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ORIGINAL RESEARCH

Assessment of correlation between obesity and glycated haemoglobin in type 2 diabetic patients

Abhishek, Jaikirat Singh Gugnani, Harkamalpreet Kaur

Govt. Medical College, Amritsar, Punjab, India

Correspondence:
Abhishek

ABSTRACT

Background: To assess the correlation between obesity and glycated haemoglobin in type 2 diabetic patients.

Materials & methods: 50 patients were enrolled. The categorisation of patients was done based on BMI. Blood samples were obtained and sent to the laboratory where HbA1c values were assessed. Further evaluation of the correlation between obesity and glycated haemoglobin in type 2 diabetic patients was done.

Results: Mean HbA1c among diabetic subjects with normal BMI, overweight and obese status was 7.2%, 8.9% and 10.1% respectively. Significant results were obtained while correlating obesity and glycated haemoglobin in type 2 diabetic patients.

Conclusion: There exists a significant correlation between obesity and glycated haemoglobin in type 2 diabetic patients.

Keywords: Obesity, Diabetes, Glycated

INTRODUCTION

Diabetes mellitus is taken from the Greek word diabetes, meaning siphon - to pass through and the Latin word mellitus meaning sweet. A review of the history shows that the term "diabetes" was first used by Apollonius of Memphis around 250 to 300 BC. Ancient Greek, Indian, and Egyptian civilizations discovered the sweet nature of urine in this condition, and hence the propagation of the word Diabetes Mellitus came into being.[1, 2] Mering and Minkowski, in 1889, discovered the role of the pancreas in the pathogenesis of diabetes. Chronic hyperglycaemia in synergy with the other metabolic aberrations in patients with diabetes mellitus can cause damage to various organ systems, leading to the development of disabling and life-threatening health complications, most prominent of which are microvascular (retinopathy, nephropathy, and neuropathy) and macrovascular complications leading to a 2-fold to 4-fold increased risk of cardiovascular diseases.[3]

More than half a billion people worldwide are obese which has a serious impact on multiple health outcomes. World Health Organization (WHO) recognizes obesity and its complications among the top 10 global risk factors leading to ~40 % of global deaths. The menace of obesity is attaining an epidemic worldwide due to changes in lifestyle and food habits. It is defined as a state of excess adipose tissue mass, and not by the bodyweight alone since muscular individuals may have overall weight gain or high body mass index (BMI) without an increase in adiposity.[4-6] Hence; we conducted the present study to assess the correlation between obesity and glycated haemoglobin in type 2 diabetic patients.

MATERIALS & METHODS

We conducted a relation between obesity and glycated haemoglobin in type 2 diabetic patients. A total of 50 patients were enrolled. Complete details of all the patients were

obtained. Only type 2 diabetic patients were included. The height and weight of all the patients were evaluated and subsequently, their BMI was calculated. The categorisation of patients was done based on BMI. The patients were called in the morning. Blood samples were obtained and sent to the laboratory where HbA1c values were assessed. Further evaluation of the correlation between obesity and glycated haemoglobin in type 2 diabetic patients was done. All the results were evaluated using SPSS software. Chi-square test and student t test were used for evaluation of results. P- value of less than 0.05 was taken as significant.

RESULTS

Out of 50 patients, 22 percent were of normal BMI, while 66 percent were overweight and 12 percent were obese. The majority proportion of patients had HbA1C values of more than 8%. Mean HbA1c among diabetic subjects with normal BMI, overweight and obese status was 7.2%, 8.9% and 10.1% respectively. Significant results were obtained while correlating obesity and glycated haemoglobin in type 2 diabetic patients.

Table 1: Distribution of patients according to BMI

BMI	Number	Percentage
Normal (less than 25 Kg/m^2)	11	22
Over-weight (25 Kg/m^2 to 29.9 Kg/m^2)	33	66
Obese (30 Kg/m^2 and above)	6	12
Total	50	100

Table 2: Distribution of patients according to HbA1c

HbA1c	Number	Percentage
Less than 6.5%	2	4
6.5% to 7.9%	12	24
8% to 9.9%	16	32
10% or more than 10%	20	40
Total	50	100

