Original Research

Assessment of correlation between obesity and glycated hemoglobin in type 2 diabetes patients

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ABSTRACT:
Background: Diabetes Mellitus is the most common metabolic disorder characterized by a series of hormone induced metabolic abnormalities and long-term complication. The present study was conducted to assess correlation between obesity and glycated hemoglobin in type 2 diabetes patients. **Materials & Methods:** 82 type II diabetes obese of either gender having age 30-70 years with more than one year duration of diabetes were included. BMI was calculated using the formula, weight in kilograms divided by height in meters squared (kg/m2). The waist circumference (WC) was measured. Venous blood sample was collected from the antecubital vein and determined for fasting plasma glucose (FPG) and glycosylated haemoglobin (HbA1c). **Results:** The mean age of onset was 46.5 years in males and 41.3 years in females, duration of diabetes was 8.5 years in males and 5.2 years in females, FBG was 154.2 mg/dl un males and 132.0 mg/dk in females, SBP was 132.2 mm Hg and 124.6 mm Hg in males and females, WC was 94.2 cm and 96.5 cm, BMI as 28.5 and 32.6 and HbA1C was 10.3 in males and 11.9 in females. The mean age of onset was 52.1 years, 40.5 years and 45.6 years, duration of diabetes was 10.5 years, 4.5 years and 6.2 years, FBG was 153.7, 147.2 and 165.4, SBP was 129.4, 128.0 and 130.6, WC was 81.9, 92.6 and 102.4, BMI was 20.5, 23.2 and 31.2 and HbA1C was 6.5, 8.6 and 8.2 in group I, II and III respectively. The difference was significant (P< 0.05). **Conclusion:** Diabetic subjects had a higher prevalence of both central and peripheral obesity. Dysglycemia was found to be on the rise in diabetic subjects with average BMI, overweight, and obese.
Key words: Diabetes, Hemoglobin, Obesity

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INTRODUCTION

Diabetes Mellitus is the most common metabolic disorder characterized by a series of hormone induced metabolic abnormalities and long-term complication.[1] The worldwide prevalence of Diabetes mellitus has risen dramatically over the past two decades, from an estimated 30 million cases in 1985 to 415 million in 2017.[2,3] Obesity is a state of excess adipose tissue mass.2 However, in the presence of nutritional abundance and a sedentary lifestyle, and influenced importantly by genetic endowment, this system increases adipose energy stores and produces adverse health consequences.[4] According to WHO global obesity almost doubled between 1980 and 2008. There were >200 million obese men and almost 300 million obese women, 11% of adults worldwide, in 2008.[5]

Combination of Type 2 diabetes (T2DM) and obesity have become a deadly combination.[6] Exact reasons for developing are still less understood, however it is believed that T2DM occurs due to several factors. Previous studies have found a close relationship between obesity and T2DM. Overweight and obese people are at higher risk of developing T2DM.[7] As per the recent data, more than 1.9 billion adults who were 18 years and older, were overweight. Of these over 600 million were obese.[8] Previous studies have documented 7 times higher risk of T2DM in people with obesity compared to those of healthy weight, with a threefold increase in risk for Obesity is thought to trigger changes to the body's metabolism. Both

insulin secretion and insulin resistance develop early in obese persons who progress later to T2DM.[9,10] The present study was conducted to assess correlation between obesity and glycated hemoglobin in type 2 diabetes patients.

MATERIALS & METHODS

The present study comprised of 82 type II diabetes obese of either gender having age 30-70 years with more than one year duration of diabetes. All were enrolled into the study with the written consent.

The subjects were divided into groups based on BMI. Anthropometric measurements, detailed history and biochemical indices were assessed. History regarding age, sex, duration of diabetes and family history of diabetes was recorded. BMI was calculated using the formula, weight in kilograms divided by height in meters squared (kg/m2). BMI: 18.0-22.9 kg/m2 (group I), Overweight: 23.0-24.9 kg/m2 (Group II), Obesity: >25 kg/m2 (Obese). The waist circumference (WC) was measured. Venous blood sample was collected from the antecubital vein and determined for fasting plasma glucose (FPG) and glycosylated haemoglobin (HbA1c). Fasting plasma glucose was assessed by glucose oxidase method and HbA1c by Latex agglutination inhibition assay. Results were assessed statistically.

