

Fast food consumption and obesity among urban college going adolescents in Bangladesh: A cross-sectional study



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ABSTRACT

Fast food consumption is an emerging trend among adolescents worldwide. College going adolescents are unduly prone to consume fast food which increases the risk of obesity in their future life. This study aimed to determine the prevalence of fast food consumption and to assess the association of fast food consumption with obesity among college going adolescents in Dhaka, Bangladesh. A total of 518 adolescent students were selected using a multi-stage sampling technique from five established colleges in Dhaka city from February 18, 2019, to June 30, 2019. A semi-structured questionnaire was used as a data collection tool. Statistical analysis was performed by SPSS, version 22. The results of this study revealed that 68.1% of students consumed fast foods at least once in the previous week. Taste or pleasure and convenience were the main drivers that triggered students to consume fast foods. About 64% of the participants consumed fast foods frequently (i.e., > 3 days/week) followed by about 36% were infrequent consumers (i.e., 1–3 days/week). There was a significant difference between students who consumed and did not consume fast food in the previous week regarding the gender, education version, study group and socio-economic class ($p < 0.05$). The study found a significant association of fast food consumption with the higher prevalence of obesity (29.9% in fast food consumers vs 9.1% in non-consumers, $p < 0.05$). In addition, male fast food consumers (OR = 2.274, 95% CI = 1.484–3.485, $p < 0.05$) as well as individuals who consumed fast foods frequently (OR = 2.712, 95% CI = 1.592–4.622, $p < 0.05$) had greater likelihood to be obese. Fast food consumption among college going adolescents was considered to be an alarming situation as well as a significant public health threat. Specific health education programs, dietary guidelines and effective public awareness campaigns could be best initiated to tackle this problem.

1. Introduction

The drastic rise in obesity rates at the end of the twentieth and the beginning of the twenty-first century remains one of the major public health issues worldwide (Cotti and Tefft, 2013). Obesity is a chronic, heterogeneous and multifactorial health disorder characterized by excessive weight gain and body fat accumulation (Albaik et al., 2015; Shori et al., 2017). According to the World Health Organization (WHO), the worldwide prevalence of obesity was estimated to be 600 million (13%) among people aged 18 years or more in the year 2014 and the figure will be 2.7 billion by 2025 as predicted by the WHO (Shori et al., 2017).

Several factors may have contributed to the obesity epidemic globally such as eating behaviors and disordered eating (Abdullah et al., 2015). Fast food consumption is one of the most significant

determinants of rising obesity rates (Afolabi et al., 2015; Shori et al., 2017) since fast food consumption has strong positive associations with weight gain (Monge-Rojas et al., 2013; Rosenheck, 2010). Previous studies also suggest that fast food consumption is responsible for insulin resistance and the development of type 2 diabetes (Abdullah et al., 2015; Pereira et al., 2005), hypertension and dyslipidemia (Kearney, 2010). People who consume fast foods once in a week are at a 20% increased risk for developing coronary heart disease and the risk increases with the consumption rates per week as revealed by previous studies (Monge-Rojas et al., 2013; Odegaard et al., 2012). Therefore, health regulatory bodies have recommended the minimum consumption of fast foods (WHO, 2003).

However, modernization and a sedentary lifestyle have amplified the hazards of fast foods for gaining unhealthy and excessive weight (Abdullah et al., 2015). Fast food refer to those foods which are

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prepared and served very quickly (Sumaedi and Yarmen, 2015) and eaten outside the home (Afolabi et al., 2015). In other words; it can be defined as those foods prepared with less nutrition value (Seo et al., 2011). Households become more reliant on the fast food industry and vendors both in developing and developed countries (Afolabi et al., 2015). Typically, burgers, sandwiches, french fries, pizza, fried chicken, puri, singara and chips are considered as fast foods (Seo et al., 2011). There made a notable change in nutrition transition through fast food composition and the structure of traditional diets to westernized diets (Kearney, 2010). Nutrition transition involves increasing consumption of fat (particularly saturated fat), sugar, sodium, cholesterol as well as a decrease in the consumption of unrefined cereal and vegetables (Afolabi et al., 2015; Askari Majabadi et al., 2016). The low price of fast foods makes them affordable to all walks of life and increases its consumption among them (Abdullah et al., 2015; Cotti and Tefft, 2013) or probably easy access (Seo et al., 2011). Increases in fast food consumption among adolescents may contribute to increasing obesity rates worldwide to become a global concern (Anderson et al., 2011; Fraser et al., 2012; Garcia et al., 2012; Jeffery and French, 1998), as excessive consumption during the transition to adulthood is associated with increased weight gain (Goon, 2015; Niemeier et al., 2006).

