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RESEARCH LETTER

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Prevalence of fried food consumption in Ramadan (Arabian) month and factors associated with health status among university students in Bangladesh: A cross-sectional study

1 | INTRODUCTION

Fast foods are defined as those foods made and served in a short period of time and are consumed outside of the house. In other words, it may be characterized as foods that have been cooked with reduced nutritional value.[1] Fast food negatively affects diet quality, body weight, and overall health.[2,3] Fast food consumption continues to grow in Western nations and is particularly prevalent among youngsters. This harmful behavior is increasing in underdeveloped countries.[4] When students join university, they have increased autonomy over their lifestyles, particularly their eating choices and practices, mainly if they are away from their families. The food intake patterns and nutritional concerns associated with university students are a significant source of worry. In recent years, global emphasis has been focused on university students' nutritional understanding and food consumption trends.[4] Fast food is consumed on a daily basis by 30%–50% of youngsters and college students.[5,6] Evidence found that 77% of overweight and obese university students have consumed fast food and cake on a regular or frequent basis.[7] Approximately 22% of the Bangladeshi university students had fast food for 4 days each week, while 21.3% reported having fast food for every day of the week.[4] More frequent consumption of fried foods is strongly linked to an increased risk of chronic disease development (i.e., four or more times per week).[8] There is compelling evidence that eating fried foods increases adults' chance of developing chronic illnesses. However, a comprehensive analysis of the impacts of fried foods on the health of university students in Bangladesh is limited. The objective of the study is to evaluate the prevalence of fried food consumption during Ramadan month among university students in Bangladesh. The study also examined the association of fried food consumption and several socioeconomic factors with gastritis, cardiovascular (CVS) illnesses, and mental health issues.

2 | METHODOLOGY

2.1 | Study design

Google Forms was used to execute this web-based cross-sectional survey. The survey comprised two parts: demographic variables and several potential factors associated with the consumption of fried foods. The questionnaire (Supporting Information) was created in English and incorporated queries from previously published papers.[4,9,10] Having gastritis, CVS disorder, and mental depression were assessed by taking dichotomic responses (yes vs. no) from the respondents. Furthermore, the research has been documented, and the manuscript has been prepared following the guidelines of the STROBE checklist,[11] and this checklist can be found in the Supporting Information.

2.2 | Sampling, data collection, and ethics

Due to a lack of contact details for all university students, we utilized a simple online-based snowball sampling technique[12,13] to collect the desired data from the university students (>18 years) having internet access. The questionnaire was given to participants who consented to participate. The survey link was distributed via social media, and the respondents were encouraged to share it with others. The compilation of data occurred between March and May of 2022, and a total of 507 responses were received. The survey was conducted in accordance with the protocols, guidelines, and ethical principles outlined in the World Medical Declaration of Helsinki.[14] Additionally, before participating in the web-based survey, each respondent provided electronic informed consent. The data collected from the survey was securely maintained as confidential by the primary author of the manuscript. Finally, the study protocol was reviewed and approved by the Human Ethical Review Committee of State University of Bangladesh.

2.3 | Data analysis

Data analysis and interpretation of the study results followed the prescribed protocols described by Assel et al.[15] The study employed descriptive statistics for univariable analysis, a χ^2 test for bivariable analysis, and logistic regression for multivariable analysis to extract and comprehend the findings.[16] All analyses were carried out using IBM SPSS software (version 20). A significance threshold of less than 5% ($p < 0.05$) was maintained for all statistical assessments.

3 | RESULTS

3.1 | Demographic characteristics

It is noted that 100% of the participants ($n = 507$) consumed fried food during Ramadan month (Supporting Information: Table S1). Male and female respondents were 64.9% and 32.1%, respectively. Over half (51.4%) of the participants were from the 21 to 23 years old age group. It is noted that 26.5% and 22.1% of participants were, respectively, above 23 years old and 18–20 years old. Almost half of the respondent's family income status was medium. Only 14.3% of respondent's family income status was high. A maximum of 62% of the participant's body mass index (BMI) was normal weight. It is mentioned that 6.3% of participants were obese. The highest 28.7% of participants spent money almost 11–20 BDT on eating fried food daily. It is also noteworthy that 25.7% and 20.1% of participants spent money, respectively, 1–10 and 21–30 BDT on eating fried food per day. Notably, 92.1% of participants had knowledge of the adverse effects of eating fried food. It is illustrious that 70.2%, 35.8%, and 18.8% of participants had, respectively, gastritis problems, mental depression, and CVS disorder. Almost half of the participants ate fried food for their own taste. Peyaju was taken by 36.9% of participants, and boots curry was taken by 28% of participants.

