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The Lifestyle Habits and Cardiovascular Disease Risk Factor Profiles of Staff Within a Provincial Tertiary Institution in South Africa

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Abstract

Background: Cardiovascular disease (CVD) is a rising burden in many parts of the world including South Africa. There is a strong relationship between CVD, type II diabetes and obesity. The CVD risk and health status of employees in tertiary institutions remains of high concern, as limited studies have been conducted in this area.

Objectives: The study objectives were to determine the: CVD risk factor profile; possible risks of other NCDs; and lifestyle habits i.e. physical activity, nutritional/dietary habits, tobacco smoking and alcohol consumption of university employees.

Methods: A cross-sectional design was conducted on academic and non-academic (professional) staff members from the University of KwaZulu-Natal, South Africa. Purposive sampling of staff within the School of Health Sciences were selected to participate in this study. The data collection included health/fitness screening questionnaires, selected anthropometric measurements and non-fasting blood tests.

Results: Seventy-five staff members with a mean age of 39.71 years old voluntarily participated in this study. A significant number of staff members presented with a moderate CVD risk profile. Body fat percentages were significantly higher for females than for males. In addition waist circumference measures indicated possible risks for Type II diabetes and metabolic syndrome. The overall lifestyle habits were adequate to poor.

Conclusion: There is an imperative need for workplace health interventions to improve CVD risk profiles and the susceptibility to other NCD's among staff in tertiary institutions.

Keywords: cardiovascular disease, workplace interventions, lifestyle habits, risk factors

1. Introduction

A non-communicable disease (NCD) describes a medical condition or disease that is non-infectious and non-transmissible among individuals such as cardiovascular disease (CVD), diabetes and pulmonary/respiratory diseases such as chronic obstructive pulmonary disease (COPD) (Kim & Oh, 2013; World Health Organisation, 2017). Cardiovascular disease and type II diabetes mellitus cause almost one million deaths per year in North Africa and the Middle East (Afshin, Micha, Khatibzadeh, Fahimi, Shi, Powles, Singh, Yakoob, Abdollahi, & Al-Hooti, 2015). Chronic obstructive pulmonary disease, ranked fourth as a major cause of death worldwide, is prevalent among more than 10% of adults (aged 40 and above). By year 2020, this disease is estimated to be the third leading cause of global mortality (Soler, Gaio, Powell, Ramsdell, Loredo, Malhotra, & Ries, 2015; van Gemert, Kirenga, Chavannes, Kamya, Luzige, Musinguzi, Turyagaruka, Jones, Tsiligianni, & Williams, 2015). Metabolic syndrome, a cluster of risk factors, such as central obesity, hypertension and circulating hypertrigly ceridaemia, increases the risk of type II diabetes mellitus by 5-fold and CVD by 3-fold (O'neill & O'driscoll, 2015). The trajectory of the incidence of NCDs in South Africa appears to be becoming a popular burden (Mayosi, Flisher, Lalloo, Sitas, Tollman, & Bradshaw, 2009). This burden will continue to follow a linear increase if no preventative measures are taken.

The introduction of western culture and diet is seen as the cause for the colossal increase in risk factors such as hypertension, obesity, and diabetes, particularly in groups of lower-income status (Van Zyl, Van der Merwe, Walsh, Groenewald, & Van Rooyen, 2012). Non-modifiable CVD risk factors cannot be altered e.g. age, gender, and family history. However, there are many risk factors that are modifiable, such as smoking, blood pressure and cholesterol. About 80% of CVD can be prevented by leading a healthy lifestyle (The Heart and Stroke Foundation, 2015). The term 'lifestyle' is typically defined as the patterns in which people go about their daily living and how they spend their time and money (Vyncke, 2002).

There is also a strong relationship between, CVDs, type II diabetes, obesity and metabolic syndrome. Risk factors for these NCDs are very similar and overlap with one another (World Heart Federation, 2015). Knowledge of health risks and benefits creates the precondition for change. The lack of knowledge about lifestyle habits and its effect on health, promotes unhealthy lifestyle habits like smoking, and sedentary behaviour. However, additional self-influences and less of self-deception in ones way of life, is needed for adopting new lifestyle habits and maintaining them (Bandura, 2004).

A recent study by Alkhatib (2015), showed a high prevalence of sedentary risk factors, including Body Mass Index (BMI), systolic and diastolic blood pressure among staff members in the United Kingdom. Post-tests showed a decrease in these risk factors among staff who participated in a campus 10-week aerobic exercise intervention (walking and running) for a maximum of 25 minutes twice a week.

In a study conducted among 139 members of the teaching staff at Higher Learning Institutions in Tanzania, Mbuya, Fredrick, and Kundi (2014) reported that 9.4% and 13.7% of the staff were diabetic and hypertensive, respectively. However, amongst this group, knowledge of the causes, signs and symptoms, risk factors and complications of diabetes and hypertension was not as expected.

Adegun and Konwea (2009) found that 490 employees from three tertiary institutions in Ekiti state, Nigeria presented with one or more chronic disease. There were no significant differences in the prevalence of chronic diseases between male and female respondents. However, a significant difference was found between academic and non-academic staff, where by the academic staff presented with a higher prevalence of chronic disease than the non-academic staff.

Studies have shown that in South Africa, risk factors for CVD are very poorly detected and treated (Tibazarwa, Ntyintyane, Sliwa, Gerntholtz, Carrington, Wilkinson, & Stewart, 2009). To the best of the authors knowledge, no studies have reported on the health risk profiles of staff members in a tertiary institution in the province of KwaZulu-Natal, South Africa.

The objectives of this study were to determine the CVD risk factor profile and possible risks of other NCD's (obesity, type II diabetes and metabolic syndrome) by assessing the lifestyle habits (physical activity, nutritional/dietary habits, tobacco smoking and alcohol consumption) of university staff members.

2. Materials and Methods

2.1 Study Design

The study design was a cross-sectional study.

