The determinants of metabolic syndrome and associated risk factors of CVDs among taxi drivers operating in Cape Town and surrounding areas: a focus on street food

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Motivation of the study

In 2016, endocrine, nutritional and metabolic syndrome (metS) including cardiovascular diseases (CVDs) were the fourth cause of death among all South Africans[1]. These diseases are thought to be fuelled by rapid nutrition and epidemiological transitions that are also characterised by urbanisation and life style changes. These lifestyle changes include increased intakes of convenient foods such as fast and street foods (SF) which are generally rich in refined carbohydrates, fats as well as salt while low in essential fatty acids, fruit and vegetables[2]. Generally street-vended foods are defined as ready-to-eat foodstuffs and beverages vended in streets and other public places such as markets or fairs for fast consumption[3]. Research has shown that these foods in combination with low levels of physical activity, stress and smoking contribute to the metS risk factors such as hypertension, insulin resistance, obesity and type 2 diabetes[4]. The prevalence of CVDs has been reported to be elevated among certain occupations. A number of international research studies stated the prevalence of CVD to be elevated among occupational drivers compared to other professions for example industrial and office workers[5,6]. In 1953, Morris reported an increased prevalence of CVD among bus drivers in England. Ever since, the association between occupational driving and CVD has been explored. Earlier comparative trials on coronary risk factors also reported an increased prevalence of type 2 diabetes mellitus, obesity and elevated levels of total serum cholesterol amongst taxi drivers. Several other studies reported similar coronary risk factors among drivers, suggesting that eating habits and the types of food consumed play an important role in the progression of CVD. In South Africa, taxi-drivers and commuters are major consumers of SF since it is relatively cheap and easily obtainable at taxi ranks and bus stations. A recent study conducted in the Western Cape, South Africa has shown that the sale of SF is mostly concentrated around the transport interchange areas. Similarly, the most and frequent consumers of these foods are those people who spend most of their time around these areas. Street foods are also shown to be sugar, fat and salt concentrated, at the same time deficient in essential fatty acids. Since many taxi drivers consume these foods often, there is a need to determine their metS, food purchasing habits, food choices, adiposity and also investigate their blood parameters and nutritional profile

Aim and objectives of the proposed study

The aim of the study is to conduct a situational analysis to determine the metabolic syndrome and the associated risk factors for cardiovascular diseases among taxi drivers operating in Cape Town taxi ranks and surrounding areas.

In response to the aim of the study, the following study objectives have been identified:

I. To determine the prevalence of metS among taxi drivers operating in Cape Town and surrounding areas. This will be done by measuring the metabolic profile of taxi drivers namely: Fasting Blood glucose (FBG) Blood pressure (BP), low-density lipoprotein cholesterol (LDL-C) and high-density lipoprotein cholesterol (HDL-C), Triglycerides and Waist circumference (WC)

II. To determine the modifiable risk factors of metS among taxi drivers. This will be done by measuring the Dietary intake of taxi drivers, Food environment surrounding the areas where taxi drivers, The frequency and the proportion of consumption of SF, Physical activity, Working hours and sleep duration, and stress levels

III. To determine the nutritional status of taxi drivers operating in Cape Town and surrounding areas. This will be done by measuring the BMI, body composition (4 skinfold measurements), and body fat distribution (waist to hip / waist to height)

IV. Determine the dietary pattern and associated risk factors for metS of taxi drivers.

V. Assess the BMI and percentage Body fat and their relationship with the risk of metS.

VI. Estimate the lifestyle practices (smoking, alcohol intake, engagement in exercise) on the occurrence of the risk of developing metS.

VII. Assess the amount of tobacco and frequency of smoking among taxi drivers and determine the relationship between smoking and their BMI and adiposity

VIII. Assess the amount of alcohol consumed and the frequency of alcohol consumption among taxi drivers and determine the relationship between alcohol consumption and their BMI, and adiposity.

IX. Comparison of waist circumference with body mass index for predicting abdominal adipose tissue among taxi driver

Methodology

Study design

This study forms part of a larger project that developed a street food (SF) vending business model designed to offer healthy and safer foods in the Cape Town and surrounding areas (i.e. Bellville, Khayelitsha, Nyanga and Cape Town) previously shown to have many SF vendors operating[3]. The current study will be a cross-sectional study that will focus on the taxi drivers' dietary intakes of SF, metabolic profile and associated risk factors of NCDs. Blood samples that will be collected and be analyzed at the Functional Foods Research Unit (FFRU) laboratory of Cape Peninsula University of Technology (CPUT).

