Original Article

The association of age, gender, ethnicity, family history, obesity and hypertension with type 2 diabetes mellitus in Trinidad

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ABSTRACT

Aims: To assess the impact of risk factors such as age, gender, ethnicity, family history, body mass index (BMI), waist circumference and hypertension, on the development of type 2 diabetes mellitus in the Trinidadian population.
Materials and Methods: A cross-sectional case control study comprised 146 non-diabetics and 147 type 2 diabetics ≥18 years of age, from North Central, South West and Eastern regions of Trinidad.
Results: Cross-tabulations revealed a significant difference between type 2-diabetes and age at $p < 0.01$, and between type 2 diabetes and family history, ethnicity, waist circumference and hypertension at $p < 0.05$. Logistic regression showed age to be the most influential risk factor. The systolic blood pressure specifically showed a significant difference at $p < 0.05$, with the mean values for non-diabetics and type 2 diabetics being, 130.62 (±2.124) and 141.35 (±2.312), respectively. No significant difference was observed between type 2 diabetes and gender and BMI.
Conclusions: Age was the most significant risk factor of type 2 diabetes. Therefore it can be concluded that family history, ethnicity, waist circumference and hypertension are more significant risk factors of this disease than BMI and gender in the Trinidadian population.

1. Introduction

Diabetes mellitus is defined as a group of metabolic disorders which are characterized by an insulin deficiency, insulin resistance or a combination of both, leading to chronic hyperglycaemia [1]. According to Black's medical dictionary type 2 diabetes mellitus (T2DM) describes patients with an insulin resistance. Diabetes increases the risk for developing heart disease, stroke, blindness, neuropathy, kidney disease and amputations. Per capita, Trinidad and Tobago has the highest number of diabetics in the Western Hemisphere and is also fifth globally. Risk factors of T2DM include age, gender, ethnicity, family history, obesity and hypertension which are investigated in this study.

It has been shown that the prevalence of T2DM increases with advancing age. However, the incidence of T2DM is increasing more rapidly in adolescents and young adults.

Rodolfo Valdez highlights in his study that T2DM must be influenced by genetics as evidenced by high occurrence within families, especially twins and a growing number of genetic markers found associated with the disease [2]. According to Samata Padaki et al., having a family history of the disease doubles or even quadruples risk [3].

Paula Ford Martin with Ian Blummer, M.D. (2005) state that more than 4 out of 5 of type 2 diabetic patients are overweight [4]. One in eight people in T&T is overweight. Thus, obesity is an investigated factor in this study using BMI and waist circumference measurements.

Globally studies show that ethnicity has a role to play in the risk of T2DM. Asian Indians have a much higher prevalence of T2DM at an earlier age compared to other ethnic groups [5]. The ethnicities more at risk are Southern Asians, Africans and African Caribbean as opposed to Europeans [6]. Ethnic differences in the prevalence of diabetes also persist after stratification by BMI [7]. This suggests that the impact of lifestyle factors on obesity and diabetes differs in various ethnic groups.

Worldwide, more men than women have T2DM [8]. Reasons for this include smoking rates, fat distribution and food choices. Men tend to store fat in their abdominal area whereas women typically store more fat subcutaneously at the hips and thighs. Hence, women may need to accumulate a greater total amount of fat before they begin to develop harmful deposits in the abdominal area. Substances such as hormones are released by abdominal fat

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cells that lead to inflammation which may decrease insulin responsiveness [9].

Lastly, the relationship of T2DM and hypertension is one of a positive feedback loop. 40% of people who are suffering from diabetes also suffer from hypertension [10].

Therefore our study seeks to investigate these factors on the risk of developing T2DM in the Trinidadian population.

2. Methods

2.1. Setting and study sample

This research was conducted at public hospitals and health centers in the North Central, South West and Eastern regions of Trinidad. Such health facilities were the Eric Williams Medical Sciences Complex (North Central), the San Fernando General Hospital (South West), the Sangre Grande Hospital (East), and the Sangre Grande Health Centre (East). A single-staged sampling method was used. From each of the three (3) regions, approximately fifty (50) type 2 Diabetic patients and fifty (50) persons undiagnosed with T2DM, were chosen to participate in the study after obtaining their consent. The study sample therefore consisted of approximately one hundred and fifty (150) type 2 diabetic and non-diabetic (i.e. undiagnosed) participants each. Pregnant women and persons under 18 years of age were excluded from the study.

