Public Health Research

Uwaka et al. Afr Chron Res Pub J 2025 1(1):19-35

Article URL:https://researchpubjournals.org/?p=1414

Assessment of the relationship between waist circumference and cardiovascular diseases risk factors among young people in North Senatorial District of Delta State, Nigeria: Study proposal.

Uwaka EO,[1,2] Otutu MO,[1] Nwose EU[1,3]

[1]Department of Public and Community Health, Novena University Ogume, Delta State, Nigeria.

[2]Director of Medical Services and Acting head of department of public health technology, Delta State Polytechnic, Ogwashi-Uku, Delta State, Nigeria.

[3]School of Health & Medical Sciences, University of Southern Queensland. Toowoomba Australia

Corresponding Author: Dr. Uwaka E.O. Director of Medical Services and Acting head of department of public health technology, Delta State Polytechnic, Ogwashi-Uku, Delta State, Nigeria. E-mail: uwaka26@yahoo.com. Tel: +2348054717405. ORCHID ID: 0009-0008-9189-0534

Received: 09/04/2025

Accepted: 12/05/2025

Published: 27/07/2025

Public Health Research

Uwaka et al. Afr Chron Res Pub J 2025 1(1):19-35

Article URL:https://researchpubjournals.org/?p=1414

Abstract

Background: In the whole world cardiovascular diseases (CVDs) remain the number one cause of death, recording over 17.9million deaths in 2019, which represents about 32% of global deaths. Over the past two decades there has generally been an improvement in cardiovascular health among middle-aged and elderly adults worldwide. However, young adults under the age of 35 years have developed increasingly unhealthy cardiovascular risk profiles.

Objective: To assess the relationship between waist circumference and cardiovascular diseases risk factors among young people in North Senatorial District of Delta State, Nigeria.

Methods: This will be a cross-sectional, descriptive, and observational hospital-based study, to be carried out among young adults aged 18-35 years living in Delta North Senatorial District, Nigeria. Statistic design will be mixed methods involving a variety of quantitative analysis approaches for the different specific objectives. An interviewer administered questionnaire will be used for data collection while data analysis will be done using SPSS version 26 and statistical significance will be set at $p = 0.05$.

Expected outcomes: This includes estimation of the prevalence of cardiovascular risk factors and their clustering among respondents. It will assess the knowledge and attitude of the respondent to CVDs risk factors. It will also assess the association between waist circumference and other obesity indices. And finally the association between obesity indices and other CVDs risk factors will also be assessed.

Significance: If the hypothesis of this study is found to be true then, it will be easier and cheaper to screen routinely for CVDs risk factors especially at General Outpatient Department (GOPD) or primary care settings using measurement of waist circumference alone.

Keywords: Waist circumference, Obesity, Cardio-metabolic diseases, Risk factors, Young adults.

Introduction:

Non-communicable diseases (NCDs), also known as chronic disorders, tend to be of long duration and are as a result of a combination of genetic, pathological, environmental and behavioural factors. (WHO, 2023). These NCDs are on the increase and are driven by forces that include rapid urbanization, globalization of unhealthy lifestyle (unhealthy diet, reduced physical activity, etc) and population aging. (WHO, 2021). The effect of these driving forces may manifest in people as raised blood pressure, increased blood glucose, elevated blood lipids, obesity and stress. (WHO, 2021) These factors listed above are referred to as cardio-metabolic diseases (CMDs), which are risk factors for NCDs. However, cardiovascular diseases (CVDs) and diabetes (which is also a metabolic disorder) are the leading NCDs worldwide (WHO, 2023). Therefore, these factors may invariably be referred to as risk factors of CVDs.

According to the Global Burden Disease Study (2019), CVDs cases rose from 272 million to 523 million, mortality from 12.1 million to 18.6 million, and disability-adjusted life years (DALY) from 279.8 million to 393.1 million between 1990 and 2019 (Sun, et al, 2023). More than four out of five CVD deaths are due to heart attacks and strokes, and one third of these deaths occur prematurely in people under 70 years of age (WHO, 2021). The increasing prevalence of CVDs among young adults is attributed to unhealthy lifestyles which usually starts from adolescence to adulthood, and this put them at a higher risk for CMDs (Andersson & Vasan, 2018). If left uncontrolled, these behaviors can lead to early development of CVDs and premature death. However, eighty percent of CVD cases are preventable, but the tools and knowledge to reduce harm to cardiovascular health are not being utilized in low and middle-income countries like Nigeria (this inequity is glaring and needs urgent attention) (Di Cesare et al, 2023).

