CARDIO-METABOLIC RISK ASSESSMENT AMONG CORPORATE WORKFORCE IN ABUJA, NIGERIA

By

Haastrup Adenrele. E.[1], Onwuama Mercy.A.C.[2], Adelowo Abiodun. B.[3]
Department of Human Kinetics and Health Education,
University of Lagos, Nigeria
[1]adenrelehaastrup@yahoo.com, +2347012269198; [2]mercyonwuama@yahoo.com, +2348033149557;
[3]omoluwabi2000@yahoo.com, +2348087806368

Abstract
This study investigated the prevalence of individual cardio-metabolic risk factors, total cardiovascular risk scores, and total type 2 diabetes risk scores among corporate workers in Abuja, Nigeria. Using purposive and simple random sampling techniques, 184 white-collar workforce above the age of 40 years were randomly selected for the study. Three (3) standardized research instruments were used for data collection, namely: the WHOSTEPwise Approach to Chronic Disease Risk Factor Surveillance Questionnaire (r=0.74), WHO/ISH Cardiovascular Diseases Risk Prediction Charts (r=64), and Finnish Diabetes Risk Score Questionnaire (r=0.77).Chi square was used to test the seven (7) research hypotheses at P ≤0.05 level of significance. The result of the study revealed that although 98.9% of the participants are aware of healthy living, only 9.2% consumes fruits/vegetables regularly; 42.9% still add salt directly to their food after cooking; 23.4% currently uses tobacco products; 18.4% are passive smokers; while majority (64.1%) do not engage in adequate moderate intensity physical activities. On biometric measurement, 57.1% were overweight/obese; 48.4% had unhealthy waist circumference; 33.7% had elevated blood pressure; 3.3% had high random blood sugar; while 28.8% had high total blood cholesterol. Also, 8.8% of the participant's had high (20 – 29.9%) to extremely high (≥40%) total cardiovascular risk scores, while 14.4% had high to very high total Type 2 diabetes risk scores. All the results were statistically significant. The study concluded that the prevalence of individual and total cardio-metabolic risks is significantly high among corporate workers in Abuja. The study therefore recommended that every corporate organizations should have a well-designed workplace health promotion policies and programmes which will afford the workforce the opportunity to be appropriately educated on healthy lifestyle, their risk of developing cardiovascular diseases and type 2 diabetes mellitus, and the different available measures to mitigate such risk.

Keywords: Cardio-metabolic Risk, Cardiovascular Diseases, Type 2 Diabetes mellitus, Body Mass Index, Corporate Workforce.

Introduction

In most parts of the world, the challenges of non-communicable diseases (NCD) have reached an epidemic proportion, with devastating consequences on the socio-economy of most nations (United Nations, 2011). Except in the Sub-Saharan Africa (SSA), NCD, principally cardiovascular diseases (CVD), cancers, chronic respiratory diseases and diabetes mellitus, are the major cause of morbidity and mortality, accounting for roughly 75% of health care costs each year, 48% of the healthy life years lost,

and more than 60% of all deaths (Bloom et al., 2011; United Nations, 2011; World Health Organization - WHO, 2009, 2011a).

In terms of prevalence and impact, CVD, tops the rest of the NCD, contributing substantially to the global burden of diseases and the escalating costs of health care. According to Khanal et al. (2017); Otgontuya, Oum, Buckley, and Bonita (2013), CVD, largely heart diseases and stroke, are the leading cause of death in most low- and middle-income countries (LMIC), accounting for about 50% to 80% of all NCD-related deaths. Specifically, on the global scale, as of the year 2012, the estimated deaths due to CVD was 17.5 million (31% of total death) with 37% of premature deaths below the age of 70.Even in Nigeria, the effect of CVD is already significant, accounting for about 7% of total death annually (WHO, 2014b). Statistical projections suggested that by the year 2030 almost 23.6 million people worldwide will be expected to die from CVD; it is therefore projected to remain the single leading cause of death globally and the biggest threat to businesses and economic development of the 21st century (World Heart Federation – WHF, 2012).

Diabetes mellitus, in particular the Type 2 (T2DM), is another NCD of an epidemic proportion in the 21st century. The International Diabetes Federation –IDF (2015), categorizes it as the third leading cause of premature death worldwide, and about 8.8% of the global adult population are already living with this disease. In Nigeria, the prevalence of Diabetes mellitus has been estimated to be 2.8%, while its disease specific death rate is 2%. These statistics has been projected to increase in the nearest future (Federal Ministry of Health – FMOH, 2015; WHO. 2011a).

