Original article

Rural and urban differences in lifestyle behaviors: a baseline survey among type II diabetic patients in an integrated nutritional supports program to combat obesity

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Abstract. *Background and aims:* Recently, the prevalence of type II diabetes and obesity has been increased in both rural and urban communities. The aim of this work was to investigate the lifestyle behaviors including food consumption, physical exercise and sleep duration among type II diabetic patients in an integrated nutritional support program in rural and urban settings in Bangladesh. *Methodology:* A baseline cross-sectional study was conducted among 512 rural and 715 urban type II diabetes patients from two different communities. Information about the participants' socio-economic and dietary patterns, duration of physical exercise, duration of sleep and body mass index (BMI) measurement were collected by related appropriate techniques. Data were analyzed by IBM SPSS 23 software. *Results:* The prevalence of obesity (BMI≥30.0) among the type II diabetic patients was significantly higher in urban settings (P<0.05). Food consumption for the energy-giving, processed foods and beverages groups significantly differs from the rural and urban settings. However, consumption of body-building and protective foods in both communities was lowered compared to the present dietary guidelines and did not show significant differences. The average contribution of different food groups' consumption was: energy giving 69.8% and 60.1%, body-building 12.4% and 13.3%, and protective foods 13.7% and 11.2% respectively for the rural and urban populations. Both males and females slept less than the recommended hours, without any significant variations among the rural and urban lifestyles. The duration of physical exercise was significantly (p <0.05), differed in both settings and the mean duration of physical exercise per day was 32±9 minutes in the rural and 23±7 minutes in the urban area. *Conclusions:* Imbalanced lifestyles through poor food consumption patterns, insufficient sleep and physical exercise may predispose to type II diabetes and obesity, therefore, proper nutrition education programs should be developed concerning lifestyle behaviors.

Key words: lifestyle behaviors, type II diabetes, obesity, integrated nutritional supports, baseline survey

Introduction

Bangladesh has been undergoing a green revolution and technological modernization last few decades. Increased trade globalization and urbanization indicates a lifestyle revolution in progress and hence a diet that used to consist mostly of rice, pulses, fish, vegetables, roots, and tubers has altered to include more chicken meat, cultured fish, processed fast foods, sugary beverages, and other unhealthy items (1-3). Simultaneously, everyday activity has switched to more sedentary pursuits, which has a significant influence on health (4). Mechanization and digitalization have recently an impact on daily behavior and activity, such as

physical exercise and sleeping time. Sleep duration affects energy expenditure; persons who sleep less hours are more likely to feel drowsy and weary during the day, preferring light activities and lowering energy expenditure (5,6). Sleep deprivation has been shown to have a deleterious influence on human metabolism, hunger hormone levels, and calorie intakes (5-8). Obesity and type II diabetes mellitus are caused by a combination of above lifestyle factors.

Obesity was shown to be prevalent in 2.3-12 percent of people in poor nations (9). Obesity, along with malnutrition, has become a major public health concern in Bangladesh. Furthermore, the prevalence of overweight and obesity is rising, particularly more in urban areas (9–11). Obesity prevalence rates for males and females in Bangladesh were estimated to be 3.0 and 6.0 percent, respectively (12). People who reside in cities are more likely to become obese as a result of poor food habits and lack of physical activity. According to a recent study, Dhaka city has a higher rate of overweight/obesity than other cities (13).

Unwanted weight gain resulting in obesity has become a main driver of the worldwide rise in type-II diabetes. Type II diabetes is a self-governing risk factor for early disease and death, but it can also cause nephropathy, retinopathy, and neuropathy, posing a significant worldwide public health burden (14). In obese those with impaired glucose tolerance, lifestyle intervention programs emphasizing nutritious diets, physical exercise, and substantial body weight reductions can prevent the onset of diabetes (14,15).

