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A Comparison of the Total Cardiovascular Risk Profiles in Military Personnel and Civil Servants in Ibadan, Oyo State, Nigeria

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Abstract
Introduction: Cardiovascular diseases remain a leading cause of preventable morbidity and mortality globally. However, while the reduction in the burden of this disease is being achieved in developed nations due to effective screening and pragmatic interventions, developing nations like Nigeria still grapple with high burdens of the disease. Multivariate risk prediction tools for CVD screening helps in early identification, risk communication, and prompt intervention in specific population groups with moderate to high risk of CVD. The study was conducted to assess and compare the cardiovascular risk profiles of military personnel and civil servants in Ibadan, Oyo state.
Methods: A comparative cross-sectional study of military personnel and civil servants aged e”40 years was conducted in Ibadan between November 2018 and February 2019. Participants were selected from Adekunle Fajuyi cantonment Ojoo and Federal Secretariat Agodi Ibadan using a two-stage simple random and systematic random sampling technique. A pre-tested semi-structured, interviewer-administered questionnaire was used to elicit information. Data was analyzed using SPSS version 22.0. The respondents' cardiovascular risk profile was determined and compared using WHO/ ISH risk prediction tools and categorized into- low, moderate, and high, based on their risk score. Associations were tested using the Chi-square test, and predictors of cardiovascular risk were determined using logistic regression with a level of statistical significance set at $p < 0.05$.
Results: There were a total of 560 respondents [military 277(49.5%) and civil servants 283 (50.5%]. The statistically significant risk factors for cardiovascular disease among the military personnel were tobacco ($p<0.001$) and alcohol use ($p=0.003$). While among the civil servants the risk factors were physical inactivity ($p<0.001$), family history of hypertension ($p=0.001$), high BMI ($p=0.001$), high total cholesterol ($p=0.002$), and high LDL ($p=0.003$). The predictors of moderate to high cardiovascular risk among the respondents were: alcohol use [OR 2.05 (95%CI= 1.28-3.29)] and high BMI [OR= 0.26, (95% CI = 0.14-0.50]. The study showed that male military personnel had a higher burden of moderate to high cardiovascular risk compared with male civil servants ($p=0.279$). While female military personnel had a lower burden of cardiovascular risk compared with female civil servants ($p=0.122$).
Conclusion: The predictors of moderate to high cardiovascular risk among the respondents were alcohol intake and high BMI. The Nigerian military authority and Federal civil service commission should improve awareness campaigns on the causes and prevention of CVD among personnel.

Keywords: *Risk prediction, cardiovascular health, WHO/ ISH, military, civil servants*

Abstrait
Introduction: Les maladies cardiovasculaires restent une cause majeure de morbidité et de mortalité évitables dans le monde. Cependant, alors que la réduction du fardeau de cette maladie est en cours dans les pays développés grâce à un dépistage efficace et à des interventions pragmatiques, les pays en développement comme le Nigeria sont toujours aux prises avec des fardeaux élevés de la maladie. Les outils de prédiction des risques multivariés pour le dépistage des maladies cardiovasculaires aident à l'identification précoce, à la communication des risques et à l'intervention rapide dans des groupes de population spécifiques présentant un risque modéré à élevé de maladies cardiovasculaires. L'étude a été menée pour évaluer et comparer les profils de risque cardiovasculaire du personnel militaire et des fonctionnaires à Ibadan, dans l'État d'Oyo.
Méthodes: Une étude transversale comparative des militaires et des fonctionnaires âgés de $\geq$40 ans a été menée à Ibadan entre novembre 2018 et février 2019. Les participants ont été sélectionnés dans le cantonnement d'Adekunle Fajuyi Ojoo et le Secrétariat fédéral Agodi Ibadan à l'aide d'un sondage aléatoire simple en deux étapes. et technique d'échantillonnage aléatoire systématique. Un questionnaire pré-testé semi-structuré administré par un intervieweur a été utilisé pour obtenir des informations. Les données ont été analysées à l'aide de SPSS version 22.0. Le profil de risque cardiovasculaire des personnes interrogées a été déterminé et comparé à l'aide des outils de prévision des risques de l'OMS/ISH et classé en - faible, modéré et élevé, en fonction de leur score de risque. Les associations ont été testées à l'aide

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du test du chi carré et les prédicteurs du risque cardiovasculaire ont été déterminés à l'aide d'une régression logistique avec un niveau de signification statistique fixé à $p < 0.05$.

Résultats: Il y avait un total de 560 répondants [militaires 277 (49.5%) et fonctionnaires 283 (50.5%). Les facteurs de risque statistiquement significatifs pour les maladies cardiovasculaires chez les militaires étaient le tabac ($p<0.001$) et la consommation d'alcool (p= Alors que chez les fonctionnaires, les facteurs de risque étaient l'inactivité physique ($p<0.001$), des antécédents familiaux d'hypertension (p=0.001), un IMC élevé (p=0.001), un cholestérol total élevé (p=0.002) et un LDL élevé (p = 0.003) Les prédicteurs de risque cardiovasculaire modéré à élevé chez les répondants étaient : la consommation d'alcool [OR 2.05 (IC à 95 % = 1.28-3.29)] et un IMC élevé [OR = 0.26, (IC à 95 % = 0.14-0.50 L'étude a montré que le personnel militaire masculin présentait un risque cardiovasculaire modéré à élevé plus élevé que les fonctionnaires masculins (p = 0.279), tandis que le personnel militaire féminin présentait un risque cardiovasculaire inférieur à celui des fonctionnaires féminins (p = 0.122).

Conclusion: Les prédicteurs de risque cardiovasculaire modéré à élevé chez les répondants étaient la consommation d'alcool et un IMC élevé. L'autorité militaire nigériane et la commission de la fonction publique fédérale devraient améliorer les campagnes de sensibilisation sur les causes et la prévention des maladies cardiovasculaires parmi le personnel.