Another interesting concern is the similar and overlapping risk factors for both CVD and T2DM, as explained by Brunzell et al. (2008); FMOH (2014, 2015); Prabhakaran et al. (2009), that the risk factors for T2DM and CVDs often cluster, and interlinked. Obesity (particularly central), high blood sugar, high blood cholesterol, and high blood pressure, are all intermediate risk factors that the two disease conditions share in common; which can then be exaggerated by aging, physical inactivity, unhealthy diet, and tobacco use. These combined risk factors for CVD and T2DM are together called Cardio-metabolic Risk (CMR) (Brunzell et al., 2008; Diabetes United Kingdom, 2009).

From the available statistics, about half of the people suffering from chronic diseases, and about one-quarter of all NCD-related deaths occursamong people below the age of 60, the productive age group and workforce of the society (Bloom et al., 2011, WHO, 2011a). This has been partly attributed to the modern fast-paced and unhealthy corporate working environment that encourages hazardous job exposures, high job demands, and inflexible work schedules (Kirsten, 2010; Sorensen et al., 2011). This unhealthy corporate environment has been noticed to be associated with increase in some health risk among the corporate workforce, some of which include obesity, physical inactivity, high blood pressure, unhealthy diet, tobacco use, and harmful alcohol consumption (Bloom et al., 2011).In the long run, the rising prevalence of NCD among the corporate working population can only to increase absenteeism, increase presenteeism (underperforming while working), negative return on investment (ROI), reduced productivity, and poor industrial competitiveness across borders (World Economic Forum, 2012).

Also, the costs to corporate employers in lost productivity due to chronic diseases may be substantially more than the direct medical and disability costs (Black, 2008). These productivity losses can be as much as 400% more than the cost of treating the chronic disease (Black, 2008; Childress & Lindsay, 2006).To this end, the study assessed the prevalence of major individual and total cardio-metabolic risk factors that can predisposes the staff of corporate organizations in Abuja, Nigeria to the development of cardiovascular diseases and Type 2 Diabetes mellitus in the nearest future.

The following research hypotheses were tested in the study:

1. There will be no significant cases of elevated Body Mass Index (BMI) among Abuja corporate workforce.

2. There will be no significant cases of increased waist circumference among Abuja corporate workforce.

3. There will be no significant cases of high blood pressure among Abuja corporate workforce.

4. There be no significant cases of current tobacco use among Abuja corporate workforce.

5. There will be no significant cases of high Total Blood Cholesterol among Abuja corporate workforce.

6. There will be no significant cases of high Total Cardiovascular Risk score among Abuja corporate workforce.

7. There will be no significant cases of high Total Type 2 Diabetes Risk score among Abuja corporate workforce.

Methods and Procedures

Population and Sampling: The population for this survey was corporate workers in the Federal Capital Territory (Abuja), Nigeria, Out of the six (6) Area Councils (Local Government Areas) in Abuja (namely Abuja Municipal, Abaji, Gwagwalada, Kuje, Bwari, and Kwali), the Abuja Municipal Area Council was selected through simple random technique. Within the selected Area Council, the Office of the Vice President was selected using purposive sampling technique. A purposive sampling technique was used to select the corporate organization because of its centrality and large staff strength. The total number of staff strength in the Office of the Vice President was 676, out of which 307 staff were above the age of 40 years. The sample size for this study was 184 participants, which was calculated using the Research Sample Size Formulaby Cochran (Charan& Biswas, 2013): $n = z^2pq / d^2$. The 184 sample were subsequently selected through simple random technique out of the staff that registered for the programme.

Research Instruments/Equipment: The following standardized research instruments were used: A modified World Health Organization'sSTEPwise Approach to Chronic Disease Risk Factor Surveillance (STEPS) questionnaire, with r=0.74 (WHO, 2001); World Health

Organization/International Society of Hypertension (WHO/ISH) Cardiovascular Risk Prediction Chart, with r=0.64(WHO, 2007); and a standardized Finnish Diabetes Risk Score (FINDRISC) questionnaire, with r=0.77 (IDF, 2015). The equipment that was used for this study were glucometer, sphygmomanometer, stadiometer, non-stretchable measuring tape, and a weighing scale. In order to determine the non-fasting total blood C\cholesterol of the participants, trained laboratory scientists withdrew the venous blood of the participants according to standard procedure. The concentration of the analyte (cholesterol) was then measured spectrophotometrically at a specific 540nm wavelength.

Procedure for Data Collection: The administration of instruments and data collection were carried out in phases. In the preparation phase, a letter of request for Ethical Clearance was obtained from the Health Research and Ethical Committee of the Federal Ministry of Health and the National Hospital Abuja; after which an internal memo was circulated to all the staff of the target organization intimating them of the programme. Interested staff who met the inclusion and exclusion criteria were registered for the programme from which the study sample were randomly selected. The risk assessment was carried out for all the participants. Five (5) trained research assistants were used; which were given 2 days intensive training before their enrollment for the study.A pilot study was carried out among 20 corporate staff of the Niger Delta Power Holding Company, Abuja.