When availability to safe and nutritious foods decreases in low and middle-income nations, a new food culture has emerged and make it easier to choose low cost, saturated fats and sugar-based higher energy foods, which may lead to overweight and obesity (5). In Bangladesh, emerging new food cultures have expanded greatly, with a wide range of food choices and dietary habits among both rural and urban populations (16). Dietary guidelines for healthy living emphasize a balanced diet, rich in energy-giving (50-60%), protective (25-30%), and body-building (15-20%) nutrients, while considered limiting salt, sugar, and fat-rich foods and beverages (17-19). In this perspective, a balanced diet might be regarded as intake of a range of fresh local foods from each of the three food groups in adequate amounts everyday. The lifestyles of metropolitan Dhaka residents have changed dramatically, with a penchant for highly processed foods, breakfast skipping, and poor physical activity (20). Obesity is on the rise in Bangladesh, particularly among urban dwellers, as a result of these developments. In addition, scheduled physical activity and sleeping hours have been linked to obesity and overweight (21).

Obesity is typically caused by excess calorie consumption compared to energy expenditure, but the etiology of obesity is far more complex, involving physiological, genetic, environmental, social, psychological, political, and even economic factors that interact in varying degrees to aid obesity progression (22). Increased fast-food chains near study hubs, increased commercial portion sizes and processed food items availability in stores, decreased physical activity, less physical exercise, and more time spent on sedentary behaviors like gossiping, watching television, browsing the net, and playing video games all contribute to weight gain from a young age (23-25).

The increasing burden of both obesity and diabetes in Bangladesh needed community engagement of health care providers who can deliver a wide range of public health intervention programs including multiscreening, health and nutrition education and counselling for common non-communicable diseases (26). In some developing countries, integrated support program provide several disease specific provitional diagnosis, dissemination of health and nutrition care education, counselling of dietary modifications etc. (27). Again, large scale community based approaches with experimentation procedure also observed in health service delivery in Bangladesh (26,27).

During Covid-19 pandemic situation, a wide range of integrated nutritional supports for diabetic patients and other non-comminicable diseases were administered by the few reasearchers (28-30). However, to our knowledge, no study has yet identified variations in lifestyle habits among obese and type II diabetes persons in rural and urban Bangladesh. Therefore, a baseline survey of type II diabetic patients in an integrated nutritional supports program to combat obesity was designed to determine the determinants of several lifestyle behaviors, such as food consumption patterns,

physical activity, and sleeping time, that could differ depending on the Bangladeshis' living conditions (rural and urban lifestyle) and have an impact on obesity and type II diabetes mellitus.

Materials and methods

A baseline cross-sectional research was conducted for an integrated nutritional supports program to combat obesity for the management of type II diabetic patients in rural and urban settings in Bangladesh. The baseline data collection and screening period was July to September 2021. A total 1227 respondents from both rural and urban areas were randomly screened as type-II diabetic patients after their informed written consent.

A standard questionnaire was created to collect the necessary information on general information, socioeconomic information, and specific dietary information. Anthropometric measurement like weight was recorded in kilograms by using a standard portable bathroom weighing machine. Height was recorded in centimeters by using a standard height machine. Body Mass Index (BMI) is calculated by dividing weight in kilograms by height in meters square, and classified according to WHO classification (31), the calculated BMI was categorized as underweight (< 18.5), normal weight (18.5–24.9), overweight (25–29.9) or obese (≥ 30.0).

Dietary history was recorded as weekly food frequency recall methods (32). We made modest adjustments to the short food frequency questionnaire (FFQ) based on FAO guidelines (33), including items considered as significant in rural and urban diets. For example, rice-based cake is commonly consumed in rural areas and an instant noodles/soup in urban areas as a snack item considered as energy giving food groups. Number of servings for each participant was calculated from the following twelve food groups, such as cereals (rice, bread, pasta, noodles and breakfast cereals); dark green leafy vegetables; non-leafy vegetables; pulses and legumes; roots and tubers; seasonal fruits and their dried products; milk and dairy products; red meat, fish, poultry and eggs; sweetened sugar beverages (SSBs); processed salty/fatty/sugary foods (French fries, salty processed meats, chocolate and confectionary, cakes, pastries and biscuits); fats/oils (butter); and water.