Introduction

Cardiovascular diseases (CVD) refer to a group of disorders involving the heart and blood vessels, or the sequelae of poor blood supply due to a diseased vascular supply [1]. Cardiovascular diseases have emerged as one of the leading causes of morbidity, premature mortality, and overburdening of public health systems, thereby escalating direct and indirect healthcare costs globally [2]. It is a life course disease that begins with the evolution of subclinical atherosclerosis which develops over many years and is usually advanced by the time symptoms occur usually in middle age [3].CVD is a serious public health problem and is the single largest cause of death worldwide [4]. It accounts for approximately 30% of all deaths and almost 50% of deaths from Non-Communicable Diseases (NCDs) [5]. Globally, approximately 17.5 million deaths in 2012 were attributed to cardiovascular disease [6] and this is projected to increase to more than 23.6 million deaths by 2030 [7]. Of these 17.5 million global deaths, myocardial infarction, cerebrovascular disease (stroke), and hypertensive heart failure accounted for 7.2 million, 5.7 million, and 2.2 million respectively [7].

CVD is not just a problem of affluent nations as over 80% of the disease burden occurs in low and middle-income countries (LMIC) with almost equal male-female prevalence [8]. It accounts for about 42% of premature deaths [9] and complicates the social and economic burden in low-income nations as it disproportionately affects younger people [10]; unlike in high-income countries where those affected are usually at least sixty years old [10].

Over the past three decades CVD prevention programs in developed countries have prioritized population-wide measures (such as risk factor awareness programs, promotion of physical activity, healthy eating programs, taxation on tobacco products, and smoking bans to promote smoking cessation) and risk-factor management targeting individuals with one or more risk factors, such as high arterial blood pressure or high serum cholesterol [11]. However, these single-risk-factor treatment approaches have achieved limited impact on the CVD reduction burden [12], due to suboptimal control and failure to address other coexisting risk factors that interact to produce an overall risk effect 13]. Hence the need for a paradigm shift from the treatment of single risk factors in isolation for a better upstream approach of total cardiovascular risk [14].

According to the World Health Organization (WHO), total cardiovascular risk is defined as the probability of an individual experiencing a CVD event such as myocardial infarction or stroke over a given time considering several risk factors simultaneously [14]. It depends on the individual's particular risk factor profile, and it is determined by the combined effect of cardiovascular risk factors, which commonly coexist and act synergistically [14]. Therefore, an individual with several mildly elevated risk factors may be at a higher risk of CVD than someone with just one elevated risk factor [14]. For over a decade, the total cardiovascular risk management approach has been advocated as an alternative approach for CVD reduction [11]. With this approach, the risk of a person can be estimated by summing the risk imparted by each of the major risk factors [11]. This approach relies on prediction scores as decision tools to aid the identification of individuals at high risk of CVD for early intervention [15]. It could also be useful to raise population awareness and communicate knowledge about the risk to individuals and subpopulations and motivate adherence to recommended lifestyle changes and therapies [16].

Several cardiovascular risk prediction tools are used in clinical practice worldwide. In developed nations such as the United States, the modified Framingham Risk Score (FRS) is the most used tool and has been adapted for use in diverse populations in other parts of the world [15]. Others include the World Health Organization (WHO) and International Society of Hypertension (ISH) (WHO/ISH) chart [14], Systematic Coronary Risk Evaluation system 3 (SCORE) [17], United Kingdom Prospective Diabetes Study (UKPDS) [17], the Reynolds Risk Score [20], QRISK1, and QRISK2 [17], Prospective Cardiovascular Munster (PROCAM) [17], and INTERHEART modifiable score 21 to mention a few. The World Health Organization (WHO) and the International Society of Hypertension (ISH) in the year 2007 recommended two sets of cardiovascular risk prediction charts for each of the [12] WHO epidemiologic sub-regions: one for settings where blood cholesterol can be measured and the other for those where it cannot [14]. The chart provides estimates of CVD risk in people who do not have symptoms of coronary heart disease (CHD) such as stroke or myocardial infarction [19]. Both sets incorporate variables such as age, gender, smoking status, blood pressure, diabetes, and with or without total cholesterol to predict a ten-year cardiovascular risk in individuals. The chart categorizes individual risk of cardiovascular events as low, moderate, high, or very high based on the overall (calculated) risk score [16]. This chart is a useful tool to help identify individuals at high total cardiovascular risk for prompt intervention and to motivate patients to modify their behavior/lifestyles [19]. It is also an easy-to-use tool for healthcare professionals to predict cardiovascular risk in resource-constrained nations like Nigeria [13]

Despite the potential usefulness of cardiovascular risk assessment, it is not commonly used in most LMICs, and most individuals do not have their cardiovascular risk assessed. Among the demanding occupations such as military and others associated with heavier responsibilities, available studies revealed a high prevalence of CVD risk factors worldwide [23]. The stressful nature of the military profession and their lifestyle could make them different from the general population regarding cardiovascular risk and related risk factors [23]. Although, the selection process during recruitment should provide a population that is healthier than the general population, a kind of "Healthy Warrior Effect" [23], the high demand of the job together with exposure to CVD risk factors such as cigarette smoking, alcohol abuse, hypertension, diabetes, and abnormal lipid level might be different compared with the civilian or general population. The study was conducted to assess and compare the cardiovascular risk profiles of military personnel and civil servants in Ibadan, Oyo State, Nigeria.

Methods

Study Area: The study was carried out in Ibadan, the capital and administrative headquarters of Oyo state and the third most populous metropolitan city in Nigeria, after Lagos and Kano [24]. Oyo state is in the Southwest region of Nigeria and is predominantly a Yoruba-speaking state [24]. According to the 2006 census, Oyo state had a total population of about 5,591589 with males and females having a population of 2,809,840 and 2,781,749 respectively [25]. The projected population of Oyo state for 2018 was 8,358,368 assuming an annual growth rate of 3.35%, with a male and female population of 4,200,175 and 4,158,188, respectively. Ibadan is an important commercial center with a high proportion of her population being traders and with a sizeable proportion of civil servants and other office workers [24]. There are three military barracks/cantonments (2 for soldiers, one for air force personnel) and two government secretariats (Federal and State) in Ibadan Oyo state. Adekunle Fajuyi Cantonment, Ojoo is the headquarters of the 2 Division Nigerian Army (NA) [26,27]. The cantonment has 2,311 military personnel consisting of officers and soldiers, with female personnel accounting for about 30% distributed across various units in the cantonment. The cantonment has a hospital that provides health care services to the personnel and families. Letmauck Cantonment, Mokola accommodates 81 Artillery battalion and support units such as military police/provost unit, ordinance unit, education unit, health service unit, etc. The cantonment serves as a logistic base for 81 artillery in its support for headquarters 2 division military operations, has a staff strength of about 600 personnel all round (officers and soldiers) with female personnel accounting for about 30%. The cantonment also has a Medical Reception Station (MRS) that provides health care services including laboratory services to the personnel and families. Air Force Base/ Detachment, Akobo is responsible for the security of the airway at Ibadan local airport. The detachment has a staff strength of about 180 comprising of commissioned and non-commissioned officers with female staff accounting for less than10%. The Air Force base has a clinic that offers basic health care services including laboratory services to the personnel and families [28].

