responses indicate a community awareness of specific actions to prevent cardiovascular diseases through abstinence. One respondent emphasizes a general call to abstain from all known causes. *"Ah… Since we know the causes of what happened, we have to abstain from all." (FGD 3/LOCATION 1/RURAL)*

Another respondent introduces practical advice on reducing salt intake and managing emotional stress.

"Daddy has said, he said when someone is having this high eh… annoyance…hen en, abstain from it, intake of salt, reduce it and the likes. So…abstain from all such." (FGD 3/LOCATION 1/RURAL)

One other respondent suggests a holistic approach involving spiritual practices, prayer, and maintaining a positive mindset.

"The only thing one can do is just to adjust. As a Christian or Muslim, pray fervently. Commit your health, your life, and your body system unto God's hands. He is our creator; He has power over it. And we should remove eh…the problem of Nigeria out of our hearts. So, let us neutralize our hearts, neutralize our hearts." (FGD 3/LOCATION 1/RURAL)

- ***Abstinence from smoking***

Participants identified abstinence from smoking as a step to prevent cardiovascular disease. The statement, *"Then smoking too, for those of us that are still smoking, it is dangerous to our health, and we are endangering other persons too" (FGD 2/LOCATION 2/URBAN)* reflects an awareness of the harmful effects of smoking on both individual and public health. This insight suggests a

recognition within the community that avoiding smoking is a proactive measure to reduce the risk of cardiovascular issues.

- ***Abstinence from alcohol***

Participants mentioned that abstinence from alcohol is also a step to prevent cardiovascular disease, stating: *"Alcohol eh… if we can stop it, abstinence from alcohol." (FGD 1/LOCATION 3/URBAN).* This indicates an awareness of the potential link between alcohol consumption and cardiovascular health.

- ***Adherence to medical prescription***

Further responses from the participants highlighted the significance of adherence to medical prescriptions, including dietary recommendations and prescribed medications, as a proactive measure in preventing cardiovascular diseases. The statements emphasize the observed positive changes resulting from following medical advice.

"When I went to the hospital, all the things I was told not to eat, I adhered to everything such that the things I was told to eat are the things I have been following. Now, when I came here two days ago, God did I" (FGD 2/LOCATION 1/RURAL)

Participants in Location 3 emphasized the importance of adherence to medical prescriptions to prevent cardiovascular disease. Statements such as *"Avoid self-medication" (FGD 1/LOCATION 3/URBAN)* and *"if he is able to get medications, and the things he has been told not to do, like if he is told to stop taking alcoholic drinks and he stops taking them, and he keeps taking his medications" (FGD 2/LOCATION 3/RURAL)* indicate an awareness of the role of medication compliance in managing and preventing cardiovascular issues. This insight suggests an understanding of the significance of following healthcare professionals' advice and prescribed treatments.

- ***Adequate rest***

Participants expressed that adequate rest and sleep are essential to preventing cardiovascular disease. The statements, *"Yeah… first and foremost, we have to get enough rest and sleep" (FGD 2/LOCATION 2/URBAN)*, *"When you are 40 or above 40, you must not be taking something that is too heavy. You must reduce stress. You rest, you sleep a lot," (FGD 2/LOCATION 2/URBAN) "the person will not think, the person will rest every time and will eat food that will be a balanced diet every time" (FGD 2/LOCATION 3/RURAL)* and *"we must rest properly. It is very, very important, very essential. No matter your work schedule, you must create time for rest" (FGD 1/LOCATION 3/URBAN)* reflect an understanding of the importance of restful sleep and stress reduction for cardiovascular health, particularly for individuals aged 40 and above.

- ***Seeking medical care***

Corollary to the above, one of the participants also underscores the role of seeking medical attention as a preventive step. The mention of going to the hospital and consulting with a doctor reflects an understanding of the importance of early detection and professional guidance.

"When we go to the hospital maybe to see the doctor, and they tell us that a certain thing is wrong with us." (FGD 3/LOCATION 1/RURAL)

"We have to take care of our health by going to the nurses and doctors to examine our BP and the rest." (FGD 2/LOCATION 2/URBAN).

"The person should go to the doctor for a test." (FGD 2/LOCATION 3/RURAL).

- ***Healthy eating habits/Change of diet***

The participants' responses underscore the community's awareness of the role of diet in preventing cardiovascular diseases. The emphasis on avoiding foods that can cause heart disease, eating properly cooked meals, avoiding junks, and incorporating fruits and vegetables reflects a proactive

approach to dietary choices.

"It is still about food. The food we eat, we have to change it. We must stop eating the foods that can cause heart disease and start to eat like fruits and vegetables. We will start to eat those ones" (FGD 2/LOCATION 1/RURAL)

Equally, in location 2, Participants emphasized healthy eating habits and a diet change as part of the steps for preventing cardiovascular disease. Recommendations such as eating unripe plantain with vegetables or rice and beans for individuals with high blood pressure demonstrate a community understanding of dietary choices to manage specific health conditions. A participant said this:

"If one has B.P., the person should eat unripe plantain with vegetables or rice and beans. If they eat that, the sugar will reduce. That unripe plantain, if we add salt and eat it with palm oil, it can work for it." (FGD 1/LOCATION 2/RURAL)

The mention of consuming fruits in the morning and being cautious about the availability of eateries suggests an awareness of the importance of overall dietary habits in cardiovascular health. Another participant had this to say:

"One should eat fruit first thing in the morning. After eating it when it is 10 am to 11 am, he can then look for food to eat." (FGD 2/LOCATION 2/URBAN)

In Location 3, participants equally support healthy eating habits and a diet change as steps to prevent cardiovascular disease. Responses such as *"We can eat vegetables, fruits, then water" (FGD 1/LOCATION 3/URBAN)* and *"We make sure that ah… fruits are not wanting eh… in the food we take every day and things that are excessive in oil and fat, we, we, we drop it and we watch what we eat as well."(FGD 1/LOCATION 3/URBAN)* indicate an awareness of the importance of incorporating nutritious foods, vegetables, and fruits into their diets. The emphasis on avoiding

excessive oil and fat and prioritizing balanced diets reflects a recognition of the role of dietary choices in maintaining cardiovascular health. A participant said this:

"the person will not think, the person will rest every time and will eat food that will be balanced diet every time" (FGD 2/LOCATION 3/RURAL)

- ***Hygienic environment***

Participants in the second location mentioned a *"hygienic environment" (FGD 2/LOCATION 2/URBAN)* as a step to prevent cardiovascular disease. While the response is concise, it suggests an awareness of the potential role of cleanliness and environmental factors in cardiovascular health. This insight may provide an opportunity to emphasize the broader impact of a clean and healthy environment on overall health, including cardiovascular health.

- ***Regular exercises***

The participants' responses indicated the community's recognition of the positive impact of regular exercise in preventing cardiovascular diseases. The simplicity of the statements emphasizes the straightforward acknowledgment of the benefits of physical activity.

"Well... exercise is very, very good and helps us a lot to be free from those challenges" (FGD 1/LOCATION 1/URBAN)

Participants also said that:

"We should also try and exercise our body because exercise reduces the chances of getting ehm... CVD, so we should have… like there are some things that are trekkable but every time, bike or tricycle, bike or tricycle" (FGD 2/LOCATION 2/URBAN).