Patho-physiologically abdominal fat, particularly visceral or ectopic adiposity, and insulin resistance are the main contributors to elevated CVDs risk factors (Oguoma, 2015). The mechanism underlying the relationship between these risk factors and CVDs lies between the concept of endothelial injury and dysfunction, deposition of low density lipoprotein cholesterol, and recruitment,

migration and proliferation of monocytes in smooth muscle cells of the arterial wall. These processes are central to the initiation and progression of atherosclerosis (Oguoma 2015).

The primary management of elevated CVDs risk factors are embedded in the core principles of primary healthcare as enshrined in the Alma Ata Declaration. Primary healthcare management of CVDs risk factors primarily begins with screening of i) behavioural/lifestyle risk factors, using knowledge, attitude and practice; and ii) measurement of CMD risk factors using waist circumference and other anthropometric measurement, blood pressure, fasting blood glucose, and serum lipid profile. The next step is risk stratification of the patients after which the patients are treated based on the above risk stratification, using either primordial, primary, secondary or tertiary preventions. These treatment measures include health education and promotion, lifestyle modification, use of medications and specialized care such cardiac and physical rehabilitation, and palliative care.

Statement of the problem:

According to a 2018 World Health Organization (WHO) country profile, non-communicable diseases (NCEs) were predicted to be responsible for 29% of all deaths in Nigeria, with cardiovascular diseases (CVDs) accounting for 11% of these fatalities (Onyema & Ike, 2020). Heart failure, stroke, and hypertension are among the CVDs that have been identified to be on the rise in Nigeria over the last 20 years (Onyema & Ike, 2020). In Delta State Nigeria, persons mostly affected are the young adults who mostly engage in CVDs risk behaviours (Oguoma et al, 2015; Umuerri, 2019). This finding was supported by studies in Delta State, South-Southern, Nigeria which showed that the prevalence of having one risk factor among young adults was 98% (Umuerri 2019), in Maiduguri, North-Eastern Nigeria was 92% (Mukhtal et al, 2021) while in Ibadan, South-Western, Nigeria it was 70.1% (Olufayo et al, 2022). These observations clearly showed that our young adults are becoming more involved with unfavorable lifestyle behaviors and are already developing CMDs which predispose them to early development of cardiovascular diseases and premature deaths. In Nigeria young adults are those aged between 18 and 35 years, but the mean ages of the study

population in many of the CVD-related epidemiological studies done in Nigeria were over 35 years. Thus, the heart health of young adults living in Nigeria can be described as largely understudied (Umuerri 2019).

Screening for these cardiovascular risk factors at the General outpatient Clinic (GOPC) is cumbersome and expensive. But measurement of most of the obesity indices (especially waist circumference and hip circumference) are easier to measure with some requiring only a measuring tape to achieve. However, of all these obesity indices, waist circumference that is used to estimate abdominal obesity (which is a fore runner to other cardiovascular risk factors), have been found to have the closest correlation with obesity, type 2 diabetes, hypertension, hypercholesterolaemia and other CVDs risk factors (Cisse et al., 2021). So, in this study four obesity indices will be considered independently as well as combined and will also correlate them with other cardiovascular risk factors. At the end, the study will try to find out how effective waist circumference alone could be used as an early predictor of other cardiovascular risk factors especially if it correlates well with these other risk factors. If the hypotheses of this study is therefore found to be true then, it will be easier and cheaper to screen routinely for cardiovascular risk factors especially at GOPC or primary care settings using measurement of waist circumference alone. This justify why the research needs to be carried out.

General Objective

To assess the relationship between waist circumference and cardiovascular diseases risk factors among young people in North Senatorial District of Delta State, Nigeria.

Specific Objectives:

To assess among young adults attending GOPC at General Hospitals in Delta North Senatorial District of Delta State:

1. The prevalence of CMD risk factors.
2. The clustering of behavioral and social risk factors with CMDs.
3. The knowledge of CMD risk factors.
4. The perception and attitude of CMD risk factors.
5. The association between behavioural and social risk factors with CMDs.
6. The association between waist circumference and other obesity indices
7. The association between obesity indices, and other CMD risk factors.

Table 1 provides an outline of these specific objectives and matched with respective hypothesis and research designs. These are followed with further details of the proposal.

