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Original Research Article

The incidence of type 2 diabetes in patients presenting for bariatric metabolic surgery at a tertiary bariatric surgery centre in India

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ABSTRACT

Background: In recent years, there has been a marked change in life-style of developing countries caused by economic growth, affluence, urbanization and dietary westernization. Few studies on the prevalence of obesity with diabetes in the Indian population have been reported. Therefore, this study was planned to estimate the prevalence of type 2 diabetes (T2D) in patients presenting for at a tertiary bariatric surgery centre in India.
Methods: In this retrospective study, authors estimated the prevalence of T2D by analyzing the hospital-based data, who were came for bariatric surgery at tertiary bariatric surgery centre in India from January 2010 to June 2018.
Results: From the hospital-based data of eight years the incidence of T2D was found 24% of the Indian population in series, who came for bariatric metabolic surgery (BMS). There was slight male preponderance in incidence of T2D based on gender. The higher incidence of T2D was found mostly in 45-60 years age group in both the male and female patients. Incidence of T2D in class of obesity was 4.3% of class I, 18.6% of class II and 77.1% in class III. The incidence of hypertension was seen 41.8% and co-prevalence of both obstructive sleep apnea syndrome and hypertension was 16.2%.
Conclusions: Age and higher BMI are strongly and independently associated with the risk of being diagnosed with T2D. The association of BMI class on the risk of T2D is stronger for people with a higher BMI relative to people with a lower BMI.

Keywords: Bariatric metabolic surgery, Incidence, Obesity, Types 2 diabetes (T2D)

INTRODUCTION

Type 2 diabetic (T2D) has reached epidemic proportions worldwide.[1] According to the estimates of DM highlighted the global prevalence of diabetes as 171 million in year 2000 and have predicted that the prevalence will be 366 million by year 2030.[1] The study also indicated that the absolute increase in the number of people with diabetes would be in India. International Diabetes Federation (IDF) (8th edition) in the year 2017 has stated that in India alone the number of people with T2D is estimated to be 72.9 million and is expected to rise to 134.3 million by 2045.[2] It affects life of nearly 40 million people in India and of equivalent scale in other developing countries. Nowadays India has been considered as T2D capital of the world. The prevalence of T2D among Indian adults is estimated to be 2.4% in rural and 4-11.6% in urban area. But the prevalence of

impaired glucose tolerance is to the tune of 3.6-9.1 which indicates that the overall prevalence may go much higher.[3]

The high genetic predisposition and high susceptibility to environmental insults, the Indian population faces a higher risk of T2D with obesity and its associated complications.[4] At present the increasing prevalence of T2D with obesity is major common concern. The obesity staging system clearly pointed towards increased mortality proportionate to the severity of obesity. Obesity itself triggers insulin resistance and thereby poses the risk of T2D. Both T2D and obesity have been associated with higher morbidity and mortality and this calls for institution of effective therapies to deal with the rising trend of complications arising out of this dual menace. In developing country incidence of T2D continues to rise among obese children and adolescents but few treatments exist.[5] Bariatric metabolic surgery (BMS) has emerged as a potential treatment for obesity because it causes substantial and durable weight reduction.[6,7]

Recent data suggest that BMS may be effective in the treatment of T2D. Study of the profile of patients coming to the tertiary care centre is important for their better management and including provision of preventive services. Hence in this research, authors planned to determine the prevalence of T2D in patients presenting for BMS at a tertiary bariatric surgery centre in India and conclude with recommendations for future research and potential criteria for the use of bariatric surgery in obese with T2D.

METHODS

This retrospective cross-sectional study was conducted in a tertiary care teaching hospital. This hospital runs a BMS to alleviate the obese and diabetic patients in Bariatric and Robotic Surgery Department. Authors estimated the prevalence of T2D by analyzing the hospital-based data, who were came for BMS at from January 2010 to June 2018.

Patients were characterized according to age and gender. Weight and height were measured by standard techniques using adult weighing scale and stadiometer respectively. The prevalence of diabetes was defined to include all individuals with known diabetes and those in whom Hemoglobin A1c (HbA1c) was ≥5.5mg/dL and fasting glucose ≥126mg/dL.[8] Treatment based T2D were classified to Oral Hypoglycemic Agents (OHA) and Insulin treatment. Denovo patients were distinguished as newly diagnosed T2D patients based on HbA1c level. Hypertensive subjects were defined as those with known hypertension or with two average systolic BP readings >140mmHg and/or diastolic BP >90mmHg.[9]

Body mass index (BMI) of all the participants was calculated by weight in kilograms/height^2 (kg/m^2) in meters. Based on BMI participants were categorized into class I obesity (BMI =27.5 to 32.5kg/m^2); class II obesity (BMI =32.5-37.5kg/m^2) and class III obesity (BMI =37.5-42.5kg/m^2). A waist circumference of >80cm in females and 90 cm for males was considered as abnormal.[10]

Statistical analysis

The collected data were numerically coded and entered in Microsoft Excel 2007 and statistical analysis was done in SPSS version 21.0. Socio-demographic variables data were analyzed using descriptive statistics like frequencies, mean and standard deviation. Chi-square test of association or Fishers exact probability test was used as applicable to assess the association between associated variables. This being a descriptive study no statistical significance tests were applied.

