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Cardiovascular and type 2 diabetes risk factors in Liberian nurses

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ABSTRACT

Background: Type 2 diabetes and cardiovascular disorders are fast growing global health burdens especially in low and middle income countries. The aim of this study was to assess the risk factors of these diseases among male and female nurses in Liberia.
Methods: The random sample of this cross-sectional study was collected from 95 Liberian nurses (63 females and 32 males) who had attended the International Nursing Education Conference in Monrovia. Data about body mass index (BMI), waist circumference (WC), systolic (SBP) and diastolic blood pressure (DBP) and fasting blood glucose (FBG) were collected. The relationships between the measured risk factors and fasting blood glucose were explored using regression analysis.
Results: Over 29% of females and 31% of males had one or more of the measured cardiovascular and type 2 diabetes risk factors. Among females, 50% were overweight or obese or centrally obese, 20% had elevated SBP and DBP, and 70% had elevated FBG. Among males, 45% were overweight or obese or centrally obese, 20% had elevated SBP and DBP, and 66% had elevated FBG. BMI was positively related to WC among both females and males. WC was positively related to SBP and DBP and FBG among both females and males. BMI had a significant relationship with SBP and DBP and FBG among both females and males.
Conclusion: These observations suggest that reducing the identified risk factors may be important for primary prevention and management of type 2 diabetes and cardiovascular disorders.

1. Introduction

Several studies have reported that insulin resistance associated with increasing body weight contributes to the development of cardiovascular risk factors, including hypertension, type 2 diabetes, and dyslipidemia (Denke, Sempose, & Grundy, 1993; Eckel & Krauss, 1998; Kannel, D'Agostino, & Cobb, 1996. The World Health Organization (2014a) report on the global prevalence of diabetes (estimated to be 9% among adults) alarmed that the disease is a serious and fast expanding global health burden. Diabetes causes extensive debility, interrupts individual and family life and affects society as a whole. Findings of the International Diabetes Federation (2014) revealed that 387 million people suffered from diabetes in 2014 and this number is expected to rise to 592 million by 2035, while 175 million people remain undiagnosed. Ninety percent of these people suffer from type 2 diabetes. The diabetes problem is especially challenging in low- and middle-income countries where nearly 80% of people with diabetes live. Further, the World Health Organization (2014b) reports that more than 80% of diabetes deaths occur in low- and middle-income countries. Shidfar, Albrzi, Salehi, and Nojomi (2012) pointed out that aside from the direct effects of diabetes, diabetes also contributes considerably to risk of cardiovascular disorders.

Risk factors that have been investigated and commonly recognized as contributing significantly and independently to type 2 diabetes include overweight and obesity, hypertension and high fasting blood glucose level (Inoue, Minami, & Yano, 2014). Overweight and obesity are major risk factors for the development of type 2 diabetes in almost all countries, both low and middle income and high income. It is reported that in adult Europeans, obesity accounts for about 80% of cases of type 2 diabetes, and about 55% of cases of hypertension (World Health Organization, 2007). The American Heart Association (2005) revealed that in the USA, obesity and development of type 2 diabetes (as well as other diseases) are strongly correlated.

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Cardiovascular and type 2 diabetes risk factors in adults e.g., high blood pressure, raised blood glucose, overweight and obesity are prevalent in Liberia. Liberia is a small, low-income, West African country with a population of 4.2 million and ranks 175 out of 187 countries according to the Human Development Index (HDI) (United Nations Development Programme, 2014), and has a total expenditure on health per capita of $102 (World Health Organization, 2015a). The World Health Organization (2014c) reports 32% adult males and 28.7% adult females are hypertensive. Raised blood glucose level in adult males is 8.4% and that of adult females is 9.3%. About 2.8% adult males and 10.6% adult females are obese; and 16.3% adult males and 25.1% adult females are overweight (World Health Organization, 2014c).