2.2 Study Setting

Staff from the School of Health Sciences, University of KwaZulu-Natal were recruited to participate in this study.

2.3 Data Collection

A health behaviour questionnaire and health screening was conducted by trained health practitioners. The most suitable time for the data collection was over a 10-day testing period, prior to the start of the students work semester (February 2017). The questionnaire was collected immediately upon completion. Thereafter, the health screening was conducted in a private room. The questionnaire comprised of specific sections from two validated questionnaires, namely, the South African Demographic and Health Survey (2003) which was developed by the South African Medical Research Council; and the American College of Sports Medicine (ACSM) (2014) pre-participation health/fitness screening tool. The South African Demographic and Health Survey (2003) questionnaire comprised of the following six sections, namely; Section A described general demographics, Section B determined physical activity, Section C concerned dietary intake, Section D determined tobacco use and Section E determined alcohol use. The ACSM (2014) pre-participation health/fitness screening tool questionnaire was used to determine the CVD risk factors and categorise the staff into either a high, moderate or low-risk CVD profile.

The health assessment comprised of resting measurements (heart rate and blood pressure); anthropometrical measurements (3-site skinfolds, waist and hip circumferences); and non-fasting blood tests conducted via the finger prick (cholesterol, triglyceride and glucose).

2.4 Data Management and Analysis Plan

Resting and anthropometrical measurements were conducted and classified as per the ACSM protocols (ACSM, 2014).

Blood tests were also conducted as per the ACSM protocol. The classification of triglycerides and cholesterol was as per the National Cholesterol Education Programme Third Adult Treatment (NCEP-ATP III) (American College of Sports Medicine, 2014). Glucose was classified as per the American Diabetes Association (ADA) (American Diabetes Association, 2015).

To categorise the staff into a high, moderate or low risk category of CVD, the American College of Sports Medicine (2014) defining criteria was used. The criteria states that if the absence of a CVD risk factor was not disclosed or was not available, the CVD risk factor should be counted as a risk factor except for Prediabetes. If Prediabetes criteria are missing, Prediabetes should be counted as a risk factor for those who are >45 years or older, and especially for those who have a current BMI of >25kg.m^2 also for those who are <45 years old but have a current BMI of of >25kg.m^2. Only positive CVD risk factors were considered, such as: age, family history, sedentary lifestyle, obesity, hypertension, dyslipidaemia and Prediabetes. Since random blood tests were performed in this study, Prediabetes and Dyslipidaemia had to be accounted for (American College of Sports Medicine, 2014).

Furthermore, any known cardiovascular, pulmonary or metabolic disease, would fall under the high risk category along with any major signs and symptoms suggestive of CVD, pulmonary or metabolic disease were categorised as high risk. If a staff member did not have any of the above mentioned but has >2 CVD risk factors present they fall into the moderate risk category. Lastly, <2 CVD risk factors they fall into the low risk category.

2.5 Sample Size

A purposive sample of 75 staff members voluntarily participated in the study.

2.6 Sample Technique

Permission to conduct this study among staff in the School of Health Sciences was granted by the University's Biomedical Research Ethics Committee (No. BE185/15). A call was sent out via email to staff, as well as flyers were posted on the notice boards around the campus requesting for staff to participate in the study. Information sheets and consent forms were handed out to participants who met the inclusion/exclusion criteria. Participants that met the inclusion/exclusion criteria were contacted and suitable times were arranged to complete the health screening protocol.

2.7 Exclusion Criteria

Part-time or contract staff employed at the University of KwaZulu-Natal and who had any history of, or current medical condition that had not been cleared by a general practioner, prohibiting a health screening assessment.

2.8 Statistical Analysis

Data was analysed using Statistical Package for Social Sciences (SPSS) version 21. Descriptive statistics including means and standard deviations and inferential statistics (Pearson's and or Spearman's correlations, chi-square) were applied. Kruskal Wallis Tests (non parametric equivalent to analysis of variance (ANOVA)) were applied for several independent samples that compared two or more groups of cases in one variable. Mann Whitney U Tests (non parametric equivalent to the independent samples t-test) and binomial tests (tests whether a significant proportion of respondents select one of a possible two responses) were also applied. A pairwise deletion was applied for missing data. The level of significance was set at 0.05. Interval data was analysed using t-tests or ANOVA.

3. Results

The sample comprised of 75 participants. Females (57.3%) and males (42.7%) with a mean age of 39.71 ($\pm$9.21) years-old completed the questionnaire and the health screening tests. The Indian/Asian race group were the largest group of the participants (58.7%) followed by Blacks (26.7%), Whites (12.0%) and Coloureds (2.7%). The participants were also grouped depending on their employment type, namely, (56%) academic staff and (44%) non-academic (professional) staff. Results will be presented as combined group, as no significant differences between groups were found.

3.1 Health Assessments

Table 1 shows the mean resting measurements of staff, while Table 2 separates data into males and females.

Table 1. Health assessment resting measures of the sample

Measurement (unit)	n	Minimum	Maximum	Mean (SD)
Systolic blood pressure (mmHg)	75	80	181	125.24 (16.01)
Diastolic blood pressure (mmHg)	75	60	115	82.53 (12.05)
Body fat (%)	75	6.11	41.20	23.15 (7.37)
Heart rate (Bpm)	75	41	110	78.21 (13.21)
Weight (Kg)	75	45.00	110.00	73.52 (14.10)
Stature (cm)	75	151.00	183.00	165.30 (8.63)
BMI (kg/m^2)	75	17.27	39.08	26.89 (4.66)
Waist circumference (cm)	75	56.60	109.00	82.75 (11.06)
Hip circumference (cm)	75	83.00	129.50	102.06 (9.96)
Waist:hip ratio	75	0.64	1.03	0.81 (0.08)
Glucose (mmol/L)	74	1.6	12.7	4.40 (1.73)
Total Cholesterol (mmol/L)	74	3.88	7.75	5.10 (0.88)
Triglycerides (mmol/L)	69	0.94	6.38	2.53 (1.23)

According to the staff members, 37.3% presented with a low-risk CVD profile whilst a significant (p=0.037) proportion of 63% presented with a moderate-risk CVD profile and 43% presented with a high-risk CVD profile. Body fat percentages averaged at 23.14% (±7.37). Further analysis revealed that body fat percentages were significantly higher for females 27.11% (±6.31) than for males 17.79% (±4.93).