RESULTS

Total 9000 BMG done with different procedures from January 2010 to June 2018 by single surgeon in tertiary care centre. Of all patients 2150 (24%) had T2D. Out of a total of 2010 T2D patients 1114 (52%) were males. There was slight male preponderance in incidence of T2D based on gender. The higher incidence of T2D was found mostly in 45-60years age group in both the male and female patients (Table 1).

Table 1: Age-wise and gender-wise screened.

Age group (years)	Male	Female
<35	130	141
35-45	334	214
45-60	508	565
>60	142	116
Total	1114 (52%)	1036 (48%)

The male and female weight was 123.4±22.82 and 110±11.32kgs. and BMI were 42.87±7.66 and 45.05±11.32kgs/m^2. Incidence of T2D in class of obesity was 4.3% of class-I, 18.6% of class-II and 77.1% in class-III (Figure 1) these findings indicate that there is significant correlation between BMI and T2D.

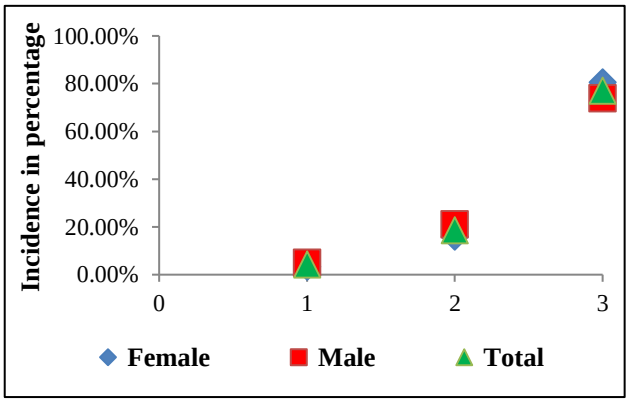

Figure 1: Incidence in percentage according to BMI classification.

In present study, hypertension was seen as co-morbidity in 899 T2D (41.8%) and co-prevalence of both obstructive sleep apnea syndrome and hypertension was 348 (16.2 %).

Table 2: Incidence of treatment based T2D.

Variables	n (%)
Only OHA (Oral hypoglycemic agents)	1626
Only insulin	28
OHA+insulin	310
Highest hemoglobin A1c	948 (45%)
HB1AC	7.7±1.25

Of all 1626 were having intake of OHA, 28 were taking only insulin, 310 were taking both the insulin and OHA. The average highest HB1AC (7.7±1.25) incidence was found in 948 (45%) from all the treatment based T2D patients (Table 2). The incidence in denovo patients was 10.7%, out of which 113 (49.1%) male and 117 (50.9%) female patients. The average highest HB1AC incidence was found 6.69±1.2 in denovo patients (Table 3).

Table 3: Incidence of denovo T2D.

	Male	Female	Total
Denovo T2D	113 (49.1%)	117 (50.9%)	230 (10.7%)
Av. HB1AC	6.68±1.2	6.69±1.1	6.69±1.2

DISCUSSION

Currently surgical treatment is the only viable long-term treatment option for obsess patients with T2D. The hospital where this study was conducted is a bariatric and robotic surgery centre which is a tertiary, high volume bariatric surgery center that gets referrals for surgical treatment including severe obesity and T2D from all over India. The present study carried out only in diagnosed cases of T2D. The highest prevalence was found in the age group 35-45years (25.48%) followed by the age group of 45-60 (49.9%). Similar findings were also observed Scott DA et al, McNair P et al, and Yoon KH et al.[11-13]

Age is one of the important risk factors for many non-communicable diseases including T2D. The main factors are that aging induces decreased insulin sensitivity and insufficient compensation of beta cell function in the face of increased insulin resistance.[14] The WHO expert committee on T2D in the second report in 1980 mentioned that there is a slight male preponderance in Southeast Asian races. Caixàs A et al, in their study of 60 patients had observed a male to female ratio of 1.14:1.[15] With regard to gender, in the present study, it was also seen that there was a slight male parentage (52%) preponderance in cases of T2D, who came for BMS.

Present study results are consistent with other studies that have examined the association between BMI and T2D using nationally representative samples. For example, Ganz ML et al, also found BMI is strongly and independently associated with the risk of being diagnosed with T2D.[16] The association of BMI class on the risk of T2D is stronger for people with a higher BMI relative to people with a lower BMI. As similar findings were also observed in our study number of incidences according to class were increasing (77.1% in class III obesity).

In present study, hypertension was seen as co-morbidity in T2D 41.8% and co-prevalence of both obstructive sleep apnea and hypertension was 16.2 %. Reddy SS et al, in their study found that 33.3% of diabetic patients also had hypertension.[17] The incidence in denovo patients was 10.7%. Of all 1626 were having intake of OHA, 28 were taking only insulin, 310 were taking both the insulin and OHA. There were significantly more OHA treated patients than insulin treated patients. Similar Jingi AM et al, found in association of insulin treatment versus oral hypoglycaemic agents with diabetic retinopathy.[18]

CONCLUSION

Using a large data of individuals with detailed electronic health records, authors were able to show the incidence of T2D in patients presenting for BMS. It is indicating that not only is BMI strongly associated with the risk of being diagnosed with T2D, but also that the magnitude of this positive association is larger for higher BMI values. Further research require on the association between BMI and the risk of developing T2D should include the timing and duration to the incident T2D diagnosis and obesity, if data are available. Although there are many treatment options, individualized long-term treatment authors recommend BMS a potential option for T2D patients.

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