"Do a lot of exercises" (FGD 1/LOCATION 3/URBAN)

"You must exercise, which is very key, be it whosoever. No matter your anointing, you must exercise" (FGD 1/LOCATION 3/URBAN)

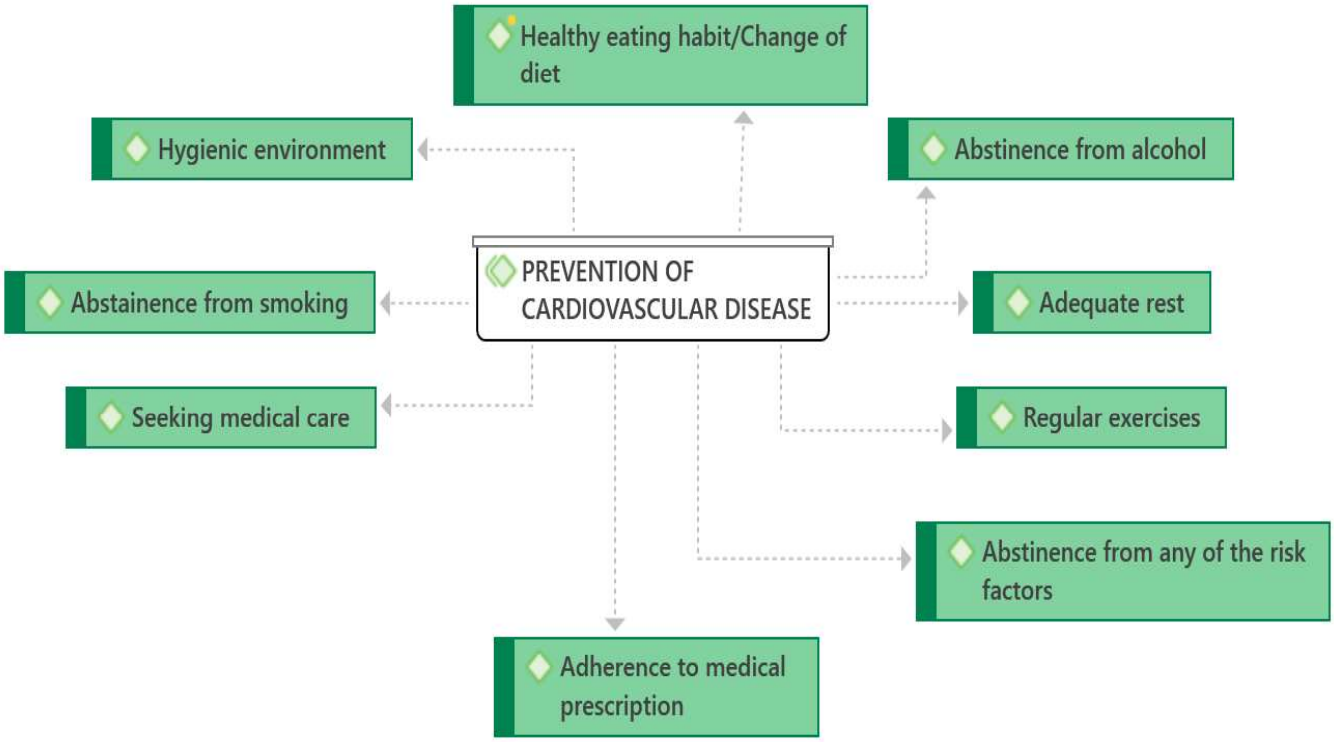

Figure 7: Prevention of cardiovascular disease

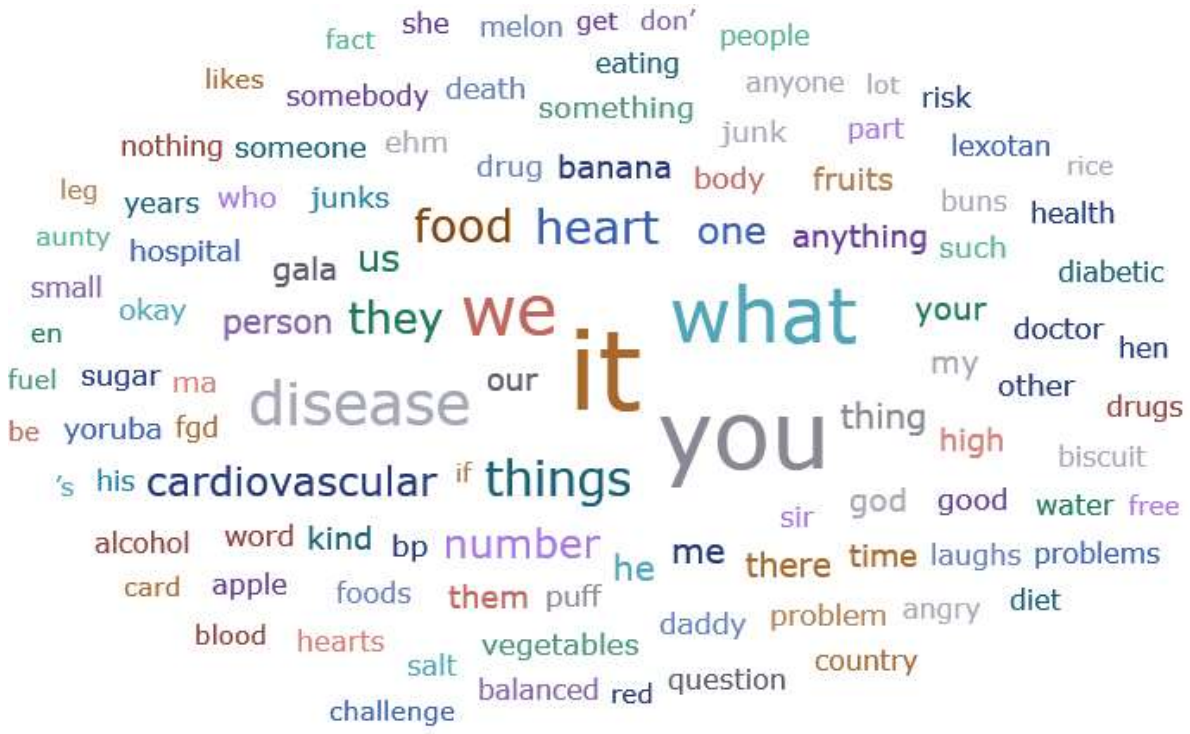

Figure 8: Word cloud of participants' CVD knowledge, perception, and prevention

Limitations

Readily available participants were recruited from the churches and mosques using a convenience sampling technique. This technique may have produced samples that do not represent the population. However, the random selection of churches and mosques in each community may have minimized this limitation. Furthermore, we recruited participants for the qualitative study using a maximum variation sampling technique, ensuring the population's representativeness on sociodemographic characteristics. Like other cross-sectional surveys, the participants may have exaggerated or understated their perception and risk level.