High significant positive correlations between waist circumferences and triglycerides, BMI, and percent body fat, were evident.

A significant number 98.7% of staff presented with a normal non-fasting glucose reading. Non-fasting total cholesterol test results found that a significant number 60% were classified in the desirable range. Futhermore, a significant number 48% of staff members were categorised in the high category for triglyceride readings.

Of the total participants, 1.33% were underweight, 34.67% were within the normal range, 37.33% participants were overweight and 17.33% participants were catergorised in the obese class I category. Lastly seven 9.33% staff members fell in the obese class II category.

Statistical analysis displayed a high significant positive correlation between BMI and fat. There was also a present significant positive correlation between waist circumference and BMI.

Waist measure was significantly higher for males than for females. With a higher age staff members had a higher waist circumference measures.

When using the National Cholesterol Education Programme Third Adult Treatment (NCEP/ATP III) norm risk of >102 and >88 cm's for males and females respectivley, a significant number of females were at risk than males. However, when using the International Diabetes Federation (IDF) norm (males >94 and females >80) it was found that females had a higher health risk than males but the percentage increased for males and females by 18.8% and 14% respectively.

A significant number (56%) of staff members fell into the pre-hypertensive group. Waist circumferences was significantly decreased in staff who presented with normal blood pressure readings than for pre-hypertension and hypertension stage I categories.

Table 2. Health assessment resting measures of males and females

Measurement (unit)	Males	Minimum	Maximum	Mean (SD)	Females	Minimum	Maximum	Mean (SD)	p-value
Systolic blood pressure (mmHg)	32	100	181	128.31 (17.26)	43	80	163	122 (14.81)	0.153
Diastolic blood pressure (mmHg)	32	60	110	84.03 (11.34)	43	60	115	81.42 (12.57)	0.356
Body fat (%)	32	6.11	26.57	17.79 (4.93)	43	12.14	41.20	27.11 (6.31)	0.000
Heart rate (Bpm)	32	41	110	76.69 (14.92)	43	42	107	79.35 (11.83)	0.392
Weight (Kg)	32	52.10	110	77.46 (14.14)	43	45	97.40	70.59 (13.49)	0.036
Stature (cm)	32	152.50	183	171.27 (7.66)	43	151	175	160.86 (6.37)	0.000
BMI (kg/m^2)	32	18.03	36.75	26.32 (3.94)	43	17.27	39.08	27.31 (5.14)	0.367
Waist circumference (cm)	32	71	109	86.76 (9.65)	43	56.60	101	79.76 (11.19)	0.006
Hip circumference (cm)	32	85	110.50	99.05 (7.15)	43	83	129.50	104.30 (11.18)	0.016
Waist:hip ratio	32	0.75	1.03	0.87 (0.07)	43	0.64	0.89	0.76 (0.06)	0.000
Glucose (mmol/L)	32	2.70	12.70	5.10 (2.15)	42	1.6	7.80	3.86 (1.07)	0.005
Total Cholesterol (mmol/L)	31	3.88	7.75	5.18 (1.02)	39	4.06	7.05	5.04 (0.77)	0.518
Triglycerides (mmol/L)	30	0.94	5.15	2.85 (1.09)	38	0.97	6.38	2.28 (1.28)	0.058

3.2 Lifestyle Habits

Results from the lifestyle habits portion of the questionnaire showed that a significant number of staff indicated that their work involves sitting. Of the sample, 34.67% were females and 17.33% were males. Activity of work in relation to fat levels, showed that fat levels were significantly higher for sitting than standing, walking or moderate walking.

The number of days the staff spent in a week walking or cycling for at least 10 minutes in order to travel to and from places was 3.12 days (±2.86). The average number of minutes that staff members spent on a usual day walking or cycling for travelling was 25.63 min (±40.71). Males walked or cycled on average, 4.03 days (±3.22) significantly more than females, 2.44 days.

A significant proportion 67% indicated that they performed moderate intensity activities such as brisk walking, cycling or swimming for at least 10 minutes at a time. Males 43.06 min (±41.72) spend more time performing moderate activities during their leisure time than females 26.74 min (±46.63). The average amount of days the staff engaged in moderate activites in a week was 2 days (±1.94).

