Overweight, obesity and chronic complications of diabetes mellitus in patients attending Diabetic Centre, Teaching Hospital, Jaffna, Sri Lanka

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Abstract

Introduction To find out the association of Body Mass Index (BMI) with chronic complications of diabetes mellitus.

Methods A descriptive study was carried out on 8401 diabetic patients registered in the Diabetic Centre, Teaching Hospital of Jaffna, Sri Lanka from May 2009 to November 2013. BMI was categorised according to WHO Southeast Asia classification. Complications were identified from the summary sheets. Retinopathy was assessed with retinal images, peripheral neuropathy was assessed clinically with monofilament and biothesometer in selected patients. Nephropathy was assessed with urine microalbumin. Ischaemic heart disease, peripheral vascular disease and cerebro-vascular accidents were assessed from medical records.

Results Of the 8401 patients 51.1% were males and 48.9% were females. The mean age of males was 61.49 years and females 60.42 years. The mean BMI was 23.70 kg/m². There was no significant difference in BMI according to gender. According to BMI 7.4% were underweight (BMI<18.5 kg/m²), 38.3% were normal weight, 20.5% were overweight and 33.8% were obese.

Rate of complications were ischaemic heart disease 21.1%, cerebrovascular accidents 3.9%, retinopathy 12.0%, peripheral neuropathy 34.1% and nephropathy 39.5%.

There was no significant difference in complication rates according to BMI categories except for hypertension.

Conclusion BMI was not associated with compli-cations of diabetes. There was association between hypertension and BMI.

Introduction

Overweight and obesity are becoming more prevalent in developing countries due to change in lifestyle [1]. One in five adults in Sri Lanka has either diabetes or prediabetes. Weight maintenance within the target body mass index (BMI) helps to prevent many diseases especially diabetes. The relationship between the metabolic control and development of chronic complications of diabetes is an important aspect of patient management [2].

It is known that the duration of diabetes mellitus, poor glycaemic control, hypertension, dyslipidaemia, smoking and BMI play a major role in development of macrovascular complications and microvascular complications [3,4]

This study examines the association between BMI and diabetic complications in patients who are treated at a diabetic centre of a Teaching Hospital in Sri Lanka.

Methods

A descriptive study was carried out at the Diabetic Centre, Teaching Hospital of Jaffna, Sri Lanka from May 2009 to November 2013. All patients followed up in the

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unit were included in the study. Data were collected from summary sheets of each patients which were filled by medical officers of diabetic centre after detailed assessment. Of the 8707 registered diabetic patients, 306 summary sheets were not included due to incomplete data. A total of 8401 patients were included in the study.

BMI was categorized according to WHO South East Asia BMI classification [5,6]. The categories were underweight ≤ 18.5 kg/m^2; normal weight= 18.5-22.99 kg/m^2; overweight = 23-24.99 kg/m^2; obesity 1=25-29.99 kg/m^2; obesity 2$\geq$30 kg/m^2.

Weight was measured using a balance beam scale and height was measured using a wall mounted stadiometer without footwear and minimal clothes. Ischaemic heart disease (IHD) and symptomatic Cerebrovascular accidents (CVA) were identified based on medical records. Retinopathy was assessed using retinal images taken by retinal cameras. They were classified as follows: normal retina; maculopathy; background retinopathy; pre proliferative retinopathy and proliferative retinopathy. Peripheral neuropathy was identified by neurological examination and by using 10g Semmes Weinstein monofilament on recommended sites on planter and dorsal aspects of feet and biothesometer in selected cases. The results were documented as peripheral neuropathy present or not present. Nephropathy was analysed based on urine micro albumin/urine creatinine ratio. Values less than 30 mg/g was categorised as normal, more than 30 mg/g was considered as nephropathy. Peripheral vascular disease (PVD) was identified based on clinical symptoms. Routine Doppler studies were not performed on patients.

Results were analysed using SPSS version 19.0. Unpaired t test was used to determine differences in means between groups. Categorical data were evaluated by chi-squared test. A two tailed $p<0.05$ was considered significant. The approval for the study was obtained from the Ethics Review Committee, Faculty of Medicine, University of Jaffna.