Table 1: Specific objectives match research designs (Uwaka et al., 2024)

Objective	Hypothesis	Research Design	Proposal Statistics
To estimate the prevalence of CMD risk factor	CMD risk factors is more prevalence among young adults in Delta North Senatorial District of Delta State	Cross-sectional	Descriptive frequencies
To assess the prevalence of clustering of behavioral/ lifestyle risk factors and CMD within the demographic variables and social risk factors	CMD risk factors clustered more among young adults with good socio-demographic index	Cross-sectional	Comparative analysis
To assess for knowledge, attitude and perception of cardio-metabolic diseases among young adults with unhealthy lifestyle	Presence of unhealthy lifestyle increases the knowledge and perception of cardio metabolic diseases	Cross-sectional	Descriptive and inferential statistics
To assess for association between behavioral /lifestyle and social risk factors with CMD.	There is a significant association between behavioral/ lifestyle and social risk factors with CMD.	Cross-sectional	Inferential analysis (Chi-squared test), Bivariate and Multivariate regression Analysis
To assess association between waist circumference and other obesity indices	There is a significant association between waist circumference and other obesity indices	Cross-sectional	Inferential analysis (t-test/anova) and multivariate regression analysis
To demonstrate for association between obesity indices and other CMD risk factors	There is a significant association between obesity indices and other CMD risk factors	Cross-sectional	Inferential analysis (t-test/anova) and multivariate regression analysis

Research Questions:

Among young adults attending GOPC at General hospitals in Delta North Senatorial District of Delta State:

1) What is the level of prevalence of CMD risk factors?
2) How clustered are the behavioural/lifestyle/social risk factors and CMDs?
3) What is the knowledge of CMD risk factors?
4) What is the perception and attitude of CMD risk factors?
5) Is there a significant association between behavioural and social risk factors with CMD?
6) Is there a significant association between waist circumference and other obesity indices?
7) Is there a significant association between obesity indices and other CMD risk factors?

Hypotheses statements

Question 1

a) Null Hypotheses: CMD risk factors is less prevalence among young adults attending GOPC at General hospitals in Delta North Senatorial District of Delta State.

b) Alternative Hypotheses: CMD risk factors is more prevalence among young adults attending GOPC at General hospitals in Delta North Senatorial District of Delta State

Question 2

a) Null Hypotheses: CMD risk factors clustered less among young adults with poor socio-demographic index in Delta North Senatorial District of Delta State.

b) Alternative Hypotheses: CMD risk factors clustered less among young adults with good socio-demographic index in Delta North Senatorial District of Delta State.

Question 3

a) Null Hypotheses: Presence of unhealthy lifestyle decreases the knowledge of CMD.

b) Alternative Hypotheses: Presence of unhealthy lifestyle increases the knowledge of CMD

Question 4

a) Null Hypotheses: Presence of unhealthy lifestyle decreases the perception and attitude of CMD.

b) Alternative Hypotheses: Presence of unhealthy lifestyle increases the perception and attitude of CMD

Question 5

a) Null Hypotheses: There is no significant association between behavioural/lifestyle and social risk factors with CMD

b) Alternative Hypotheses: There is a significant association between behavioural/lifestyle and social risk factors with CMD

Question 6

a) There is no significant association between waist circumference and other obesity indices?

b) Alternative Hypotheses: There is a significant association between waist circumference and other obesity indices?

Question 7

a) Null Hypotheses: There is no significant association between obesity indices and other CMD risk factors?

b) Alternative Hypotheses: There is a significant association between obesity indices and other CMD risk factors?

Methods

Study design

This is designed to be a cross-sectional, descriptive, and observational hospital-based study. Statistic design is mixed methods involving a variety of quantitative analysis approaches for the different specific objectives (Table 1).

Study area or setting:

Administratively there are three senatorial districts in Delta State, Delta North, Delta Central and Delta South. The Delta North Senatorial District (DNSD), which is the study area, covers 9 local governments namely Aniocha North, Aniocha South, Ika North East, Ika South, Ndokwa East, Ndokwa West, Oshimili South, Oshimili North and Ukwani. In the State, each of the local government area headquarters has a state owned secondary health facility locate in them. Therefore, each of these facilities will be used for our study.

Study Population:

The study population comprises of young adults aged (18 – 35) years, living in the North Senatorial District of Delta State.

Sample size

The total of 450 respondents divided among 9 secondary facilities was determined, which came down to 50 respondents per facility.

Inclusion and Exclusion Criteria

Inclusion Criteria: This shall comprise young adults who have resided in DNSD for at least 1 year

Exclusion Criteria: Pregnant women, chronically ill patients, and patients attending private health facilities.