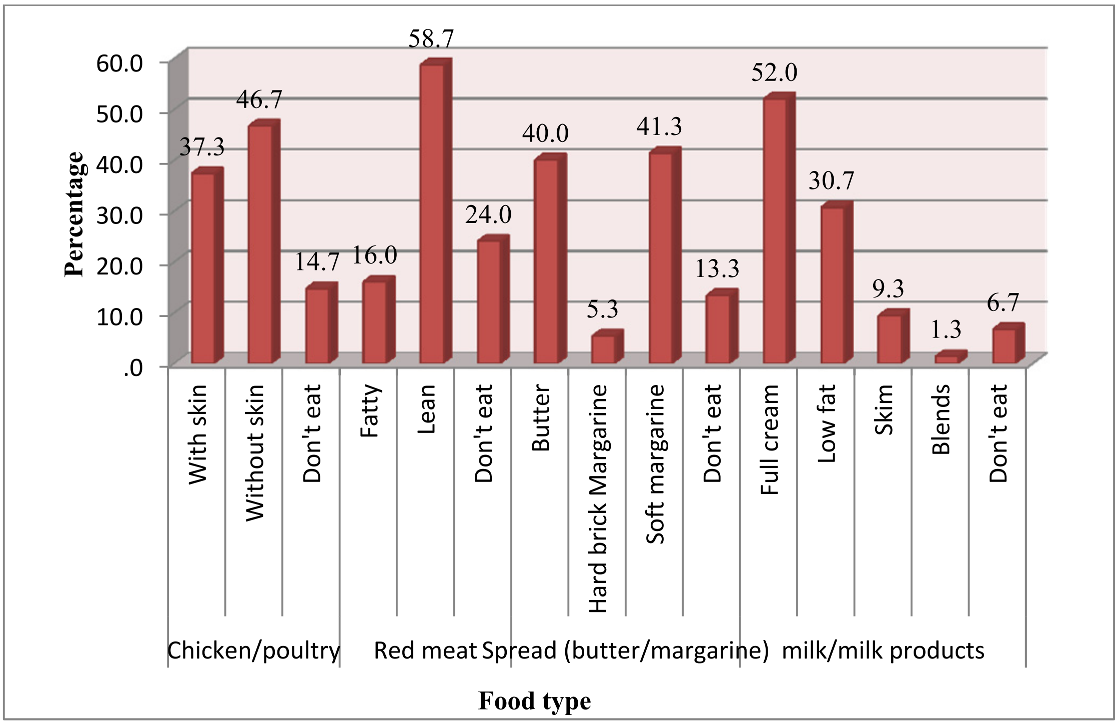

Figure 1. Preferred food types

Figure 1 shows the most preferred option of food types. The four different categories were:

Chicken/poultry, red meat, spread (butter/margarine) and milk/milk products. A significant number indicated that they eat chicken without skin. More than half of the staff consumed lean red meat and a significant amount indicated that they ate butter and soft margarine. Additionally, a substantial number indicated that they drink full cream and low fat milk.

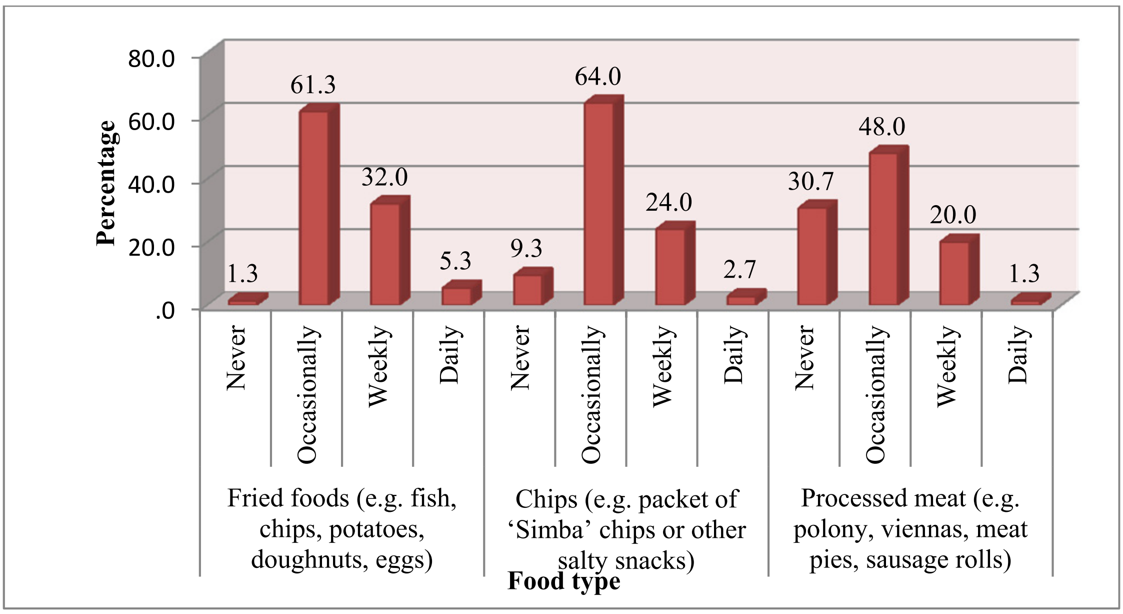

Figure 2. Frequency of certain food types consumed

Figure 2 depicts the frequency of food types consumed. A significant number occasionally ate fried foods (e.g. fish, chips, potatoes, doughnuts, eggs). Almost two-thirds of the staff (n=48) occasionally ate chips (e.g. packet of

Simba chips or other salty snacks) and (n=36) occasionally ate processed meat (e.g. polony, viennas, meat pies, sausage rolls). A positive correlation between waist circumference an consuming processed meat (e.g. polony, viennas, meat pies, sausage rolls) was found.

Results on alcoholic consumption found that a significant number of staff 68% agreed that they consumed an alcoholic drink like beer, wine, spirits or sorghum beer (beer manufactured from maize) and 55% of staff consumed this in the last 12 months. At least 12.5% of males were found to drink at least five days a week and 21.9% of males drank a minimum of once a week. Statistical analysis showed negative correlations between fat and alcohol intake on average.

Eighty-eight percent of staff currently did not smoke any tobacco products, such as cigarettes, cigars, or pipes and 89% do not smoke tobacco products daily.

4. Discussion

Findings showed that 43% of staff members were at high-risk (any known cardiovascular, pulmonary or metabolic disease, would fall under the high-risk category along with any major signs and symptoms suggestive of CVD, pulmonary or metabolic disease), 63% were at moderate-risk (has >2 CVD risk factors present) while 37.3% of participants were at low-risk (has <2 CVD risk factors present). Similarly, (Dreyer, Dreyer, & Rankin, 2010) found, when using a coronary risk index (Bjurstrom & Alexiou, 1978), 30% of New Zealand staff members were at high-risk (>3 coronary artery disease (CAD) risk factors), 19% presented with two or three CAD risk factors and 21% remained free of any CAD risk factors. Whereas, in a study conducted in ten Melbourne workplaces, Freak-Poli, Wolfe, and Peeters (2010) utilised the Absolute Cardiovascular Disease Risk Assessment and found that only six of the 726 employees were at a high-risk and 46 of them were at an intermediate/moderate-risk of developing cardiovascular disease within the next ten years.