Bangladesh is a densely populated country in the southeast region. It has a population of over 160 million of which adolescents account for 20.5% (MCH, 2016). In recent times, the prevalence of obesity among adolescents has been rising rapidly in urban settings in Bangladesh (Banik and Rahman, 2018; Bulbul and Hoque, 2014; Rahman et al., 2014). Decreasing numbers of playgrounds likely led to less physical activity and more sedentary lifestyles, going to contribute to a burgeoning issue of overweight and obesity among urban adolescents (Goon, 2015). College going adolescents are consuming fast foods both occasionally and regularly which may contribute to the increased risk of obesity and related health complications, resulting in increased health care costs. There is a scarcity of available literature on fast food consumption and the risk of obesity among adolescents in Bangladesh. Therefore, the objective of this study was to determine the prevalence of fast food consumption and to assess the association of fast food consumption with obesity among college going adolescents.

2. Materials and methods

2.1. Study participants

Dhaka is the capital city of Bangladesh, which holds the highest concentrations of colleges and fast food outlets. Therefore, this cross-sectional study was conducted in Dhaka and the target population was college going adolescents. The only inclusion criterion was the individuals aged 10–19 years. A multi-stage sampling technique was employed to recruit subjects for the study. In the first phase, five colleges (Rajuk Uttara Model College, Lalmatia Housing Society College, National Ideal College, Udayan Higher Secondary School, and Dhaka College) were selected using simple random sampling from the study site. Then in each of the selected colleges, some classes were selected conveniently. In the third phase, a pre-tested semi-structured questionnaire was distributed to all of the students in the selected classes. A well-trained data collection team was employed to collect data under the direct supervision of the authors. After completion of the questionnaire, they were approached for anthropometric measurements and further analysis.

2.2. Date collection procedures

After preliminary observations and review of literature, a questionnaire had been developed, the majority of which had been drawn from previous similar studies (Abdullah et al., 2015; Shori et al., 2017) and modified by the authors themselves. The questionnaire was translated into Bangla and then translated back to English by different

persons to assess validity. The questionnaire was pre-tested in a sample of 40 college going adolescents before implementation in the final study. The questionnaire contained two sections. Section A contained the question about the participant's demographic background such as age, gender, living status. Anthropometric measurements were also taken which included participants' weight and height. Section B included information about the behavior of fast food consumption. Before that, we cleared to the students which food groups are considered as fast food.

Before the administration of the questionnaires to the students, the aim of the study was clearly articulated and formal written consent was taken from each of them. The participation was voluntary; all their information was kept anonymous and confidential. The study also approved by the concerned authority of the respective colleges and ethical review committee of Biological Faculty, Jahangirnagar University, Dhaka, Bangladesh. Data were collected from February 18, 2019, to June 30, 2019. A dataset from 518 participants was kept for final analysis following the removal of incomplete questionnaires.

2.3. Anthropometric measurements

The Weight and height of a person were measured in the morning by a trained researcher according to written standardized procedures. Bodyweight was measured to the nearest 0.1 kg using electronic portable scales and height was measured to the nearest 1 cm. Measurements were done with school uniform and without shoes. Body Mass Index (BMI) was calculated as the ratio of weight (kg) to height squared (m^2). Underweight was defined as having a BMI lower than the 5th percentile, overweight was defined as having a BMI between the 85th and 95th percentile, and obesity was defined as having a BMI in the 95th percentile or higher (Seo et al., 2011).