The Federal Secretariat, Agodi accommodates the Ministries, Departments and Agencies (MDAs) such as Ministry of Labor and Productivity, Ministry of Agriculture, Ministry of Education, Ministry of Information and National Orientation; agencies such as National Agency for Food and Drugs Administration and Control (NAFDAC), etc. The secretariat has a staff strength of about two thousand across the MDAs and female staff constitute about 45% of the total workforce. The secretariat also has a staff clinic that provides basic services like medical care and laboratory services for the staff.

The Oyo State Secretariat, Agodi serves as the administrative headquarters for the Oyo state government. The state civil servants carry out their administrative activities from the secretariat. The secretariat accommodates the Oyo state governor's office, Ministries, Departments, and Agencies in the state. Oyo state has 15 Ministries, 7 Departments, and 52 Agencies all located within the state secretariat complex. The secretariat has a staff strength of over 3,000 distributed across the MDAs with female workers account for about 50% of total staff strength. The secretariat also has a staff clinic that offers basic medical services including laboratory services to all staff.

Study Design: The study design was a comparative cross-sectional study.

Study Population: The Nigerian military personnel and civil servants in the selected military cantonment and secretariat in Ibadan, Oyo state, respectively. [29].

Inclusion Criteria: Commissioned and non-commissioned military officers who were 40 years and above and Civil servants who were 40 years and above.

Exclusion Criteria

Military personnel and civil servants with a history of myocardial infarction, cardiac failure, or cerebrovascular diseases (stroke). Military personnel who just came back from military operations (within Nigeria or United Nations mission operations) less than 3 months before the commencement of the study. Non-staff of Federal secretariat visiting the secretariat during the study. Any military personnel or civil servant found to be too ill to grant an interview and Pregnant women.

Sample Size Determination

The sample size for the study was determined using the formula for comparing two independent proportions; n = (Z1-á/2 +Z1-â) 2 [P1 (1-P1) + P2 (1-P2)] d 2 where n = Minimum sample size for each group Z1-á/2 = Value of standard normal deviate corresponding to the probability of type I error (á) at 5% = 1.96 Z1-â = Value of standard normal deviate corresponding to the probability of making type II error (â) of 20%. Power at 80% = 0.84 31 P1= Prevalence of moderate to high cardiovascular risk among the military = 9.1% (0.091)26 P2= Prevalence of moderate to high cardiovascular risk among civil servants = 20% (0.2). n = 160 per group Adjusting for design effect of 1.5, n= (160x 1.5) = 240 With addition of 10% non-response, the required minimum sample size for each group was 267 giving a total of 534 respondents. However, 560 military personnel and civil servants participated in the study.

Sampling Technique

A two-stage simple random and systematic random sampling was used to recruit participants into the study.

Stage I. Simple random sampling technique by balloting was used to select Adekunle Fajuyi cantonment out of the two Nigerian Army cantonments (Adekunle Fajuyi Ojoo and Letmauck Cantonment Mokola). Similarly, a simple random sampling technique by balloting was used for the selection of the Federal secretariat out of the two secretariats (Federal secretariat and Oyo state secretariat) in Ibadan. Stage II: a Systematic random sampling technique was then used to select study participants (military personnel and civil servants) into the study from a complete list of personnel. The sampling interval (kth) was calculated for each group using N/n, (where N is the sample frame and n is the calculated sample population). The kth for military personnel was 9 (2311/267) and 8 (2000/267) for civil servants. Then simple random sampling technique by balloting was used to select the initial respondent for each day into the study and subsequently every ninth participant for the military personnel and every eighth for civil servants was selected from a full list of personnel at both sites. However, where an individual was not eligible, the next randomly generated number was used to recruit the next participant until the required sample size was completed.

Study Instruments

Interviewer-administered questionnaires were used for data collection. Questions from previously validated instruments were adapted and modified. This included the STEP-wise approach to Surveillance (STEPS) questionnaire developed by the WHO for noncommunicable disease surveillance [30], NDHS 2013, and a questionnaire from a previous study [31] was used. A pre-test of questionnaires was conducted, and ambiguous questions were refined.

The questionnaire consisted of seventy questions under four main sections. Section A: Socio-demographic information. Section B: Behavioral information of the respondents such as tobacco use, alcohol consumption, dietary intake, physical activities. Section C: Physical measurements such as Height, Weight, Body Mass Index (BMI), Blood pressure reading. Section D: Biochemical measurements: Fasting Plasma Glucose (FPG) and lipid profile. WHO/ISH cardiovascular risk prediction chart for WHO Africa, sub-region D was used to categorize the respondents' 10-year risk of cardiovascular events e.g., as low (risk score 20%).

Validation of Study Instruments

The weighing scale was calibrated with a known weight and necessary adjustments were made to achieve consistent measurement. The stadiometer was calibrated with a known height or length calibration rod and necessary adjustment was made to achieve consistent measurement with the length of the calibration rod. Precision studies were carried out for the lipids and glucose using bovine precision sera (RANDOX, UK) at the beginning of every week of data collection.

Data Collection

Data Collection Instruments, Digital sphygmomanometer (Omron MX2 Basic) was used for BP measurement, Omron (HN289) weight measurement machine stadiometer (England meter) for height measurement, and Hitachi analyzer machine for lipid profile and FPG analysis.