Procedure for Data Analysis: The data collected from participants were subjected to descriptive statistics of frequency count and percentage. The Chi square was used for inferential statistics to test the hypotheses at $P \leq 0.05$ level of significance. The Statistical Package for Social Science (SPSS) for Windows, version 15 software (SPSS Inc., Chicago, IL) was used to analyze the data. The data was expressed as mean ± SD.

Results

Table 1: Socio-Demographic Distribution of Participants

Variables	Responses	Frequency (n- 184)
Gender	Male	108 (58.7%)
	Female	76 (41.3%)
Age (Years)	**40 – 49**	116 (63.1%)
	50 – 59	56 (30.4%)
	60 – 69	12 (6.5%)

Table 1 shows that the male population (58.7%) of the study were slightly more than the female population (41.3%), while majority (63.1%) are within the active working age group of between 40 and 49 years.

Table 2: Medical History and Awareness of Healthy Lifestyle

Variables	Responses	Male	Female	Total
Medical History	Hypertension	21(11.4%)	8 (4.4%)	29 (15.8%)
	Diabetes mellitus	14 (7.6%)	4 (2.2%)	18 (9.8%)
	Coronary Heart Disease/ Heart Attack	0 (0.0%)	0 (0.0%)	0 (0.0%)
	None	77 (41.8%)	66 (35.9%)	143 (77.7%)
Awareness of the need to live Healthy Lifestyle	Yes	106 (57.6%)	76 (41.3%)	182 (98.9%)
	No	2 (9.4%)	0 (0.0%)	2 (1.1%)

Table 2 show that 15.8% and 9.8% of the participants had previous history of hypertension and diabetes mellitus, while majority (98.9%) are aware of the need to live a healthy lifestyle in order to prevent chronic diseases.

Table 3: History of Lifestyle Practices among Participants

Variables	Responses	Male	Female	Total (n -184)
Frequency of Vegetables/ Fruits Consumption	< 5 Days/Week	99 (53.8%)	68 (37.0%)	167(90.8%)
	≥ 5 Days/Week	9 (4.8%)	8 (4.4%)	17(9.2%)
Addition of Salt to Food after Cooking	Yes	37 (20.1%)	42 (22.8%)	79 (42.9%)
	No	71 (38.6%)	34 (18.5%)	105 (57.1%)
Current Smoking/Tobacco Use	Yes	39 (21.2%)	4 (2.2%)	43 (23.4%)
	No	69 (37.5%)	72 (39.1%)	141 (76.6%)
Passive Smokers (n – 141)	Yes	18 (12.8%)	8 (5.6%)	26 (18.4%)
	No	64 (45.4%)	51 (36.2%)	115 (81.6%)
History of Alcohol Consumption in the last 30 days	Yes	53 (28.8%)	27 (14.7%)	80 (43.5%)
	No	55 (29.9%)	49 (26.6%)	104 (36.5%)
History of Alcohol Consumption above 2 standard units in the last 30 days (n – 80)	Yes	53 (66.2%)	19 (23.8%)	72 (90.0%)
	No	0 (0.0%)	8 (10.0%)	8 (10.0%)
History of Moderate Intensity Physical Activities	< 5 Days/Wk.	73 (39.7%)	45(24.4%)	118 (64.1%)
	> 5 Days/Wk.	35 (19.0%)	31(16.9%)	66 (35.9%)
History of Vigorous Intensity Physical Activities	< 3 Days/Wk.	86 (46.7%)	71(38.6%)	157 (85.3%)
	> 3 Days/Wk.	22 (12.0%)	5 (2.7%)	27 (14.7%)

Table 3 shows that a significant part of the participants do not practice healthy living: infrequent fruits/vegetable consumption (90.8%); added salt intake (42.9%); and current tobacco use (23.4%).

Table 4: Physical Measurements among Participants

Variables	Measurements	Male	Female	Total (n – 184)
Body Mass Index (Kg/M^2)	Underweight: < 8.5	3 (1.6%)	0 (0.0%)	3 (1.6%)
	Normal: 18.5 – 24.9	44 (23.9%)	32 (17.4%)	76 (41.3%)
	Overweight: 25.0 – 29.9	45 (24.5%)	33 (17.9%)	78 (42.4%)
	Obesity: ≥30	16 (8.7%)	11 (6.0%)	27 (14.7%)
Waist Circumference (cm)	< 94 in Male and < 80 in Female	66 (35.8%)	29 (15.8%)	95 (51.6%)
	94 – 102 in Male and 80 – 88 in Female	36 (19.6%)	33 (17.9%)	69 (37.5%)
	> 102 in Male and > 88 in Female	6 (3.3%)	14 (7.6%)	20 (10.9%)

Table 4 shows that more than half (57.1%) of the participants were either overweight or obese, while almost half (48.4%) of the participants had unhealthy waist circumference.