2.4. Statistical analyses

Statistical analysis was carried out using the Statistical Package for Social Sciences program (SPSS, version 22.0). Percentage, mean and standard deviations were calculated wherever applicable. Chi-square test and binary logistic regression with 95% confidence intervals (95% CI) were used to explore the bivariate associations between fast food consumption and obesity. A *p*-value of less than 0.05 indicates the results are statistically significant at 5% level of significance.

3. Results

A total of 518 college going adolescents participated in the present study with a mean (\pm SD) age of 17.03 (\pm 1.36) years. The socio-demographic characteristics of the participants were shown in Table 1. The participants were considered fast food consumers who had reported to consume fast food at least once in the previous week before the survey. Out of 518, 354(68.3%) of the participants had reported consuming fast food in the previous week. Among the fast food consumers, 64.1% were frequent consumers ($>$ 3 days/week) and 35.9% were infrequent consumers (1–3 days/week). Taste/pleasure (58.5%) and convenience (32.5%) were reported as the main reasons for choosing fast foods. The 46.6%, 26.8% and 22.9% of participants consumed fast foods for snacks (during tiffin or evening), breakfast and lunch respectively. The majority of the participants (35.9%) consumed fast foods with friends. The mean (\pm SD) monthly expenditure on fast food consumption was 736.44 (\pm 259.87) BDT (Table 2).

Table 3 illustrates the comparison of fast food consumption in study participants by the chi-square test between who consumed fast foods in the previous week and who not consumed. This table showed that there was a significant difference between subjects who consumed and did not consume fast food in the previous week regarding the gender, education version, study group and socio-economic class ($p <$ 0.05). Nevertheless, there was no significant association between living status

Table 1
Socio-demographic characteristics of the participants (n = 518).

Characteristics	Category	Frequency (n)	Percentage (%)
Age (years)	Mean ±SD	17.03± 1.36	
Gender	Male	268	51.7
	Female	250	48.3
Study group	Science	210	40.5
	Business	188	36.3
	Humanities	120	23.2
Education version	Bangla	323	62.4
	English	195	37.6
Living Status	Home (with family)	387	74.7
	Hostel/Mess	131	25.3
Socio-economic class	Low (> 25000 BDT)	136	26.3
	Medium (25000-50000 BDT)	219	42.3
	High (> 50000 BDT)	163	31.5
Religion	Muslim	457	88.2
	Non-Muslim	61	11.8

Table 2
Characteristics of fast food consumption of the study participants.

Characteristics	Category	Frequency (n)	Percentage(%)
Fast food consumption in previous 7 days	Yes	354	68.3
	No	164	31.7
Frequency of fast food consumption (days/week) (n = 354)	Infrequently (1–3 days/week)	127	35.9
	Frequently (> 3 days/week)	227	64.1
Reasons behind fast food consumption (n = 354) ^a	Taste/pleasure	207	58.5
	Convenience	115	32.5
	Influenced by peer	49	13.8
	Lack of suitable option	45	12.7
	Pocket friendly	18	5.1
Usual time of fast food consumption ^a	Breakfast	34	9.6
	Lunch	81	22.9
	Dinner	115	32.5
	Snacks (tiffin/evening)	165	46.6
Accompany person ^a	Family	155	43.9
	Friends	127	35.9
	Self	95	26.8
Average amount of money spent on fast food monthly	< 500 BDT	96	27.1
	500-1000 BDT	212	59.9
	> 1000 BDT	46	13.0
	Mean ± SD	736.44 ± 259.87	

^a Multiple responses.

Table 3
The relationship between demographic variables and fast food consumption.