Data Collection Methods: Physical Measurement of study participants consisted of measurement of weight, height, waist and hip circumference, Blood Pressure (BP), and Heart Rate (HR). The participants' weight was measured using Omron digital weighing scales (HN289) with light clothing, no footwear or belt, and measurement was recorded to the nearest 0.1kg. The weighing scale was validated using a reference known weight daily. The height of the participants was measured with a calibrated stadiometer with no footwear, jungle hat, or cap, and measurement was recorded to the nearest 0.1cm.

The body mass index (BMI) of the participants was calculated from weight (kg)/height^2 (m^2) [28]. The waist circumference (WC) in (cm) and the hip circumference (HC) in (cm) were measured according to the WHO protocol with a tape measure applied round and snugly to the body but not compressing the skin at the midpoint between the lowest rib and the iliac crest and the levels of the greater trochanters respectively and these measurements were recorded to the nearest 0.1cm [28]. The Waist: Hip ratio (WHR) was calculated from WC/HC [28].

The blood pressure and heart rate of study participants were measured using a digital sphygmomanometer (Omron MX2 Basic) with adult size cuff applied to the left arm circumference [29] midway between the olecranon and acromion with the subject in the sitting position, arm supported at the heart level, and feet flat on the floor [13]. Participants were instructed to sit down quietly for 5-10 minutes before the blood pressure measurement was taken. Three independent measurements were taken with at least an interval of one minute between each reading, however, the average value of the last two readings was documented as the current blood pressure [28].

Biochemical measurements involved the collection of about 5-8ml of fasting venous blood from the brachial vein into a 5 ml sodium fluoride tube for glucose assay and 5ml plain vacutainer for lipid profile [29] following an aseptic procedure by a registered medical laboratory technician. The study participants were instructed to fast for at least 12 hours overnight and not to take anything including drugs, water, beverages, alcohol, or soft drink before they had their blood sample collected in the morning on or before 10.00 am at the study center in the selected cantonment/secretariat. To ensure compliance, each participant was reminded through their contact phone number the night before and the morning of their appointment day. Samples collected were placed on ice (4 °C) and transported to the biochemistry laboratory where plasma and serum specimen was separated by centrifugation at 3000 rpm for analysis. The fasting plasma glucose (FPG) was analyzed using the glucose oxidase method while serum total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C), and triglycerides (TG) were determined using standard colorimetric procedures [29]. The concentration of the low-density lipoprotein cholesterol (LDL-C) was determined using the Fried Wald equation for participants with a TG < 4.0mmol/l, and assay through standard colorimetric procedures when its level was > 4.0mmol/l. A registered medical laboratory scientist did all biochemical analysis and the level of biochemical measurements was determined using cut-off values based on guidelines of the National Cholesterol Education Program (NCEP ATP III), the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure (JNC7) and the American Diabetes Association.

Training of Research Assistants

Four research nurses, two medical laboratory technicians, and one medical laboratory scientist were recruited. They were trained for two days by the researcher and a senior registrar from the Department of Chemical Pathology, University College Hospital (UCH) Ibadan on the use og f maintenance of ethical standards, data collection instruments, standard procedure for Physical measurement, and blood specimen collection. The first session of the training was on the introduction to the study, conduct, and approach of research assistants towards the respondents and interview techniques. The second session of the training was a recap of the first session, how ethical standards should be maintained during the research- respect for persons, privacy, confidentiality, etc. This was followed by a practical session on physical measurement and specimen collection procedures. The research assistants were supervised regularly by the principal investigator on the field to ensure ethical standards were maintained.

Data Management

Dependent (Outcome) Variable

Cardiovascular risk profile: (Low, Moderate and High). The cardiovascular risk for each respondent was estimated using the WHO/ISH risk prediction chart for Africa, sub-region D (which included Nigeria). The respondents' cardiovascular risk profile was classified as low, moderate, and high using WHO/ISH charts 39 (<10%-19.9%, 20-29.9%, and ≥ 30%, respectively). Also, participants with markedly raised levels of single risk factors e.g., Cholesterol (total) ≥ 8.0mmol/l, BP>160/100, and FBS ≥ 7 mmol/l were defined as having coronary risk equivalents and classified as having high cardiovascular risk.

Independent Variable

Socioeconomic variables: Level of education, monthly income; and lifestyle variables: alcohol intake, physical activity level, dietary intake, and BMI.

Statistical Analysis

The data collected was checked for errors, cleaned, entered, and analyzed using Statistical Package for Social Sciences software (SPSS) version 23.0. Data checking and cleaning were done daily to make sure missing items are accounted for and improperly entered variables were corrected. Descriptive statistics including frequencies, proportions, percentages, and means were compared for the prevalence of risk factors for cardiovascular disease between the military personnel and civil servant respondents, and appropriate tables and figures were generated. Cardiovascular risk was determined using

Cardiovascular risk factor	Definition
Hypertension	Systolic blood pressure ≥140 mm Hg and/or diastolic blood pressure ≥90 mm Hg
DM	Fasting plasma glucose ≥7.0 mmol/L
Obesity (General)	BMI≥30 kg/m2
Overweight	BMI=25.0-29.9 kg/m2
Abdominal Obesity	Waist circumference ≥88cm in females and ≥102 cm in males
Increased waist-hip ratio	Waist: hip ratio >0.85 in females and >0.95 in males
Hypercholesterolemia	Fasting serum cholesterol ≥5.0 mmol/L
Low -HDL	Fasting serum HDL-C<1.2 mmol/L in females and<1.0 mmol/L in males
Elevated LDL-C	LDL-C≥3.4 mmol/L
Hypertriglyceridemia	Fasting serum triglyceride level ≥1.7 mmol/L
Inadequate fruit and vegetable intake	Failure to take 5 serving of fruits and vegetables/per day in the preceding 7 days
Low level of physical activity	5 or more days of any combination of walking, moderate or vigorous intensity activities achieving a total physical activity < 600MET minute a week.
A smoker	Someone who is currently using any tobacco product such as cigarettes daily in preceding 30 days
Alcohol use	Consumption of any type of alcohol in the preceding 30 days
Cerebrovascular disease (stroke)	An individual with history of one or more of the following symptoms; Unilateral or bilateral motor impairment (including uncoordination), Aphasia/dysphasia (non-fluent speech); Hemianopia (half-sided impairment of visual fields); Diplopia (double vision); Forced gaze (conjugate deviation); Apraxia (inability to perform purposeful movements); Ataxia (failure of muscular coordination)
Cardiac failure	A clinical syndrome characterized by dyspnoea, fatigue, and clinical signs of congestion leading to frequent hospitalizations, poor quality of life, and shortened life expectancy.
Myocardial Infarction	A clinical symptoms of left side chest pain, which radiate to left arm, neck and jaw, shortness of breath, abnormal heart beat ± sweating, nausea, vomiting, anxiety, fatigue and body weakness.

