Original Article

Incidence of Obesity and Overweight amongst Type 2 Diabetic patients, visiting the Tertiary Care Hospital of Lahore

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ABSTRACT

Objective: Diabetes continues to be one of the most prevalent global and local health problems as per IDF data. A strong relationship between obesity, overweight, and diabetes has been established and thus requires a better understanding of the prevalence of obesity and overweight among type 2 diabetics for their better management and prevention of complications. This study evaluates the incidence of overweight and Obesity amongst Type 2 diabetes patients visiting the OPD clinic of Ghurki Trust Teaching Hospital Lahore.

Method: The study sample comprised 500 type 2 diabetics who attended the diabetes clinic at GTTH, a tertiary care hospital in Lahore. All the confirmed type 2 diabetes cases were included in the study sample. The patients who had undergone any gastric surgery for weight loss or were taking weight loss medication were excluded. Data was analyzed using SPSS Statistics version 24.

Result: The BMI was measured in 500 patients (293 males and 207 females) who attended the clinic. According to the measured BMI, 113 (22.6%) were non-obese i.e. BMI 18.5-24.9(M=70(23.9%) and F=43(20.7%). Overweight (BMI 25-29.9 kg/m^2), and obese (BMI$\geq$ 30kg/m^2), were 224(44.8%) and 126 (25.27%) respectively. Female were more overweight than males (40.9% vs 50.2%) and also grade II obesity was more in female than male T2DM patients (6.4% vs 14.9%)

Conclusion: The prevalence of obesity in patients with type 2 diabetes mellitus in our population is high, especially in females.

Keywords: Obesity, Overweight, Type 2 Diabetes mellitus, HbA1c, BMI

Introduction

Diabetes is an international concern; it knows no borders and does not discriminate among social classes[1]. Prevalence of Diabetes, especially T2DM, is expected to increase significantly with time, thus, further adding to the financial burden on healthcare budgets globally[2]. Early detection of the disease and associated comorbidities can significantly help in reducing the economic burden but also decreasing the associated mortalities and complications like cardiovascular comorbidities, blindness, limb amputation, and renal failure[3]. Unluckily, the prevalence of diabetes mellitus continues to increase globally as well as in Pakistan. Around 573 million adults have DM worldwide, out of which 32 million people are in Pakistan[4]. Due to this high prevalence, Pakistan, at the moment, ranks third in the world in terms of prevalence of diabetes[5].

On the other hand, obesity has also become a global pandemic with 1.9 billion people being overweight and 630 million people obese as per 2024 data[6]. Both these diseases lead to increasing diabetes and CVD related mortalities. At least 2.8 million mortalities worldwide are attributed to obesity every year[7]. Pakistan is no different in terms of obesity from the rest of the world, currently ranking tenth with a prevalence of overweight adults being 22.8% and that of obesity at 5.1%[8]. According to published literature, patients having greater BMI are at higher risk of having diabetes mellitus and its complications9, and vice versa. Those who are overweight or obese have seven and three times more risk of developing DM respectively. And, those who are diabetic and then they put on weight become more insulin resistant, thus need more medicines and more complications arise from the disease. According to local data and work done in the South Asian region, the incidence of obesity and overweight is quite variable, with a range of 45-90 % in various studies[10][11].

In this study, we have attempted to find out the incidence of overweight and obesity in Type 2 DM patients visiting the outpatient clinic of a tertiary care hospital, which may reflect true value in our region and plan treatments and management accordingly. This may help in reducing complications and decreasing associated morbidity and mortality.

Materials and Methods

500 patients with confirmed type 2 DM who attended the diabetes clinic between October 2023 and October 2024 were enrolled in the study after informed consent. Patients having type 1 DM, patients who could not stand, i.e., are wheelchair bound, pregnant women, patients who were taking any therapy for weight loss, or had undergone any Bariatric procedure were excluded from the study.

Weight and height of each subject were measured and recoded. Weight was measured in kg (to the nearest 0.5kg) using a calibrated scale, on a firm horizontal surface, without shoes and with the subject in light clothing. Height was measured (in metres) to the nearest 0.1cm. BMI was calculated by dividing the weight (kg) by the square of the height in metres (m^2). Body mass index (BMI) – was expressed in kg/m^2. Subjects with BMI <18.5 were classified as underweight and those having BMI of 18.5–22.9 were grouped as normal weight. Those with BMI of 23.0–24.9 were overweight and those with ≥25.0 were classified as obese. Obesity was further subdivided into grade I (BMI=25.0 −29.9), grade II (BMI≥30), respectively.

Continuous variables were evaluated by descriptive statistics, using means and standard deviation (SD), and differences measured by t-test. Confidence intervals (95% CI) were calculated for precision of sample estimation, variability of the characteristics, and degree of confidence being studied. Median values and interquartile range (IQR 25-75%) were also used to show the central tendency.