Conclusion

Few community-dwelling adults had a poor CVD perception, while half had a moderate/high-risk level. Rural dwellers and Ogun state residents had lower perception scores than their counterparts, while males and Lagos state residents had higher risk scores. Having a secondary education or below, living in rural areas, and living in Oyo and Ogun states predicted having a low perception score. The predictors of high-risk scores were being male, increasing age, and residing in Lagos and Ogun State. The results of the focus group discussions showed that participants had good knowledge and perception of cardiovascular diseases as they correctly identified the risk factors and preventive measures. The qualitative results corroborated the quantitative results that showed participants' high CVD perception, indicating the convergence of the two data. The proportion of participants with moderate/high-risk levels is concerning; therefore, we recommend that public health campaigns and medical outreaches be conducted regularly to sensitize people about the disease and promote its early diagnosis. These measures may reduce the CVD prevalence and mortality rate.

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Appendices

Appendix A: Ethical Approval Letters

UNIVERSITY OF ALBERTA

RESEARCH ETHICS OFFICE
Health Research Ethics Board

2-01 North Power Plant (NPP)
11312 - 89 Ave NW
Edmonton, Alberta, Canada T6G 2N2
Tel: 780.492.0459
www.uab.ca/reo

Approval Form

Date:	August 22, 2022
Study ID:	Pro00122480
Principal Investigator:	Oluwagbohunmi Awosoga
Study Title:	How Adults in Selected Urban and Rural Communities in Southwest Nigeria Perceive Cardiovascular Disease, Risk Factors and their Risk status: A Critical Factor in Preventing and Managing Cardiovascular Disease
Approval Expiry Date:	August 22, 2023
Sponsor/Funding Agency:	University of Lethbridge 6020 PRENTICE INSTITUTE FOR GLOBAL POPULATION AND ECONOMY RESEARCH AFFILIATE FUND

Thank you for submitting the above study to the Health Research Ethics Board - Health Panel. Your application has been reviewed and approved on behalf of the committee.

Approved Documents:

Recruitment Materials
FOCUS GROUP FORM.docx
Letter of Initial Contact
INVITATION TO PARTICIPATE IN A RESEARCH STUDY.docx
Consent Forms
HREB_Healthpanel_Participant Consent Form_New.docx
HREB_Healthpanel_Participant Consent Form_Focus Group.docx
Questionnaires, Cover Letters, Surveys, Tests, Interview Scripts, etc.
Questionnaires.docx
Focus Group Guide
Cover Letter for the Questionnaire.docx
Protocol/Research Proposal
Research Protocol
Study Methodology Flowchart.docx
Other Documents
Measurement of Variables
e_flier English
e_flier Yoruba
e_poster

Any proposed changes to the study must be submitted to the REB for approval prior to implementation. A renewal report must be submitted next year prior to the expiry of this approval if your study still requires ethics approval. If you do not renew on or before the renewal expiry date, you will have to re-submit an ethics application.

Approval by the REB does not constitute authorization to initiate the conduct of this research. The Principal Investigator is responsible for ensuring required approvals from other involved organizations (e.g., Alberta Health Services, Covenant Health, community organizations, school boards) are obtained, before the research begins.

Sincerely,

Carol Bolick, Ph.D.
Associate Chair, Health Research Ethics Board - Health Panel

UNIVERSITY OF ALBERTA

RESEARCH ETHICS OFFICE
Health Research Ethics Board

2-01 North Power Plant (NPP)
11312 - 89 Ave NW
Edmonton, Alberta, Canada T6G 2N2
Tel: 780.492.0459
www.uab.ca/reo

Notification of Approval (Renewal)

Date:	July 26, 2023
Renewal ID:	Pro00122480_REN1
Principal Investigator:	Oluwagbohunmi Awosoga
Study ID:	Pro00122480
Study Title:	How Adults in Selected Urban and Rural Communities in Southwest Nigeria Perceive Cardiovascular Disease, Risk Factors and their Risk status: A Critical Factor in Preventing and Managing Cardiovascular Disease
Sponsor/Funding Agency:	University of Lethbridge 6020
Sponsor/Funding Agency:	PRENTICE INSTITUTE FOR GLOBAL POPULATION AND ECONOMY RESEARCH AFFILIATE FUND
Approval Expiry Date:	July 24, 2024

Thank you for submitting this renewal application. Your application has been reviewed and approved.

This re-approval is valid for another year. If your study continues past the expiration date as noted above, you will be required to complete another renewal request. Beginning at 30 days prior to the expiration date, you will receive notices that the study is about to expire. If you do not renew on or before the renewal expiry date, you will have to re-submit an ethics application.

All study related documents should be retained so as to be available to the Health REB upon request. They should be kept for the duration of the project and for at least 5 years following study completion.

Approval by the REB does not constitute authorization to initiate the conduct of this research. The Principal Investigator is responsible for ensuring required approvals from other involved organizations (e.g., Alberta Health Services, Covenant Health, community organizations, school boards) are obtained, before the research begins.

Sincerely,

Emily Nolan
REB Specialist
On behalf of
Anthony S. Joyce, Ph.D.
Chair, Health Research Ethics Board - Health Panel

Note: This correspondence includes an electronic signature (validation and approval via an online system)

Alberta Health Services

Covenant Health

INSTITUTE FOR ADVANCED MEDICAL RESEARCH AND TRAINING (IAMRAT)
College of Medicine, University of Ibadan
Director: Prof. IkeOluwapo O. Ajayi,
MBBS (Ib), M. Cl.Sc., Ph.D, MD, FMCGP, FWACP
Tel: 08023268431
E-mail: ikeajayi2003@yahoo.com

UI/UCH EC Registration Number: **NHREC/05/01/2008a**

NOTICE OF FULL APPROVAL AFTER FULL COMMITTEE REVIEW

Re: How adults in selected urban and rural communities in Southwest Nigeria perceive cardiovascular disease, risk factors and their risk status: a critical factor in preventing and managing cardiovascular disease

UI/UCH Ethics Committee assigned number: UI/EC/22/0200

Name of Principal Investigator:	**Dr O. Awosoga**
Name of Local Principal Investigator:	**Dr Nse A. Odunaiya**
Address of Local Principal Investigator:	Department of Physiotherapy College of Medicine University of Ibadan, Ibadan
Date of receipt of valid application:	09/06/2022

Date of meeting when final determination on ethical approval was made: **N/A**

This is to inform you that the research described in the submitted protocol, the consent forms, and other participant information materials have been reviewed and *given full approval by the UI/UCH Ethics Committee.*

This approval dates from **08/09/2022 to 07/09/2023.** If there is delay in starting the research, please inform the UI/UCH Ethics Committee so that the dates of approval can be adjusted accordingly. Note that no participant accrual or activity related to this research may be conducted outside of these dates. *All informed consent forms used in this study must carry the* UI/UCH EC *assigned number and duration of* UI/UCH EC *approval of the study.* It is expected that you submit your annual report as well as an annual request for the project renewal to the UI/UCH EC at least four weeks before the expiration of this approval in order to avoid disruption of your research.

The National Code for Health Research Ethics requires you to comply with all institutional guidelines, rules and regulations and with the tenets of the Code including ensuring that all adverse events are reported promptly to the UI/UCH EC. *No changes are permitted in the research without prior approval by the* UI/UCH EC *except in circumstances outlined in the Code. The* UI/UCH EC *reserves the right to conduct compliance visit to your research site without previous notification.*

UI/UCH EC
09 SEP 2022
APPROVED

Professor IkeOluwapo O. Ajayi
Director, IAMRAT
Chairperson, UI/UCH Research Ethics Committee
E-mail: uiuchec@gmail.com

OLABISI ONABANJO UNIVERSITY TEACHING HOSPITAL (OOUTH)
P.M.B. 2001, SAGAMU, NIGERIA
Health Research Ethics Committee (HREC)
e-mail: oouth.hrec@yahoo.com
Registration Number: NHREC/28/11/2017

OOUTH/HREC/549/2022AP

16th September, 2022

Dr. Awosoga O.
University of Lethbridge
Canada..