Characteristics	Category	Fast food consumer; n (%)	Fast food non-consumer; n (%)	χ ² value (p-value)
Gender	Male	198(73.9)	70(26.1)	7.879
	Female	156(62.4)	94(37.6)	(0.005)
Study group	Science	129 (61.4)	81 (38.4)	7.909
	Business	136 (72.3)	52 (27.7)	(0.019)
	Humanities	89 (74.2)	31(25.8)	
Education version	Bangla	208(64.4)	115(35.6)	6.167
	English	146(74.9)	49(25.1)	(0.013)
Living status	Home (with family)	259(66.9)	128(33.1)	1.416
	Hostel/Mess	95(72.5)	36(27.5)	(0.234)
Socio-economic class	Low	76(55.9)	60(44.1)	16.698
	Medium	151(68.9)	68(31.1)	(0.000)
	High	127(77.9)	36(22.1)	
Religion	Muslim	313(68.5)	144(31.5)	0.041
	Non-Muslim	41(67.2)	20(32.8)	(0.840)

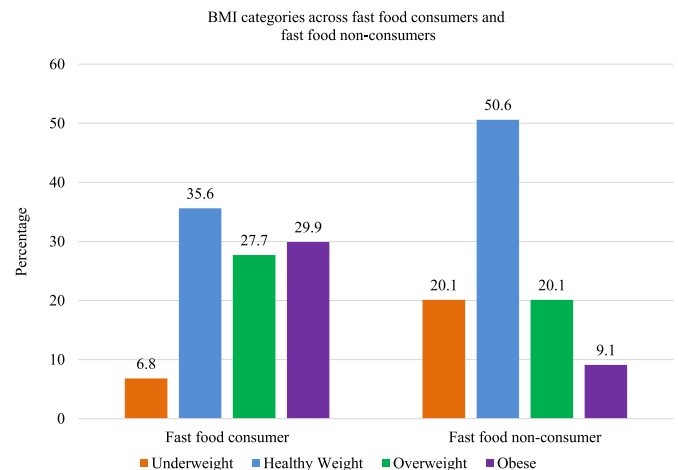


Fig. 1. Distribution of BMI categories according to fast food consumption.

and religious status with fast food consumption.

The students were considered obese if he/she had BMI ≥ 95th percentile. According to this criterion, 29.9% were identified as obese among fast food consumers whereas 9.1% were obese among the fast food non-consumers (Fig. 1). The present study showed a significant association of fast food consumption with the higher prevalence of obesity ($\chi^2 = 27.078, p < 0.05$). Among the fast food consumers, the gender was significantly associated with a higher prevalence of obesity (67.0% in males vs. 33.0% in females; $p < 0.05$). It is also found a significant association between weekly frequency of fast food consumption and obesity (20.8% in infrequent consumers (1–3 days/week) vs. 79.2% infrequent consumers (> 3 days/week); $p < 0.05$). Logistic regression analysis further revealed that fast food consumers were 4 times more likely to be obese than non-consumers (OR = 4.246, 95% CI = 2.383–7.565, $p < 0.05$). Moreover, male fast food consumers (OR = 2.274, 95% CI = 1.484–3.485, $p < 0.05$) as well as individuals who frequently consumed fast foods (OR = 2.712, 95% CI = 1.592–4.622, $p < 0.05$) were more likely to be obese (Table 4).

4. Discussion

This study was able to determine the prevalence of fast food consumption among college going adolescents and its association with the chance of being obese. The prevalence of fast food consumption among college going adolescents based on last week's reporting was found to be 68.3%. It seems that the consumption of fast food in college going adolescents is high due to the lack of recreational facilities and entertainment in urban settings. Previous literature supports that fast food is consumed frequently in Dhaka city and that the prevalence of fast

Table 4
The relationship between fast food consumption and obesity.

Variables	Obese; N (%)	Non-obese; N (%)	χ ² value (p-value)	OR (95% CI)	p-value
Fast food Consumption in the previous week					
Yes	106 (29.9)	248(70.1)	27.078 (0.000)	4.246 (2.383–7.565)	0.000
No	15 (9.1)	149(37.5)		1	
Fast food consumption by gender (n = 354)					
Male	81(66.9)	187(47.1)	14.617 (0.000)	2.274 (1.484–3.485)	0.001
Female	40(33.1)	210(52.9)		1	
Frequency of fast food consumption (n = 354)					
Infrequently	22 (20.8)	103(41.5)	14.035 (0.000)	1	0.000
Frequently	84 (79.2)	145(58.5)		2.712 (1.592–4.622)	

