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Original article

Adiposity, hypertension and weight management behaviours in Ghanaian type 2 diabetes mellitus patients aged 20–70 years

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ABSTRACT

Objective: This study assessed the prevalence of general and abdominal obesity and hypertension as well the weight management behaviours of type 2 diabetes mellitus patients.
Methods: It included 378 diabetes patients seeking care from two hospitals in Ghana. Standard methods and tools were used to assess participants' weight, height, waist circumference (WC), blood pressure (BP) and fasting plasma glucose (FPG). Weight management behaviours were measured using a questionnaire.
Results: The prevalence of general obesity, abdominal obesity and hypertension was 20.1%, 46.6% and 67.7% respectively. Abdominal obesity was more likely in participants who: skipped breakfast, engaged in exercise to lose weight and were generally overweight/obese. General overweight and obesity was more likely in participants who: reported receipt of weight management counselling, engaged in exercise to lose weight, had a weight management plan/goal, and were abdominally obese. Hypertension was less likely in participants who had: no formal education, diabetes for ≥5 years and modified their dietary habits to lose weight but more likely in those who skipped breakfast.
Conclusion: Abdominal obesity, general overweight/obesity, and hypertension were frequent in this sample and were influenced by weight management behaviours.

1. Introduction

Diabetes has become a global health issue affecting both developed and developing countries. Described as "hunger in the mist of plenty", diabetes affects 382 million adults globally and was responsible for over 5.1 million deaths in 2013 [1]. Over 80% of the people living with diabetes are in low- and middle-income countries. About 20 million of these cases occur in the Africa region. According to the International Diabetes Federation all types of diabetes are on the increase and type 2 diabetes in particular is estimated to increase by 55% in 2035 [2]. Type 2 diabetes is responsible for 85–95% of all diabetes cases in developed countries and may be responsible for an even higher percentage in low- and middle-income countries [2].

Overweight and obesity measured by body mass index (BMI) are known risk factors of type 2 diabetes mellitus. It is been estimated that the risk of developing diabetes increases by 2–3 fold in obese individuals when obesity is 120% of ideal weight [3]. Apart from affecting the effective management of hyperglycaemia, excess body weight also interferes with the effective treatment of hypertension and dyslipidemia [4].

As one of the principal components of the metabolic syndrome, abdominal obesity (measured by a waist circumference (WC) >88 cm for women and >102 cm for men) is also an important risk factor of type 2 diabetes. Abdominal obesity is linked to impaired glucose tolerance, impaired insulin-stimulated glucose disposal and decreased metabolic removal of insulin [5].

Hypertension is a common comorbidity in persons living with type 2 diabetes mellitus. Hypertension is reported in over two-thirds of patients with diabetes and its development coincides with the development of hyperglycaemia [6]. There is a close association between impaired glucose tolerance and high blood pressure. Hypertension is more frequent in both type 1 and type

Abbreviations: WHO, World Health Organisation; IDF, International Diabetes Federation; UNICEF, United Nations Childrens' Education Fund; CHD, coronary heart disease; BMI, body mass index; FPG, fasting plasma glucose; SBP, systolic blood pressure; DBP, diastolic blood pressure; WC, waist circumference; NHANES III, National Health and Nutrition Examination Survey III; SAAT, subcutaneous abdominal adipose tissue; IAAT, intra-abdominal adipose tissue.

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2 diabetes people than those without diabetes. The prevalence of hypertension is associated with a 4–5 fold in mortality largely from coronary artery disease and stroke [7].

Weight management is an important component of diabetes self-management. Several studies have demonstrated the significant role of weight loss activities in reducing the risk of diabetes and rate of developing diabetes complications [8,9]. Given the significant role of weight management in the treatment and management of diabetes, it's pertinent to assess the weight management behaviours of diabetes patients to inform practice and the design of interventions. Even though the prevalence of diabetes is rising in Africa, the healthcare systems appear to be less equipped to handle chronic diseases such as these. Limited staff, infrastructure and emphasis on infectious diseases further aggravate the situation. This increases the risk of diabetes complications and increased mortality [10–12]. Furthermore, this situation has resulted in either limited or contrasting data on the prevalence of diabetes, its complications and management in the Africa region.

This study determined the prevalence of general obesity, abdominal obesity and hypertension as well as the weight management behaviours of Ghanaian adult type 2 diabetes patients age 20–70 years. Factors associated to general and abdominal obesity in this sample population were also investigated.