Table 5: Blood Pressure Measurements among Participants

Variables	Measurements	Male	Female	Total (n – 184)
Blood Pressure (mm/Hg)	Normal: < 120/< 80	21 (11.4%)	22 (12.0%)	43 (23.4%)
	Pre – Hypertension: 120 – 139/80 – 89	50 (27.2%)	29 (15.7%)	79 (42.9%)
	Stage 1 Hypertension: 140 – 159/90 – 99	26 (14.1%)	14 (7.6%)	40 (21.7%)
	Stage 2 Hypertension: ≥160/≥100	11 (6.0%)	11 (6.0%)	22 (12.0%)

Table 5 shows that 42.9% of the participants were in pre-hypertensive state, while 33.7% had elevated blood pressure.

Table 6: Biochemical Measurements among Participants

Variables	Measurements	Male	Female	Total (n – 184)
Random Blood Sugar (mg/dL)	Normal: ≤61– 139	81 (44.0%)	59 (32.1%)	140 (76.1%)
	Impaired: ≥140– 199.9	22 (12.0%)	16 (8.7%)	38 (20.7%)
	High: ≥200	5 (2.7%)	1 (0.5%)	6 (3.3%)
Total Blood Cholesterol (mg/dL)	Normal: < 200	72 (39.1%)	59 (32.1%)	131 (71.2%)
	High: ≥200	36 (19.6%)	17 (9.2%)	53 (28.8%)

Table 6 shows that 3.3% of the participants had high random blood sugar, while 28.8% were noticed to have high total blood cholesterol.

Table 7: Total Cardio-metabolic Risk Scores among Participants

Variables	Scores	Male	Female	Total (n – 184)
Total Cardiovascular Risk Scores	Low Risk: < 10%	89 (48.3%)	67 (36.4%)	156 (84.7%)
	Moderate Risk: 10 – 19.9%	9 (4.9%)	3 (1.6%)	12 (6.5%)
	High Risk: 20 – 29.9%	6 (3.3%)	2 (1.1%)	8 (4.4%)
	Very High Risk: 30 – 39.9%	0 (0.0%)	0 (0.0%)	0 (0.0%)
	Extremely High Risk: ≥40%	4 (2.2%)	4 (2.2%)	8 (4.4%)
Total Type 2 Diabetes mellitus Risk Scores	Low Risk: < 7	56 (30.4%)	33 (17.9%)	89 (48.4%)
	Slightly Elevated Risk: 7 – 11	16 (8.7%)	24 (13.0%)	40 (21.7%)
	Moderate Risk: 12 – 14	18 (9.8%)	11 (6.0%)	29 (15.8%)
	High Risk: 15 – 20	16 (8.7%)	6 (3.3%)	22 (12.0%)
	Very High Risk: > 20	2 (1.1%)	2 (1.1%)	4 (2.2%)

Table 7 shows that 8.8% of the participants had high (20 – 29.9%) to extremely high (≥40%) total cardiovascular risk scores, while 14.4% had high to very high total Type 2 diabetes risk scores.

Testing of Hypotheses

Hypothesis One: There will be no significant cases of elevated Body Mass Index among Abuja corporate workforce.

Table 8: Chi-Square Analysis of Cases of Elevated Body Mass Index

Variables	N	Mean	S.D	X^2Calc	X^2tab	Df	Remark	Decision
Elevated Body Mass Index	184	0.97	1.72	230.692	5. 87	2	Significant	Rejected

From Table 8 above, the X^2calc 230.692 is greater than X^2 tab 5. 87. The null hypothesis is therefore rejected while the alternate hypothesis which states that there will be significant **cases of elevated Body Mass Index among Abuja corporate workforce** is accepted at 95% Alpha level.

Hypothesis Two: There will be no significant cases of increased waist circumference among Abuja corporate workforce.

Table 9: Chi-Square Analysis of Increased Waist Circumference

Variables	N	Mean	S.D	X^2Calc	X^2tab	Df	Remark	Decision
Increased Waste circumference	417	1.27	1.07	86.502	5. 84	2	Significant	Rejected

From Table 9 above, the X^2calc 86.502 is greater than X^2 tab 5. 84. The null hypothesis is therefore rejected while the alternate hypothesis which states that there will be significant **increased waist circumference among Abuja corporate workforce** is accepted at 95% Alpha level.

Hypothesis Three: There will be no significant cases of high blood pressure among Abuja corporate workforce.