Figure 1: Operative definitions for components of the risk profiles

the following variables: age, gender, smoking status, cholesterol level (mmol/l), systolic blood pressure, and presence or absence of diabetes according to WHO/ISH prediction chart to arrive at individual cardiovascular risk score. The cardiovascular risk profile of individuals was then categorized into low, moderate, and high using the cardiovascular risk score and was compared between the military personnel and civil servants. Inferential statistics were done using chi-square analysis to determine associations between the socioeconomic variables and cardiovascular risk at a 5% level of significance.

Table 1: Sociodemographic characteristics of respondents

Variable	Military personnel N=277	n (%)	Civil servant N=283	n (%)	X^2	p-value
Age group (year)						
40-49	233	(84.1)	177	(62.5)	33.215	**<0.001***
50-59	44	(15.9)	106	(37.5)		
Mean± SD	**44.04±5.1**		**47.00±6.1**			
Sex						
Male	249	(89.9)	156	(55.1)	84.533	**<0.001***
Female	28	(10.1)	127	(44.9)		
Marital status						
Currently married	249	(89.9)	260	(91.9)	0.664	0.415
Not currently married**	28	(10.1)	23	(8.1)		
Ethnic group						
Yoruba	81	(29.2)	223	(78.8)		
Hausa	91	(32.9)	5	(1.8)	162.734	**<0.001***
Igbo	24	(8.7)	21	(7.4)		
Others***	81	(29.2)	34	(12.0)		
Highest level of educationcompleted						
First degree/Equivalent and above	50	(18.1)	190	(67.1)	174.559	**<0.001***
OND/Equivalent	49	(17.7)	56	(19.8)		
Secondary school and below	178	(64.3)	37	(13.1)		
Rank/level in the job						
Commissionedofficer/senior staff	27	(9.7)	213	(75.3)	245.364	<**0.001***
Non-commissioned/juniorstaff	250	(90.3)	70	(24.7)		
Duration in the service(years)						
<10	15	(5.4)	100	(35.3)	77.727	**<0.001***
10-20	138	(49.8)	105	(37.1)		
$\geq$21	124	(44.8)	78	(27.6)		
Average monthly income (N)						
<100,000.00	228	(82.3)	201	(71.0)	16.447	**<0.001***
100,000-200,000.00	33	(11.9)	71	(25.1)		
>200,000.00	16	(5.8)	11	(3.9)		
Median monthly income						
(N) 69,000.00 (30,000 - 450,000.00)						
USD equivalent $189.04						
(82.19 -1232.88) ****						

* Significant at 5% **Single, cohabiting, separated, divorced, widow(er) ***Igala 19 (3.4); Benin 19 (3.4); Urhobo 9 (1.6); Idoma 9 (1.6); Ijaw 9 (1.6);Efik 5 (0.9); Fulani 5 (0.9) Calabar 4 (0.7); Tera 3 (0.5); Ebira 3 (0.5); Kabara 3 (0.5); Ibibio 3 (0.5);Tangali 2 (0.4);Taroh 2 (0.4); Akwa Ibom 2 (0.4);Givari 2 (0.4); Nupe 2 (0.4); Nandu 1(0.2); Bura 1 (0.2); Mbula 1 (0.2); Afemai 1 (0.2);Rurama 1(0.2); Bete 1(0.2); Zuru 1 (0.2); Zaar 1 (0.2); Keliba 1 (0.2); Marghi 1(0.2); Bra 1 (0.2); Itshekiri 1 (0.2);Kutumi 1 (0.2); Tiv 1 (0.2)

****USD official exchange rate at ¦ 365/Dollar at the time of writing

Variables that were significant up to 10% on bivariate analysis were fitted into a logistic model to identify predictors of moderate to high cardiovascular risk among the military personnel and civil servants.

Ethical Consideration

Ethical approval for the study was obtained from the Oyo State Health Research Ethical Committee and permission to carry out the study in the cantonment and secretariat was gotten from the General Officer Commanding (GOC) 2 Division Nigerian Army, Adekunle Fajuyi cantonment and Comptroller General, Federal secretariat, Agodi GRA Ibadan.

Informed consent. Written informed consent was obtained from the participants before administering the questionnaires. Participants were also informed that participation was voluntary and that they were free to decline participation or withdraw from the study at any time without reprisal or loss of benefits

The operative definitions of the metabolic profiles are in Figure 1.

Results

In all, six hundred subjects were approached to participate in the study out of which five hundred and seventy-eight subjects participated in the first phase of the study (general questionnaire administration and physical measurement), however only five hundred and sixty respondents consented to participate in biochemical analysis to complete the study giving a response rate of 93.3%. Two hundred and seventy-seven (49.5%) of these respondents were military personnel, while two hundred and eighty-three (50.5%) were civilians.

