Overweight and obesity among the urban and rural type 2 diabetic subjects in Bangladesh

Palash Chandra Banik[1]^, Rajib Mondal[2]^, Anower Hussain[3]

[1]Department of Noncommunicable Diseases (NCD), Bangladesh University of Health Sciences (BUHS), Dhaka, Bangladesh; [2]Department of Public Health, Hamdard University Bangladesh (HUB), Munshiganj, Bangladesh; [3]Department of Community Dentistry (CD), Bangladesh University of Health Sciences (BUHS), Dhaka, Bangladesh

Contributions: (I) Conception and design: PC Banik; (II) Administrative support: PC Banik; (III) Provision of study materials or patients: PC Banik; (IV) Collection and assembly of data: R Mondal, PC Banik; (V) Data analysis and interpretation: PC Banik, R Mondal; (VI) Manuscript writing: All authors; (VII) Final approval of manuscript: All authors.

Correspondence to: Palash Chandra Banik. Assistant Professor, Department of Noncommunicable Diseases (NCD), Bangladesh University of Health Sciences (BUHS), 125/1, Darus Salam Road, Dhaka 1216, Bangladesh. Email: palashcbanik@gmail.com.

Background: In Bangladesh, both overweight and diabetes are the major public health issues, and their increasing trends have been observed among the general population. Interestingly, no study has been reported with the prevalence of overweight and obesity among the urban and rural type-2 diabetes mellitus (T2DM) subjects in Bangladesh. This study aimed to determine the prevalence of overweight and obesity among urban and rural T2DM subjects in Bangladesh.

Methods: A cross-sectional study was conducted among the 1,200 T2DM urban and rural subjects from 16 diabetes care centers/facilities of the Health Care Development Project (HCDP) of Bangladesh Diabetes Association. Height and weight measurements and subsequent calculation of body mass index (BMI) to identify the overweight and obesity were done according to the WHO standard guidelines. Descriptive statistics and Chi-square tests were performed using SPSS software version 25.

Results: The prevalence of overweight was 34.4% (95% CI, 31.7–37.1), and it was higher among the urban respondents than the rural respondents (37.1% *vs.* 31.1%). And the prevalence of obesity was 11.4% (9.6–13.2), and was also higher among the urban respondents than the counterparts (14.3% *vs.* 7.7%). The differences between overweight and obesity between urban and rural areas were significant (P<0.001).

Conclusions: The prevalence of overweight and obesity is noticeable among the T2DM subjects in Bangladesh, and both exist higher among urban subjects than rural subjects. A comprehensive, pragmatic weight reduction intervention strategy for the T2DM subjects should be planned and implemented.

Keywords: Overweight; obesity; type 2 diabetes mellitus (T2DM); urban; rural; Bangladesh

Introduction

Excess body weight (overweight and obesity) and diabetes are the leading causes of cardiovascular deaths worldwide (1-4). The relationship between overweight/obesity and diabetes is also already established many years before (2-4). In Bangladesh, both overweight/obesity and type-2 diabetes mellitus (T2DM) are the major public health issues at present, and two clear increasing trends have been observed among its general population (5-10). However, the broadly explored prevalence of overweight and obesity

among the T2DM subjects in Bangladesh is quite limited. Available evidence from a study in a tertiary level urban hospital setting, it has been reported that nearly one-quarter and half of its reproductive-aged T2DM women subjects were overweight and obese, respectively (11). Still, it is quite inadequately studied the prevalence of overweight and obesity largely among the urban and rural Bangladeshi T2DM subjects. In case of any intervention, a substantial understanding of the prevalence is a fundamental and crucial aspect. In this context, the current study has been designed to determine the prevalence of overweight and obesity among urban and rural T2DM subjects in Bangladesh.

We present the following article in accordance with the STROBE reporting checklist (available at http://dx.doi.org/10.21037/jxym-20-96).