Results

The study population comprised of 8401 diagnosed diabetic patients of which 51.1% were males and 49.9% were females. The mean age of the study population was 60.97 years (SD=11.25). The mean BMI of the study population was 23.70 kg/m^2 (SD=3.97 kg/m^2). Mean BMI of males was 23.71 kg/m^2 and of females was 23.69 kg/m^2. There was no significant difference in BMI between males and females. Distribution according to BMI using WHO Southeast Asia classification was as follows: Underweight (BMI <18.5 kg/m^2) 7.4%, normal weight (BMI 18.5-22.99 kg/m^2) 38.3%, over weight (BMI 23-24.99 kg/m^2) 20.5%, obesity 1 (BMI 25-29.99 kg/m^2) 27.5% and obesity 2 (BMI >30 kg/m^2) 6.3% (Figure 1). IHD was present in 21.1% of diabetic patients and symptomatic CVA was present in 3.9%. PVD was not analysed as patients were not assessed

with routine duplex studies. Retinopathy was present in 12% of all diabetic patients, peripheral neuropathy in 34.1% and nephropathy in 39.5%. The overall complication rate did not differ significantly in different BMI categories ($p>0.05$).

Prevalence of hypertension was 42.2% in under-weight, 52.8% in normal weight, 55.0% in overweight, 56.1% in obesity 1 and 65.2% in obesity 2. The prevalence of hypertension increased with increasing BMI.
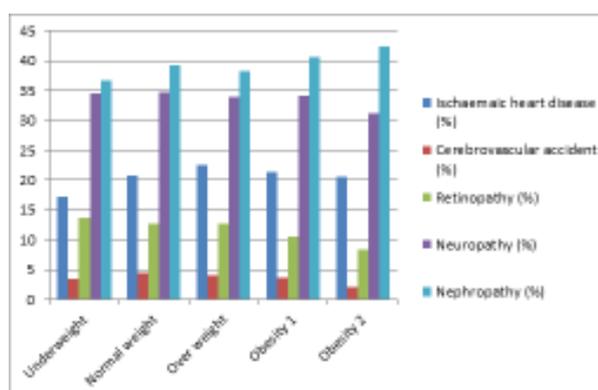

Figure 1. **Percentage of diabetic complications according to BMI categories.**

Discussion

Our study found that BMI is not an independent risk factor for developing diabetic complications. However high BMI is associated with increased incidence of hypertension.

The mean BMI of diabetic patients was 23.70 kg/m^2. There was no significant difference in BMI according to gender. This is similar to a study done previously in Sri Lanka which reported a mean BMI of 23.67 kg/m^2 (SD=0.58) [9]. The average BMI is less than in the Western countries indicating that the South Asians are at risk of getting metabolic disorders at a lower BMI.

In this study 45.7% were underweight or normal weight and 54.3% were overweight or obese. This is similar to a study on the prevalence of overweight and obesity in Sri Lankan adults where the prevalence of overweight and obesity was 60.6% [10]. This difference could be due to life style modification after the treatment of diabetes. However the exact reasons needs to be studied further.

In this study increased BMI was not associated with any of the complications of diabetes. This is similar to findings of another study done in Sri Lanka which looked at association of chronic complications of type 2 DM [11]. They reported that increased BMI was not associated with any of the complications other than nephropathy [11]. Our study also showed increased prevalence of nephropathy with increasing BMI, however it was not statistically significant.

Similar complication rates within different BMI categories may be due to good control of other risk factors such as hypertension, hyperlipidaemia and blood glucose. BMI itself is not an independent risk factor for developing complications of diabetes but it worsens hypertension, hyperlipidaemia and poor glycaemic control which in turn increase the chronic complications. There is evidence that high blood pressure is significantly associated with diabetic vascular complications [12]. In type 1 diabetic patients high BMI is associated with hypertension and atherogenic profile as part of insulin resistance syndrome [13]. In our study the prevalence of hypertension increased with BMI, however the overall macro and microvascular complication rates were not associated with BMI.

Many studies have shown that overweight and obesity are associated with increased risk of complications [14,15,16]. This is through the worsening of glycaemic control and blood pressure. To prevent the complications and achieve the ideal target, patients need either higher dosage of medications or more number of medications.

Acknowledgements

Conflicts of interest

There are no conflicts of interest.

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