Table 1 shows respondents' socio-demographic characteristics. The mean age of the military personnel was 44.04 ± 5.1years which was slightly lower compared with the civil servants 47.00±6.1years ($p<0.001$). There was a higher proportion 249 (89.9%) of male respondents among the military personnel compared with 156 (55.1%) among the civil servants ($p<0.001$). Regarding ethnic groups, the Yoruba tribe constituted a higher proportion, 223 (78.8%) among the civil servants compared with 81 (29.2%) among the military

Table 2: Metabolic profile of the respondents

Variable	Military personnel N=277	n (%)	Civil servant N=283	n (%)	X^2	p-value
Blood sugar						
Normal	266	(96.0)	271	(95.8)	0.026	0.873
High	11	(4.0)	12	(4.2)		
Mean ±SD	**4.62±1.6**		**4.13±1.1**			
Blood pressuremeasurement						
Normal	216	(78.0)	221	(78.1)	0.001	0.974
High**	61	(22.0)	62	(21.9)		
Cholesterol total						
Normal	211	(76.2)	181	(64.0)	9.947	**0.002***
High	66	(23.8)	102	(36.0)		
Mean ±SD	**4.12±1.3**		**4.50±1.5**			
HDL						
Male						
Normal	104	(41.8)	60	(38.5)		
Low	145	(58.2)	96	(61.5)	0.435	0.510
Mean ± SD	**1.16±0.94**		**1.12±0.52**			
Female						
Normal	15	(53.6)	64	(50.4)	0.093	0.761
Low	13	(46.4)	63	(49.6)		
Mean ± SD	**1.02±0.34**		**1.15±0.55**			
LDL						
Normal	194	(70.0)	164	(58.0)	8.865	**0.003***
High	83	(30.0)	119	(42.0)		
Mean ±SD	**2.82±1.25**		**3.12±1.37**			
TG						
Normal	223	(80.5)	239	(84.5)	1.510	0.219
High	54	(19.6)	44	(15.5)		
Mean ±SD	**1.27±0.74**		**1.05±0.57**			

*Significant at 5%

** Mild, moderate, and severe

Table 3: Cardiovascular risk mean score of respondents

Variable	Military Personnel	Civil servants
Cardiovascular riskmean score	1.22±0.59	1.18±0.55

personnel (p<0.001). Regarding the duration of service, one hundred and twenty-four (44.8%) of the military respondents have spent over twenty years in the (military) service compared to 78 (27.6%) of the civil servants (p<0.001).

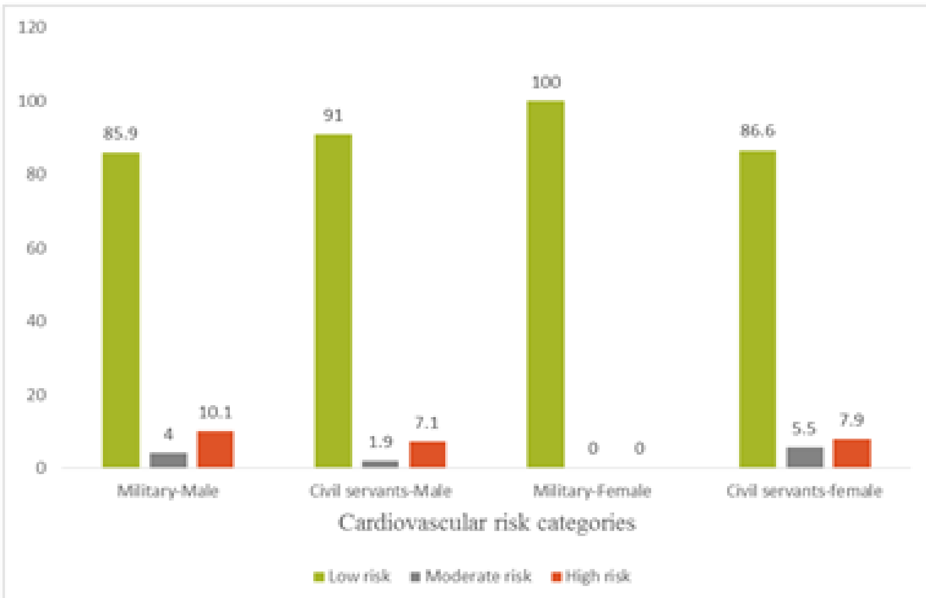

Figure 2: Cardiovascular risk profile of respondents by occupation and gender using the WHO/ISH prediction chart

A higher proportion 131 (47.3%) of the military personnel compared to 115 (40.6%) among the civil servants had ever consumed alcohol (p= 0.113). Similarly, the current use of alcohol among the respondents was higher 100 (36.2%) among the military personnel compared to 70 (24.8%) of the civil servants (p= 0.003). Regarding the use of tobacco products, a higher proportion 72 (26.0%) among the military personnel compared to 36 (12.7%) among the civil servants had ever used tobacco products (p<0.001). Similarly, a higher proportion, 44 (15.9%) of the military personnel compared to 13 (4.6%) of the civil servants were currently using any tobacco product (p<0.001). Fifty-nine (21.3%) of military personnel had an adequate intake of fruits and vegetables which is comparable to 57 (20.3%) among the civil servants (p=0.735).

Regarding elevated blood glucose among the respondents, the proportion 11 (4.0%) of military personnel and civil servants 12 (4.2%) were comparable (p=0.873). Similarly, the proportion of hypertensive individuals among the military personnel 61 (22.0%) and civil servants 62 (21.9%) were comparable (p=0.974). A higher proportion 102 (36.0%) among the civil servants compared to 66 (23.8%) among the military personnel had high total cholesterol level (mean total cholesterol for military: 4.12±1.3, and civil servants: 4.50±1.5) (p=0.002) Shown in Table 2.

The Cardiovascular risk mean score for the military was 1.22±0.59 while that of civil servants was 1.18±0.55. The Cardiovascular risk profile of respondents by occupation and gender using the WHO/ISH prediction chart is shown below in Figure 2.

Figure 2 shows the cardiovascular risk profile of respondents with WHO/ISH chart. A slightly lower proportion, 249 (85.9%) of male military personnel compared to 156 (91.0%) of the male civil servants had low risk. In the moderate-risk categories, there was a higher proportion, 10 (4.0%) of male military personnel compared to 3 (1.9%) of male civil servants in the same risk category. Also, in the high-risk category, 25 (10.1%) of male military personnel compared to 11 (7.1%) of the civil servants were in this category (p=0.279). Among the female respondents, all 28 (100.0%) of female military personnel compared to 110 (86.6%) of female civil servants were in the low-risk category. A higher proportion, 7 (5.5%) of female civil servants were in the moderate risk category and 10 (7.9%) in high-risk categories compared to 0 (0.0%) among the female military personnel (p=0.122). The predictors of moderate to high cardiovascular risk among the respondents were: alcohol use [OR 2.05 (95%CI= 1.28-3.29)] and high BMI [OR= 0.26, (95% CI = 0.14-0.50]. Male military personnel had a higher burden of moderate to high cardiovascular risk compared with male civil servants (p=0.279). While female military personnel had a lower burden of cardiovascular risk compared with female civil servants (p=0.122).