Table 10: Chi-Square Analysis of Cases High Blood Pressure

Variables	N	Mean	S.D	X^2Calc	X^2tab	Df	Remark	Decision
High Blood Pressure	184	1.43	1.62	134.88	3.65	1	Significant	Rejected

From Table 10 above, the X2 calc 134.88 is greater than X2 tab 3. 65. The null hypothesis is therefore rejected while the alternate hypothesis which states that there will be significant cases of high blood pressure among Abuja corporate workforce is accepted at 95% Alpha level.

Hypothesis Four: There be no significant cases of current tobacco use among Abuja corporate workforce.

Table 11: Chi-Square Analysis of Current Tobacco Use

Variables	N	Mean	S.D	X^2Calc	X^2tab	Df	Remark	Decision
Current Tobacco Use	184	1.33	0.946	47.01	3.82	1	Significant	Rejected

From Table 11 above, the X^2calc 47.01 is greater than X^2 tab 3.82. The null hypothesis is therefore rejected while the alternate hypothesis which states that there will be **significant cases of current tobacco use among Abuja corporate workforce** is accepted at 95% Alpha level.

Hypothesis Five: There will be no significant cases of high Total Blood Cholesterol among Abuja corporate workforce.

Table 12: Chi-Square Analysis of Cases of High Total Blood Cholesterol

Variables	N	Mean	S.D	X^2Calc	X^2tab	Df	Remark	Decision
Cases of High Total Blood Cholesterol	184	1.72	1.41	101.744	3.82	1	Significant	Rejected

From Table 12 above, the X^2calc 101.744 is greater than X^2 tab 3.82. The null hypothesis is therefore rejected while the alternate hypothesis which states that there will be **significant cases of high total blood cholesterol among Abuja corporate workforce** is accepted at 95% Alpha level.

Hypothesis Six: There will be no significant cases of high Total Cardiovascular Risk score among Abuja corporate workforce.

Table 13: Chi-Square Analysis of High Total Cardiovascular Risk Score

Variables	N	Mean	S.D	X^2Calc	X^2tab	Df	Remark	Decision
High Total Cardiovascular Risk Score	184	1.64	0.932	226.421	7.26	4	Significant	Rejected

From Table 13 above, the X^2calc 226.421 is greater than X^2 tab 7.26. The null hypothesis is therefore rejected while the alternate hypothesis which states that there will be **significant high total cardiovascular risk score risk among Abuja** corporate workforce is accepted at 95% Alpha level.

Hypothesis Seven: There will be no significant cases of high Total Type 2 Diabetes Risk score among Abuja corporate workforce.

Table 14: Chi-Square Analysis of High Total Type 2 Diabetes Risk Score

Variables	N	Mean	S.D	X^2Calc	X^2tab	Df	Remark	Decision
High Total Type 2 Diabetes Risk Score	184	1.68	0.920	364.114	8.16	4	Significant	Rejected

From Table 14 above, the X^2calc 364.114 is greater than X^2 tab 8.16. The null hypothesis is therefore rejected while the alternate hypothesis which states that there will be **significant high total Type 2 diabetes risk score among residents in Abuja**is accepted at 95% Alpha level.

Discussion of Findings

As noted in the introduction section diverse local and international publications are of the opinion that a typical modern corporate workplace is an efficient incubation ground for various disease promoting risk factors, and if unchecked will ultimately contribute to the increasing prevalence of the chronic diseases. The study was designed to either confirm or reject such position. According to the results, although only 15.8% of the participants had a medical history of hypertension (Table 2), the study revealed that 33.7% of the participants actually had high blood pressure on measurement (Table 5). The high blood pressure prevalence was noticed to be more in the male population (20.1%) compared to the female population (13.6%). This result is statistically significant (Table 10). This finding is similar to the national high blood pressure prevalence of 34.8% (WHO, 2014b). The disparity of medical history of high blood pressure and actual prevalence of high pressure in the study population supports the popular international 'Rule of Halves' in hypertension management which states that "only half of all people with hypertension are diagnosed; among which only half receive appropriate care, and out of the people receiving treatment, only half will reach the desired treatment targets."

Also, while 9.8% of the participants had medical history of diabetes mellitus (Table 2), only 3.3% were

actually noticed to have high blood sugar (Table 6). This disparity in the medical history of diabetes mellitus and the actual prevalence of diabetes might be due to gestational diabetes which occurs only during pregnancy and reverses back to normal after delivery. This finding of this study is similar to the national diabetes prevalence of 2.8% (WHO, 2014b). As explained by Avendano and Mackenbach (2006), there exist a positive and continuous association between blood glucose and cardiovascular risk, which extends well below the usual fasting glucose level for diabetes or related disorders.