*p -value less than 0.05 was considered significant.

food consumption is increasing (Bipasha and Goon, 2013; Goon, 2015). However, direct comparisons with our results are difficult because studies have varied by the study population, period of study, method of data collection, and question structure. As in Bangladesh, the prevalence of fast food consumption is increasing among adolescents reported in previous studies around the world. More than half of the Saudi adolescent girls consumed fast foods at least once a week as reported by Shori et al. (2017). Moreover, fast food consumption among adolescents in the United States had been increasing as reported by Niemeier et al. (2006). Convenience and taste/pleasure of the fast foods had been reported as the main reasons for consumption. This finding is consistent with previous studies (Anderson et al., 2011; Goon, 2015). Easy access to fast foods was the main reason for choosing fast foods as stated by Shori et al. (2017). Fast foods usually look very appealing and mouthwatering. Another special feature of fast food is ready to eat food and easily available. Adolescents are attracted by appealing looks of fast foods and consume without consideration of nutritional value. The present study also found that about half of the participants had fast foods for snacks during the tiffin period (break times) or in evening and dinner. This finding somehow corresponds to previous studies (Daradkheh et al., 2018; Das, 2016). Adolescents spend most of the time away from home attending colleges and tuition classes. During this time, they may consume fast foods as snacks to meet their hunger. This study found that the majority of the participants consumed fast food with family members and friends. This finding was consistent with previous studies (Driskell et al., 2006; Shori et al., 2017). Fast food consumption is gaining popularity in urban settings as working parents have less time for meal preparation. So, fast food can be a better option. Moreover, fast food can be handy for skipping breakfast. Adolescents may take fast food for recreational while they are with their friends. The average monthly expenditure for fast food consumption was between 500 and 1000 BDT as reported by the participants in the present study. This expenditure for fast consumption puts an extra economic burden on their parents. Males were more inclined to consume fast foods than females ($p < 0.05$). This finding is consistent with previous studies (Bipasha and Goon, 2013; Goon, 2015). Students enrolled in the English version and belong to a higher socio-economic class consumed fast more frequently than others. This finding was consistent with an Australian study which exhibited a connection between fast food consumption and socio-economic class (Faheem and Bukhari, 2018). It is plausible because fast food consumption has been seen as a symbol of affluence. In Bangladesh, English version students usually come from affluent families. So, the trend of fast food consumption was common among them as being a symbol of 'modernity and/or affluently'.

The present study found a significant association between fast food consumption and obesity. Furthermore, the greater percentage of obesity was observed among the participants who consumed fast foods frequently (i.e., > 3 days/week). Approximately thirty percent of participants taking fast foods were identified as obese, a similar study among university students in Bangladesh showed that just above thirty percent of the fast food consumers were obese (Goon, 2015). Another study conducted in Saudi Arabia showed obesity prevalence among fast food consumers 8.4% (Shori et al., 2017). Males and frequent consumers were at increased risk to be obese compared to others. Males spend more time outside the home than females which leads them to take fast foods as snacks. Fast food consumption has a positive impact on weight gain (Ben Ayed et al., 2019; Garcia et al., 2012; Jayasinghe and De Silva, 2014; Mohammadbeigi et al., 2018). Fast foods are usually purchased easily through self-service or carryout eating places without waiter services (Daradkheh et al., 2018; Kaushik et al., 2011; Satia et al., 2004). These types of foods are generally poor in micro-nutrients and fiber (Daradkheh et al., 2018; Goon, 2015; Satia et al., 2004), rich in saturated fatty acids (Ai-Otaibi and Basuny, 2015; Rosenheck, 2010), high in glycemic index and energy density (Anderson et al., 2011; Pereira et al., 2005; Rosenheck, 2010) and larger portion size (Pereira et al., 2005) than home-made foods (Feeley

et al., 2009). Moreover, the average energy density of an entire fast food menu is approximately more than twice the energy density of a healthy menu (Azadbakht and Esmaillzadeh, 2008; Prentice and Jebb, 2003). Increasing rates of obesity and overweight have been linked to the rising energy density of the diet (Mendoza et al., 2006). Obesity is the most important risk factor for different non-communicable diseases such as type 2 diabetes (Pereira et al., 2005), heart disease (Jayasinghe and De Silva, 2014) and hypertension and dyslipidemia (Kearney, 2010). In spite of such negative outcomes, the adolescents are getting addicted to fast food and leading themselves at risk of different health problems and economic crisis.