CERTIFICATE OF APPROVAL

Re: How Adults in Selected Urban and Rural Communities in Southwest Nigeria Perceive Cardiovascular Disease, Risk Factors and Their Risk Status: A critical Factor in Preventing and Managing Cardiovascular Disease.

I wish to inform you that following appropriate review, the OOUTH- Health Research Ethics Committee has granted you an approval to proceed on the above study for a period of one year from, Friday, 16th September, 2022 to Friday, 15th September, 2023.

You are to note that this approval is given on the basis of your corrected Protocol. Any proposed change in the protocol should be communicated to the Committee for consideration ahead of execution.

Kindly inform the Committee when the study is to commence to facilitate monitoring by designated representative(s) of the OOUTH Health Research Ethics Committee.

Dr. O. A. Sogebi
Chairman, OOUTH-HREC

OOUTH HEALTH RESEARCH ETHICS COMMITTEE • SAGAMU •

COLLEGE OF MEDICINE, UNIVERSITY OF LAGOS
HEALTH RESEARCH ETHICS COMMITTEE
CMUL HREC Registration Number: NHREC/19/08/2019B
Office Address: 2nd Floor Biomedical Engineering Block
College of Medicine University of Lagos, Idi-Araba, Lagos
P.M.B.12003, Lagos Nigeria
Telephone: 08028642463, 08025187265, 08023119431
E-mail: hrec@cmul.edu.ng *website:* cmul.unilag.edu.ng

Chairman:
Prof. Kolawole S. Oyedeji
BSc (Uniport) MSc (Ife), MSc (Unilag)
MSocSci-HRE (South Africa), FMLSCN (Nig)
CPHPM (Ilorin), PhD (Unilag).

Vice Chairman:
Dr. Oluwakemi O. Odukoya
MBBS (Lagos), MPH (Lagos), M.Sc.
MWACP, FMCPH.

25th December, 2022

Re: How Adults In Selected Urban and Rural Communities In Southwest Nigeria Perceive Cardiovascular Disease, Risk Factors and Their Risk Status: A Critical Factor In Preventing and Managing Cardiovascular Disease

CMULHREC Number: CMUL/HREC/11/22/1110
Name of Principal Investigator: Dr. Oluwagbohunmi Awosoga
Name of Local Co-Investigator: Dr. Nse A. Odunaiya
Date of receipt of valid application: 24th November, 2022
Date of meeting when final determination of research was made: 25th December, 2022

APPROVAL LETTER

The above named proposal has been adequately reviewed; the protocol and safety guidelines satisfy the conditions of CMULHREC policies regarding experiments involving human and or animal participants.

Therefore, the study under its reviewed state is hereby **approved by the Health Research Ethics committee of College of Medicine of the University of Lagos.**

Prof. Kolawole S. Oyedeji — 12012023
Name of CMULHREC Chairman — ***Signature & Date***

Dr. Oluwakemi O. Odukoya
Name of CMULHREC Member — ***Signature & Date***

This approval is given with the investigator's responsibility declaration as attached and that;

i) You will submit in CMULHREC prescribed forms, annual progress report during the course of this study, if it is more than one year and final report as the case may be if less than one year and after completion of the study.

ii) The CMULHREC reserves the right to monitor and review this approval; even after the commencement of your study and inform you of any further changes or amendments that may be required for your compliance.

This approval dates from **25/12/2022 to 24/12/2023.** If there is delay in starting the research, please inform the HREC so that the dates of approval can be adjusted.

Appendix B: Informed Consent Form

DEPARTMENT OF PHYSIOTHERAPY
COLLEGE OF MEDICINE
UNIVERSITY OF IBADAN, IBADAN, NIGERIA

FAX: 234 - 02 - 2411768
TELEX: Campus 31128 NG
e-mail: physiotherapyui@gmail.com
physiotherapy @com.ui.edu.ng
website: www.com.ui.edu.ng/physiotherapy

MAILING ADDRESS:
COLLEGE OF MEDICINE (UCH)
P.M.B. 5017. G.P.O. IBADAN, NIGERIA
Phone: 234-8020804864

UNITS

Sports Physiotherapy & Health Promotion
PROF. ARINOLA O. SANYA
B.Sc. M.Ed., Ph.D. (Ib.)
M.M.R.T.B. (Nig), S.R.P. (U.K.)

PROF. A. F. ADENIYI
B.Sc. (Ib), M.Sc. (Ib.); Ph.D (Ib); FNPC
MNSP; RMRTB (Nig.); RHCPC (UK.)

DR. A. A. FABUNMI
B.Sc. (Physiotherapy),
M.Ed. (Exercise Physiology)
Ph.D. (Exercise Physiology)

Paediatrics & Neurophysiotherapy
PROF. T. K. HAMZAT, FAAS
B.Sc. (Hons) Ib;
Ph.D. (Neurophysiotherapy), MNSP

DR. OLUBUKOLA A. OLALEYE
B.Sc, M.Sc, Ph.D (Ib.); FNPC, MNSP

DR. MARGARET B. FATUDIMU
B. Physiotherapy,
M.Sc. (Neurophysiotherapy)
Ph.D. (Neurophysiotherapy)

Musculoskeletal Physiotherapy
PROF. ADERONKE O. AKINPELU
B.Sc, M.Ed. Ph. D. (Ib.)

PROF. B. O. A. ADEGOKE
B.Sc. (Ib.), M.Sc. (Pittsburgh),
Ph.D. (Ib.); FNSP

DR. O. AYANNIYI
B.Sc., M.Sc, Ph.D (Ib.),
Dip. MDT, FMII, FNPC, MNSP

DR. ADESOLA C. ODOLE
B.M.R. (Ife); M.Sc. (Ib.), B.Sc.
(Biomedical Education); Ph.D. (Ib.)

Cardiorespiratory Physiotherapy
DR. NSE A. ODUNAIYA
B.Sc., M.Ed., (Ib.), Ph.D (Capetown), MACAPN

DR. A. O. JAIYESIMI
B.Sc., M.Sc., Ph.D (Ib.), FNPC, FNSP

Geriatrics & Community Physiotherapy
DR. OMOYEMI O. OGWUMIKE
B.Sc. Physiology, M.Sc. Physiology
B.Sc. Physiotherapy, M.Sc. Physiotherapy
Ph.D Physiotherapy, MACAPN, RMRTB (Nig.)

DR. O. O. DADA
B.Sc (Hons) Ib; M.Sc (Ib.); Ph.D (Ib.); MNSP

INFORMED CONSENT FORM

Title of the research: How adults in selected urban and rural communities in southwest Nigeria perceive cardiovascular disease, risk factors and their risk status: a critical factor in preventing and managing cardiovascular disease.