Moreover, almost half of the sample (48%) were classified within the high-risk category for triglyceride readings (48%). Stensvold, Tverdal, Urdal, and Graff-Iversen (1993) reported that non-fasting triglyceride readings at 3.0 mmol/L (95% confidence interval 1.9 to 4.8) are a strong independent risk factor for total deaths from cardiovascular diseases amongst women.

Statistical analysis of the current study showed that body fat percentages were significantly higher for females than for males. A similar trend was found amongst staff in New Zealand with the mean body fat percent values for both females and males were 24% and 13% respectively (Dreyer et al. (2010). Concomitant to the above findings, according to the World Health Organisation (WHO) statistics, selected WHO regions found women more likely to be obese than men. In the WHO regions for Africa, Eastern Mediterranean and South East Asia, women had roughly double the obesity prevalence of men (World Health Organisation, 2016). However, findings from the Australian Bureau of Statistics (2014-2015) presented a higher number of males overweight or obese than females (70.8% compared with 56.3% respectively). According to ACSM fitness categories for body composition for men by age, males on average have a good body fat percentage with regard to the staff members' mean age (39.71, $\pm$9.21) and for women by age, females on average have a poor body fat percentage with regard to the staff members' mean age (39.71, $\pm$9.21). From the above stated, both genders face an increased risk of obesity.

Furthermore, mean BMI measurements were slightly higher among female staff members' than male staff members' (ACSM, 2014). On the contrary, a study amongst Canadian staff by Perusse-Lachance, Tremblay, and Drapeau (2010), revealed that 50.5% and 31.6% of males and females respectively were categorised as overweight-obese. A recent local study conducted in Cape Town by Koen, Philips, Potgieter, Smit, van Niekerk, Nel, and Visser (2017) found that of 300 staff participants (Stellenbosch University) 58% had a current BMI of ≥ 25 kg/m2, however, the results of the study were self-reported. Despite there being noticeable differences between the genders in the above-mentioned studies, there is still a problematic presence of both females and males in the overweight category. Therefore, staff members' in this study are susceptible to increased body fat and BMI measures whilst working within a tertiary institution. Consequently, individuals with known obesity or excess weight generally have a higher prevalence of elevated blood pressure than lean persons (Ogden, Carroll, Fryar, & Flegal, 2015; Rosendorff, Lackland, Allison, Aronow, Black, Blumenthal, Cannon, De Lemos, Elliott, & Findeiss, 2015; Saydah, Bullard, Cheng, Ali, Gregg, Geiss, & Imperatore, 2014).

Waist measures were significantly higher for males than for females. Furthermore, the study found a positive relationship between age and waist circumference measurements. Puoane, Steyn, Bradshaw, Laubscher, Fourie, Lambert, and Mbananga (2002) also noted the same correlation in their study. Although there is a positive relationship between age and waist circumference, age is a non-modifiable risk factor. Therefore it can be predicted that as staff members age their waist size may increase, potentially due to poor lifestyle habits. However, longitudinal studies need to be conducted to confirm this.

Waist circumference was also used as a potential risk factor according to the NCEP/ATP III norms. In the current study, a significant number of females were at an increased risk in comparison to males. However, when using the IDF norms, females presented with a higher health risk than males, but the percentage increased in males and females by 18.8% and 14% respectively in comparison to using the NCEP/ATP III norms. An increased waist circumference, is linked with a potential risk factor for developing type II diabetes (Grundy, 2004). Although there is a need for further research with regards to underlying pathophysiological mechanisms resulting in metabolic syndrome, the presence of abdominal adiposity and insulin resistance are more likely to be significant to this disease (Cornier, Dabelea, Hernandez, Lindstrom, Steig, Stob, Van Pelt, Wang, & Eckel, 2008). Metabolic syndrome is associated with a possible 5-fold increased risk for type II diabetes and, according to Kurian and Cardarelli (2007), the risk for CVD amongst diabetics is two to three times higher compared to non-diabetics. Overall, the staff have a higher risk for developing either type II diabetes or metabolic syndrome. Moreover, based on the waist circumference according to NCEP/ATP and IDF III norms, BMI measurements and body fat percentage results, it is possible that females are at a higher risk of developing type II diabetes and metabolic syndrome among the School of Health Sciences staff.

South Africa has a case of physical inactivity, with 49% of adult women and 43% of adult men not meeting the health requirements and physical levels of physical activity during leisure and occupational time across longitudinal studies (Joubert, Norman, Bradshaw, Goedecke, Steyn, & Puoane, 2007). In this study, although staff are participaiting in some form of physical activty, they are not meeting the recommended ACSM guidelines where adults of their age group (18-65 years) should be performing moderate intensity physical activity for at least 30 minutes on 5 days of the week. Additionally, more than half of staff members (52%) indicated that their work involves sitting. Prolonged hours of sedentary behaviours could be detrimental to one's health. A study conducted by American Heart Association (2016) showed that participants with less seated time over a two year period, had a positive effect on their lifespan. Joubert, Norman, Lambert, Groenewald, Schneider, Bull, and Bradshaw (2007) found across their longitudinal cohort studies that physical inactivity is associated with at least a 1.5-2.0-fold higher risk than most chronic diseases of lifestyle. With the staff unable to meet the physical activity guidelines during their lesuire time, and increased sedentary time during their occupational hours, this behaviour could be a major contributing factor to their CVD risk profile.

The traditional diet is associated with an increase in degenerative diseases unlike a western diet, consisting of lower carbohydrates/fibres and higher fats (Bourne, Lambert, & Steyn, 2002). The current study found diet in general was poor. A positive correlation was found between waist circumference and consuming processed meat which was similar to the findings by Newby, Muller, Hallfrisch, Qiao, Andres, and Tucker (2003), where a diet high in fruit, vegetables, reduced-fat dairy, and whole grains and low in red and processed meat, fast food, and soda was associated with smaller gains in BMI and waist circumference. With these findings, the staff members could decrease their risk of possible type II diabetes and metabolic syndrome in the future. Based on these correlations, the staff members do not have healthy eating habits and this has been potentially influenced by the food availability within the university, as well as westernisation.