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Categorical variables were expressed as numbers and percentages and their difference was evaluated by the chi-square test. Spearman test was used for correlation for ordinally constructed variables, and its p-value. All statistical analyses were two-sided, using 5% significance level, i.e. significance was defined as p value < 0.05. Analysis was performed using SPSS software, version 24.0 for Windows (SPSS Inc, Chicago, Illinois, USA). Written informed consent was taken from all participants and the study was conducted per the Declaration of Helsinki. The ethics committee of GTTH also approved the study.

Results

500 patients were included for this study, 293(58.6%) were male, while 207(41.4%) were females. The median age of the participants was 53.0 years with a range of 28–72 years. Male gender was older with a median age of 54.0 years compared with a median age of 51.0 years for the women (p=0.94). The mean duration of DM was 6.2 years and was longer among men compared with women, i.e. 7.2 years vs 5.2 years, p=0.04. Table 1

Table 1. Gender distribution and BMI stratification

Age Range	Male				Female		
Years	No	BMI Mean $\pm$ SD	S.E	No	BMI Mean $\pm$ SD	S.E	
Over all	293	27.4 $\pm$ 3.2	0.44	207	28.2 $\pm$ 2.4	0.34	
25-34	43	24.2 $\pm$ 1.6	0.34	17	24.6 $\pm$ 2.6	0.37	
35-44	80	25.6 $\pm$ 2.2	0.33	42	26.2 $\pm$ 2.4	0.42	
45-54	122	25.4 $\pm$ 3.2	0.63	108	26.8 $\pm$ 3.2	0.6	
55-64	32	26.2 $\pm$ 2.8	0.40	33	26.4 $\pm$ 2.8	0.42	
65	16	25.8 $\pm$ 2.6	0.20	7	26.2 $\pm$ 2.6	0.36	

Table 1 shows the BMI values of the study participants. The incidence of obesity among the study participants was 25.27% and was higher among men compared with women (27.3% vs 25.2% p=0.18), but the difference was not statistically significant. Overall incidence of overweight was 44.8 % with females being more overweight than males (50.2% vs 40.9%) p value <0.001.

Table 2. BMI values of study participants according to WHO criteria for Asian population

BMI Category	MI Value	Male % n=293	Female % n=207	Total n=500
Under weight	< 18.5	23 (7.84%)	10 (4.83%)	23 (4.6%)
Normal	18.5 - 22.9	70 (23.89%)	43 (20.77%)	113 (22.6%)
Over weight	23.0 - 24.9	120 (40.95%)	104 (50.24%)	224 (44.8%)
Obese	$\geq$ 25	80 (27.30%)	50 (24.15%)	126 (25.27%)
Grade I	25-29.9	51 (17.40%)	13 (6.28%)	63 (12.6%)
Grade II	>30	29 (9.89%)	37 (17.86%)	63 (12.6%)

Table 2 shows the number of the participants based on various BMI categories.

There was a significant difference between the mean BMI for both genders in various age groups. The peak difference in the mean BMI between females and males was in those aged 45-54. In patients with a low or normal BMI, there was a male preponderance. Among the group with a BMI < 18.5, there were 23 (7.8%) males out of 293 and 10 (4.8%) out of 207 were females (P = 0.008). Among those with normal weight (BMI, 18.5-22.9 kg/m^2), there were 70 (23.8%) out of 293 males and 43 (20.7%) out of 207 females (P < 0.0001). In the overweight group (BMI of 23-24.9 kg/m^2), 120 (40.9%) were male and 104 (50.2%) were female (P <0.001). In the group with mild obesity class 1 (BMI of 25-29.9 kg/m^2), there were 17.4% males and 6.28% were females, P < 0.0001. In the

group with moderate obesity or class 2 (BMI ≥ 30), we found a much higher rate of obesity among the females than males with the incidence of 17.86 % vs 9.89 % in males (p < 0.0001).

Majority of our patients, 52% were on combination therapy with Metformin and Glibenclamide, 28% of patients were either on sulphonylurias with SGLT2 inhibitor, while 20% of patients were on a combination of insulin with Metformin. All patients were on one of these regimens.

Discussion

Obesity is one of the modifiable risk factors for type 2 DM. It has been linked to various complications including elevated blood pressure, cardiovascular disease, lipid disorders, Diabetes Mellitus, osteoarthritis, sleep apnea and related conditions[12]. In individuals with obesity, there is impairment of glucose-dependent insulin secretion leading to increased gluconeogenesis and hence worsening/ development of DM. The risk of type 2 DM also increases exponentially with an increase of BMI[13].