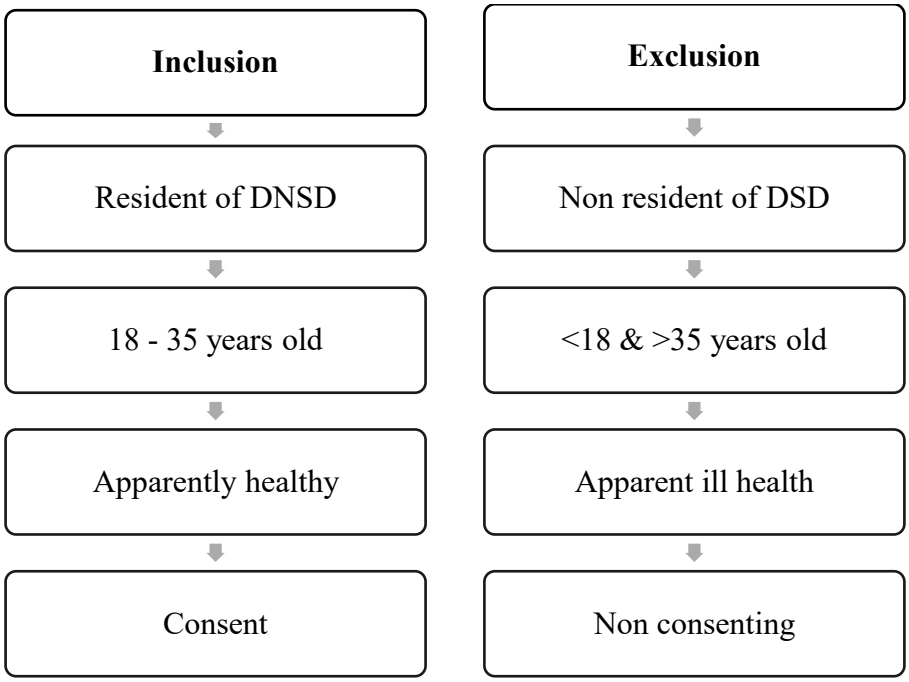

Fig 1: Selection criteria (Uwaka et al, 2024)

Sampling method:

Health facility: First, a purposeful selection of one General/Central hospital from each of the local Government headquarters and any other government specialist health facility found in that Local Government area will be selected.

Participants: Multi-staged sampling method will be used to select 50 respondents from each health facility who meets the inclusion criteria. The sampling design will follow the random and systematic approaches involving two steps. The sample size of 450 with the first respondent selected via a simple random sampling (balloting) method between the first four visitors who present at the GOPC with the inclusion criteria. Afterwards every fifth patient with the inclusion criteria will be selected until the sample size of fifty (50) for each facility is met (Fig 2).

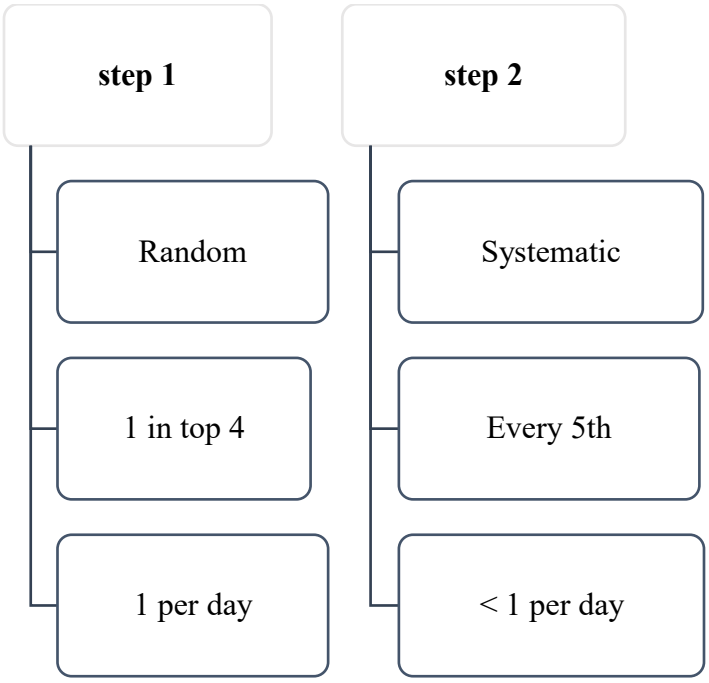

Fig 2: Summary of recruitment process (Uwaka et al, 2024).