RESULTS

Table I Comparison of parameters

Parameters	Male	Female	P value
Age of onset	46.5	41.3	0.12
Duration of diabetes	8.5	5.2	0.01
FBG	154.2	132.0	0.05
SBP	132.2	124.6	0.09
DBP	88.4	86.8	0.93
WC	94.2	96.5	0.82
BMI	28.5	32.6	0.94
HbA1C	10.3	11.9	0.17

Table I shows that mean age of onset was 46.5 years in males and 41.3 years in females, duration of diabetes was 8.5 years in males and 5.2 years in females, FBG was 154.2 mg/dl un males and 132.0 mg/dk in females, SBP was 132.2 mm Hg and 124.6 mm Hg in males and females, WC was 94.2 cm and 96.5 cm, BMI as 28.5 and 32.6 and HbA1C was 10.3 in males and 11.9 in females. The difference was non- significant (P> 0.05).
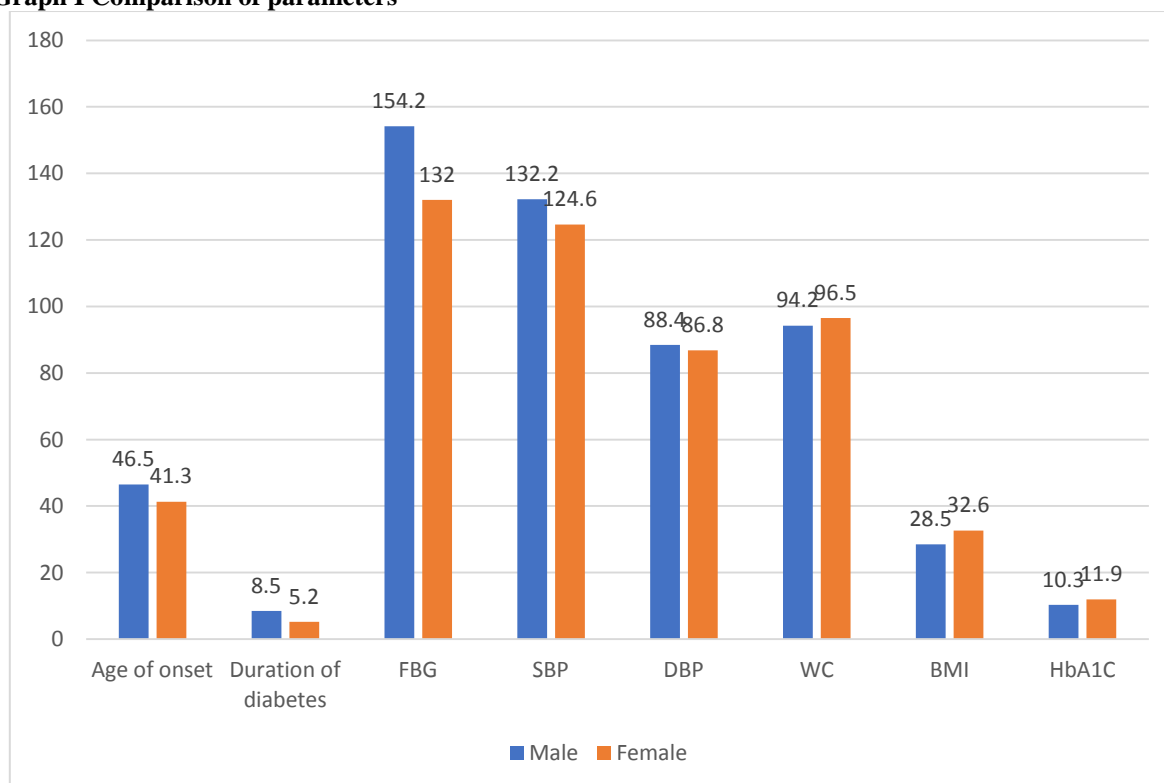
Graph I Comparison of parameters