According to Table 3, almost all (90.8%) of the participants do not eat fruits and vegetables at least 5 days a week, this was noticed to be more in the male population (53.8) compared to the female population (37.0%). The result of this study is similar to the finding of a study in Ogun state Nigeria which noticed that only 27.8% of the study population eats vegetables, fruits every day (Alebiosuet al., 2013). As alluded by Alberti, Zimmet, and Shaw (2007), unhealthy diet, comprising of poor vegetables and fruits consumption, is an identified risk factor in the development of T2DM.
Almost half (42.9%) of the participants still add salt directly to their food after cooking (Table 3). Based on the submission of the WHO (2003; 2011b), dietary salt consumption is an important determinant of blood pressure levels and of overall cardiovascular risk for coronary heart disease and both forms of stroke. This relationship between salt consumption and risk for CVD is direct and progressive with no apparent threshold (WHO, 2011b).

Table 3 also revealed that that almost one quarter (23.4%) of the participants (21.2% of males, and 2.2% of the females) currently uses some form of tobacco products (cigarette, cigar, pipes or snuff), while 18.4% out of the non-tobacco products users are passive smokers. The result of the current tobacco use is statistically significant (Table 11). This finding is higher than the national current daily tobacco smoking prevalence of 6% (WHO, 2011a); but similar to the national passive/second hand workplace smoking prevalence of 17.3% (FMOH, 2015). Tobacco use is the single most avoidable cause of disease, disability, and cardiovascular related death many countries of the world (Centre for Disease Control and Prevention – CDC, 2009).

According to the result, 43.5% of the participants drank alcoholic beverages in the last 30 days (Table 3), while majority (90.0%) of the people that drinks alcohol takes the product beyond the recommended safe alcohol limit. The WHO (2011a; 2014b) ranked Nigeria among the highest alcohol consuming nations in Africa. Excessive or harmful alcohol use is associated with hypertension, acute myocardial infarction/stroke, and other chronic diseases (CDC, 2009).

Table 3 also shows that majority (64.1%) of the participants do not engage in adequate moderate intensity physical activities. This sedentary lifestyle is slightly more in the male population (39.7%) compared to

the female population (24.4%). This result is higher than the WHO (2014a) estimated Nigeria's insufficient physical activity prevalence of 19.8%. Although it is slightly lower to the Nigeria Federal Ministry of Health's working class sedentary lifestyle prevalence of 80% (FMOH, 2015). According to the WHF (2015), physical inactivity is the fourth highest risk factor for death in the world, and it is responsible for more than one in four cases of heart disease and diabetes deaths, and more than one in five cases of breast and colon cancer.

As observed in Table 4, more than half (57.1%) of the participants were either overweight or obese; while almost half (48.4%) had unhealthy waist circumference. This result was noticed to be statistically significant (Table 8 and 9). This result of this finding is similar to the result of local studies on unban working class population in Nigeria that observed that 48.9% of their study population had elevated BMI (Alebiosu, et al., 2013), while Agu, Agu, and Nnaji (2015), observed that 42.6% and 74.0%in the study population of the working class study population in Onitsha, Anambra state were obese and had elevated waist circumference respectively. Overweight/obesity and increase/unhealthy waist circumference has been categorized as one of the three most significant risk factors for NCD such as CVD, Type 2 diabetes mellitus (T2DM), and musculoskeletal disorders (Alberti, Zimmet, & Shaw, 2007; WHO, 2016).
Also, 28.8% of the participants were noticed to have high total blood cholesterol ($\geq$200 mg/dLor $\geq$5.0 mmol/L). The Total Cholesterol was noticed to be higher in the male population (19.6%) compared to the female population (9.2%) (Table 6). This result was noticed to be statistically significant (Table 12). This finding is higher than the national high total cholesterol prevalence of 16.1% (13.6% in males and 18.5% in females) (WHO, 2011a). High blood cholesterol is a primary and major cause of the build-up of atherosclerosis, which is the major component of the pathophysiology of CVD (American Association of Clinical Endocrinologists, 2012).

The study also noticed that 8.8% of the participants had high (20 – 29.9%) to extremely high ($\geq$40%) total cardiovascular risk scores (Table 7); while 14.4% of the participants had a high and above risk for Type 2 Diabetes mellitus. This result was noticed to be statistically significant (Table 13 and 14). This result of this study is similar to the findings of a study that uses the WHO/ISH CVD risk prediction charts

on a working class study group of a developing country in which the total CVD high risk score was 6% (Otgontuya,Oum, Buckley, & Bonita, 2013); while Agu, Agu, and Nnaji, (2015) observed 9.0% high and above total diabetes risk among corporate workers in Anambra state, Nigeria. Considering the fact that the individual CVD and T2DM risk factors are relatively high among the study population, it is assumed that the total CVD and T2DM risk scores among the participants might increase further unless appropriate interventions are implemented.