For both rural and urban Bangladeshis, the aforementioned twelve food groups were divided into three major groups (energy-giving, body-building, and protecting) and two minor groups (processed foods, sugary foods and beverages). Energy-giving foods (cereals, roots, and tubers) should account for at least 6 servings per day, while protective and body-building foods (red meat, fish, poultry, eggs, dairy, and legumes) should account for at least 5 and 2 servings per day, respectively. Water intake was based on individual needs, with minimal processed foods. Sugary foods and beverages were regarded minimum or avoided (19,34).

'What time do you fall asleep?' and 'What time do you wake up?' were the two questions used to evaluate sleeping time. There were 10 options for when an adult would fall asleep, ranging from "about 9 p.m. or earlier" to "around 1 a.m. or later," with a 30 minute gap between each group. The wake-up time was divided into 12 groups, ranging from 'about 6 a.m. or earlier' to 'around lunchtime or later,' with a 30 minute gap between each category. Answers were converted to numerical values by using the median value of the time interval in the categorized answer. The difference between the wake-up and falling-asleep times determined the ultimate sleeping time. The time of physical exercise was calculated of an individual's all activities of the cyclic type, e.g. walking, running, cycling, swimming and so on.

The protocol was approved by the Ethical Review Committee of the Department of FTNS, Mawlana Bhashani Science and Technology University: ERC No. 2020-002.

Statistical analysis

The IBM SPSS 23.0 windows application was used for all data processing and statistical analysis. The frequency distribution, percentage means, and standard deviation of the data were all examined. The link between groups and various types of nutritional status, behavioral status, and socio-economic status was investigated using statistical tests at 95% confidence interval (P value at 0.05).

Results and discussion

Table 1 shows the socio-demographic statistics, both overall and by gender. Total 1227 participants were screened as type II diabetes from both rural (n= 512) and urban (n=715) areas, where male and female ratio was 53.1:46.9. Majorities of the respondents were Muslim in both areas. The mean age of all respondents was 52.7 years, 53.8 years in rural and 52.8 years in urban areas.

Table 1. Socio-demographic characteristics of participants at baseline survey.

Characteristics	Participants (n=1227)	Rural (n=512)	Urban (n=715)
Sex			
Male	651 (53.1%)	283 (55.3)	368 (51.5)
Female	576 (46.9%)	229 (44.7)	347 (48.5)
Religion			
Islam	1079 (87.9%)	458 (89.5)	621 (86.9)
Hindu	148 (12.1%)	54 (10.5)	94 (13.1)
Age (Years)			
40-49	347 (28.3)	148 (28.9)	199 (27.8)
50-59	474 (38.6)	197 (38.5)	277 (38.7)
60-69	314 (25.6)	128 (25.0)	186 (26.1)
70-79	92 (7.5)	39 (7.6)	53 (7.4)
Age in Year (Mean±SD)	52.7±7.5	53.8 ±7.8	52.8 ±7.6

Nutritional status among the type II diabetic patients were shown in Table 2. The percentage of obesity was 64.7 and 77.4% for rural and urban male respectively while in rural and urban females were 56.3 and 60.5% respectively. There was significant BMI differences emerged between both rural and urban living areas ($p<0.05$).

Adult sleep duration was below international norms (35) in both living locations, with rural and urban males sleeping time 6.22 and 6.05 hours per day, respectively was shown in Table 3. In rural and urban females, the sleeping time were 6.13 and 5.82 hours per day respectively. Regardless where they lived, their sleep duration was short which may have led to the high prevalence of obesity and overweight in both rural and urban settings. Timing of physical exercise per day was significantly differing in both sex and habitants. The regular physical exercise was seen more and significant (<0.05) in males compared to females in both settings (Table 3).

Figure 1 showed the consumption of average contribution of food group among rural and urban type-II diabetic patients. In both areas, energy giving foods were the main contributor while processed and sugary foods were varried. Energy-giving, body-building, and protecting foods contributed an average of 69.8, 12.4, and 13.7% of the dietary categories in rural areas, respectively. In urban settings, those were 60.1, 13.3 and 11.2% respectively. Moreover, the percentage of processed foods and sugary beverages averaged were

Table 2. Nutritional status among the type II diabetic patients according to BMI classification.