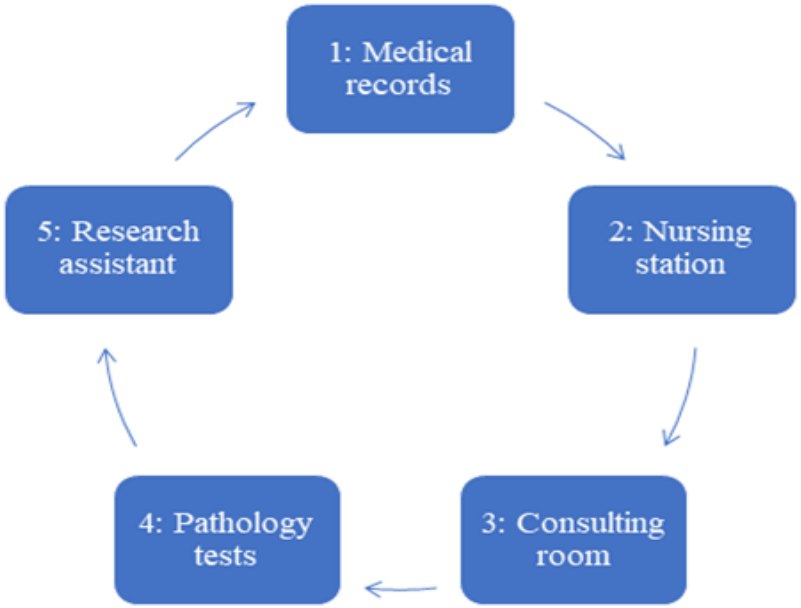

Fig 3a: Data collection procedure

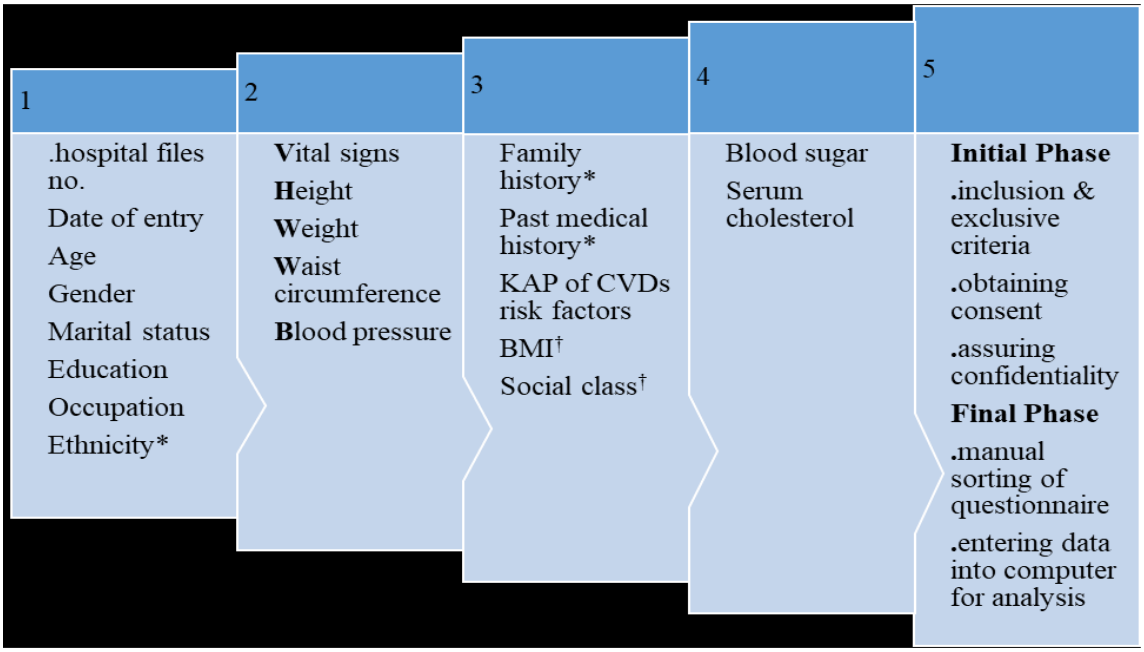

Fig 3b: Details of data collection procedure: Dynamic flow chart (Uwaka et al, 2024)
*Data for qualitative analysis, †dependent variables

Validity and reliability: The data collection tool was an adoption of the standard reliable and validated resource from the World Health Organisation , which has been in use for quite some time (World Health Organization, 2017, 2024).