2. Methods

2.1. Participants

This cross-sectional study was conducted among 378 diabetes patients seeking care from the outpatient diabetes care of two hospitals in Tamale, Ghana, from January to July 2014. This is part of the Tamale Diabetes Study (TDS), a small authors' funded study among type 2 diabetes mellitus patients. The TDS collects varied health information of the diabetes patients including clinical variables, anthropometric data, demographics, and weight management behaviours, self-assessment of weight status and receipt of weight management counselling as well as knowledge on the treatment and management of the condition. For the current study, clinical variables, anthropometric data, demographics, weight management behaviours and receipt of weight management counselling were included into the analysis. During the study period all previously diagnosed diabetes patients aged 20 years and older seeking care from the hospital were included into the study based on an inclusion and exclusion criteria. Purposively, 403 participants were approached to participate in the study. Three hundred and ninety eight were eligible to participate, out of which 378 agreed and consented to the study. Participation in the study was voluntary and all participants provided informed consent. The study was approved and granted permission by the Research Unit of the Tamale Teaching Hospital.

2.2. Inclusion criteria

Participants aged 20 years and older and self-reported type 2 diabetes and have been living with diabetes for 1 year and longer were eligible to participate in the study.

2.3. Exclusion criteria

Those aged younger than 20 years; being pregnant; lactating mothers and self-reported type 1 diabetes were excluded from the study. Furthermore, participants reporting a history of heart failure, myocardial infarction, acromegaly, hypothyroidism, hypogonadism, and any other chronic diseases were excluded. Additionally, those on prolonged steroid use, and those who were on active drug treatment for obesity were not eligible to participate.

2.4. Anthropometric variables

Weight, height, waist and hip circumferences were measured by the 2nd author using standard procedures. Weight was measured without shoes and wearing light clothing to the nearest kilogram using the United Nations Childrens' Education Fund (UNICEF) electronic scale manufactured by seca. Height was measured without shoes on to the nearest centimetre using a wall-mounted standardized microtoise manufactured by seca. BMI was calculated as body weight in kilograms divided by the squared value of body height in metres (kg/m^2) and categorized into underweight, normal weight, overweight and obesity based on the World Health Organisation (WHO) criteria. Accordingly, BMI $\leq$18.5 kg/m^2 was considered underweight, 18.5–24.9 kg/m^2: normal weight, 25.0–29.9 kg/m^2: overweight, and $\geq$30 kg/m^2: obese [13].

WC was measured midway between the inferior angle of the ribs and the suprailiac crest [14]. Hip circumference was measured as the maximal circumference over the buttocks in centimetres. Both measurements were measured to the nearest 1 cm using a non-stretchable fibre-glass measuring tape (Butterfly, China). During both measurements, participants stood in an upright position, with arms relaxed at the side, feet evenly spread apart and body weight evenly distributed in accordance with the WHO expert consultation report on WC and waist-to-hip ratio [14]. Abdominal obesity was determined as a WC >102 cm in men and >88 cm in women according to the WHO cut-off points and risk of metabolic complications for WC [14].

2.5. Clinical variables

Clinical variables such as blood pressure (BP) and fasting plasma glucose (FPG) were measured using standard procedures by the nurses who provide routine care to the diabetes patients. After the participant was seated and rested for about 5 min, BP was measured with the participant sitting with the arm resting at the level of the heart using a standard mercury sphygmomanometer. Systolic blood pressure (SBP) and diastolic blood pressure (DBP) were recorded to the nearest 2 mm Hg. A second measurement was done for a participant if the first measurement was found to be hypertensive for confirmatory purposes. Hypertension was defined as a SBP of $\geq$140 mm Hg and/or a DBP of $\geq$90 mm Hg.

Fasting blood glucose was measured using Accu-Chek Active blood glucose metre manufactured by Roche Diagnostics GmBH in accordance with the user guidelines provided by the manufacturer.

2.6. Covariates

Socio-demographic characteristics such as age, duration of diabetes, family history of diabetes, educational level and marital status were collected using a self-administered questionnaire. In addition, weight management behaviours of the participants were also assessed using the same questionnaire. The socio-demographic variables were categorized as follows: age (<50 years and $\geq$50 years), educational status (no education, low and high level of education), marital status (married and not married), religious following (Islamic, Christianity and African traditional religion) and number of years since diabetes diagnosis (>5 years and $\geq$5 years). Low level of education included those who reported to have attained basic level of education (Primary and Junior high). High level of education included those who reported to have attained senior high level of education or higher. All participants who