Characteristics		Participants (n=1227)			Male			Female		
		Rural (n=512)	Urban (n=715)	P-value	Rural (n=283)	Urban (n=368)	P-value	Rural (n=229)	Urban (n=347)	P-value
Body Mass Index	Undernutrition (<18.5)	9 (1.8)	2 (0.3)	<0.05	5 (1.8)	1 (0.3)	<0.05	4 (1.7)	1 (0.3)	<0.05
	Normal (18.5-24.9)	34 (6.6)	33 (4.6)		19 (6.7)	19 (5.2)		15 (6.6)	14 (4.0)	
	Overweight (25.0-29.9)	157 (30.7)	185 (25.9)		76 (26.9)	63 (17.1)		81 (35.4)	122 (35.2)	
	Obesity (≥30.0)	312(60.9)	495 (69.2)		183 (64.7)	285 (77.4)		129 (56.3)	210 (60.5)	
	Total	512 (100.0)	715 (100.0)		283 (100.0)	368 (100.0)		229 (100.0)	347 (100.0)	

Table 3. Lifestyle behaviors among the type II diabetic patients.

Characteristics	Participants (n=1227)			Male			Female		
	Rural (n=512)	Urban (n=715)	P-value	Rural (n=283)	Urban (n=368)	P-value	Rural (n=229)	Urban (n=347)	P-value
Sleep duration (hour/day)	6.15±1.31	6.01±1.33	>0.05	6.22±1.51	6.05±1.46	>0.05	6.13±1.22	5.82±1.34	>0.05
Duration of physical exercise (min/day)	31±8	22±6	<0.05	26±7	19±5	<0.05	36±9	27±7	<0.05