Data collection

The main tool for this project is the questionnaire that has been adapted mainly from the WHO STEPS manual (World Health Organization, 2017, 2024) which is commonly used for observational studies. (Babaee et al., 2020; Bell Ngan et al., 2020; Oguoma et al., 2018). Also, the knowledge, attitude and practice section of the questionnaire has been adopted from the cardiovascular diseases risk factors knowledge, attitude, and practice-29 (Koohi et al, 2021). The data collections were set to occur in five stages (Fig 3). The questionnaire at the end will contain sections for social risk factors (socio-demography), behavioural/lifestyle measures, knowledge, attitude and perception of cardiovascular diseases risk factors, physical measurements,

and biochemical measurements of participants (Fig 4).

Statistical Analysis:

The data will be analysed along the following research questions and hypothesis (see table 1). The questionnaires will be manually sorted out, entered into a computer and the obtained data will be analyzed using IBM SPSS version 20. Descriptive analysis of all the variables measured will first be done, and the categorical variables will be reported as frequencies and proportions/percentages, while the continuous variables will be reported as means ± standard deviation. Cross-tabulations will be done to test for associations between the different categorical variables (in line with the objective of the study) using the chi-square test. Fisher's exact test will be used where the expected value is less than 5. Mixed logistic regression models will be conducted to estimate the association between each of the four obesity indicators (Body Mass Index-BMI, Waist Circumference-WC, Hip Circumference-HC and Total Body Fat Percentage-TBF%) as exposure variables and each of the CVDs risk factors (hypertension, hyperlipidaemia, hyperglycemia, behavioural risk factors, social risk factors) as dependent variables, in terms of ORs and 95%CIs. Since BMI, WC, HC and TBF% are inter-related, the strongest relationship with cardiovascular risk factors will be investigated by conducting mixed logistic regression models. This will be done by estimating the association (ORs and 95% CIs) between all four obesity indices as dependent variables in one model and each of the other CVDs risk factors as outcome variables.

Study limitations- SWOT summary

Strengths:

The sampling strategy used probability sampling method to ensure a good representative sample of the population. The questionnaire adapted is relatively cheaper. It is suitable for large representative population which can easily be collected, and widely used for epidemiology studies globally. The use of both quantitative and qualitative methods (mixed- methods approach) provides a comprehensive understanding of the research process. This study had a response rate of over 95% which increase the reliability of the findings. The accuracy of the measured variable was high because most of the tools used were standardized and validated.

Weaknesses:

Being a cross-sectional study with lack of control group makes it difficult to establish causality. There were no measures to control confounding variables and this therefore, may have influenced the findings. Errors in collecting and computing data may totally not be ruled out in a study and this may have compromise the accuracy of the findings.

Opportunities:

Almost ninety-five percent (95%) of the instruments used for measurements in this methodology were standard and validated. Ranging from the instruments used for the anthropometric measurements, laboratory measurements and the qualitative measures of physical activity, quality of diet, cigarette smoking and alcohol intake were all validated with good reliability scores. The study's findings may inform a policy decision where instruments used in methodology for studies should be standard and validated.

Threats (further limitations):

The cross-sectional design of the study will limit the ability of the study to provide causal inference. Limited financial resources made the study hospital base. The fact that the study is hospital-based may also affect the results of the study since it may not be a true representation of the entire population. Relying on self-reported data may introduce biases and inaccuracy. And the use of small sample size may not be a representative of the population.

Significance of the study

From the above analysis it's not surprisingly, therefore, in a review of the global CVD burden, it was observed that the burden borne by young people showed an increasing trend (Umuerri 2019). Therefore, this poor and worsening cardio-metabolic health among young adults calls for immediate public health actions to improve lifestyle behaviors and reduce cardio-metabolic disease risk, which are vital for young adults to prevent cardiovascular disease in their later life (Ibrahim et al., 2024, Gooding 2015). So, given that cardio-metabolic diseases are largely preventable and lifestyle behaviors are theoretically modifiable, devising effective and targeted interventions to improve cardio-metabolic health in young adults would deliver long-term health benefits (Shi et al, 2011).

Public health implications of the study

Risk Assessment: For screening of the general population for CVDs and their risk factors at the GOPC, measuring waist

circumference could be a routine part of general physical examination, along with other parameters like blood pressure, body temperature, respiratory rate and pulse rate.

Preventive Strategies: Individuals with an increased waist circumference would be advised to focus on lifestyle modifications, including regular exercise, healthy diet choices, and weight management, to reduce their cardiovascular risk.