In our country DM is on the rise and every fourth adult is suffering from it[5]. Similarly, Obesity is more prevalent in Type 2 DM[7]. We conducted this study to find out the incidence of Obesity in the adult population visiting the GTTH Diabetic clinic. In our study, the overall mean BMI for females was 28.2 ± 2.4, while for males was 27.4± 3.2. Our results show that overweight patients were the most common entity, with around 45 % of diabetic patients being overweight, and amongst those 45 %, the majority were females. In contrast, around 25 % of the total screened people were obese, with the majority of them being males. Interestingly, Grade I and Grade III obese were predominantly males, while Grade II obese were males. We have used BMI as a marker to differentiate between the overweight and obese population. Same criteria have been used by various previous studies done on the same topic.

The prevalence of overweight and obesity amongset T2DM patients in this study was markedly higher than the value in the general population, but these values are consistent with studies and data coming from other settings, which showed similar or higher values in T2DM patients[8] [9] [10]. When we scrutinize the data, it is revealed that high prevalence has been reported in countries which are labelled as higher income countries[21]. In UK, approximately 86%–90% of T2DM patients had BMI≥25 [14] in Australian studies, 53% were in obese category and 32.8% were in overweight;[15] in a Saudi Arabian study, 87.5% had BMI ≥25 with prevalence found higher in females (87.7%) than in males (83.1%)[16]. African data shows varying rates of obesity in Tanzania (85.0%),[17] Sudan (64.4%),[18] Ethiopia (40%),[19] Nigeria (27.4%–83%) [20]. Urbanisation, globalisation, adoption of processed food eating habits, and indeed reduction of physical activity all contribute towards the increasing trend of overweight and obesity.

In our study, the incidence of overweight (BMI ≥ 30 kg/m^2) was more in women as compared to males. Many factors have been associated with an increased risk of obesity and DM in females, which may be dietary habits and more sedentary lifestyles as compared to males. In a remarkable study done in Saudi Arabia[22], working women had a lower rate of obesity and overweight than non-working ones, which clearly goes in favor of the lifestyle of females and refraining from exercise, which leads to more weight gain. Same might be the reason for increased incidence of females being grade II obese as compared to males. Literature shows that obesity has increased in the general population and T2DM as well in Asian countries[23] and simultaneously the risk of diabetes mellitus in the Asian countries is raised even at lower BMIs as compared to countries from other continents. A study conducted in Pakistan revealed that 72 % of TDM2 patients had obesity, and most of the obese patients were females[24]. This value is far less than the

value in our study. Our patients were coming from a more affluent and educated class, which may be the reason for this. In another study in the local population, 89.9% of the studied population was overweight and obese, and many were diabetic too[25]. This frequency of high obesity in other studies than our study may also be due to regional demographics and lifestyle variations, and it may be the reason for such a wide variation.

There are certain strengths and limitations in our study. We have used a simple parameter of BMI as a benchmark of obesity and overweight, and a small sample size was used, which cannot reflect the overall incidence of the country, but can act as a source of further research and data collection. Our study was conducted in the outpatient diabetes clinic in a private health facility and did not include patients visiting public health facilities so the results may not apply to the general population. This data was not designed for any research purpose, wasn't validated, and had no quality checks done for plausibility and completeness, and only a very limited number of variables were captured. Waist circumference and waist to hip ratio may also have been used to further strengthen the results.

Conclusion

Overweight and obesity were high among T2DM patients of our study population and may contribute significantly to the morbidity and mortality of T2DM. Despite being of high value, our results of obesity are less than the values in other local studies. More knowledge and access to healthcare professionals through media and availability of healthcare professionals may be the reason. Still then, appropriate strategies to improve nutrition and promote weight loss in TDM2 are urgently needed to combat this increasing health challenge.

References

1. Marshall SM, Flyvbjerg A. Prevention and early detection of vascular complications of diabetes. BMJ. 2006 Sep;333(7566):475–80.
2. Afshin A, Forouzanfar MH, Reitsma MB, GBD 2015 Obesity Collaborators. Health effects of overweight and obesity in 195 countries over 25 years. N Engl J Med 2017;377:13–27
3. Han SJ, Boyko EJ. The evidence for an obesity paradox in type 2 diabetes mellitus. Diabetes Metab J2018;42:179–87
4. Sun H, Saeedi P, Karuranga S, Pinkepank M, Ogurtsova K, Duncan BB, et al. IDF Diabetes Atlas: Global, regional and country-level diabetes prevalence estimates for 2021 and projections for 2045. Diab Res Clin Pract. 2021
5. Hasan SU, Siddiqui MR. Nationwide prevalence of type 2 diabetes mellitus and pre-diabetes in Pakistan: A systematic review and meta-analysis. Diabetes Research and Clinical Practice. 2024 Aug 22:111815.
6. Branca, F., Ursu, P. and Aguayo, V., 2023. A plan for accelerated action on obesity. The Lancet Global Health, 11(8), pp.e1170-e1171.
7. Meldrum DR, Morris MA, Gambone JC. Obesity pandemic: causes, consequences, and solutions-but do we have the will? Fertil Steril. 2017 Apr;107(4):833-839.
8. Tanveer M, Hohmann A, Roy N et al. The current prevalence of underweight, overweight, and obesity associated with demographic factors among Pakistan school-aged children and adolescents—