Smokers have 70% higher risk for CVD in comparison to non-smokers. The risk for contracting CVD is directly related with years of smoking (Kurian & Cardarelli, 2007). In this study 88% of the staff do not currently smoke any tobacco products and 89% do not smoke tobacco products daily. Athough most staff members are not primarily smoking, some staff members are indirectly faced with passive smoking and could be negligent to the harmful affects it can have on one's health. Barnoya and Glantz (2005) found that the effects of brief (minutes to hours) passive smoking are often nearly as large (averaging 80% to 90%) as chronic active smoking.

With regards to the staffs' alcohol intake, a significant number of staff (68%) said they consume a drink that contains alcohol such as beer, wine, spirits or sorghum beer. The average volume of alcohol consumption and patterns of drinking, especially heavy drinking occasions, play a significant role in contributing to the burden of diseases (Rehm, Mathers, Popova, Thavorncharoensap, Teerawattananon, & Patra, 2009) However, Ronksley, Brien, Turner, Mukamal, and Ghali (2011) found that light to moderate alcohol consumption is associated with a reduced risk of multiple cardiovascular outcomes. Based on these findings, if staff members have a moderate to high alcohol intake on average, this lifestyle habit would be a positive risk factor to their overall cvd risk profile.

5. Conclusion

Overall, staff members' presented with high and moderate risk for CVD. Additionally, waist measures revealed a possible risk of type II diabetes and metabolic syndrome. Selected lifestyle habits of staff members' remain adequate to poor. The lack of proper nutrition, potentially due to influences of food availability and convenience (fast food cafeterias which remain predominant in teritiary institutions) could be attributable to the increased waist circumferences, BMI measurements and body fat percentages that were found among the staff. With the staff spending a large amount of time at work, an increase in the promotion of physical activity during working hours is needed to counteract the increased sedentary behaviour during working hours. Furthermore, this could help staff reach minimal physical activity guidelines, recommended by ACSM in order to decrease risk of CVD and other NCD's.

The increased health risk of staff members' is associated with poor nutrition, however, with the improvement through knowledge and education, this could potentially decrease the poor dietary habits and increase the health of all staff members' thus increasing work production. Lifestyle habits is a modifiable risk factor that overlaps with specific NCD's such as obesity, type II diabetes and metabolic syndrome along with CVD. Previous studies (Eberly, Stamler, and Neaton (2003); (Langsted, Freiberg, & Nordestgaard, 2008; Mora, Rifai, Buring, & Ridker, 2008) concluded that non-fasting triglyceride levels may be more useful than fasting triglyceride levels for risk stratification of cardiovascular disease. However, further research of non-fasting blood measures as a CVD risk needs to be conducted.

Hence, a workplace health intervention is warranted for the staff to improve their CVD risk and risk of potential NCD's in the future. By developing a setting as such, this promotes convenience and initiative to staff members' during their working day, to conform to weekly systematic health check-ups with regards to their CVD risk factors. These results should then be recorded and tracked with a health professional. In this way, staff members' can then utilise this workplace health centre to perform personal consultations and exercise rehabilitation recommendations with a health professional, based on their results.

6. Limitations

Although the study achieved its aims and objectives, there were still some unavoidable limitations. Firstly, due to the small sample size, generalisations of the staff members should be made with caution. Secondly, only non-fasting blood measures were taken. The results, could have varied had both been tested. Thirdly, by participants not knowing or answering untruthfully of their blood pressure level, fasting cholesterol and glucose levels it could have skewed the data for the CVD risk profiling. In addition, participants could have been bias towards their lifestyle habits. Lastly, CVD risk factors and lifestyle habits could be influenced by genetics and or culture.

7. Strengths

The use of obtaining the CVD risk profiles from the questionnaire as well as performing the individual health screening among the participants, increased the reliability of their CVD risk profiles. A simliar study by Koen et al. (2017) previously reported on the health and wellness of staff members within a tertiary institution, however the results obtained were self-reported rather than performing the actual health screenings. Therefore, the study is the first to address the health concerns and CVD risk factors among staff members within a tertiary institution in South Africa, hence filling the gap in the literature.

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Competing Interests Statement

The authors declare that they has no competing or potential conflicts of interest.

References

Adegun, J., & Konwea, E. (2009). The Prevalence of Hypokinetic Disorders among Workers in Tertiary Institutions in Ekiti State, Nigeria. *Nebula, 6*(2), 177-186.

Afshin, A., Micha, R., Khatibzadeh, S., Fahimi, S., Shi, P., Powles, J., ... Al-Hooti, S. (2015). The Impact of Dietary Habits and Metabolic Risk Factors on Cardiovascular and Diabetes Mortality in Countries of the Middle East and North Africa in 2010: A Comparative Risk Assessment Analysis. *British Medical Journal, 5*(5), 1-16. https://doi.org/10.1136/bmjopen-2014-006385

Alkhatib, A. (2015). High Prevalence of Sedentary Risk Factors Amongst University Employees and Potential Health Benefits of Campus Workplace Exercise Intervention. *Work*, 52(3), 589-595. https://doi.org/10.3233/WOR-152182

American College of Sports Medicine. (2014). *ACSM'S Guidelines for Exercise Testing and Prescription* (L. S. Pescatello, 9th ed.). Philadelphia: Wolters Kluwer/Lippincott Williams & Wilkins Health.