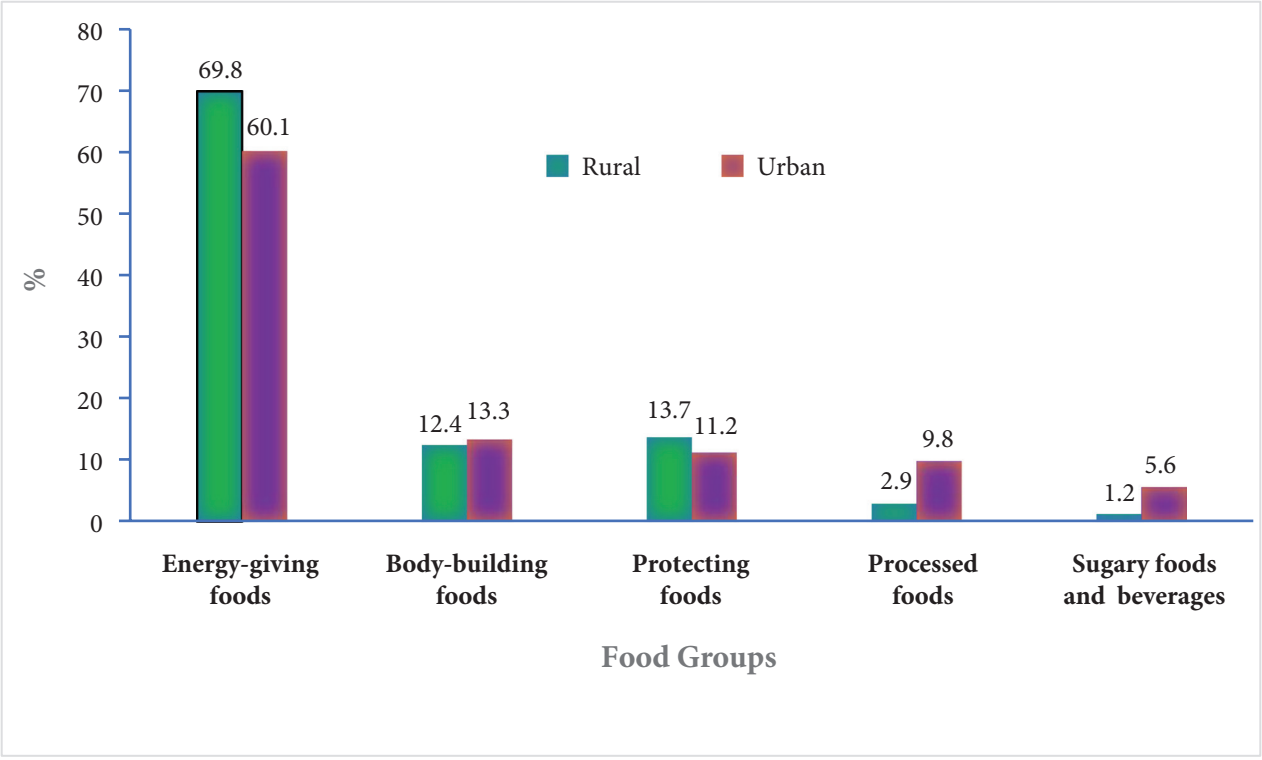

Figure 1. Average contribution of food group consumption patterns.

2.9 and 1.2% in rural areas, and 9.8 and 5.6% in urban areas, respectively. It was also assessed the food frequency consumption patterns based on numbers of servings taken per day among the both areas type-II diabetic patients, and found significance differences in dietary behaviors among the type-II diabetes patients depending on their locale settings (Table 4).

The frequency of energy-giving foods was found to be higher in rural regions than in urban ones. Other foods, such as bodybuilding foods, protective foods, processed foods, sugary foods, and drinks, were consumed more often in urban regions than in rural areas. Most diabetic population met the Bangladeshi guidelines for body building foods about 15%, but doesn't meet their protective foods need.

Conclusions

The significant differences in rural and urban baseline survey exhibit the various stages of lifestyle behaviors undergoing in Bangladesh. Although

Table 4. Food frequency consumption (No. of Servings) patterns among the type-II diabetic patients.

Characteristics	Total Participants (n=1227)			Male			Female		
	Rural	Urban	P-value	Rural	Urban	P-value	Rural	Urban	P-value
Energy giving foods	7.43 ±2.01	5.92 ±1.93	<0.05	8.63 ±2.34	6.12 ±2.01	<0.05	6.82 ±1.93	5.28 ±1.67	<0.05
Body building foods	2.48 ±1.31	2.53 ±1.13	>0.05	2.64 ±1.15	2.83 ±1.21	>0.05	1.99±1.11	2.23 ±1.16	>0.05
Protective foods	3.61 ±1.36	3.33 ±1.28	>0.05	3.83 ±1.26	3.41 ±1.46	>0.05	3.41±1.22	3.17 ±1.42	>0.05
Processed foods	1.19 ±0.61	1.87 ±0.69	<0.05	1.24 ±0.56	1.96 ±0.77	<0.05	1.13±0.63	1.49 ±0.68	<0.05
Sugary foods and beverages	0.94 ±0.24	1.79 ±0.43	<0.05	1.14 ±0.31	1.88 ±0.44	<0.05	0.76±0.17	1.39 ±0.36	<0.05

energy-giving foods are the major contributor in both rural and urban locations, but the diets of Bangladeshis differ greatly in terms of processed foods and sugary beverages. Similarly, the duration of physical exercise significantly differ in both rural and urban settings. Overall, sleep durations are short no matter where in live.

Overweight and obesity may increase as a result of increasing these poor lifestyle habits, leading to chronic illnesses in the next few decades. Therefore, a more integrated nutritional supports with proper nutrition education programs is urgently needed to control these lifestyle behaviors successfully.

Conflict of Interest: The authors have declare no conflict of interest.

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Abbreviation: BMI: Body Mass Index; SSBs: Sweetened sugar and beverages; SPSS: Statistical Package for the Social Sciences.