2.2. Study design and data collection

This research was a cross-sectional case control study. A questionnaire was administered to each participant who was given the option to either complete it themselves, or with the assistance of a study coordinator. The questionnaire inquired the participant's age, gender, ethnicity, family history of T2DM and their experience of various symptoms and diseases. Also, their weight and height were measured using a weight scale and height rod, respectively, waist circumference measured using a measuring tape, and blood pressure readings taken using an automatic blood pressure kit with the participant seated and relaxed. These measurements were taken by the study coordinators. The data collected were recorded with confidentiality for subsequent analysis.

2.3. Data analysis

The recorded data were tabulated and coded on Microsoft Office Excel 2007, then transferred to the SPSS 16.0 (SPSS, Inc., CA, USA) software program for analysis. Diagrams were constructed to illustrate the statistical information obtained. SPSS was used to perform: crosstabulations between T2DM and each variable (age, gender, ethnicity, family history, BMI status, waist circumference and hypertension); and the independent samples t-test to compare the mean values of BMI, waist circumference, diastolic blood pressure, and systolic blood pressure, between the non-diabetic (control) and type 2 diabetic participants. These calculations were done to determine any significant difference between T2DM and each variable within the study sample. A p value of <0.05 was considered significantly different. SPSS was also used to perform binary logistic regression to determine which variable had the most significant relationship with T2DM.

3. Results

The study sample consisted of 293 participants (146 non-diabetics and 147 type 2 diabetics), of which 64.2% were female and 35.8% were male. The percentage of participants within each age group were as follows: 8.8% between ages 18 and 28, 10.6% between ages 26 and 38, 13.7% between ages 39 and 48, 24.2% between ages 49 and 58, 17.4% between ages 59 and 65 and 25.6% over age 65. 48.5% of participants were Indo-Trinidadians, 30.7% were Afro-Trinidadians and 20.8% were of mixed descent. 71.3% of participants had a family history of T2DM, while 19.5% did not, with the remaining 9.2% not knowing if a family history of the disease was present. 79% of the sample had a waist circumference at or above the cut-off point (for their respective sex) for increased risk of developing T2DM. With respect to BMI status, 3% of participants were underweight, 30% normal weight, 31% overweight, and 36% obese. According to the blood pressure readings measured on site, 26.6% of the sample had a normal blood pressure, 28% were pre-hypertensive, and 28.4% were hypertensive.

3.1. Non-modifiable risk factors

There was a significant difference between age and T2DM at $p < 0.01$. An increase in age was significantly correlated with an increased prevalence of the disease. There was also a significant difference between family history and the prevalence of T2DM at $p < 0.05$. Having no family history of T2DM decreased the chances of having the disease. Furthermore, the study showed a significant difference between ethnicity and T2DM at $p < 0.05$. The Indo-Trinidadian ethnic group had the highest percentage of type 2 diabetics while the Afro-Trinidadian ethnic group had the lowest.
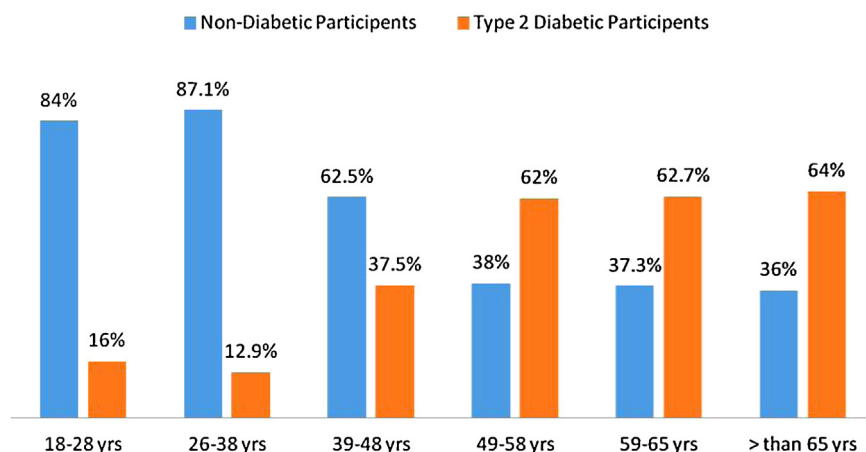

Fig. 1. A bar chart showing the percentages of type 2 diabetic and non-diabetic participants within each age group in the study sample.