Name and affiliation of researcher: This study is being conducted by Dr Nse A. Odunaiya, a senior lecturer in the Department of Physiotherapy, College of Medicine, University of Ibadan.

Sponsor(s) of research: This study is sponsored by the Prentice Institute for Global Population and Economy.

Purpose(s) of research: This research aims to investigate the cardiovascular disease risk status of adults in southwest Nigeria and their perception of cardiovascular disease risk.

Procedure of the research and what shall be required of each participant: We will use a multistage sampling technique to recruit participants for the study. You will be required to complete two questionnaires, and measurements of your waist-hip ratio, blood pressure, and blood sugar will be taken. You may also participate in a focus group discussion where you will be asked about your perception of cardiovascular disease risk.

Expected duration of research and participant(s)' involvement: We expect you to be involved in this research just once. You should not spend more than one hour participating in the research.

Risk(s): No risks are attached to your participation in this research.

Costs to the participants, if any, of joining the research: Your participation in this research will only cost you a bit of your time.

Benefit(s): The goal of this research is to find out the cardiovascular disease risk of adults in southwest Nigeria, as this may serve as a basis for developing prevention programs to reduce the risk of the disease among adults in this region.

Confidentiality: All information collected in this study will be given code numbers, and no name will be recorded. This cannot be linked to you in any way, and your name or any identifier will not be used in any publication or reports from this study.

Voluntariness: Your participation in this research is entirely voluntary.

Alternatives to participation: If you choose not to participate in this research, it will not affect you in any way.

Due inducement(s): You will be compensated for the cost of transportation to and from the focus group discussion site, but you will not be paid any fees for participating in this research.

Consequences of participants' decision to withdraw from research and procedure for orderly termination of participation: You can also choose to withdraw from the research at any time. However, the researchers promise to make an effort in good faith to comply with your wishes as much as is practicable.

Modality of providing treatments and action(s) to be taken in case of injury or adverse event(s): If you suffer any injury because of your participation in this research, you will be treated at a government hospital, and the research will bear the cost of this treatment.

What happens to research participants and communities when the research is over: The researchers will inform you of your blood pressure, blood sugar level, and cardiovascular disease risk after the necessary information has been obtained from you.

Statement about sharing benefits among researchers and whether this includes or excludes research participants: There is no plan to contact any participant now or in the future about commercial benefits.

Any apparent or potential conflict of interest: We are unaware of any information that may cause the researcher to do their work with fear or favour.

Statement of the person obtaining informed consent: I have fully explained this research to _____ and have given sufficient information, including about risks and benefits, to make an informed decision.

DATE: _____ SIGNATURE: _____

NAME: _____

Statement of the person giving consent: I have read the research description and had it translated into a language I understand. I have also discussed this with the researcher, and to my satisfaction, I understand that my participation is voluntary. I know enough about the research study's purpose, methods, risks, and benefits to judge that I want to take part in it. I understand that I may freely stop being part of this study at any time. I have received a copy of this consent form and an additional information sheet.

DATE: _____ SIGNATURE: _____

NAME: _____

WITNESS' SIGNATURE (if applicable): _____

WITNESS' NAME (if applicable): _____

Detailed contact information, including contact address, telephone, fax, e-mail, and any other contact information of researcher(s), institutional HREC and head of the institution: This research has been approved by the Ethics Committee of the University of Ibadan and the Chairman of this Committee can be contacted at Biode Building, Room 210, 2nd Floor, Institute for Advanced Medical Research and Training, College of Medicine, University of Ibadan, E-mail: uiuchec@gmail.com Research Ethics Administrator (08067114881). In addition, if you have any questions about your participation in this research, you can contact the principal investigator,

Name: Dr Nse A. Odunaiya
Department: Physiotherapy
Phone: 08166650567
Email: nselaw2000@gmail.com

PLEASE KEEP A COPY OF THE SIGNED INFORMED CONSENT.

Appendix C: Perception of Risk of Heart Disease Scale

Scoring instructions

Please answer by circling the options of each item, which are scored as

Strongly disagree=1

Disagree= 2

Agree= 3

Strongly agree= 4

		Strongly disagree	Disagree	Agree	Strongly agree
1	There is a possibility that I have heart disease	1	2	3	4
2	There is a good chance I will get heart disease in the next 10 years	1	2	3	4
3	A person who gets heart disease has no chance of being cured	1	2	3	4
4	I have a high chance of getting heart disease /because of; my past behaviors	1	2	3	4
5	I feel sure that I will get heart disease	1	2	3	4
6	Healthy lifestyle habits are unattainable	4	3	2	1
7	It is likely that I will get heart diseases	1	2	3	4
8	I am at risk for getting heart disease	1	2	3	4
9	It is possible that I will get heart disease	1	2	3	4
10	I am not doing anything now that is unhealthy to my heart	4	3	2	1
11	I am too young to have heart disease	4	3	2	1
12	People like me do not get heart disease	4	3	2	1
13	I am very healthy so my body can fight of heart disease	4	3	2	1

14	I am not worried that I might get heart disease	4	3	2	1
15	People my age are too young to get heart disease	4	3	2	1
16	People my age do not get heart disease	4	3	2	1
17	My lifestyle habits do not put me at risk for heart disease	4	3	2	1
18	No matter what I do, if I am going to get heart disease, I will get it	4	3	2	1
19	People who don't get heart disease are just plain lucky	4	3	2	1
20	The causes of heart diseases are unknown	4	3	2	1

Appendix D: Non-Laboratory-Based INTERHEART Risk Score

Risk factor	Question	Points for the answer		Points for each section
Age	Are you a man 55 years or older OR woman 65 years or older?		2	**Points:**
	OR Are you a man younger than 55 years or woman younger than 65 years		0	
Smoking. Pick the description which matches you best:	I never smoked		0	**Points:**
	OR I am a former smoker (last smoked more than 12 months ago)		2	
	OR I am a current smoker or I smoked regularly in the last 12 months, and I smoke…	1-5 cigarettes per day	2	
		6-10 cigarettes per day	4	
		11-15 cigarettes per day	6	
		16-20 cigarettes per day	7	
		More than 20 cigarettes per day	11	
Second hand smoke	Over the past 12 months, what has been your typical exposure to other people's tobacco smoke?	Less than 1 hour or exposure per week or no exposure	0	**Points:**
		OR One or more hours of secondhand smoke exposure per week	2	
Diabetes	Do you have diabetes mellitus?	Yes	6	**Points:**
		No or unsure	0	
High Blood Pressure	Do you have high blood pressure	Yes	5	**Points:**
		No or unsure	0	
Family history	Have either or both of your biological parents had a heart attack?*	Yes	4	**Points:**
		No or unsure	0	
Waist to hip ratio	Pick one only:	Quartile 1: Less than 0.873	0	**Points:**
		Quartile 2 &3: 0.873 - 0.963	2	
		Quartile 4: greater than or =0.964	4	
Psychosocial factors	How often have you felt work or home life stress in the last year? Pick one only	Never or some periods	0	**Points:**
		OR Several periods of stress or permanent stress	3	
	During the past 12 months, was there ever a time when you felt sad, blue, or depressed for two	Yes	3	**Points:**

	weeks or more in a row?	No	0	
Dietary factors. Pick one answer for each food group mentioned	Do you eat salty food or snacks one or more times a day	Yes	1	**Points:**
		No	0	
	Do you eat deep fried foods or snacks or fast foods 3 or more times a week?	Yes	1	**Points:**
		No	0	
	Do you eat fruit one or more times daily?	Yes	0	**Points:**
		No	1	
	Do you eat vegetables one or more times daily?	Yes	0	**Points:**
		No	1	
	Do you eat meat and/ or poultry 2 or more times daily?	Yes	2	**Points:**
		No	0	
Physical activity	How active are you during your leisure time?	I am mainly sedentary or perform mild exercise (requiring minimal effort)	2	**Points:**
		OR I perform moderate or strenuous physical activity in my leisure time	0	