American Diabetes Association. (2015). Classification and Diagnosis of Diabetes. *Diabetes Care, 38*(Supplement 1), S8-S16. https://doi.org/10.2337/dc15-S005

American Heart Association. (2016). Heart Disease and Stroke Statistics-2016 Update: A Report from the American Heart Association. *Circulation, 133*(4), e38-360. https://doi.org/10.1161/CIR.0000000000000350

Australian Bureau of Statistics. (2014-2015). *National Health Survey First Results Australia 2014-15.* Retrieved from http://www.ausstats.abs.gov.au/ausstats/subscriber.nsf/0/CDA852A349B4CEE6CA257F150009FC53/$File/national health survey first results, 2014-15.pdf

Bandura, A. (2004). Health Promotion by Social Cognitive Means. *Health Education & Behavior, 31*(2), 143-164. https://doi.org/10.1177/1090198104263660

Barnoya, J., & Glantz, S. A. (2005). Cardiovascular Effects of Secondhand Smoke Nearly as Large as Smoking. *Circulation, 111*(20), 2684-2698. https://doi.org/10.1161/CIRCULATIONAHA.104.492215

Bjurstrom, L. A., & Alexiou, N. G. (1978). A Program of Heart Disease Intervention for Public Employees: A Five Year Report. *Journal of Occupational and Environmental Medicine, 20*(8), 521-531. https://doi.org/10.1097/00043764-197808000-00002

Bourne, L. T., Lambert, E. V., & Steyn, K. (2002). Where Does the Black Population of South Africa Stand on the Nutrition Transition? *Public Health Nutrition*, *5*(1a), 157-162. https://doi.org/10.1079/PHN2001288

Cornier, M. A., Dabelea, D., Hernandez, T. L., Lindstrom, R. C., Steig, A. J., Stob, N. R., … Eckel, R. H. (2008). *The Metabolic Syndrome. Endocrine Reviews*, *29*(7), 777-822. https://doi.org/10.1210/er.2008-0024

Dreyer, S., Dreyer, L. I., & Rankin, D. M. (2010). The Health and Wellbeing of Staff Members at a Tertiary Institution in New Zealand. *Journal of Research in Health, Physical Education, Recreation, Sport & Dance*, *5*(1), 45.

Eberly, L. E., Stamler, J., & Neaton, J. D. (2003). Relation of Triglyceride Levels, Fasting and Nonfasting, to Fatal and Nonfatal Coronary *Heart Disease. Archives of Internal Medicine*, *163*(9), 1077-1083. https://doi.org/10.1001/archinte.163.9.1077

Freak-Poli, R., Wolfe, R., & Peeters, A. (2010). Risk of Cardiovascular Disease and Diabetes in a Working Population with Sedentary Occupations. *Journal of Occupational and Environmental Medicine*, *52*(11), 1132-1137. https://doi.org/10.1097/JOM.0b013e3181f8da77

Grundy, S. M. (2004). Obesity, Metabolic Syndrome, and Cardiovascular Disease. *The Journal of Clinical Endocrinology & Metabolism*, *89*(6), 2595-2600. https://doi.org/10.1210/jc.2004-0372

Joubert, J., Norman, R., Bradshaw, D., Goedecke, J. H., Steyn, N. P., & Puoane, T. (2007). Estimating the Burden of Disease Attributable to Excess Body Weight in South Africa in 2000. *South African Medical Journal, 97*(8), 683-690.

Joubert, J., Norman, R., Lambert, E. V., Groenewald, P., Schneider, M., Bull, F., ... Bradshaw, D. (2007). Estimating the Burden of Disease Attributable to Physical Inactivity in South Africa in 2000. *South African Medical Journal, 97*(8), 725-731.

Kim, H. C., & Oh, S. M. (2013). Non-Communicable Diseases: Current Status of Major Modifiable Risk Factors in Korea. *Journal of Preventive Medicine and Public Health, 46*(4), 165. https://doi.org/10.3961/jpmph.2013.46.4.165

Koen, N., Philips, L., Potgieter, S., Smit, Y., van Niekerk, E., Nel, D., ... Visser, J. (2017). Staff and Student Health and Wellness at the Faculty of Medicine and Health Sciences, Stellenbosch University: Current Status and Needs Assessment. *South African Family Practice*, 1-7. https://doi.org/10.1080/20786190.2017.1396788

Kurian, A. K., & Cardarelli, K. M. (2007). Racial and Ethnic Differences in Cardiovascular Disease Risk Factors: A Systematic Review. *Ethnicity and Disease*, *17*(1), 143-152.

Langsted, A., Freiberg, J. J., & Nordestgaard, B. G. (2008). Fasting and Nonfasting Lipid Levels Influence of Normal Food Intake on Lipids, Lipoproteins, Apolipoproteins, and Cardiovascular Risk Prediction. *Circulation*, 118(20), 2047-2056. https://doi.org/10.1161/CIRCULATIONAHA.108.804146

Mayosi, B. M., Flisher, A. J., Lalloo, U. G., Sitas, F., Tollman, S. M., & Bradshaw, D. (2009). The Burden of Non-Communicable Diseases in South Africa. *The Lancet, 374*(9693), 934-947. https://doi.org/10.1016/S0140-6736(09)61087-4

Mbuya, F. E., Fredrick, F., & Kundi, B. (2014). Knowledge of Diabetes and Hypertension among Members of

Teaching Staff of Higher Learning Institutions in Dar Es Salaam, Tanzania. *Tanzania Journal of Health Research, 16*(2). https://doi.org/10.4314/thrb.v16i2.5

McNaughton, S. A., Crawford, D., Ball, K., & Salmon, J. (2012). Understanding Determinants of Nutrition, Physical Activity and Quality of Life among Older Adults: The Wellbeing, Eating and Exercise for a Long Life (Well) Study. *Health and Quality of Life Outcomes, 10*(1), 1. https://doi.org/10.1186/1477-7525-10-109

Mora, S., Rifai, N., Buring, J. E., & Ridker, P. M. (2008). Fasting Compared with Nonfasting Lipids and Apolipoproteins for Predicting Incident Cardiovascular Events. *Circulation, 118*(10), 993-1001. https://doi.org/10.1161/CIRCULATIONAHA.108.777334

Newby, P. K., Muller, D., Hallfrisch, J., Qiao, N., Andres, R., & Tucker, K. L. (2003). Dietary Patterns and Changes in Body Mass Index and Waist Circumference in Adults. *The American Journal of Clinical Nutrition, 77*(6), 1417-1425. https://doi.org/10.1093/ajcn/77.6.1417

O'neill, S., & O'driscoll, L. (2015). *Metabolic Syndrome: A Closer Look at the Growing Epidemic and Its Associated Pathologies. Obesity Reviews, 16*(1), 1-12. https://doi.org/10.1111/obr.12229

Ogden, C. L., Carroll, M. D., Fryar, C. D., & Flegal, K. M. (2015). *Prevalence of Obesity among Adults and Youth: United States, 2011-2014* (US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics).