Epidemiological studies have reported relationships between obesity, hypertension, and type 2 diabetes (Bloomgarden, 2002; Colosia, Palencia, & Khan, 2013; Stratton et al., 2006; Zanella, Kohlmann, & Ribeiro, 2001). Moreover, Zhou, Hu, and Chen (2008) reported a positive relationship between body mass index, waist circumference and blood pressure. Also, Modan, Halkin, and Almog (1985) established a relationship between high blood pressure, obesity and high fasting blood glucose level. There is paucity of such studies in the sub-Saharan Africa, and such studies are scarcely done among healthcare workers. Because of financial and social impact of cardiovascular disorders and type 2 diabetes, investigating the relationships of their risk factors among the frontline health workers is important to increase understanding of the diseases and can be useful in the advancement of public health policy and controlling of the diseases. In Liberia, nurses, including registered nurses, nurse-midwives, licenced practical nurses, public health nurses, community health nurses, etc. (0.28 per 1000 population) comprise sixty-seven percent of the total number of health workers (Africa Health Workforce Observatory, 2010). Therefore, knowing the risk predictors in this important group of health care professionals will help improve understanding, management and prevention of these diseases in the population at large. Risk factors are usually indicative of the presence or onset of diseases, and as such, anthropometric measures frequently are employed to ascertain this. Because there are gender differences in anthropometric predictors, we sought to evaluate the risk factors in female and male nurses separately. Our objective was to assess cardiovascular and type 2 diabetes risk factors among male and female nurses in Liberia. Additionally, to evaluate the relationship of three type 2 diabetes and cardiovascular disease risk factors (body mass index, central obesity, and high blood pressure) and fasting blood glucose level in this population.

2. Methods

2.1. Setting and participants

This cross-sectional study was carried out in May 2014. Using a random sampling design, 95 nurses (63 females and 32 males) out of the 106 nurses who had attended the International Nursing Education Conference in Monrovia, Liberia were invited to participate. Random sample of nurses were drawn from the conference registration system using computer generated random numbers. Trained nurses collected the following anthropometric predictors of type 2 diabetes and cardiovascular disease risk factors: body mass index, central obesity, systolic and diastolic blood pressure and fasting blood glucose level.

2.2. Data collection

Standing body height was measured to the nearest 0.1 cm. Body weight was measured using bathroom-type scale to the nearest 0.1 kg. All participants were weighed on the same scale. The scale was initially calibrated by known standard weight (10 kg) and tared to zero after each use. The subjects wore light clothing and had no shoes on. Body mass index was calculated as weight (kg) divided by height squared (m^2). The degree of obesity was estimated using the threshold values published by the World Health Organization (2015b).

Central obesity was determined by measuring waist circumference. We used a rubber measuring tape at the level of the umbilicus and measured waist circumference to the nearest 0.5 cm. Waist circumference thresholds of 80 cm or above for females and 94 cm or above for males were used to indicate high levels of obesity-related health risk, respectively (Katzmarzyk et al., 2011).

Blood pressure was taken using an automatic monitor, after five minutes rest, and with the subject in a seated position. The presence of hypertension was defined as a systolic blood pressure $\geqslant$140 mmHg or a diastolic blood pressure $\geqslant$90 mmHg. The subjects had fasted twelve hour prior, and fasting blood glucose level was determined, to the nearest 0.1 mg/dl, using a personal glucose monitor. Impaired fasting blood glucose and diabetes were defined according to the International Diabetes Federation (2006) and the American Diabetes Association (2012) criteria. Impaired fasting blood glucose was defined as a fasting blood glucose level of 100–125 mg/dl (5.6–6.9 mmol/l). Diabetes was defined as a fasting blood glucose level greater than or equal to 125 mg/dl (6.9 mmol/l).

2.3. Data analyses

Descriptive statistics for variables were used with tables, means and standard deviations. Average values (mean) and standard deviations (SD) were used to describe the continuous variables. Absolute (N) and relative (%) frequencies were used for the description of categorical variables. Relationships between body mass index, central obesity, systolic blood pressure, diastolic blood pressure, and fasting blood glucose were analyzed using linear regression. Statistical significance was set at $p < .05$ and analyses were conducted using SPSS statistical software (version 17.0).

2.4. Ethical considerations

Subjects were informed about the objectives of the study, guaranteed anonymity and the voluntary nature of the study. After the nurses agreed to participate, written informed consent was obtained from each of them. Those participants who were likely to have type 2 diabetes or had impaired fasting blood glucose were counseled to see their physicians for follow-up with an oral glucose tolerance test or other diagnostic tests and possible treatment. The study was approved by the Ethical Committee of the College of Health and Science, Adventist University of West Africa. Prior to the study, we made sure that our research met the international ethical standard for the protection of human participants, in particular, with respect to the World Medical Association Declaration of Helsinki (2002).

3. Results

Ninety-five nurses who had never been diagnosed with type 2 diabetes took part in the study, which was 90% of the conference attendees. The mean age of the sixty-three females was 33.8 years (±6.65) with a range of 18–64 years. The mean age of the thirty-two males was 30.5 years (±5.83) with a range of 22–55 years. The study subjects came from different parts of the country and the general nursing workforce consisting of registered nurses, nurse-midwives, licenced practical nurses, public health nurses,