Appendix E: Focus Guide

1. What do you understand by the term “cardiovascular disease” (CVD)?

   Probes

2. What problems do you think are associated with CVD?

   Probes

3. What do you think can put a person at risk of having CVD?

   Probes

4. What CVD risk factors do you think you may have from your knowledge of CVD?

` Probes

5. How do you think the risk factors of CVD can be prevented?

   Probes

Appendix F: Ìgbéléwọ̀n Ìwòye Ẹ̀ni Nípa Ewu àti ní Àìsàn Ọkàn

Ìlànà ìfúnni ní máàkìàfiyelé

Jọ̀ọ́, yan èyí tí ó bá a yín mu jùlọ

Mi ò faramọ rárá =1

Mi ò faramọ= 2

Mo faramọ= 3

Mo faramọ gan-an = 4

		Mi ò faramọ rárá	Mi ò faramọ	Mo faramọ	Mo faramọ gan-an
1	Ó ṣeé ṣe kí ó jẹ́ pé mo ní àìsàn ọkàn	1	2	3	4
2	Ó ṣeé ṣe dáadáa pé mo máa ni àìsàn ọkàn ní bí ọdún mẹ́wàá sí ìsinyìí	1	2	3	4
3	Ẹ̀ni tó ní àìsàn ọkàn kò ní ìrètí ìwòsàn rárá	1	2	3	4
4	Ó ṣeé ṣe púpọ̀ fún mi láti ní àìsàn ọkàn torí àwọn ìṣe mi àtẹ̀yìnwá	1	2	3	4
5	Mo mọ̀ dájú pé mo máa ni àìsàn ọkàn	1	2	3	4
6	Ìgbéayé ní ìlànà ìlera tó péye kò ṣeé ṣe	4	3	2	1
7	Ó ṣee é ṣe pé mo máa ní àìsàn ọkàn	1	2	3	4
8	Mo wà nínú ewu àti ní àìsàn ọkàn	1	2	3	4
9	Ó ṣeé ṣe kí n ní àìsàn ọkàn lọ́jọ́ iwájú	1	2	3	4
10	Mi ò ṣe ohunkóhun báyìí tí ó lè ṣe àkóbá fún ọkàn mi	4	3	2	1
11	Mo kéré lọ́jọ́ orí láti ní àìsàn ọkàn	4	3	2	1
12	Àwọn èèyàn bí tèmi kì í ní àìsàn ọkàn	4	3	2	1
13	Mo wà ní ìlera tó péye, nítorí náà, ara mi lè gbógùn ti àìsàn ọkàn.	4	3	2	1
14	Mi ò páyà pé mo lè ní àìsàn ọkàn	4	3	2	1
15	Àwọn èèyàn tó wà ní ọjọ́-orí mi ti kéré jù láti ní àìsàn ọkàn	4	3	2	1

16	Àwọn èèyàn tó wà ní ọjọ́-orí mi kì í ní àìsàn ọkàn	4	3	2	1
17	Ìṣe ìgbéayé mi kò fimí sínú ewu àtiní àìsàn ọkàn	4	3	2	1
18	Ohunkóhun tí n ó báa ṣe, bí n ó bá ní àìsàn ọkàn, n ó ni.	4	3	2	1
19	Àwọn èèyàn tí kò ní àìsàn ọkàn kàn ṣoríire ni	4	3	2	1
20	A kò mọ àwọn nǹkan tí ó ń ṣòkùnfà àìsàn ọkàn	4	3	2	1

Appendix G: Àmì Ewu ti INTERHEART Alàìgbéyẹ̀wò ní Láàbù

Okùnfà ewu	Ìbéèrè	Àmì fún ìdáhùn	Àmì fún ìpín kọ̀ọ̀kan
Ọjọ́-orí	Ṣé ọkùnrin tí ọjọ́-orí rẹ̀ jẹ́ ọmọ-ọdún márùndínlógóta tàbí ju bẹ́ẹ̀ lọ tàbí obìnrin tí ọjọ́-orí rẹ̀ jẹ́ márùndínlógóta tàbí ju bẹ́ẹ̀ lọ niyín?	2 TÀBÍ Ṣé ẹ jẹ́ ọkùnrin tí kò tó ọmọ-ọdún márùndínlàádọ́rin tàbí obìnrin tí kò tó ọmọ-ọdún márùndínlógóta 0	Àpapọ̀ àmì
Mimu sìgá. Ẹ Yan Àpejúwe tí ó báa yínmu	N ò mu sìgá rí 0 TÀBÍ Mo ti mu sìgá rí (ó ti ju oṣù méjìlá sẹ́yìn tí mo mu sìgá) 2 TÀBÍ Mo ṣì ń mu sìgá báyìí tàbí mo mu sìgá dáadáa láàárín oṣù méjìlá sẹ́yìn. Mo mu Sìgá kan sí márùn-ún lójúmọ́ 2 Sìgá méfà sí mẹ́wàá lójúmọ́ 4 Sígà mọ́kànlá sí méjìdógún lójúmọ́ 6 Sìgá mẹ́rìndínlógún sí ogún lójúmọ́7 Ju ogún sìgá lọ lójúmọ́ 11		Àpapọ̀ àmì
Fífa èéfín sìgá sínú	Láàárín oṣù méjìlá sẹ́yìn, báwo ni ẹ ṣe fa èéfín sìgá tí àwọn mìíràn ń mu sínú sí?	Kò tó wákàtí kan, tí mo fi fa sìgá sínú lọ́sẹ̀, tàbí mi ò fa èéfín sínú rárá 0 TÀBÍ fífa èéfín sìgá sínú fun wákàtí 2 kan tàbí ju bẹ́ẹ̀ lọ lọ́sẹ̀	Àpapọ̀ àmì
Ìtọ́-ṣúgà	Ṣé ẹ ní ìtọ́ ṣúgà?	Bẹ́ẹ̀ ni 6 Rárá tàbí kò dájú 0	Àpapọ̀ àmì
Èjè-ríru	Ṣé ẹ ní èjè-rírú	Bẹ́ẹ̀ ni 5 Rárá tàbí kò dájú 0	Àpapọ̀ àmì
Ìfarahàn nínú ẹbí	Ǹjẹ́ ọkan tàbí àwọn òbí yín méjéèjì ti ní àìsàn ọkàn?	Bẹ́ẹ̀ ni 4 Rárá tàbí kò dájú 0	Àpapọ̀ àmì
Ìwọn bèbè ìdí sí ìbàdí	E yan ọkan péré	Ìlàrin 1: kò tó 0.873 0 Ìlàrin 2 &3: 0.873 – 0.963 2	Àpapọ̀ àmì

