DIABESITY: THE STUDY OF ASSOCIATION OF OBESITY IN PATIENTS WITH RISK OF TYPE 2 DIABETES MELLITUS IS IT CENTRAL AND/OR GENERAL

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ABSTRACT

BACKGROUND

Global epidemic of obesity has highlighted the magnitude of the risk associated with this disease. Obesity is associated with risk of not only type 2 diabetes mellitus but other non-communicable diseases. Obesity is well documented and modifiable risk factor. Other diseases e.g. hypertension, diabetes etc., in presence of obesity have overall increased mortality. Both central and general obesity are associated with type 2 diabetes, central obesity being more commonly associated with T2DM. India is facing rapid surge of diabetes and obesity correlating with rapid economic growth in last few decades. Better glycaemic control is achieved with appropriate weight management. Non-expensive tool like body mass index and waist circumference are used to identify obesity. Detecting and addressing it will reduce morbidity and mortality along with reduction of socioeconomic burden of society.

MATERIALS AND METHODS

Prospective study was carried out in diabetes clinic in Karad Tahasil from Maharashtra. Patients attending from February 2015 to October 2018 were enrolled. There anthropometric measurements as height, weight, waist circumference were taken after their informed consent. Body mass index was used to decide general and waist circumference central obesity. Data analysis was done with t-test and Chi-square.

RESULTS

The results showed 48.5% males and 56.5% females were having general obesity (p=0.067), and 60.7% males and 82.3% females were having central obesity. Surprisingly our study shows 24.9% (25.8% males, 23.8% females) were diabetic in spite of normal BMI. Females outnumber males to have both general and central obesity.

CONCLUSION

Both general and central obesity are strongly associated with type 2 diabetes mellitus, females outnumbering males in both. Timely management of obesity will help for better glycaemic control, and reduction in mortality. Appropriate weight management in our health care is need of the hour.

KEYWORDS

Type 2 DM, General Obesity, Central Obesity.

HOW TO CITE THIS ARTICLE: Patil DP. Diabesity: the study of association of obesity in patients with risk of type 2 diabetes mellitus is it central and/or general. J. Evid. Based Med. Healthc. 2019; 6(5), 262-266. DOI: 10.18410/jebmh/2019/54

BACKGROUND

Global epidemic of obesity is "Globesity". According to World Health Organization (WHO), globesity is rapidly increasing worldwide. It is a complex disorder having serious social and psychological impact in all age and socioeconomic groups there by affecting both developed and developing countries. There is association of obesity with more death rate driven by comorbidities like type 2 diabetes mellitus (T2DM), hypertension, steatohepatitis, dyslipidaemia, gastroesophageal reflux disease, certain types of cancer, arthritis, obstructive sleep apnoea (OSA), polycystic ovarian syndrome (PCOS), and infertility.[1] There is significant financial and health loss to individual and society. In spite of significant efforts to aware the people the obesity prevalence is continuously increasing.[2]

Obesity is proven risk factor for diabetes[3-5] and it is modifiable.[6] Diabetes and obesity together is called "Diabesity". It is associated with poor control of blood sugar, blood pressure, serum cholesterol subjecting individuals to develop microvascular and macrovascular complications. Lot of studies have proved relation between obesity and development of diabetes.[7]

The central obesity is more commonly associated with diabetes than general fat.[8,9] Body mass index (BMI) is used to measure general obesity and waist circumference, waist hip ratio for central obesity. Central obesity has great significance in Indian population.[10,11] South Asians have low rate of obesity calculated by BMI cutoff points in spite of

Financial or Other, Competing Interest: None.
Submission 14-01-2019, Peer Review 18-01-2019,
Acceptance 25-01-2019, Published 01-02-2019.
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DOI: 10.18410/jebmh/2019/54

larger waist circumference and waist hip ratio (WHR) indicating more central obesity.[12] The characteristic metabolic profile of central obesity is hyperinsulinemia, increased insulin resistance, and higher incidence of diabetes.[12]

India is facing modern epidemic of T2 DM correlating rapid economic growth in past several decades.[13] Today India is considered as diabetic capital of world.[14] Simple anthropometric measurements are used to decide obesity and are important in clinical practice and epidemiological studies.[15] As obesity predisposes diabetes, It is prime important to see the prevalence of obesity in these patients and manage it with diet, lifestyle modification. The purpose of this study to see central and general obesity in type 2 diabetes mellitus patients attending diabetes clinic.

Aims and Objectives

In spite of obesity being well established risk factor for T2 DM, glycaemic control is more targeted than obesity in the management of diabetes patients. We conducted this study to look in to the association between central and general obesity with risk of being diagnosed type 2 diabetes, also to see whether central or general obesity is more commonly associated with diabetes. Our another purpose is to see how common diabetes is in the category of normal BMI patients. This study is carried out in diabetes center located at Karad tehsil in Maharashtra. This type of study was not carried out in this region.