Methods

Study design, population, and setting

This cross-sectional study was conducted among 1,200 T2DM men and women patients in 2011–2012 who visited multiple centers of Health Care Development Projects owned by the Diabetic Association of Bangladesh (BADAS). A total of sixteen centers was selected; seven were from Dhaka districts, and the resting nine were from several districts of the northern part of Bangladesh. We selected the study centers purposively and followed a convenient sampling method to collect outdoor and indoor patients' data. Exclusion criteria included all acute illnesses as well as mental instability of the subjects. The total size of 1,200 samples was much higher than the estimated sample size for this study (using the $n = Z^2 pq/d^2$ formula) that well-satisfied the required sample size.

Data collection instruments and procedures

We used a pre-tested semi-structured questionnaire comprised of demographic information (such as sex, age, and area of living) and anthropometric measurements (such as height and weight). The data collection procedure was comprised of two consecutive phases: (I) a face-to-face interview using the questionnaire, and (II) anthropometric measurements. Respondents were asked about their demographic information. The anthropometric measurements were taken by following the World Health Organization (WHO) standard guidelines described in 'Noncommunicable disease risk factors survey Bangladesh

2010' (12). Respondent's height and weight were used to calculate their body mass index (BMI). Furthermore, respondents were identified as underweight, normal weight, overweight, and obese when their BMIs were <18.5, 18.5–24.9, 25.0–29.9, and ≥30.0 kg/m², respectively, according to the WHO BMI classification system using BMI (12). Overweight and obese were the main outcome variables in this study.

Statistical procedure

We used SPSS software (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp.) for data processing and statistical analyses. Descriptive statistics were used to illustrate demographic factors, BMI, and BMI status (underweight, normal weight, overweight, and obese) related factors and expressed as numbers, percentages, means, and standard deviations. A Chi-square test was also performed to see the relationship between urban *vs.* rural areas and men *vs.* women with BMI.

Ethical implications

The research protocol was approved by the Ethical Review Committee of Bangladesh Diabetic Association (Identification number: BADAS/BIO/EA/11/033) on 17th January 2011. The study was conducted in accordance with the Declaration of Helsinki. The purpose of the study, the rights of the respondents, and data safety issues were explained to the participants. All subjects gave their verbal and written informed consent for inclusion before participating in the study.

Results

Participants

Out of total 1,200 respondents [men 445 (37.1%); and women 755 (62.9%)], total 669 (55.8%) were from urban areas [men 251 (37.5%); and women 418 (62.5%)], and remaining 531 (44.3%) were from rural areas (men 194 (36.5%); and women 337 (63.5%)). The mean age of the respondents was 51.6±11.9 years (men 55.1±11.9; women 49.6±11.4), whereas in urban respondents it was 52.0±11.8 years (men 54.6±11.8; women 50.5±11.6) and in rural respondents, it was 51.1±12.0 years (men 55.8±12.0; women 48.4±11.1) (data not shown in the *Table 1*).

Table 1 Prevalence of overweight and obesity according to area and sex of the type-2 diabetic subjects in Bangladesh

BMI classification	Overall % (95% CI)			Urban % (95% CI)			Rural % (95% CI)			P value (urban vs. rural
	Men N=445	Women N=755	Both N=1,200	Men N=251	Women N=418	Both N=669	Men N=194	Women N=337	Both N=531	
Underweight	4.3 (2.4–6.2)	4.1 (2.7–5.5)	4.2 (3.1–5.3)	2.0 (0.3–3.7)	1.9 (0.6–3.2)	1.9 (0.9–2.9)	7.2 (3.6–10.8)	6.8 (4.1–9.5)	7.0 (4.8–9.2)	0.001*
Normal weight	53.7 (49.1–58.3)	47.8 (44.2–51.4)	50.0 (47.2–52.8)	54.1 (47.9–60.3)	43.8 (39.0–48.6)	46.6 (42.8–50.4)	56.7 (49.7–63.7)	52.8 (47.5–58.1)	54.2 (50.0–58.4)	
Overweight	33.9 (29.5–38.3)	34.7 (31.3–38.1)	34.4 (31.7–37.1)	36.7 (30.7–42.7)	37.3 (32.7–41.9)	37.1 (33.4–40.8)	30.4 (23.9–36.9)	31.5 (26.5–36.5)	31.1 (27.2–35.0)	
Obese	8.1 (5.6–10.6)	13.4 (11.0–15.8)	11.4 (9.6–13.2)	10.0 (6.3–13.7)	17.0 (13.4–20.6)	14.3 (11.6–17.0)	5.7 (2.4–9.0)	8.9 (5.6–11.9)	7.7 (5.4–10.0)	
P value (men vs. women)	0.034*			0.084			0.928			