The major strength of this study is that it provides unique population-based estimates of fast food consumption specifically among adolescents in urban settings. Our study has a few limitations too. The study was cross-sectional and conducted only in Dhaka city; as a result, it could not be generalized. Another limitation of this study was self-reported data which always involves the risk of recall bias and insufficient funding.

5. Conclusion

Majority of the college going adolescents consume fast foods in the study area. This study found a positive association between fast food consumption and obesity. Therefore, it is recommended to limit fast food consumption. As fast foods are poor in nutrition value, there should be a change in the food market, includes increasing the availability of healthy foods. A combined effort from families, colleges and the government are essential to control the epidemic. Also, the college canteen and outside food outlets should be encouraged to provide healthy foods.

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Author's contribution

Rajon Banik: Conceptualization, Data acquisition, Data analysis, Writing - original draft, Validation. **Shabnam Naher:** Supervision, Conceptualization, Writing - review & editing, Validation. **Sabbir Pervez:** Writing - review & editing, Validation. **Md. Moyazzem Hossain:** Writing - review & editing, Validation.

Declaration of competing interest

The authors declare that they have no conflict of interest

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.obmed.2019.100161>.

References

Abdullah, N.N., Mokhtar, M.M., Bakar, M.H.A., Al-Kubaisy, W., 2015. Trend on fast food consumption in relation to obesity among selangor urban community. *Procedia* -