MATERIALS AND METHODS

Prospective study had been carried out at diabetes clinic Karad tehsil in Maharashtra. Patients attending outpatient department (OPD) from February 2015 to October 2018. Both already diagnosed or newly detected T2 DM patients were enrolled. With due consent from all individual's information was collected. The data was routine baseline anthropometric measurements. The clinical and anthropometric data were recorded in electronic data sheet, collected data was anonymized and then analysed. Data analysis was done by t-test and Chi-square.

Total 686 subjects were registered in the study comprising 392 males and 294 Females.

Data collected from each patient includes age, sex, duration, family history of diabetes, height, weight, waist circumference, BMI, ongoing drug therapy for diabetes and other medical disorder. In anthropometric measurements body weight, height, waist circumference were taken in standing position without shoes and participants wearing light clothes. The waist circumference was measured from the center point of the distance between iliac crest and the lower most margins of the ribs. BMI was calculated as the ratio of weight (kg) per height squared (m2).

General obesity as shown in table no. 1 was defined by following Criteria, as per Consensus statement for diagnosis of obesity published in journal Association of Physicians India[16] and guidelines from WHO Expert Consultation implemented in 2004.[17]

BMI- Kg/m^2	Category
< 18.5	Underweight
18.5 – 22.9	Normal,
23.0 - 24.9	Overweight
>25	General Obesity

Table 1

Central obesity was defined as per WHO Expert Consultation on waist circumference[18] shown in table 2.

Sex	Waist Circumference
Male	>90 cm
Female	>88 cm

Table 2

Inclusion Criteria

All patients with T2 DM attending our diabetes clinic as already diagnosed or newly detected cases were included.

Exclusion Criteria

1. Patients with recent weight loss due to severe hyperglycaemic state.
2. Patient with generalized oedema due to Renal cause, congestive cardiac failure.
3. Patients taking weight reducing medication.
4. Gestational diabetic women.
5. Other chronic disorders causing weight loss.
6. Drug induced diabetes (e.g. Steroids).
7. Type 1 diabetes mellitus.
8. Patients having skeletal abnormalities.
9. Diabetic patients who have undergone bariatric surgery.

RESULTS

Out of 686 subjects 57.14% were male with mean age 55.62 years with std. deviation 12.077, 42.86% were female with mean age 54.74 and std. deviation 10.688 (p=0.321), shown in table no 3.

	Sex	N	Mean	Std. Deviation	Std. Error Mean
Age	Male	392	55.62	12.077	0.610
	Female	294	54.74	10.688	0.623

Table 3. Group Statistics

t=0.993, p=0.321

Interpreting the duration of diabetes 31.6% (34.2% male and 28.2% female) were having less than 1 year, 35.3% (32.9% male and 38.4% female) had 1-5 years, 18.4% (19.1% male and 17.3% female) had 5-10 years, 14.7% (13.8% male and 16.0% female) were having diabetes for more than 10 years (p=0.242).

		Sex		Total
		Male	Female	
Duration of DM	<1 yr.	134	83	217
		34.2%	28.2%	31.6%
	1-5 yrs.	129	113	242
		32.9%	38.4%	35.3%
	5-10 yrs.	75	51	126
		19.1%	17.3%	18.4%
	>=10 yrs.	54	47	101
		13.8%	16.0%	14.7%
Total		392	294	686
		100.0%	100.0%	100.0%

Table 4. Duration Gr * Sex Cross Tabulation

Chi-square=4.186, p=0.242

Females have raised BMI compared to males, Percentage wise 51% (48.5% male and 56.5% female) were having general obesity(p=0.067), distribution of general obesity (BMI) is shown in table 5. Significant number of subjects 24.9% (25.8% male, 23.8% female) were diabetic in spite of normal BMI.

		Sex		Total
		Male	Female	
BMI_Gr	<18	22	7	29
		5.6%	2.4%	4.2%
	18-22.9	101	70	171
		25.8%	23.8%	24.9%
	23-24.9	79	51	130
		20.2%	17.3%	19.0%
	>25	190	166	356
		48.5%	56.5%	51.9%
Total		392	294	686
		100.0%	100.0%	100.0%

Table 5. BMI Gr * Sex Cross Tabulation

Chi-square=7.174, p=0.067

In view of the possible gender difference in the prevalence of obesity the distributions of BMI and waist circumference were determined separately for men and women with type 2 diabetes described in table 6 and 7.

Waist Circumference	Frequency	Percent
≤78	47	12.0
79-90	107	27.3
>90	238	60.7
Total	392	100.0

Table 6. Males

	Frequency	Percent
≤72	25	8.5
73-80	27	9.2
>80	242	82.3
Total	294	100.0

Table 7. Females

The association of central/abdominal obesity was more seen in females (60.7% male and 82.3% female). In males (39.3%) as compared to females (17.7%) waist circumference less than defining value of central obesity is seen.