References

1. Soon JM, Tee ES. Changing trends in dietary pattern and implications to food and nutrition security in Association of Southeast Asian Nations (ASEAN). Int J Nutr Food Sci 2014; 3(4): 259-269. doi: 10.11648/j.ijnfs.20140304.15.
2. Gibson E, Stacey N, Sunderland TC, Adhuri DS. Dietary diversity and fish consumption of mothers and their children in fisher households in Komodo District, eastern Indonesia. PLoS One 2020; 15(4): e0230777. doi.org/10.1371/journal.pone.0230777.
3. Cockx L, Colen L, De Weerdt J, Paloma GY. Urbanization as a driver of changing food demand in Africa: evidence from rural-urban migration in Tanzania. JRC Technical Reports. EUR 28756 EN European Commission, Luxembourg, 2019. doi:10.2760/515064.
4. Park JH, Moon JH, Kim HJ, Kong MH, Oh YH. Sedentary lifestyle: Overview of updated evidence of potential health risks. Korean J Fam Med 2020; 41(6): 365. doi: 10.4082/kjfm.20.0165.
5. Galy O, Paufique E, Nedjar-Guerre A, et al. Living in rural and urban areas of New Caledonia: impact on food consumption, sleep duration and anthropometric parameters among Melanesian adolescents. Nutrients 2020; 12(7): 2047. doi: 10.3390/nu12072047.
6. Naito R, Yun LW, Wan YC. Sleep deprivation and its associated factors among undergraduate students in Malaysia. Asia Pac J Public Health 2021; 33(5): 530-538. doi:10.1177/10105395211019930.
7. Zhu B, Shi C, Park CG, Zhao X, Reutrakul S. Effects of sleep restriction on metabolism-related parameters in healthy adults: A comprehensive review and meta-analysis of randomized controlled trials. Sleep Med Rev 2019; 45: 18-30. doi: 10.1016/j.smrv.2019.02.002.
8. Radcliffe PN, Whitney CC., Fagnant HS, et al. Severe sleep restriction suppresses appetite independent of effects on appetite regulating hormones in healthy young men without obesity. Physiol Behav 2021; 237: 113438. doi: 10.1093/cdn/nzaa063_070.
9. Ghannadiasl F. Associations between white blood cells count and obesity in apparently healthy young adults. Nutr Food Sci 2020; 50 (6): 1013-1019. doi: 10.1108/nfs-08-2019-0270.
10. Al Muktadir MH, Islam MA, Amin MN, et al. Nutrition transition–Pattern IV: Leads Bangladeshi youth to the increasing prevalence of overweight and obesity. Diabetes Metab Syndr : Clin Res Rev 2019: 13(3): 1943-1947. doi:10.1016/j.dsx.2019.04.034.
11. Hossain MS, Siddiqee MH, Ferdous S, et al. Is childhood overweight/obesity perceived as a health problem by mothers of preschool aged children in Bangladesh? A community level cross-sectional study. Int J Environ Res Pub Health 2019; 16(2): 202. doi: 10.3390/ijerph16020202.