Discussion

This study assessed and compared the total cardiovascular risk profile of military personnel and civil servants in Ibadan, Oyo state and their predictors. Concerning the cardiovascular risk profile of respondents, the highest proportion (85.9%) of the male military personnel were in the low-risk profile while 4.0% and 10.1% were in the moderate and high-risk profile, respectively. While among the female military personnel, all (100.0%) were in the low-risk profile. The high risk of cardiovascular disease among the military respondents in this study is in agreement with a similar study in Saudi Arabia among the military personnel where the prevalence of high risk of cardiovascular disease was reported as 9.1% (using ATP-III Framingham chart) [23]. However, the findings were at variance from a study in North-central Iraq among the US troops in support of Operation Iraqi Freedom where 10-year risk of "cardiac ischemia" among troops referred for ischemic evaluation was reported as low (5.3±3.1%). The variation in the findings could be associated with the objective and methodology of the study. While the reported study was specific on ischemic cardiac evaluation, this study assessed the risk of any of the cardiovascular diseases. Similarly, the reported study used electrocardiography for evaluating cardiac ischemia among the respondents, while this study used WHO/ISH recommended cardiovascular risk tool. Among the civil servant respondents, the highest proportion (91.0%) of male civil servants were in the low-risk profile while 1.9% and 7.1% were in the moderate and high cardiovascular risk profile, respectively. And among the female counterparts, the highest proportion (86.6%) were in the low-risk profile while 5.5% and 7.9% were in the moderate and high cardiovascular risk profile, respectively. This finding was similar to a study carried out in Osun State, Southwest Nigeria among the University community dwellers. Low cardiovascular risk profiles were reported for the three categories of dwellers- students, junior and senior staff (87%, 84%, and 80% respectively) [34], while moderate to high-risk profiles were documented for 13%, 16% and 20% for student, junior and senior staff respectively (using Framingham risk calculator).[33] However, this finding was at variance from a study in Ekiti State, Southwest Nigeria among the rural community dwellers with a reported prevalence of 59.1%, 31.1% and 9.8% for low, moderate/intermediate, and high cardiovascular risk profiles respectively using the Framingham risk prediction chart.[35] The variation in the findings could be attributed to respondents' age. While the reported study selected respondents aged e" 60 years, this study selected a younger age group 40-60 years. Overall, the highest proportion of male military personnel and civil servants were in the low cardiovascular risk profile (85.9% among male military personnel and 91% among male civil servants). However, in the moderate to high cardiovascular risk profile, there was a higher proportion (14.1%) of male military personnel compared with 8.8% of the civil servants. The mean age of the male military personnel (44.21±5.2 years) in this study was slightly lower compared with male civil servants with a mean age of 47.62±5.7 years, yet the military personnel have a higher risk of cardiovascular disease compared with civil servants, this further buttress the fact that the risk of cardiovascular disease is not determined by one single risk factor but rather clustering of many risk factors. Among the female respondents, a higher proportion (100.0%) of female military respondents had a low cardiovascular risk profile compared with 86.6% of female civil servants with another 5.5% and 7.9% in the moderate and high cardiovascular risk profile. Although the female military personnel were younger (mean age 42.57 ±3.9 years) compared with female civil servants (mean age 46.25±5.7), the age of the female civil servants could have clustered with other risk factors for cardiovascular disease to determine their high cardiovascular risk profile

Conclusion

This study set out to determine the comparison of total cardiovascular risk profiles in military personnel and civil servants in Ibadan, Oyo state. Most of the military personnel and civil servants were in the low cardiovascular risk profile, while a slightly higher proportion of male military personnel were in the moderate to high cardiovascular risk profile compared with the male civil servants. Similarly, a higher proportion of female civil servants were in moderate to high cardiovascular risk profile compared with female military personnel. Risk factors like smoking and alcohol use were common among the military personnel while physical inactivity, family history of hypertension, obesity, high cholesterol (total) were common risk factors for CVD among the civil servants.

Recommendations/Policy implications

Since the risk of cardiovascular disease is similar in both groups:

1. Individuals with moderate to high cardiovascular risk profiles should adhere strictly to medical advice from their care givers to lower their risk of the disease.
2. Individuals with low cardiovascular risk profiles should undergo periodic medical check-up for early detection of rising risk and prompt intervention.

To the Federal Government of Nigeria

1 The federal government through the Ministries of Information and Health should provide public enlightenment on the risk factors for CVD and other non-communicable diseases in the country. This can be achieved through collaboration with Non-Governmental Organizations (NGO), Community Based Organizations (CBO) and Faith Based Organizations (FBO) at every level of governance.

Federal Civil Service Commission

1. In collaboration with Ministry, Departments and Agencies should encourage employees on regular physical activity as a way of promoting healthy living.
2. Should include periodic medical examination of personnel as part of annual staff appraisal and promotion prerequisite exercises.

The Army Headquarters (AHQ)

1. Through Nigerian Army Medical Corps (NAMC) should adopt risk prediction tools (in line with national recommendation) for cardiovascular risk screening among her personnel alongside providing tobacco quit support.

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Contributorship statement: SI conceptualized the study, was involved in data collection, entry, analysis, and reporting. OP and OO supervised from conceptualization to reviewing the final draft. OO wrote the first paper draft till the final submission draft.