Conclusion

The study therefore concluded that since the prevalence of individual and total cardio-metabolic risk is high among corporate workforce in the Federal Capital Territory (Abuja), a significant number of the workers are at high risk of developing cardiovascular diseases and Type 2 Diabetes mellitus in the next 10 years, unless definite preventive measures are taken to control the identified cardio-metabolic risk factors.

Recommendations

Based on the findings of the study, the following recommendations were made:

1. Government and all stakeholders should embark on public health campaigns to educate corporate workers in the Federal Capital Territory (FCT) Abuja about cardiovascular diseases and diabetes and how to mitigate their common risk factors.

2. Government and corporate organizations should provide policies that encourage healthy living, with availability and affordability of healthy food alternatives in the workplaces.

3. Every corporate organizations in the FCT should establish a well - designed workplace health promotion programme for their staff.

4. Government and every corporate organizations in the FCT should make the WHO/ISH cardiovascular prediction chart and the FINDRISC questionnaire available in all the corporate organizations in the FCT, and encourage the people to be screened for cardio-metabolic risk on regular bases, and subsequently educate them on mitigating measures.

5. The workforce through their association should demand for healthy working environment, and for regular health promotion programme in their various organizations.

6. Government and all stakeholders should embark on further researches on how to make corporate workplaces in the FCT Abuja a more health promoting centres.

References

Agu U., Agu M. &Nnaji G. (2015). Assessment of risk of developing diabetes mellitus among local government employees in Onitsha, south-eastern Nigeria. *Epidemiology Reports, 3,*4 - 7. http://www.hoajonline.com/journals/pdf/2054-9911-3-4.pdf. doi: 10.7243/2054-9911-3-4

Alberti K. G. M. M, Zimmet P. & Shaw J. (2007), International Diabetes Federation: A consensus on type 2 diabetes prevention. *Diabetic Medicine, 24,* 451 – 463. DOI: 10.1111/j.1464-5491.2007.02157.x.

Alebiosu, O. C., Familoni, O. B., Ogunsemi, O. O, Raimi, I.T.H, Balogun, W.O., Odusan O., … Adewuyi P. (2013). A. Community based diabetes risk assessment in Ogun state, Nigeria (World Diabetes Foundation project 08-321). *Indian J EndocrinolMetab., 17* (4): 653– 658. doi: 10.4103/2230-8210.113756.

American Association of Clinical Endocrinologists (2012). American Association of Clinical Endocrinologists' Guideline for the management of dyslipidemia and prevention of atherosclerosis. *Endocrine Practice 18* (1): 1 – 77.

Avendano, M., &Mackenbach, J. P. (2006). Blood glucose levels: facing a global crisis. *Thelancet, 368*: 1631 – 1632.

Black D. C. (2008). Dame Carol Black's Review of the Health of Britain's Working Age Population: Working for a Healthier Tomorrow. Retrieved on the 18th April, 2017 from https://www.gov.uk/government/ uploads /system/ uploads/attachment_data/file/209782/hwwb-working-for-a-healthier-tomorrow.pdf.

Bloom, D. E., Cafiero, E.T., Jané-Llopis, E., Abrahams-Gessel, S., Bloom, L.R., Fathima, S., … Weinstein, C. (2011). The Global Economic Burden of Non-communicable Diseases. World Economic Forum. Retrieved on the 24th July, 2016 from https://www.world-heart-federation.org/wp-content/uploads/2017/05/WEF_Harvard_HE_GlobalEconomicBurdenNon Communicable Diseases_2011.pdf.

Brunzell, J. D., Davidson, M., Furberg, C. D., Goldberg, R. B., Howard, B. V., Stein J. H., … Witztum, J. L. (2008). Lipoprotein Management in Patients with Cardiometabolic Risk: Consensus Conference Report from the American Diabetes Association and the American College of Cardiology Foundation. *J. Am. Coll. Cardiol., 51*:1512 – 1524. doi:10.1016/j.jacc.2008.02.034.

Center for Disease Control and Prevention (2009). The Power of Prevention: Chronic disease . . . the public health challenge of the 21st century. Retrieved from https://www.cdc.gov/chronicdisease/pdf/2009-power-of-prevention.pdf.

Charan J., & Biswas T. (2013). How to Calculate Sample Size for Different Study Designs in Medical Research? *Indian J Psychol Med. 2013; 35*(2): 121–126. doi: 10.4103/0253-7176. 116232. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3775042/

Childress, J. M. & Lindsay, G. M. (2006). National Indications of Increasing Investment in Workplace Health Promotion Programs by Large and Medium-Size Companies. *NC Med J., 67* (6): 449 – 452.

Diabetes United Kingdom (2009). Prediabetes - Preventing the Type 2 diabetes epidemic. Retrieved on the 21st November, 2017 from https://www.diabetes.org.uk/Prediabetes-Preventing-Type-2-diabetes-epidemic.pdf.