Perusse-Lachance, E., Tremblay, A., & Drapeau, V. (2010). Lifestyle Factors and Other Health Measures in a Canadian University Community. *Applied Physiology, Nutrition, and Metabolism, 35*(4), 498-506. https://doi.org/10.1139/H10-035

Puoane, T., Steyn, K., Bradshaw, D., Laubscher, R., Fourie, J., Lambert, V., ... Mbananga, N. (2002). Obesity in South Africa: The South African Demographic and Health Survey. *Obesity Research, 10*(10), 1038-1048. https://doi.org/10.1038/oby.2002.141

Rehm, J., Mathers, C., Popova, S., Thavorncharoensap, M., Teerawattananon, Y., & Patra, J. (2009). Global Burden of Disease and Injury and Economic Cost Attributable to Alcohol Use and Alcohol-Use Disorders. *The Lancet, 373*(9682), 2223-2233. https://doi.org/10.1016/S0140-6736(09)60746-7

Ronksley, P. E., Brien, S. E., Turner, B. J., Mukamal, K. J., & Ghali, W. A. (2011). Association of Alcohol Consumption with Selected Cardiovascular Disease Outcomes: A Systematic Review and Meta-Analysis. *BMJ, 342*, d671. https://doi.org/10.1136/bmj.d671

Rosendorff, C., Lackland, D. T., Allison, M., Aronow, W. S., Black, H. R., Blumenthal, R. S., … Findeiss, L. (2015). Treatment of Hypertension in Patients with Coronary Artery Disease: A Scientific Statement from the American Heart Association, American College of Cardiology, and American Society of Hypertension. *Journal of the American Society of Hypertension, 9*(6), 453-498. https://doi.org/10.1016/j.jash.2015.03.002

Saydah, S., Bullard, K. M., Cheng, Y., Ali, M. K., Gregg, E. W., Geiss, L., ... Imperatore, G. (2014). Trends in Cardiovascular Disease Risk Factors by Obesity Level in Adults in the United States, Nhanes 1999 - 2010. *Obesity, 22*(8), 1888-1895. https://doi.org/10.1002/oby.20761

Skaal, L., & Pengpid, S. (2011). Obesity and Health Problems among South African Healthcare Workers: Do Healthcare Workers Take Care of Themselves? *South African Family Practice, 53*(6), 563-567. https://doi.org/10.1080/20786204.2011.10874153

Soler, X., Gaio, E., Powell, F. L., Ramsdell, J. W., Loredo, J. S., Malhotra, A., ... Ries, A. L. (2015). High Prevalence of Obstructive Sleep Apnea in Patients with Moderate to Severe Chronic Obstructive Pulmonary Disease. *Annals of the American Thoracic Society, 12*(8), 1219-1225. https://doi.org/10.1513/AnnalsATS.201407-336OC

Stensvold, I., Tverdal, A., Urdal, P., & Graff-Iversen, S. (1993). *Non-Fasting Serum Triglyceride Concentration and Mortality from Coronary Heart Disease and Any Cause in Middle Aged Norwegian Women. BMJ, 307*(6915), 1318-1322. https://doi.org/10.1136/bmj.307.6915.1318

The Heart and Stroke Foundation. (2015). *Health*. Retrieved from http://www.heartfoundation.co.za/health - sthash.9eK4Rch7.dpuf

Tibazarwa, K., Ntyintyane, L., Sliwa, K., Gerntholtz, T., Carrington, M., Wilkinson, D., ... Stewart, S. (2009). A Time Bomb of Cardiovascular Risk Factors in South Africa: Results from the Heart of Soweto Study "Heart Awareness Days. *International Journal of Cardiology, 132*(2), 233-239. https://doi.org/10.1016/j.ijcard.2007.11.067

van Gemert, F., Kirenga, B., Chavannes, N., Kamya, M., Luzige, S., Musinguzi, P., ... Williams, S. (2015). Prevalence of Chronic Obstructive Pulmonary Disease and Associated Risk Factors in Uganda (Fresh Air Uganda): A Prospective Cross-Sectional Observational Study. *The Lancet Global Health, 3*(1), e44-e51. https://doi.org/10.1016/S2214-109X(14)70337-7

Van Zyl, S., Van der Merwe, L. J., Walsh, C. M., Groenewald, A. J., & Van Rooyen, F. C. (2012). Risk-Factor Profiles for Chronic Diseases of Lifestyle and Metabolic Syndrome in an Urban and Rural Setting in South Africa. *African Journal of Primary Health Care & Family Medicine, 4*(1), 10 pages. https://doi.org/10.4102/phcfm.v4i1.346

Vyncke, P. (2002). Lifestyle Segmentation from Attitudes, Interests and Opinions, to Values, Aesthetic Styles, Life Visions and Media Preferences. *European Journal of Communication*, *17*(4), 445-463. https://doi.org/10.1177/0267323102017004030l

World Health Organisation. (2016). *Global Health Observatory (Gho) Data*. Retrieved from http://www.who.int/gho/ncd/risk_factors/obesity_text/en/

World Health Organisation. (2017). *Noncommunicable Diseases*. Retrieved from http://www.who.int/mediacentre/factsheets/fs355/en/