Table II Clinical and biochemical characteristics as per BMI groups

Parameters	Group I	Group II	Group III	P value
Age of onset	52.1	40.5	45.6	0.12
Duration of diabetes	10.5	4.5	6.2	0.01
FBG	153.7	147.2	165.4	0.05
SBP	129.4	128.0	130.6	0.09
DBP	81.4	81.4	78.4	0.93
WC	81.9	92.6	102.4	0.02
BMI	20.5	23.2	31.2	0.05
HbA1C	6.5	8.6	8.2	0.04

Table II, graph II shows that mean age of onset was 52.1 years, 40.5 years and 45.6 years, duration of diabetes was 10.5 years, 4.5 years and 6.2 years, FBG was 153.7, 147.2 and 165.4, SBP was 129.4, 128.0 and 130.6, WC was 81.9, 92.6 and 102.4, BMI was 20.5, 23.2 and 31.2 and HbA1C was 6.5, 8.6 and 8.2 in group I, II and III respectively. The difference was significant (P< 0.05).

Graph II Clinical and biochemical characteristics as per BMI groups
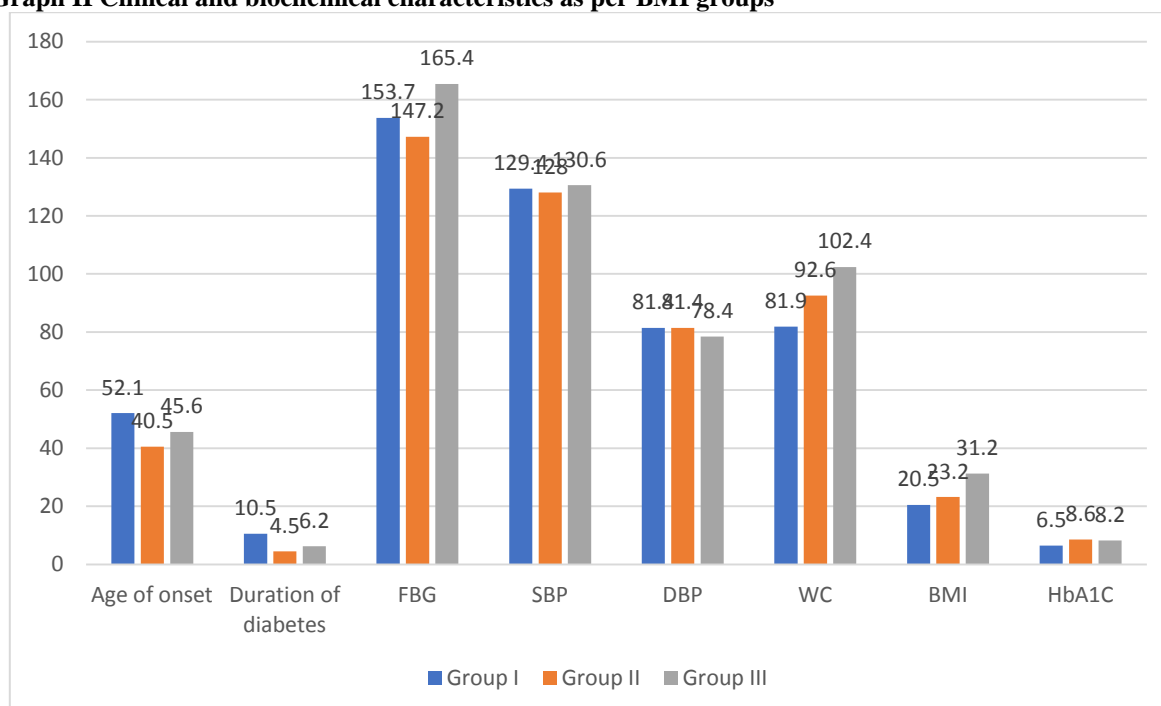
DISCUSSION