Federal Ministry of Health, Nigeria (2014). National Nutritional Guideline on Non-Communicable Disease Prevention, Control and Management. Retrieved on the 13th of December, 2016 from http://www.health.gov.ng/doc/NutritionalGuideline.pdf.

Federal Ministry of Health, Nigeria (2015). National Strategic Plan of Action on Prevention and Control of Non-Communicable Diseases. Retrieved on the 31st of December, 2016 from https://www.medbox.org/Nigeria-national...prevention-and-control...non-communicablediseases .pdf.

International Diabetes Federation (2015). IDF DIABETES ATLAS Seventh Edition 2015. Retrieved on the 12th June, 2017 from http://www.oedg.at/pdf/1606_IDF_Atlas_2015_UK.pdf.

Khanal, M. K., Ahmed, M. S. A., Moniruzzaman, M., Banik, P. C., Dhungana, R. R., Bhandari P., …Shayami, A. (2017). Total Cardiovascular Risk for next 10 years among Rural Population of Nepal using WHO/ISH Risk Prediction Chart. *BMC Res Notes, 10*: 120.

Kirsten, W. (2010). Making the Link between Health and Productivity at the Workplace — A Global Perspective. *Industrial Health, 48*: 251–255.

Otgontuya, D., Oum, S., Buckley, B. S., & Bonita, R. (2013). Assessment of Total Cardiovascular Risk using WHO/ISH Risk Prediction Charts in Three Low and Middle Income Countries in Asia. *BMC Public Health, 13*: 539.

Prabhakaran, D., Jeemon, P., Goenka, S., Lakshmy, R., Thankappan K. R., Ahmed F., … Reddy, K. S. (2009). Impact of a Worksite Intervention Program on Cardiovascular Risk Factors: A Demonstration Project in an Indian Industrial Population. *JACC, 53*: 1718 – 1728.

Sorensen, G., Landsbergis, P., Hammer, L., Amick III, B. C., Linnan, L., Yancey A., … Pratt, C. (2011). Preventing Chronic Disease in the Workplace: A Workshop Report and Recommendations. *American Journal of Public Health, 101*: 196 – 207.

United Nations (2011). Draft Resolution Submitted by the President of the General Assembly: Political declaration of the High-level Meeting of the General Assembly on the Prevention and Control of Non-communicable Diseases. Retrieved on the 22nd October, 2017 from http://www.who.int/nmh/events/un_ncd_summit2011/political_declaration_en.pdf.

World Economic Forum (2012). The Workplace Wellness Alliance: Investing in a Sustainable Workforce. Retrieved on the 6th September, 2016 from http://documents.bcg.com/TheWorkplace WellnessAlliance_Jan 2012.pdf.

World Health Organization (2003). Joint WHO/FAO Expert Consultation on Diet, Nutrition and the Prevention of Chronic Diseases. WHO Technical Report Series 916. Retrieved on the 4th May, 2014 from http://apps.who.int/iris/bitstream/10665/42665/1/WHO_TRS_916.pdf.

World Health Organization (2011a). Global Status Report on Non-Communicable Diseases 2010. Retrieved on the 8th October, 2014 from http://apps.who.int/iris/bitstream/10665/44579/1/9789240686458_eng.pdf.

World Health Organization (2011b). Strategies to monitor and evaluate population sodium consumption and sources of sodium in the diet: Report of a joint technical meeting convened by WHO and the Government of Canada. Retrieved on the 18th October, 2018 from http://apps.who.int/iris/bitstream/handle/10665/44614/9789241501699_eng.pdf.

World Health Organization (2014a). Global status report on Non-communicable Diseases 2014. Retrieved on the 8th October, 2016 from http://apps.who.int/iris/bitstream/handle/10665/148114/9789241564854_eng.pdf?sequence=1.

World Health Organization (2014b). Non-communicable diseases country profiles 2014. Retrieved on the 8th May 2017 from http://apps.who.int/iris/bitstream/10665/128038/1/9789241507509_eng.pdf.

World Health Organization (2016). Preventing disease through healthy environments: A global assessment of the burden of disease from environmental risks. Retrieved on the 4th of July, 2017 from http://apps.who.int/iris/bitstream/10665/204585/1/9789241565196_eng.pdf?ua =1.

World Heart Federation (2012). Urbanization and cardiovascular disease: Raising heart-healthy children in today's cities. Retrieved on the 8th September, 2016 from https://www.world-heart-federation.org/wp-content/uploads/2017/05/FinalWHFUrbanizationLoResWeb.pdf.

World Heart Federation (2015). Physical activity: vital to global health Physical. Retrieved on the 18th October, 2018 from http://www.worldheartfederation.org/fileadmin/user_upload/children/documents/factsheets/Factsheet_Physical_activity.pdf. www.worldhaert.org.