	Ìlàrin 4: ju tàbí 0.964		4	
Okùnfà ìṣe ìṣe-ojoojúmọ́	Báwo ni ẹ ṣe rò pé iṣẹ́ tàbí ilé ṣe nira sí lọ́dún tó kọjá. Yan ọ̀kan.	Kò ṣẹlẹ̀ rí tàbí ní àwọn àkókò kan ÌTÀBÍ Ọ̀pọ̀ wàhálà nígbà gbogbo.	0 3	Àpapọ̀ àmì
	Ní àárín oṣù méjìlá sẹ́yìn, ǹjẹ́ ìgbà kankan wà tí ọkàn yin gbọgbẹ́ fún ọ̀ṣẹ̀ méjì tàbí ju bẹ́ẹ̀ lọ léraléra?	Bẹ́ẹ̀ ni Rárá	3 0	Àpapọ̀ àmì:
Òkùnfà ajẹmọ́ oúnjẹ. E yan ìdáhùn kan fún oúnjẹ kọ̀ọ̀kan tí a dárúkọ	Ǹjẹ́ ẹ máa ń jẹ oúnjẹ oníyọ̀ tàbí ìpanu ní ẹ̀ẹ̀kan tàbí ju bẹ́ẹ̀ lọ lójúmọ́?	Bẹ́ẹ̀ ni Rárá	1 0	Àpapọ̀ àmì:
	Ǹjẹ́ ẹ máa ń jẹ oúnjẹ díndín bíi àkàrà, pọfupọ́ọ̀fù, ìpápánu tàbí àràjẹ ní ẹ̀ẹ̀mẹta tàbì ju bẹ́ẹ̀ lọ lọ́sẹ̀?	Bẹ́ẹ̀ ni Rárá	1 0	Àpapọ̀ àmì:
	Ǹjẹ́ ẹ máa ń jẹ èso ní ẹ̀ẹ̀kan tàbí ju bẹ́ẹ̀ lọ lójúmọ́?	Bẹ́ẹ̀ ni Rárá	1 0	Àpapọ̀ àmì:
	Ǹjẹ́ ẹ máa ń jẹ ẹ̀fọ́ ní ẹ̀ẹ̀kan tàbí ju bẹ́ẹ̀ lọ lójúmọ́?	Bẹ́ẹ̀ ni Rárá	0 1	Àpapọ̀ àmì:
	Ǹjẹ́ ẹ máa ń jẹ ẹran màálúù, ewúrẹ́ àti bẹ́ẹ̀ bẹ́ẹ̀ lọ tàbí ẹran abíyẹ́ bíi adìyẹ, pẹ́pẹ́yẹ, tòlótòló àti bẹ́ẹ̀ bẹ́ẹ̀ lọ ní ẹ̀ẹ̀mejì tàbí ju bẹ́ẹ̀ lọ lójúmọ́?	Bẹ́ẹ̀ ni Rárá	2 0	Àpapọ̀ àmì:
Ìṣe ojoojúmọ́	Báwo ni ìṣe ojoojúmọ́ yín ní àkókò tí ọwọ́-bá-dilẹ̀	Mo sábà máa ń wà lójú kan ni tàbí pé mo máa ń ṣé àwọn nǹkan tí kò la wàhálà lọ (tí kò gba	2	Àpapọ̀ àmì:

	akitiyan púpọ̀) _____ TÀBÍ Mo máa ń ṣe iṣẹ́ níwọ̀n 0 tàbí dáadáa ní àkókò tí ọwọ́-bá-dilẹ̀

Appendix H: Data Repository

CVD perception and risk data.sav

Appendix I: Other Analysis Tables

A1: Participants' CVD perception

State	Rural n (%)	Urban n (%)
Oyo state		
Poor perception	83 (29.5)	23 (11.9)
Good perception	198 (70.5)	170 (88.1)
Lagos State		
Poor perception	50 (20.0)	49 (19.7)
Good perception	200 (80.0)	200 (80.3)
Ogun State		
Poor perception	136 (53.8)	77 (28.8)
Good perception	117 (46.2)	190 (71.2)
All Sample		
Poor perception	269 (34.3)	149 (21.0)
Good perception	515 (65.7)	560 (79.0)

A2: Participants' risk level

Parameter	Rural **n (%)**	Urban **n (%)**
Oyo		
Low	180 (64.5)	99 (52.1)
Moderate	77 (27.6)	64 (33.7)
High	22 (7.9)	27 (14.2)
Lagos		
Low	95 (38.0)	116 (46.8)
Moderate	84 (33.6)	84 (33.9)
High	71 (28.4)	48 (19.3)
Ogun		
Low	100 (39.8)	144 (53.9)
Moderate	113 (45.0)	92 (34.5)
High	38 (15.2)	31 (11.6)
All samples		
Low	375 (48.1)	359 (50.9)
Moderate	274 (35.1)	240 (34.0)
High	131 (16.8)	106 (15.0)

A3: Response distribution on Non-Laboratory-Based INTERHEART Risk Score

Risk factor	Question		Points	f (%)
Age	Are you a man younger than 55 years or a woman younger than 65 years		2	1167 (78.3)
	Are you a man 55 years or older OR a woman 65 years or older		0	323 (21.7)
Smoking	Never smoked		0	1393 (93.5)
	Last smoked > 12 months ago OR Current smoker (1-5 cigarettes per day)		2	89 (6.0)
	Current smoker (6-10 cigarettes per day)		4	4 (0.3)
	Current smoker (11-15 cigarettes per day)		6	1 (0.1)
	Current smoker (16-20 cigarettes per day)		7	1 (0.1)
	Current smoker (> 20 cigarettes per day)		11	2 (0.1)
Second-hand smoke	Over the past 12 months, what has been your typical exposure to other people's tobacco smoke?	Less than 1 hour of exposure per week or no exposure	0	1370 (91.9)
		One or more hours of second-hand smoke exposure per week	2	120 (8.1)
Diabetes	Do you have diabetes mellitus?	No or Unsure	0	1415 (95.0)
		Yes	6	75 (5.0)
High blood pressure	Do you have high blood pressure?	No or Unsure	0	1181 (79.3)
		Yes	5	309 (20.7)
Family history	Have either or both of your biological parents had a heart attack? *	No or Unsure	0	1409 (94.6)
		Yes	4	81 (5.4)
Waist-to-hip ratio	Pick one only:	Quartile 1 (<0.873)	0	783 (52.6)
		Quartile 2 & 3 (0.873 to 0.963)	2	511 (34.3)
		Quartile 4 (≥0.963)	4	195 (13.1)
Psychosocial factors	How often have you felt work or home life stress in the last year? Pick one only	Never or some periods	0	897 (60.2)
		Several periods of stress or permanent stress	3	593 (39.8)
	During the past 12 months, was there ever a time when you felt sad, blue, or depressed for two weeks or more in a row?	No	0	849 (57.1)
		Yes	3	639 (42.9)
Dietary factors. Pick one answer for each food group mentioned	Do you eat salty food or snacks one or more times a day?	No	0	541 (36.3)
		Yes	1	948 (63.7)
	Do you eat deep fried foods or snacks or fast foods three or more times a week?	No	0	757 (50.8)
		Yes	1	733 (49.2)
	Do you eat fruit one or more times daily?	Yes	0	774 (51.9)
		No	1	716 (48.1)
	Do you eat vegetables one or more times daily?	Yes	0	582 (39.1)
		No	1	908 (60.9)
	Do you eat meat and/or poultry two or more times daily?	No	0	757 (50.8)
		Yes	2	733 (49.2)
Physical activity	How active are you during your leisure time?	I perform moderate or strenuous physical activity in my leisure time	0	689 (46.3)
		I am mainly sedentary or perform mild exercise (requiring minimal effort)	2	800 (53.7)