Diagnostic criteria for metS

MetS will be diagnosed using the new harmonised guidelines of the international diabetes federation (IDF) which requires large waist circumference (WC) of ≥94cm (males) and ≥80cm (Females) in addition to two of the following criteria: low HDL-C of <1.0 mmol/L (males) and <1.3 mmol/L (female), high TG of ≥1.7 mmol/L), elevated BP (≥130 mmHg systole and/or ≥85 mmHg diastole), or FBG (≥5.6 mmol/L)[7]

Socio-demographic and dietary intake questionnaires

A previously validated questionnaire aimed at South Africans aged 15 years and older, which was employed in the South African National Health and Nutrition Examination Survey 1 (SANHANES-1) will be used to elucidate information on socio-demographic and dietary intake.

Anthropometric measurements

Anthropometric measurements will be done according to the standard procedure. Measurements include height, weight, WC, hip circumference as well as tricep, bicep, sub-scapular and supra-iliac skinfolds.

Blood pressure measurements

Blood pressure will then be measured after 5–10-min rest in a sitting position with a Riester mercury sphygmomanometer.

Blood sampling

After an average 10-hr overnight fasting, a venous blood sample will be obtained from the antecubital vein to measure serum fasting blood sugar (FBS), high-density lipoprotein (HDL) cholesterol, and triglyceride.

The proposed research subjects and sample size

After conducting a systematic review of similar studies, we found only 2 studies by Kornsteiner et al. (2008) and Richopoulou et al. (2003) that recruited between 30 and 80 subjects, respectively. As such, in the current study, hundred and eighty (N=160) volunteer male taxi drivers between the ages of 18+ years will be targeted and recruited from 4 Cape Metropole transport interchange areas by means of invitation letters handed out to drivers. The proposed sample size is also based on the outcomes from the larger South African SF project undertaken in 2013 to 2014[3] that suggested majority of SF vendors to operate around the transport interchange areas, with majority of consumers of these foods being found around these transport interchange areas. Moreover, this sample size is based on the 15% of the overall sample size of 1 047 consumers interviewed in the aforementioned larger SF project. This previous sample was calculated based on the 2011 Census the urban (including formal and informal urban) population in the Western Cape was 4,088,709. The minimum sample size to represent this population was calculated to be 785 based on the 95% level of significance, 80% power, 50% defects (which gives the maximum sample size) and 0.05 margin of error (http://www.wessa.net/rwasp_sample.wasp). Accounting for a 25% nonresponse, the final sample was estimated at 1,047.

Statistical analysis

Statistical analysis will be conducted with IBM SPSS Statistics 24. Descriptive statistics will be used to describe the basic features such as socio-demographic information and other outcomes of the study sample. In this case means, medians, standard error of means and standard deviations will be presented based on whether the outcomes obtained follow normal or skewed distributions. Statistical significant difference will be shown using confidence intervals that do not overlap and p values <0.05. Moreover, advanced statistical tests to be computed will depend on the distribution of the study data and will determined whether parametric or non-parametric tests will be applied to the data. Dietary intake data will be analysed with the MRC Food Finder 111 programme and compared with South Africa's recommended nutrient reference values.

Significance of the research

The current study aims to determine the metabolic profile and the associated risk factors of NCDs of taxi drivers in the identified areas. This will be the first study in South Africa to collect data on selected nutritional status biomarkers and dietary habits among local taxi ranks. If associations are found between SF intake and the selected biomarkers appropriate nutrition education programmes can be developed to support better food choices and dietary habits among this group of the population and thereby contribute reducing the risk NCDs. The information obtained from the study will guide evidence-based intervention prevention in this area of nutrition.

Expected outcomes, results and contributions of the research

It is expected that taxi drivers participating in this study will consume SF at least three times per week accompanied by high consumption of total and saturated fats, salt, refined carbohydrates and sugar, as well as low intakes of fruit, vegetables, fibre and fatty fish. Further associations between SF consumption and metabolic profile and the associated risk factors of NCDs expected since current literature indicates a link between these factors. Bearing this in mind, the proposed research seeks to provide the first information in SA on dietary habits among taxi drivers, as well as supply data on biochemical parameters. The proposed study will further emphasise the role of the taxi drivers' overconsumption and inadequate status of the selected nutrients, their health behaviours, and the role these play in the development of NCDs. The information obtained from this study will provide a platform for further public health research in this neglected area of nutrition. In the long run this may be beneficial to support public health in SA.

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