Patient Education: Healthcare providers would educate patients about the significance of waist circumference and its role in cardiovascular health. This awareness can motivate individuals to adopt healthier habits and seek timely medical interventions.

Time frame

This research from initiation till its complete will take 30 months.

Ethical compliance

Ethical clearance:

Approval for the research will be sought from the Research and Ethics committee of the Delta State Ministry of Health, Delta State Hospital Management Board and Novena University Ogume, Delta State.

Consent/confidentiality:

Informed consent will be obtained from each participant and confidentiality will be maintained at each stage in accordance with clinical principle for the guidance of physicians in medical research as stipulated in the Helsinki Declaration of 1964 as reviewed in the sixth edition of 2008 (Williams, 2008).

References

Andersson, C., & Vasan, R. S. (2018). Epidemiology of cardiovascular disease in young individuals. Nature reviews. Cardiology, 15(4), 230–240. https://doi.org/10.1038/nrcardio.2017.154

Antza, C., Gallo, A., Boutari, C., Ershova, A., Gurses, K. M., Lewek, J., Mirmaksudov, M., Silbernagel, G., Sandstedt, J., & Lebedeva, A. (2023). Prevention of cardiovascular disease in young adults: Focus on gender differences. A collaborative review from the EAS Young Fellows. Atherosclerosis, 384, 117272. https://doi.org/10.1016/j.atherosclerosis.2023.117272

Babaee, E., Tehrani-Banihashem, A., Eshrati, B., Purabdollah, M., & Nojomi, M. (2020). How much hypertension is attributed to overweight, obesity, and hyperglycemia using adjusted population attributable risk in adults? Int J Hypertens, 2020, 4273456. https://doi.org/10.1155/2020/4273456

Bell Ngan, W., Essama Eno Belinga, L., Essam Nlo'o, A. S. P., Roche, F., Goethals, L., Mandengue, S. H., & Bongue, B. (2020). Surveillance of cardiovascular Risk factors in the Fifth Military Sector Health center, Ngaoundéré, Cameroon: observational study. JMIR Form Res, 4(11), e18567. https://doi.org/10.2196/18567

Cisse, K., Samadoulougou, S., Ouedraogo, M., Kouanda, S., & Kirakoya-Samadoulougou, E. F. (2021). Prevalence of abdominal obesity and its association with cardiovascular risk among the adult population in Burkina Faso.medRxiv (Cold Spring Harbor Laboratory). https://doi.org/10.1101/2021.01.25.21250457

Di Cesare, M., Bixby, H., Gaziano, T., Hadeed, L., Kabudula, C., McGhie, D. V., Mwangi, J., Pervan, B., Perel, P., Piñeiro, D., Taylor, S., & Pinto, F. (2023). World Heart Report 2023: Confronting the World's Number One Killer. Geneva, Switzerland. Available online at: https://world-heart-federation.org/wp-content/uploads/World-Heart-Report-2023.pdf Accessed 25/11/24

Gooding HC, Shay CM, Ning H, Gillman MW, Chiuve SE, Reis JP, et al. Optimal lifestyle components in young adulthood are associated with maintaining the ideal cardiovascular health profile into middle age. J Am Heart Assoc. 2015;4:e002048. https://doi.org/10.1161/jaha.115.002048

Ibrahim, K. G., Adeshina, K. A., & Jega, A. Y. (2024). Garcinia kola: A scoping review of its benefits in cardiometabolic health. Sokoto Journal of Medical Laboratory Science, 9(2), 185–196. https://doi.org/10.4314/sokjmls.v9i2.22

Koohi, F., Amiri, P., Mehrabi, Y., Karimi, M., & Khalili, D. (2021). Development and validation of a knowledge, attitude, and practice questionnaire regarding cardiovascular diseases in an Iranian general population. BMC Public Health, 21(1), 2050. https://doi.org/10.1186/s12889-021-12135-3

Mukhtar, I. G., Abdullahi, A. T., Muhammad, S. M., Sabiu, N. H., & Salisu, A. I. (2021). Prevalence of modifiable cardiovascular risk factors among undergraduate students in Kano Nigeria: A need for action. Journal of Taibah University Medical Sciences, 17(4), 578-586. https://doi.org/10.1016/j.jtumed.2021.10.013