- Social and Behavioral Sciences 202, 505–513. <https://doi.org/10.1016/j.sbspro.2015.08.189>. December 2014.
- Afolabi, W.A.O., Oyawoye, O.O., Sanni, S.A., Onabanjo, O.O., 2015. Proximate and cholesterol composition of selected fast foods sold in Nigeria. *Niger. Food J.* 31 (1), 70–76. [https://doi.org/10.1016/s0189-7241\(15\)30058-8](https://doi.org/10.1016/s0189-7241(15)30058-8).
- Ai-Otaibi, H.H., Basuny, A.M., 2015. Fast food consumption associated with obesity/overweight risk among university female student in Saudi Arabia. *Pak. J. Nutr.* 14 (8), 511–516.
- Albaik, M., Khan, J., Ardwai, M.-S., Moselhy, S.S., 2015. Predication of Biochemical Changes and Vitamin D Level in Obese Women 3 (1), 267–272.
- Anderson, B., Rafferty, A.P., Lyon-Callo, S., Fussman, C., Imes, G., 2011. Fast-food consumption and obesity among Michigan adults. *Prev. Chronic Dis.* 8 (4), A71.
- Askari Majabadi, H., Solhi, M., Montazeri, A., Shojaeizadeh, D., Nejat, S., Khalajabadi Farahani, F., Djazayeri, A., 2016. Factors influencing fast-food consumption among adolescents in tehran: a qualitative study. *Iran. Red Crescent Med. J.* 18 (3), 7–9. <https://doi.org/10.5812/ircmj.23890>.
- Azadbakht, L., Esmailzadeh, A., 2008. Fast foods and risk of chronic diseases. *J. Res. Med. Sci.* 13 (1), 1–2.
- Banik, S., Rahman, M., 2018. Prevalence of overweight and obesity in Bangladesh: a systematic review of the literature. *Current Obesity Reports* 7 (4), 247–253. <https://doi.org/10.1007/s13679-018-0323-x>.
- Ben Ayed, H., Yaich, S., Ben Hmida, M., Trigui, M., Ben Jemaa, M., Jedidi, J., et al., 2019. Prevalence, determinants and outcomes of general and abdominal obesity in medical students. *Obes. Med.* 13 (December 2018), 39–44. <https://doi.org/10.1016/j.obmed.2018.12.007>.
- Bipasha, M.S., Goon, S., 2013. Fast food preferences and food habits among students of private universities in Bangladesh. *South East Asia Journal Of Public Health* 3 (1), 61–64.
- Bulbul, T., Hoque, M., 2014. Prevalence of childhood obesity and overweight in Bangladesh: findings from a countrywide epidemiological study. *BMC Pediatr.* 14 (1), 1–8. <https://doi.org/10.1186/1471-2431-14-86>.
- Cotti, C., Tefft, N., 2013. Fast food prices, obesity, and the minimum wage. *Econ. Hum. Biol.* 11 (2), 134–147. <https://doi.org/10.1016/j.ehb.2012.04.002>.
- Daradkheh, G., Al Muhannadi, A., Chandra, P., Al Hajr, M., 2018. Fast food vs healthy food intake and overweight/obesity prevalence among adolescents in the state of Qatar. *J. Obes. Treat. Weight. Manag.* 1 (1), 1–4.
- Das, J.C., 2016. Fast food consumption in children: a review. *Med. Clin. Rev.* 01 (01), 1–4. <https://doi.org/10.21767/2471-299x.1000001>.
- Driskell, J.A., Meckna, B.R., Scales, N.E., 2006. Differences exist in the eating habits of university men and women at fast-food restaurants. *Nutr. Res.* 26 (10), 524–530. <https://doi.org/10.1016/j.nutres.2006.09.003>.
- Faheem, S., Bukhari, H., 2018. The association between socio-economic status and fast food consumption in Australia. 1 (2), 1–6.
- Feeley, A., Pettifor, J.M., Norris, S.A., 2009. Fast-food consumption among 17-year-olds in the birth to twenty cohort. *S. Afr. J. Clin. Nutr.* 22 (3), 118–123. <https://doi.org/10.1080/16070658.2009.11734232>.
- Fraser, L.K., Clarke, G.P., Cade, J.E., Edwards, K.L., 2012. Fast food and obesity: a spatial analysis in a large United Kingdom population of children aged 13–15. *Am. J. Prev. Med.* 42 (5), e77–e85. <https://doi.org/10.1016/j.amepre.2012.02.007>.
- Garcia, G., Sunil, T.S., Hinojosa, P., 2012. The fast food and obesity link: consumption patterns and severity of obesity. *Obes. Surg.* 22 (5), 810–818. <https://doi.org/10.1007/s11695-012-0601-8>.
- Goon, S., 2015. Fast food consumption and obesity risk among university students of Bangladesh. *Eur. J. Prev. Med.* 2 (6), 99. <https://doi.org/10.11648/j.ejpm.20140206.14>.
- Jayasinghe, J.M.J.K., De Silva, L.P.U., 2014. Fast food consumption and health status of students of a university in Sri Lanka. *J. Food. Agric.* 7 (1–2), 38. <https://doi.org/10.4038/jfa.v7i1-2.5192>.