12. Biswas T, Garnett SP, Pervin S, Rawal LB. The prevalence of underweight, overweight and obesity in Bangladeshi adults: Data from a national survey. PloS One 2017; 12(5): e0177395. doi: 10.1371/journal.pone.0177395.
13. Zamsad M, Banik S, Ghosh L. Prevalence of overweight, obesity and abdominal obesity in Bangladeshi university students: A cross-sectional study. Diabetes Metab Syndr : Clin Res Rev 2019; 13(1): 480-483. doi: 10.1016/j .dsx.2018.11.015.
14. Galaviz KI, Weber MB, Straus A, Haw JS, Narayan KV, Ali MK. Global diabetes prevention interventions: a systematic review and network meta-analysis of the real-world impact on incidence, weight, and glucose. Diabetes Care 2018; 41(7):1526-34. doi: 10.2337/dc17-2222.
15. Gong Q, Zhang P, Wang J, et al. Morbidity and mortality after lifestyle intervention for people with impaired glucose tolerance: 30-year results of the Da Qing Diabetes Prevention Outcome Study. Lancet Diabetes Endocrinol 2019; 7(6):452-61. doi: 10.1016 /S2213-8587(19)30093-2.
16. Neufeld LM, Andrade EB, Suleiman AB, et al. Food choice in transition: adolescent autonomy, agency, and the food environment. The lancet 2021; 399 (10320): 185-197. doi: 10.1016/S0140-6736(21)01687-1.
17. de Brauw A, Waid J, Meisner CA, Akter F, Khan BF. Food systems for healthier diets in Bangladesh: Towards a research agenda. IFPRI Discussion Paper 1902; International Food Policy Research Institute (IFPRI): Washington, DC, USA, 2019. doi: 10.2499/p15738coll2.133549.
18. Dietary Guideline for Bangladesh (2013), www.fao.org/3 /a-as880e.pdf
19. Huq, AKO. Human Nutrition and Applied Dietitics, A Text Book, Nutrition Information Cell, Dhaka 2012; 1, 197-205.
20. Islam MR, Trenholm J, Rahman A, Pervin J, Ekström EC, Rahman SM. Sociocultural influences on dietary practices and physical activity behaviors of rural adolescents—a qualitative exploration. Nutrients 2019; 11(12):2916. doi:10.3390/nu11122916.
21. Hayes JF, Balantekin KN, Altman M, Wilfley DE, Taylor CB, Williams J. Sleep patterns and quality are associated with severity of obesity and weight-related behaviors in adolescents with overweight and obesity. Child Obes. 2018; 14(1):11-7. doi: 10.1089/chi.2017.0148.
22. Aronne LJ, Nelinson DS, Lillo JL. Obesity as a disease state: a new paradigm for diagnosis and treatment. Clin cornerstone 2009; 9(4):9-29. doi: 10.1016/s1098-3597(09)80002-1.
23. Rolls BJ. The supersizing of America: portion size and the obesity epidemic. Nutrition today. 2003; 38(2):42-53. doi:10.1097/00017285-200303000-00004.
24. Andersen RE, Crespo CJ, Bartlett SJ, Cheskin LJ, Pratt M. Relationship of physical activity and television watching with body weight and level of fatness among children: results from the Third National Health and Nutrition Examination Survey JAMA; 279(12):938-42. doi: 10.1001/ jama.279.12.938.
25. Wright SM, Aronne LJ. Causes of obesity. Abdominal Radiology 2012; 37(5): 730-732. doi: 10.1007 /s00261-012-9862-x.
26. Rawal L, Jubayer S, Choudhury SR, et al. Community health workers for non-communicable diseases prevention and control in Bangladesh: a qualitative study. Global health research and policy, 2021; 6, 1-10. doi:10.1186 /s41256-020-00182-z.
27. El Arifeen S, Christou A, Reichenbach L, et al. Community-based approaches and partnerships: innovations in health-service delivery in Bangladesh. The Lancet, 2013; 382(9909), 2012-2026. doi:10.1016/S0140-6736(13)62149-2.
28. Hu A. O, Bazlur Rahim A. N. M., Moktadir S. M, et al. Integrated nutritional supports for diabetic patients during COVID-19 infection: A comprehensive review. Current Diabetes Reviews, 2022;18(3), 52-60. doi:10.2174 /1573399817666210301103233.
29. Jayawardena R, Sooriyaarachchi P, Chourdakis M, et al. Enhancing immunity in viral infections, with special emphasis on COVID-19: A review. Diabetes & Metabolic Syndrome: Clinical Research & Reviews, 2020; 4(4), 367-382. doi:10.1016/j.dsx.2020.04.015.
30. Kolcu G, Kolcu M. I. B, Demir S, Gulle K. Evaluation of learning management system in medical education in time of COVID-19. Progress in Nutrition, 2020; 22 doi: 10.23751/pn.v22i2-S.10443.
31. WHO Consultation on Obesity: Preventing and Managing the Global Epidemic. Geneva, Switzerland: World Health Organization; 2000 WHO Technical Report Series 894.
32. Bingham SA, Nelson M, Paul AA, Haraldsdottir J, Loken EB, Van Staveren WA. Methods for data collection at an individual level. In Manual on methodology for food consumption studies 1988: 53-106. Oxford Univ. Press.
33. Kennedy G, Ballard T, Dop MC. Guidelines for measuring household and individual dietary diversity. Food and Agriculture Organization of the United Nations; 2011.
34. Nahar Q, Choudhury S, Faruque M, et al. Desirable dietary pattern for Bangladesh. Final Res. Results, 2013;15, 226-244.
35. Consensus Conference Panel, Watson NF, Badr MS et al. Recommended amount of sleep for a healthy adult: a joint consensus statement of the American Academy of Sleep Medicine and Sleep Research Society. J Clin Sleep Med 2015 15; 11(6):591-2. doi: 10.5665/sleep.4886.

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