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References

1. World Economic Forum and the Harvard School of Public Health. The Global Economic Burden of Non-communicable Diseases. Programme on the Global Demography of Ageing. 2011.
2. Ghorpade AG, Shrivastava SR, Kar SS, Sarkar S, Majgi SM, Roy G. Estimation of the Cardiovascular risk using the World Health Organization/International Society of Hypertension (WHO/ISH) risk prediction charts in a rural population of South India. Int J Heal Policy Manag [Internet]. 2015; 4(8):531–6.
3. Raitakari OT, Juonala M, Kähönen M, Taittonen L, Laitinen T, Mäki-Torkko N, et al. Cardiovascular risk factors in childhood and carotid artery intima-media thickness in adulthood. Journal of American Medical Association. 2003; 290(17):2277–83.
4. Mahabhashyam RN, Singh SP, Carolin A, Varaprasada MS. A study of 10 years risk Prediction of CAD – applying "Framingham risk scores" among the coal mine employees of the Singareni Collieries company ltd, Telangana state, India. Int J Community Med Public Health. 2017;4(6):2151–5.
5. World Health Organization (WHO). Global status report on noncommunicable diseases. 2010.
6. World Health Organization (WHO). Global status report on noncommunicable diseases. 2014.
7. American Heart Association (AHA) and American Stroke Association (ASA). Heart Disease and Stroke Statistics. 2017.
8. World Heart Organization/World Heart Federation/ World Stroke Organization. Global Atlas on Cardiovascular disease prevention and control. WHO, Geneva. 2011.
9. World Health Organization (WHO). Non communicable Diseases Country Profiles. 2011.
10. Gaziano TA. Reducing The Growing Burden Of Cardiovascular Disease In The Developing World. Health Aff. 2007; 26(1):13–24.
11. Grundy SM, Pasternak R, Smith S, Fuster V. Assessment of Cardiovascular Risk by Use of Multiple-Risk-Factor Assessment Equations: A Statement for Healthcare Professionals From the American Heart Association and the American College of Cardiology. Circulation. 1999; 1097(99):1348–59.
12. Ndindjock R, Gedeon J, Mendis S, Paccaud F, Bovet P. Potential impact of single-risk factor versus total

risk management for the prevention of cardiovascular events in Seychelles. Bull World Health Organ. 2011; 89(4):286–95.

13. Mendis S, Lindholm LH, Anderson SG, Alwan A, Koju R, Onwubere BJC, et al. Total cardiovascular risk approach to improve the efficiency of cardiovascular prevention in resource-constrained settings. Journal of Clinical Epidemiology. 2011; 64(12):1451–62.
14. World Health Organization (WHO). Prevention of Cardiovascular Disease. 2007.
15. Batsis, J.A., Lopez-Jimenez, F. Cardiovascular risk assessment - From individual risk prediction to estimation of global risk and change in risk in the population. BMC Med 2010 8: 29 https://doi.org/10.1186/1741-7015-8-29
16. Lloyd-Jones DM. Cardiovascular risk prediction: Basic concepts, current status, and future directions. Circulation. 2010; 121(15):1768–77.
17. Cooney MT, Bc H, Dudina AL, Graham IM, Bc H. Value and Limitations of Existing Scores for the Assessment of Cardiovascular Risk A Review for Clinicians. JAC 2009; 54(14):1209–27.
18. Ofori SN, Odia OJ. Risk assessment in the prevention of cardiovascular disease in low resource settings. Indian Heart J. 2016; 68(3):391–8.
19. Norhayati M, Sharifah Amirah S, Lili Husniati Y, Mohd Noor N. Cardiovascular risk: associated factors, assessment and agreement between WHO/ISH risk prediction chart and Framingham Scoring System among Primary Care Patients in Kelantan, Malaysia. Int J Collab Res Intern Med Public Heal. 2013; 5(12):652–63.
20. National Cholesterol Education Program (NCEP). Executive Summary of the Third Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults. Adult Treatment Panel III 2001; 285.
21. Bosomworth NJ. Practical use of the Framingham risk score in primary prevention: Canadian perspective. Can Fam physician Le Med Fam Can. 2011; 57(4):417–23.
22. Grover SA LI. The challenges and benefits of cardiovascular risk assessment in clinical practice. Can J Cardiol. 2011; 27(4):481–7.
23. Al-Dahi S, Al-Khashan H, Al Madeer MAM, Al-Saif K, Al-Amri MDS, Al-Ghamdi O, et al. Assessment of Framingham Cardiovascular Disease Risk Among Militaries in the Kingdom of Saudi Arabia. Mil Med. 2013; 178(3):299–305.
24. Nigerian Urban Reproductive Health Initiative (NURHI). Family Planning Social Mapping in Ibadan and Kaduna, Nigeria. 2011.
25. Adeline IA, Eme OI. Census Politics in Nigeria: An Examination of 2006 Population Census. J Policy Dev Stud. 2015; 9(3):47–72.
26. Hussain, N.A.A., Akande, T.M., Adebayo O. Prevalence of cigarette smoking and the knowledge of its health implications among Nigerian soldiers. East Afr J Public Health. 2009;6(2):168–70.
27. Johnson OE, Adedoyin RA, Awotidebe TO, Mbada CE, Otolorin OA, Owoseni I. Cardiovascular Risk Among Undergraduates in a Nigerian University. Int J public Heal Epidemiol. 2013; 118 (4):117–8.
28. Edward AO, Oladayo AA, Omolola AS, Adetiloye AA, Adedayo PA. Prevalence of traditional cardiovascular risk factors and evaluation of cardiovascular risk using three risk equations in Nigerians living with human immunodeficiency virus. N Am J Med Sci. 2013;5(12):680–8.
29. Osegbe ID, Soriyan OO, Ogbenna AA, Okpara HC, Azinge EC. Risk factors and assessment for cardiovascular disease among HIV-positive patients attending a Nigerian tertiary hospital. Pan Afr Med J. 2016; 23:1–9.
30. World Health Organization. WHO STEPwise approach to chronic diseases risk factor surveillance (STEPS). 2009.
31. Sanusi, RA., Ogundero, AO, Folasire OF. Knowledge, Attitude and Practice of Healthy Lifestyle among Undergraduate students of the University of Ibadan, Nigeria. West African J Food Nutr . 2014; 12(2):58–68.
32. Grosz A, Toth E, Peter I. A 10-year follow-up of ischemic heart disease risk factors in Mil Ogunmola JO, Olaifa OA, Akintomide AO. Assessment of Cardiovascular Risk in a Nigerian Rural Community as a Means of Primary Prevention Evaluation Strategy Using Framingham Risk Calculator. IOSR J Dent Med Sci. 2013; 7 (3):45–9.86
33. Adedoyin RA, Balogun MO, Adekanla AA, Oyebami MO, Adebayo RA, Onigbinde TA. An assessment of cardiovascular risk among the people of a Nigerian university community. Eur J Cardiovasc Prev Rehabil. 2006; 13 (4):551–4.

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