In developing countries, such as India obesity prevalence is rising (5%) with a greater tendency to harmful intraabdominal obesity at lower BMI in the population, and the consequences for metabolic and cardiovascular health are disproportionate to obesity prevalence.[11,12] Although not a direct measure of adiposity, the most widely used method to gauge obesity is the Body Mass Index (BMI), which is equal to weight/height (in kg/m2). Glycated Hemoglobin (HbA1c) is a routinely used marker for long-term glycemic control.[13] In accordance with its function as an indicator for the mean blood glucose level, HbA1c predicts the risk for the development of diabetic complications in diabetic patients and may be suggested as diagnostic criteria that detects more diabetes and pre-diabetes cases than fasting glucose or oral glucose tolerance test OGTT. Hyperinsulinemia and insulin resistance are pervasive features of obesity, increasing with weight gain and diminishing with weight loss.[14] The present study was conducted to assess correlation between obesity and glycated hemoglobin in type 2 diabetes patients.

In present study, mean age of onset was 46.5 years in males and 41.3 years in females, duration of diabetes was 8.5 years in males and 5.2 years in females, FBG was 154.2 mg/dl un males and 132.0 mg/dk in females, SBP was 132.2 mm Hg and 124.6 mm Hg in males and females, WC was 94.2 cm and 96.5 cm, BMI as 28.5 and 32.6 and HbA1C was 10.3 in males and 11.9 in females. Sisodia et al[15] correlated body mass index (BMI) and glycaemic control (HbA1c) in type 2 Diabetic patients. In this study 100 patients of type 2 diabetic were subjected to detailed history, clinical examination, BMI, HbA1c and routine biochemical investigations. Results: Out of 100 diabetic patients included in this study 62 of them were male and 38 were female. Among 100 patients. Majority of patients were overweight (BMI 25-29.9) which is account to about 58 of total cases, 30 patients

were normal BMI and 12 patients were obese. Statistical analysis a positive correlation found between BMI and poor glycaemic control (HbA1c), which is significant.

We found that mean age of onset was 52.1 years, 40.5 years and 45.6 years, duration of diabetes was 10.5 years, 4.5 years and 6.2 years, FBG was 153.7, 147.2 and 165.4, SBP was 129.4, 128.0 and 130.6, WC was 81.9, 92.6 and 102.4, BMI was 20.5, 23.2 and 31.2 and HbA1C was 6.5, 8.6 and 8.2 in group I, II and III respectively. Devendra et al[16] assessed if there was a link between obesity and dysglycemia. Hundred T2DM patients with age between 30-70 years with more than one year duration of diabetes were studied. Participants had their anthropometric measurements, comprehensive histories, and biochemical indices evaluated. All the subjects' medical history was documented, including their age, gender, diabetes length, and diabetes family history. The subjects were measured without the use of shoes or clothes, and according to the updated consensus guidelines. Body mass index, waist circumference, glycemic profile and blood pressure were also measured. Participants were divided based on BMI in to 3 groups viz. Normal BMI (18.0-22.9 kg/m2), Overweight (23.0-24.9 kg/m2) and Obesity (>25 kg/m2).Results: T2DM was more prevalent in 40-60 years of age (60%) and among males (60%). The mean age, duration of diabetes, FPG, were higher in male than in female diabetics while the mean levels of BMI and HbA1c are higher in female than male diabetics but not statistically significant. Duration of diabetes was longer in male as compared to female diabetics and statistically significant. Age of onset, systolic and diastolic blood pressure were found to be only marginally elevated in males as compared to female diabetics. A positive correlation was observed between the BMI and WC of both female.

CONCLUSION
Authors found that diabetic subjects had a higher prevalence of both central and peripheral obesity. Dysglycemia was found to be on the rise in diabetic subjects with average BMI, overweight, and obese.

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