A4: Three most prevalent risk factors in each state

	Risk factor	Prevalence (%)
	Oyo State	
1	**Eat vegetables one or more times daily**	
	Yes	33.8
	No	66.2*
2	**Eat salty food one or more times daily**	
	No	35.7
	Yes	64.3*
3	**Physical activity level at leisure time**	
	Moderate or strenuous	53.1
	Sedentary or mild exercise	46.9*
	Lagos State	
1	**Eat vegetables one or more times daily**	
	Yes	30.9
	No	69.1*
2	**Eat salty food one or more times daily**	
	No	44.1
	Yes	55.9*
3	**Physical activity level at leisure time**	
	Moderate or strenuous	47.6
	Sedentary or mild exercise	52.4*
	Ogun State	
1	**Eat salty food one or more times daily**	
	No	29.5
	Yes	70.5*
2	**Physical activity level at leisure time**	
	Moderate or strenuous	38.8
	Sedentary or mild exercise	61.2*
3	**Eat fried or fast food three more times a week**	
	No	39.8
	Yes	60.2

* = prevalence of the risk category

A5: Three most prevalent risk factors in rural and urban areas

	Risk factor	Prevalence
	Rural	
1	**Eat salty food one or more times daily**	
	Yes	33.2
	No	66.8*
2	**Eat vegetables one or more times daily**	
	No	39.9
	Yes	60.1*
3	**Physical activity level at leisure time**	
	Moderate or strenuous	47.4
	Sedentary or mild exercise	52.6*
	Urban	
1	**Eat vegetables one or more times daily**	
	Yes	38.1
	No	61.9*
2	**Eat salty food one or more times daily**	
	No	39.8
	Yes	60.2*
3	**Physical activity level at leisure time**	
	Moderate or strenuous	45.0
	Sedentary or mild exercise	55.0*

* = prevalence of the risk category

A6: Binary logistic regression: sociodemographic characteristics that could differentiate good and poor perception. (≤40 = poor; ≥41 = good)

Parameter	Regression Coefficient (B)	Odds Ratio	*p*-value
Sex (reference = male)	-0.314	0.730	0.016*
Age group: Young adult (reference)			0.954
Middle-aged adult	0.009	1.010	0.958
Older adult	0.045	1.046	0.787
Marital status (reference = do not have a partner)	0.056	1.058	0.688
Education: Primary or no formal (reference)			<0.001*
Secondary	0.713	2.040	<0.001*
Tertiary	0.486	1.626	0.001*
Residence (reference = rural)	0.593	1.809	<0.001*
State: Oyo (reference)			<0.001*
Lagos State	-0.867	0.420	<0.001*
Ogun State	-1.101	0.333	<0.001*
Constant	-0.928	0.395	<0.001*

Approach: simultaneous entry. * = *p*-value < 0.05 is significant.
Model summary: χ^2 (9, N = 1458) = 133.712, $p < 0.001$. Nagelkerke R square = 0.126. Overall prediction success was modest at 74.6%, with 94.8% of people with good perception correctly classified and 23.1% with poor perception classified.

A7: Binary logistic regression: sociodemographic characteristics that could differentiate low-risk and high-risk levels. (≤ 9 = low-risk; ≥10 = high-risk)

Variable	Regression Coefficient (B)	Odds Ratio	*p*-value
Sex (reference = male)	0.509	1.664	<0.001*
Age group: Young adult (reference)			<0.001*
Middle-aged adult	-1.206	0.299	<0.001*
Older adult	-0.901	0.406	<0.001*
Marital status (reference = do not have a partner)	-0.003	0.997	0.984
Education: Primary or no formal (reference)			0.003*
Secondary	0.304	1.356	0.053
Tertiary	-0.244	0.784	0.069
Residence (reference = rural)	0.067	1.070	0.564
State (Oyo reference)			<0.001*
Lagos State	-0.506	0.603	<0.001*
Ogun State	0.109	1.115	0.414
Constant	0.732	2.079	<0.001*

Approach: simultaneous entry. * = *p*-value < 0.05 is significant.
Model summary: χ^2 (9, N = 1450) = 137.028, $p < 0.001$. Nagelkerke R square = 0.120. Overall prediction success was modest at 60.9%, with 64.9% of people with low-risk status correctly classified and 57.0% with high-risk status correctly classified.

A8: Communalities of PRHDS items

	Item	Initial communalities
1.	Ó ṣeé ṣe kí ó jẹ́ pé mo ní àìsàn ọkàn	.533
2.	Ó ṣeé ṣe dáadáa pé mo máa ni àìsàn ọkàn ní bí ọdún mẹ́wàá sí ìsinyìí	.618
3.	Ẹni tó ní àìsàn ọkàn kò ní ìrètí ìwòsàn rárá	.151
4.	Ó ṣeé ṣe púpọ̀ fún mi láti ní àìsàn ọkàn torí àwọn ìṣe mi àtẹ̀yìnwá	.601
5.	Mo mọ̀ dájú pé mo máa ni àìsàn ọkàn	.552
*6.	Ìgbéayé ní ìlànà ìlera tó péye kò ṣeé ṣe	.203
7.	Ó ṣee é ṣe pé mo máa ní àìsàn ọkàn	.599
8.	Mo wà nínú ewu àti ní àìsàn ọkàn	.611
9.	Ó ṣeé ṣe kí n ní àìsàn ọkàn lọ́jọ́ iwájú	.554
*10.	Mi ò ṣe ohunkóhun báyìí tí ó lè ṣe àkóbá fún ọkàn mi	.403
*11.	Mo kéré lọ́jọ́ orí láti ní àìsàn ọkàn	.487
*12.	Àwọn èèyàn bí tèmi kì í ní àìsàn ọkàn	.520
*13.	Mo wà ní ìlera tó péye, nítorí náà, ara mi lè gbógùn ti àìsàn ọkàn.	.569
*14.	Mi ò páyà pé mo lè ní àìsàn ọkàn	.593
*15.	Àwọn èèyàn tó wà ní ọjọ́-orí mi ti kéré jù láti ní àìsàn ọkàn	.581
*16.	Àwọn èèyàn tó wà ní ọjọ́-orí mi kì í ní àìsàn ọkàn	.540
*17.	Ìṣe ìgbéayé mi kò fimí sínú ewu àtiní àìsàn ọkàn	.595
*18.	Ohunkóhun tí n ó báa ṣe, bí n ó bá ní àìsàn ọkàn, n ó ni.	.196
*19.	Àwọn èèyàn tí kò ní àìsàn ọkàn kàn ṣoríire ni	.475
*20.	A kò mọ àwọn nǹkan tí ó ń ṣòkùnfà àìsàn ọkàn	.445

* = reverse-coded items.