An empirical cross-sectional study. International Journal of Environmental Research and Public Health. 2022 Sep 15;19(18):11619

9. Ogle GD, James S, Dabelea D, Pihoker C, Svennson J, Maniam J, et al. Global estimates of incidence of type 1 diabetes in children and adolescents; Results from the International Diabetes Federation Atlas, 10th Edition. *Diabetes Res Clin Pract* 2021

10. Sulaiman N, Elbadawi S, Hussein A, Abus- nana S, Madani A, Mairghani M, et al. Preva- lence of overweight and obesity in United Arab Emirates expatriates: the UAE national diabetes and lifestyle study. Diabetol Metab Syndr. 2017;9(1):88.

11. Asif M, Aslam M, Altaf S, Atif S, Majid A. Prevalence and sociodemographic factors of overweight and obesity among Pakistani adults. Journal of obesity & metabolic syndrome. 2020 Mar 3;29(1):58.

12. Afshin A, Forouzanfar MH, Reitsma MB, GBD 2015 Obesity Collaborators. Health effects of overweight & obesity in 195 countries over 25 years.N Engl J Med 2017;377:13–27.

13. Han SJ, Boyko EJ. The evidence for an obesity paradox in type 2 diabetes mellitus. Diabetes Metab J 2018;42:179–87.

14. Daousi C, Casson IF, Gill GV, et al. Prevalence of obesity in type 2 diabetes in secondary care: association with cardiovascular risk factors. Postgrad Med J 2006;82:280–4.

15. Thomas MC, Zimmet P, Shaw JE. Identification of obesity in patients with type 2 diabetes from Australian primary care: the NEFRON-5 study. Diabetes Care 2006;29:2723–5.

16. Abed Bakhotmah B. Prevalence of obesity among type 2 diabetic patients: non-smokers housewives are the most affected in Jeddah, Saudi Arabia. Open J Endocr Metab Dis 2013;03:25–30.

17. Damian DJ, Kimaro K, Mselle G, et al. Prevalence of overweight and obesity among type 2 diabetic patients attending diabetes clinics in northern Tanzania. BMC Res Notes 2017;10:515.

18. Ali YA, Almobarak AO, Awadalla H, et al. Obesity among Sudanese adults with diabetes: a population-based survey. Ann Transl Med 2017;5:5.

19. Kiros KG, Abyu GY, Belay DS, et al. Magnitude of overweight and associated factors among type 2 diabetes mellitus patients at Mekelle public hospitals, Tigray, Ethiopia: a cross-sectional study. BMC Res Notes 2019;12:762.

20. Gezawa ID, Uloko AE, Gwaram BA, et al. Pattern of obesity among patients with type 2 diabetes at a tertiary healthcare center in northern Nigeria. Diabetes Metab Syndr Obes 2019;12:2785–90.

21. Tino S, Mayanja BN, Mubiru MC, et al. Prevalence and factors associated with overweight and obesity among patients with type 2 diabetes mellitus in Uganda—a descriptive retrospective study. BMJ Open 2020;10:e039258. doi:10.1136/ bmjopen-2020-039258

22. Al-Hazzaa HM, Abahussain NA, Al-Sobayel HI et al. Lifestyle factors associated with overweight and obesity among Saudi adolescents. BMC Public Health. 2012;12:354. doi: 10.1186/1471-2458-12-354.

23. Khan, S., Ubaid, M., Wazir, Z et al. Frequency of obesity in patients with Type 2 Diabetes Mellitus. Journal of Medical Sciences 2024, 32(2), 126–130. https://doi.org/10.52764/jms.24.32.2.2

24. Amin F, Imran M, Hafeez SA et al. Diabetes and its associated factors: A Retrospective cohort analysis of a large database at Indus Hospital Health Network. Pakistan Journal of Medical Sciences. 2024;40(2)

25. Jafar, A., Iqbal, R., Shahab, et al. Diabesity: Prevalence of Diabetes Mellitus Type II in Overweight and Obese Patients: A Cross-Sectional

Study in Mayo Hospital, Lahore. Journal of Society of Prevention, Advocacy and Research KEMU 2023. 2(2), 09–17.

Author's Contribution:

TT: Conceived and designed the study, involved in data collection, performed statistical analysis and writing the manuscript.

MA, AM, MRJ, AA, UK, II, MF, SS, UH: Collected the data, critical review and preparation of manuscript.

All authors have read, approved the final manuscript and are responsible for the integrity of the study.