DISCUSSION

Factors like obesity and overweight are implicated in diseases like diabetes and hypertension. Large number of investigations about them are carried in western population,[19-22] few studies are done in Asian population.[23-25]

It has been shown that Indian population is at risk of diabetes, cardiovascular disease even with only modest overweight, central obesity and decreased physical activity.[17] According to World Health Organization (WHO) expert group, Asian population is differently associated between body mass indexes, the percentage of body fat and health risk for type 2 diabetes as compared to western or other population. The prevalence of diabetes in urban India is 8.2% and rural south india is 2.4%, this has been demonstrated by Singh et al.[26] The study carried out by diabetic clinic in university hospital have shown statistically significant higher BMI in diabetic patients as compared to non-diabetic.[27] Our study has got significant statistical difference between BMI groups (underweight, normal, overweight, obese). These findings in accordance with other studies, showing that overweight and obesity are consistent parameters associated with diabetes and cardiovascular risk in majority population.[28]

The incidence and severity of the related disease condition are thought to increase with increase in body mass index (BMI) and waist circumference. In general, both general and central obesity are associated with more incidence of disease condition. Our data shows that obesity is common in the representative sample of type 2 diabetes patients attending our diabetes clinic. This is similar to shown by other studies.[10,11] As compared to general obesity the percentage of central obesity was higher, so in our study central obesity is more commonly associated than general obesity. BMI more than 25(general obesity) was significantly more common in females. Also, increased waist circumference was more common in females. Large no of individuals are overweight, obese and waist circumference above defining value. This indicate that early detection and addressing central obesity will help in our Asian population. About 19% individuals in our study are overweight according to revised criteria for measurement of obesity in Asian population.[17] This group might have missed if western

guidelines were followed and this is important target in primary prevention. There is slight predominance of male in overweight category.

To demonstrate superiority of BMI or waist circumference as a diabetes indicator there are no conclusive studies, but at least waist circumference can be taken as indicator of diabetes progression.[29] Review study done by McNeil and colleagues have shown that inadequate sleep and energy dense high carbohydrate diet predisposes to central obesity and type 2 diabetes in susceptible individuals.[30] Individuals who are prone to develop diabetes selectively get more visceral fat than subcutaneous fat. This may be due to defective adipogenesis or morphological specificities of adipose tissue which is independent of body fat level.[31] Patients presenting with new onset type 2 diabetes are overweight as compared to non-diabetic individuals,[32] so obesity plays casual role in pathogenesis of type 2 diabetes. In type 1 diabetes obesity is not predisposing factor and individuals are young and non-obese.[11] This reflect continuation of original predisposing factor as obesity in type 2 DM.

According to Rangrajan committee of Indian government 29.5% people (30.9%-rural & 26.4% -urban) live below poverty line in our country. In spite of this we have surprisingly found that in large no of diabetic patients the average BMI is in overweight and obese group, and waist circumference is above normal value. These findings indicate that not only food is associated with being overweight and abnormal fat distribution but there may be interplay of genetic predisposition, lack of exercise and sedentary lifestyle.

It becomes important consideration weather the management of obesity comparatively late in natural history of cardiovascular disease is going to make any impact. To favour this proposition, it has been proved that if overweight and obese patients with diabetes mellitus type 2 rapidly reverses insulin resistance and restore normal blood sugar concentration if they lose weight.[33] Multiple and various intervention studies in patients with type 2 diabetes have shown that losing weight will give modest improvement in glycaemic control and cardiovascular risk profile as long as weight loss is maintained.[34]

In majority of Indians BMI more than 23 kg/m2 is associated with central obesity and coronary risk. Weight Seems to be fundamental importance in prevention of diabetes and weight reduction is associated with lower BMI. It is universally believed that obesity is disease indicator yet in present time it is essential to have precise knowledge of various anthropometric parameters which are early and unambiguous indicators. It is important at time when both diabetes and metabolic syndrome are on rising scale. Another important factor in early detection and addressing is it requires minimal intervention and inexpensive. Health care takers and clinician's role is alerting and conveying it to patient. Patients at high risk factors should be suggested cost effective life style modification. As there is worldwide surge of obesity and diabetes, comprehensive approach to enhance both physical activity and nutrition targeting individual and population is required.[35]

The limiting factor in our study I) physical activity was not measured II) serum insulin was not measured.

CONCLUSION

The worldwide epidemic of obesity has focused the extent of the risks associated with this disease. Our study showed that obesity is strong and independent factor in patients being diagnosed with type 2 diabetes mellitus. Both general and central obesity are associated with type 2 diabetes; association of central obesity is more common. Females outnumber males in having central as well as general obesity. It is not mandatory to have high BMI in diabetes as our study shows that significant number of individuals are diabetic in spite of normal BMI. All obese diabetic patients should be advised to bring down BMI to at least near normal to achieve better glycaemic control. Screening the people for obesity and addressing that will help not only detecting the risk of type 2 diabetes but will reduce morbidity and mortality associated with diabetes itself and associated diseases. Further attention towards appropriate weight management should be given in our health care to reduce socioeconomic burden in our society.

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