Nwankwo, M., Okamkpa, C. J., & Danborno, B. (2022). Comparison of diagnostic criteria

and prevalence of metabolic syndrome using WHO, NCEP-ATP III, IDF and harmonized criteria: A case study from urban southeast Nigeria. Diabetes & Metabolic Syndrome Clinical Research & Reviews, 16(12), 102665. https://doi.org/10.1016/j.dsx.2022.102665

Oguoma V.M., Nwose E.U., Richards R.S. Skinner, T.C., Digban, K.A., Onyia, I.N. (2015). Prevalence of cardio-metabolic syndrome in Nigeria: a systematic review. Public Health, 129(5), 413-23. https://doi.org/10.1016/j.puhe.2015.01.017

Oguoma, V. M., Nwose, E. U., Skinner, T. C., Richards, R. S., & Bwititi, P. T. (2018). Diet and lifestyle habits: Association with cardiovascular disease indices in a Nigerian sub-population. Diabetes Metab Syndr, 12(5), 653-659. https://doi.org/https://doi.org/10.1016/j.dsx.2018.04.007

Olufayo, O. E., Ajayi, I. O., & Ngene, S. O. (2022). Clustering of cardiovascular disease risk factors among first-year students at the University of Ibadan, Nigeria: a cross-sectional study. Sao Paulo Medical Journal = Revista Paulista de Medicina, 141(2), 98–106. https://doi.org/10.1590/1516-3180.2021.0998.11052022

Onyema, C., & Ike, S. (2020). Cardiovascular diseases in Nigeria: What has happened in the past 20years? Nigerian Journal of Cardiology,17(1),21-26. https://doi.org/10.4103/njc.njc_33_19

Shi, S., Huang, H., Huang, Y., Zhong, V. W., & Feng, N. (2023). Lifestyle behaviors and cardiometabolic diseases by race and ethnicity and social risk factors among US young adults, 2011 to 2018. J Am HeartAssoc, 12(17), e028926. https://doi.org/10.1161/jaha.122.028926

Sun, J., Qiao, Y., Zhao, M., Magnussen, G., Xi, B. (2023). Global, regional and national burden of cardiovascular diseases in youths and young adults aged 15 – 39 years in 204 countries/territories, 1990 – 2019: a systematic analysis of Global Burden of Disease study 2019. BMC Medicine, 21(1):222. https://doi.org/10.1186/s12916-023-02925-4

Umuerri EM. (2019). Heart disease: lifestyle, knowledge, and perception among young Nigerian adults. Int J Cardiovasc Acad, 5(4), 134-40. https://ijcva.org/articles/doi/IJCA.IJCA_28_19

Uwaka, O. E., Otutu, M. O., & Nwose, E. U. (2024). Assessing the relationship between

waist circumference and cardiovascular diseases risk factors among young people in North Senatorial District of Delta State Nigeria: Mixed-method study protocol. *Protocol.io*. https://www.protocols.io/view/assessing-the-relationship-between-waist-circumfer-5jyl8d1x8g2w/v1

Williams, J. R. (2008). The Declaration of Helsinki and public health. Bull World Health Organ, 86(8), 650-652. https://doi.org/10.2471/blt.08.050955

World Health Organization. (2017). The WHO STEPwise instrument for non-communicable disease risk factor surveillance. In WHO STEPS Surveillance Manual. World Health Organization. https://cdn.who.int/media/docs/default-source/ncds/ncd-surveillance/steps/steps-manual.pdf?sfvrsn=c281673d_10

World Health Organization. (2021). Cardiovascular diseases (CVDs). Retrieved 28th Dec 2024 from https://www.who.int/news-room/fact-sheets/detail/cardiovascular-diseases-(cvds)#:~:text=Cessation%20of%20tobacco%20use%2C%20reduction,adopt%20and%20sustain%20healthy%20behaviours

World Health Organization (WHO). Non-communicable diseases. Updated on September 16th, 2023. Available at www.who.int>noncommunicable diseases>factsheets. Accessed December 23rd, 2023.

World Health Organization. (2024). The WHO STEPwise instrument for non-communicable disease risk factor surveillance. In WHO STEPS Surveillance Manual. World Health Organization. https://cdn.who.int/media/docs/default-source/ncds/ncd-surveillance/q-by-q_steps_instrument_v3.2.docx?sfvrsn=63b7a628_1&download=true

Declarations

Acknowledgement

I want to thank my supervisors Professor Uba Ezekiel Nwose and Dr. Michael Otutu for their time, support and contributions in reviewing this subject matter. I also want to thank my wife and children for staying with me throughout this period.

Conflict of interest

Nil.

Funding

Nil