- Jeffery, R.W., French, S.A., 1998. Epidemic obesity in the United States: are fast foods and television viewing contributing? *Am. J. Public Health* 88 (2), 277–280. <https://doi.org/10.2105/ajph.88.2.277>.
- Kaushik, J.S., Narang, M., Parakh, A., 2011. Fast food consumption in children. *Indian Pediatr.* 48 (2), 97–101. <https://doi.org/10.1007/s13312-011-0035-8>.
- Kearney, J., 2010. Food consumption trends and drivers. *Philos. Trans. R. Soc. Biol. Sci.* 365 (1554), 2793–2807. <https://doi.org/10.1098/rstb.2010.0149>.
- MCH Service Unit, 2016. National strategy for adolescent health 2017–2030. Ministry of Health and Family Welfare, Bangladesh Retrieved from. <http://coastbd.net/wp-content/uploads/2017/07/National-Strategy-for-Adolescent-Health-2017-2030-Final-Full-Book-21-06-17.pdf>.
- Mendoza, J.A., Drewnowski, A., Cheadle, A., Christakis, D.A., 2006. Dietary energy density is associated with selected predictors of obesity in U.S. Children. *J. Nutr.* 136 (5), 1318–1322. <https://doi.org/10.1093/jn/136.5.1318>.
- Mohammadbeigi, A., Asgarian, A., Moshir, E., Heidari, H., Afrashteh, S., Khazaei, S., Ansari, H., 2018. Fast food consumption and overweight/obesity prevalence in students and its association with general and abdominal obesity. *J. Prev. Med. Hyg.* 59 (3), 236–240. <https://doi.org/10.15167/2421-4248/jpmh2018.59.3.830>.
- Monge-Rojas, R., Smith-Castro, V., Colón-Ramos, U., Aragón, M.C., Herrera-Raven, F., 2013. Psychosocial factors influencing the frequency of fast-food consumption among urban and rural Costa Rican adolescents. *Nutrition* 29 (7–8), 1007–1012. <https://doi.org/10.1016/j.nut.2013.01.021>.
- Niemeier, H.M., Raynor, H.A., Lloyd-Richardson, E.E., Rogers, M.L., Wing, R.R., 2006. Fast food consumption and breakfast skipping: predictors of weight gain from adolescence to adulthood in a nationally representative sample. *J. Adolesc. Health* 39 (6), 842–849. <https://doi.org/10.1016/j.jadohealth.2006.07.001>.
- Odegaard, A.O., Koh, W.P., Yuan, J.M., Gross, M.D., Pereira, M.A., 2012. Western-style fast food intake and cardiometabolic risk in an Eastern country. *Circulation* 126 (2), 182–188. <https://doi.org/10.1161/circulationaha.111.084004>.
- Pereira, M.A., Kartashov, A.I., Ebbeling, C.B., Van Horn, L., Slattery, M.L., Jacobs, P.D.R., Ludwig, D.S., 2005. Fast-food habits, weight gain, and insulin resistance (the CARDIA study): 15-year prospective analysis. *Lancet* 365 (9453), 36–42. [https://doi.org/10.1016/S0140-6736\(04\)17663-0](https://doi.org/10.1016/S0140-6736(04)17663-0).
- Prentice, A., Jebb, S., 2003. Fast foods, energy density and obesity: a possible mechanistic link. *Obes. Rev.* 4 (4), 187–194.
- Rahman, S., Islam, M.T., Alam, D.S., 2014. Obesity and overweight in Bangladeshi children and adolescents: a scoping review. *BMC Public Health* 14 (1), 1–8. <https://doi.org/10.1186/1471-2458-14-70>.
- Rosenheck, R., 2010. Fast Food Consumption and Increased Caloric Intake : a Systematic Review of a Trajectory towards Weight Gain and Obesity Riskpp. 535–547. <https://doi.org/10.1111/j.1467-789X.2008.00477.x>.
- Satia, J.A., Galanko, J.A., Siega-Riz, A.M., 2004. Eating at fast-food restaurants is associated with dietary intake, demographic, psychosocial and behavioural factors among African Americans in North Carolina. *Public Health Nutr.* 7 (8), 1089–1096. <https://doi.org/10.1079/phn2004662>.
- Seo, H. sun, Lee, S.K., Nam, S., 2011. Factors influencing fast food consumption behaviors of middle-school students in Seoul: an application of theory of planned behaviors. *Nutrition Research and Practice* 5 (2), 169–178. <https://doi.org/10.4162/nrp.2011.5.2.169>.
- Shori, A.B., Albaik, M., Bokhari, F.M., 2017. Fast food consumption and increased body mass index as risk factors for weight gain and obesity in Saudi Arabia. *Obes. Med.* 8, 1–5. <https://doi.org/10.1016/j.obmed.2017.09.002>.
- Sumaedi, S., Yarmen, M., 2015. Measuring perceived service quality of fast food restaurant in islamic country: a conceptual framework. *Procedia Food Science* 3, 119–131. <https://doi.org/10.1016/j.profoo.2015.01.012>.
- WHO, J., Consultation, F.A.O.E., 2003. Diet, nutrition and the prevention of chronic diseases. WHO, Geneva, Switzerland.