Underweight = BMI <18.5 kg/m^2; normal weight = BMI 18.5–24.9 kg/m^2; overweight = BMI 25.0–29.9 kg/m^2; obese = BMI ≥30.0 kg/m^2. Chi-square test has been done; P<0.05 considered as level of significance. BMI, body mass index.

Prevalence of overweight and obesity

The overall prevalence of overweight was 34.4% (95% CI, 31.7–37.1), and it was found higher among urban respondents compared to the rural respondents [37.1% (33.4–40.8%) *vs.* 31.1% (27.2–35.0%)], irrespective of sex. And, the overall prevalence of obesity was 11.4% (9.6–13.2%), and similar to the overweight, it was also found higher among the urban respondents compared to the counterparts [14.3% (11.6–17.0%) *vs.* 7.7% (5.4–10.0%)], here irrespective of sex and the difference was significant (P<0.001). Furthermore, obesity seemed higher among women than men, irrespective of the urban and rural areas (details in the *Table 1*).

Discussion

Bangladesh is passing through a nutritional transition from under-nutrition to over-nutrition (overweight and obesity) due to the country's socio-economic advancement. Previously, people were dying due to under-nutrition and communicable diseases; however, it is due to the over-nutrition and noncommunicable diseases (13). On the other hand, diabetes mellitus is also increasing day by day (9,10). To the best of our knowledge, no study has been conducted among urban and rural Bangladeshi T2DM subjects to assess overweight and obesity scenarios. In this present study, it has been firstly explored the given context.

We have found a noticeable proportion of our study subjects were overweight and obese, regardless of whether they were from urban or rural areas. Around one-third of our overall T2DM subjects were overweight, and the urban T2DM subjects were identified with a higher proportion than the rural T2DM subjects (37.1% *vs.* 31.1%), irrespective of the sex. Over one-tenth of our overall T2DM subjects were overweight, and the urban T2DM subjects were identified with a higher proportion than the rural T2DM subjects (14.3% *vs.* 7.7%) irrespective of the sex. Furthermore, we also found a higher prevalence of obesity among women than men, irrespective of the urban and rural areas. However, in our study, we have found a much higher prevalence of overweight (37.3%) and oppositely much less prevalence of obesity (17.0%) in our urban T2DM subjects when compared to the reproductive-aged T2DM women subjects of a domestic study in a tertiary level urban hospital setting (overweight 22%; and obesity 48%) (11). Again, we have found a combatively less prevalence of both overweight and obesity in our study than T2DM subjects in a study from Saudi Arabia (overweight 39.8%; and obesity 38.3%) (14). This variation in the prevalence of overweight and obesity in our study than the domestic and Saudi Arabian study might potentially as well as evidently be due to the difference in the socio-demographic factors like recruited age group (11,14), and also in the BMI classification system. In contrast, we used WHO guidelines in contrast to the BMI classification system for the South Asian used in the domestic study (14). Moreover, poor dietary practice and low physical activities could be the possible reason

for varying the overweight and obesity among the study population. Besides, they might adhere to the drug for DM management rather than lifestyle modification (11,14).

This study's mentionable limitation might be the cross-sectional study design that can't capture the causal-effect relationship of overweight/obesity with T2DM. We had to select the study samples conveniently, and the study centers purposively from the country's central and northern parts, which might be considered a methodological limitation regarding the generalizability of the study results. Another limitation of this study could be the overrepresentation as the data collected from the health care facilities and all sick people only came there may be obese diabetic subject were sicker and more visited the facilities. However, the present study will give a snapshot of overweight and obesity situations in the country. The research question can be clarified more clearly by the large-scale population-based nationally representative studies in the future.