Table 3: Correlation

BMI	Mean HbA1c	SD	p- value
Normal (less than 25 Kg/m^2)	7.2	1.2	0.0012*
Over-weight (25 Kg/m^2 to 29.9 Kg/m^2)	8.9	1.8	
Obese (30 Kg/m^2 and above)	10.1	2.1	

*: Significant

DISCUSSION

Diabetes mellitus is a group of chronic metabolic conditions, all of which are characterized by elevated blood glucose levels resulting from the body's inability to produce insulin or resistance to insulin action or both. Nonmodifiable risk factors for type 2 diabetes include age, race or ethnicity, family history (genetic predisposition), history of gestational diabetes, and low birth weight. Diabetes incidence and prevalence increase with age.[7] Glycated haemoglobin (HbA1c) level, which is a useful indicator of glycaemic control, is an independent risk factor of CVD in patients with or without diabetes. Recently, high HbA1c level has been shown to increase the risks of cardiovascular adverse outcomes and all-cause mortality in overweight and obese patients with diabetes.[8,9] Hence; we conducted the present

study to assess the correlation between obesity and glycated haemoglobin in Type 2 diabetic patients.

Out of 50 patients, 22 percent were of normal BMI, while 66 percent were overweight and 12 percent were obese. The majority proportion of patients had HbA1C values of more than 8%. Mean HbA1c among diabetic subjects with normal BMI, over-weight and obese status was 7.2%, 8.9% and 10.1% respectively. Garg S et al evaluated the effect of obesity on SpO2 in a wide range of glycated haemoglobin (HbA1c) levels in ambulatory type 2 diabetic patients. A cohort of 60 subjects irrespective of diabetic status was recruited and clustered in group I (HbA1c <6.5) and group II (HbA1c ≥6.5) depending on HbA1c. SpO2 (%) levels were measured by pulse oximetry. The blood concentration of HbA1c was <6.5 in 29 participants and ≥6.5 in 31 participants. Plasma fasting and postprandial glucose, HbA1c as well as Hb levels were significantly ($p<0.50$) higher in diabetics as compared to non-diabetics. Waist circumference (WC) ($r=-400$; $p=0.026$) and body mass index (BMI) ($r=-381$; $p=0.034$) showed a significant negative correlation with SpO2 in diabetic patients. On adjusting HbA1c in group II, SpO2 was found to be independently and inversely associated with WC ($p=0.042$) and BMI ($p=0.049$). Obesity was found to be a strong independent contributor to the reduction in oxygen carrying capacity in ambulatory type 2 diabetic subjects. However, there is no effect of glycated Hb on SpO2 in the same population.[10]

In the present study, significant results were obtained while correlating obesity and glycated haemoglobin in type 2 diabetic patients. Sheth J et al determined the association of dyslipidaemia and obesity with glycated haemoglobin (HbA1c) in T2DM and non-diabetic subjects. The study was carried out on 931 subjects including 430 diabetic and 501 non-diabetic subjects with detailed anthropometric parameters. Dyslipidaemia, central- and peripheral- obesity were observed (50.27 %; 75 % and 59.83 %) in all the study subjects respectively. Additionally, hyper-non-HDL-C was detected in 23.49 % and 22.56 % of T2DM and non-diabetic subjects. Significant linear associations of hyper-TC, hyper-LDL-C and hyper-non-HDL-C were observed with HbA1c in T2DM and non-diabetic control subjects respectively. Centrally- and peripherally- obese dyslipidaemic subjects also showed a significant association with HbA1c in T2DM and control subjects respectively. Their study demonstrated the high prevalence of dyslipidaemia and obesity in all subjects irrespective of their disease status in a Western Indian population.[11] Sisodia RK et al correlated Body Mass Index (BMI) and glycaemic control (HbA1c) in type 2 Diabetic patients. In their study, 100 patients with type 2 diabetes were subjected to a detailed history, clinical examination, BMI, HbA1c and routine biochemical investigations. Out of 100 diabetic patients included in this study, 62 of them were male and 38 were female. Among 100 patients. The majority of patients were overweight (BMI 25-29.9) which is account for about 58 of the total cases, 30 patients had normal BMI and 12 patients were obese. Statistical analysis found a positive correlation between BMI and poor glycaemic control (HbA1c), which is significant. Obesity (BMI) is associated with poor glycaemic control.[12]

CONCLUSION

There exists a significant correlation between obesity and glycated haemoglobin in type 2 diabetic patients.

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