Conclusions

The current study revealed that the prevalence of overweight and obesity are noticeable among the T2DM subjects in Bangladesh, irrespective of the urban and rural areas. And, the prevalence of both overweight and obesity is higher in urban subjects compared to rural subjects. A comprehensive, pragmatic weight reduction intervention strategy for T2DM subjects should be planned and implemented to manage diabetes better.

Acknowledgments

Footnote

Reporting Checklist: The authors have completed the STROBE reporting checklist. Available at http://dx.doi.org/10.21037/jxym-20-96

Data Sharing Statement: Available at http://dx.doi.org/10.21037/jxym-20-96

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at http://dx.doi.org/10.21037/jxym-20-96). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The research protocol was approved by the Ethical Review Committee of Bangladesh Diabetic Association (Identification number: BADAS/BIO/EA/11/033) on 17th January 2011. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). The purpose of the study, the respondents' rights, and data safety issues were explained to the participants. All subjects gave their verbal and written informed consent for inclusion before participating in the study.

References

1. World Health Organization. Overweight and obesity key facts. Available online: https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight
2. Scherer PE, Hill JA. Obesity, Diabetes, and Cardiovascular Diseases: A Compendium. Circ Res 2016;118:1703-5.
3. Censin JC, Peters SAE, Bovijn J, et al. Causal relationships between obesity and the leading causes of death in women and men. PLoS Genet 2019;15:e1008405.
4. Liu XM, Liu YJ, Zhan J, et al. Overweight, obesity and risk of all-cause and cardiovascular mortality in patients with type 2 diabetes mellitus: a dose-response meta-analysis of prospective cohort studies. Eur J Epidemiol 2015;30:35-45.
5. Biswas T, Garnett SP, Pervin S, et al. The prevalence of underweight, overweight and obesity in Bangladeshi adults: Data from a national survey. PLoS One 2017;12:e0177395.
6. Das SK, Chisti MJ, Huq S, et al. Changing trend of overweight and obesity and their associated factors in an urban population of Bangladesh. Food and Nutrition Sciences 2013;4:678-89.

7.   Zaman MM, Rahman MM, Rahman MR, et al. Prevalence of risk factors for non-communicable diseases in Bangladesh: results from STEPS survey 2010. Indian J Public Health 2016;60:17-25.

8.   Chowdhury MAB, Adnan MM, Hassan MZ. Trends, prevalence and risk factors of overweight and obesity among women of reproductive age in Bangladesh: a pooled analysis of five national cross-sectional surveys. BMJ Open 2018;8:e018468.

9.   Biswas T, Islam A, Rawal LB, et al. Increasing prevalence of diabetes in Bangladesh: a scoping review. Public Health 2016;138:4-11.

10. Zaman MM, Choudhury SR, Ahmed J, et al. Blood glucose and cholesterol levels in adult population of Bangladesh: Results from STEPS 2006 survey. Indian Heart J 2016;68:52-6.

11. Akter J, Shahjahan M, Hossain S, et al. Determinants of overweight and obesity among Bangladeshi diabetic women of reproductive age. BMC Res Notes 2014;7:513.

12. World health Organization. Non-communicable disease risk factors survey Bangladesh 2010. Available online: https://www.who.int/docs/default-source/searo/bangladesh/pdf-reports/year-2007-2012/non-communicable-disease-risk-factor-survey-bangladesh-2010.pdf?sfvrsn=37e45e81_2

13. Hasan M, Sutradhar I, Shahabuddin A, et al. Double Burden of Malnutrition among Bangladeshi Women: A Literature Review. Cureus 2017;9:e1986.

14. Abed Bakhotmah B. Prevalence of Obesity among Type 2 Diabetic Patients: Non-Smokers Housewives Are the Most Affected in Jeddah, Saudi Arabia. Open Journal of Endocrine and Metabolic Diseases 2013;03:25-30.