3.2 | χ^2 analysis

Table 1 represents the significant association between demographic characteristics and having gastritis, CVS disorders and mental depression of the respondents. BMI ($p = 0.001$) and reasons of eating fried food ($p = 0.027$) were significantly associated with having gastritis. Gender ($p = 0.031$) and BMI ($p = 0.005$) were significantly associated with having CVS disorder. BMI ($p = 0.001$) and knowledge of negative impact of fired food consumption ($p = 0.025$) were significantly associated with having mental depression.

3.3 | Logistic regression analysis

Table 2 represents the potential factors associated with gastritis, CVS disorder, and mental depression of the respondents. Having gastritis was 4.27 times higher among those who had obesity (adjusted odds ratio [AOR] = 4.27, 95% confidence interval [CI]: 1.74–10.72, $p = 0.002$) and 1.87 times higher among participants who were overweight (AOR = 1.287, 95% CI: 1.01–3.41, $p = 0.044$) compared to the normal weight group participants. Besides, having gastritis was a 49% lower chance among those who were spending money with 11–20 BDT per day of eating fried food (AOR = 0.51, 95% CI: 0.26–0.98, $p = 0.045$) than the participants who spent 1-10 BDT per day. Having CVS disorder was 1.85 times higher among males than females (AOR = 1.85, 95% CI: 1.10-3.21, $p = 0.024$). Having CVS disorder was also 3.72 times higher among the participants who had obesity (AOR = 3.72, 95% CI: 1.64–8.27, $p = 0.001$) compared to participants with normal BMI. Moreover, having CVS disorder was 1.74 and 2.15 times higher among those who said the reasons for eating fried food were for their own taste (AOR = 1.74, 95% CI: 1.01–3.08, $p = 0.049$) and social gathering (AOR = 2.15, 95% CI: 1.08–4.25, $p = 0.027$), respectively than the family tradition. Having mental depression was 4.32 times higher among those who had obesity (AOR = 4.32, 95% CI: 1.95–10.12, $p < 0.001$) than the normal weight group of respondents and 2.71 times higher among those who had knowledge of the negative effect of taking fried food (AOR = 2.71, 95% CI: 1.24–6.81, $p = 0.020$) than the respondents who had no knowledge about adverse effects of fried food consumption.

4 | DISCUSSION

Although several evidence on eating habits during the month of Ramadan have been found[10,17–19] as per our knowledge, this was the first report on the consumption of fried food during Ramadan month on university students in Bangladesh context. The study revealed that most of the respondents knew the negative effects of taking fried food in this time. The following physiological problems, such as gastritis problem, mental depression, and CVS disorder were observed among most of the respondents who took fried food during Ramadan month.

This study indicated that BMI was significantly associated with gastritis, CVS disorder, and mental depression. Also, our study stated that spending money for eating fried food was associated with having gastritis, and obesity is linked with spending money on fried food. In line with our findings, Lee showed that financial status was significantly associated with higher BMI for both men and women.[20] Another study confirmed that fried food consumption is associated with an increase in BMI.[21] A study found that people with more wealth tend to eat more fried food and are more likely to be obese.[20] Studies also showed that people who consume fast food are more likely to be obese and have higher health costs, and they suffer from anxiety about financial conditions.[22] It is a well-known fact that those who suffer from obesity due to eating habits, spend more on health than others.[23]

Our findings also revealed that fried food consumption was significantly associated with gastritis problem in Ramadan. These

TABLE 1 χ^2 test for evaluating the association between demographic variables and having gastritis, cardiovascular (CVS) disorders, and mental depression of the study participants.

	Having gastritis			Having CVS			Having mental depression		
Parameters	**Mild**	**Severe**	***p* Value**	**No**	**Yes**	***p* Value**	**No**	**Yes**	***p* Values**
Total, *N* (%)	274 (74.7%)	93 (25.3%)		404 (82.6%)	85 (17.4%)		294 (65.2%)	157 (34.8%)	
Gender									
Female	103 (37.6%)	41 (44.6%)	0.288	152 (37.7%)	21 (24.7%)	**0.031**	111 (37.8%)	56 (35.9%)	0.775
Male	171 (62.4%)	51 (55.4%)		251 (62.3%)	64 (75.3%)		183 (62.2%)	100 (64.1%)	
Age (years)									
18–20	55 (20.1%)	18 (19.4%)	0.150	94 (23.3%)	15 (17.6%)	0.119	67 (22.8%)	32 (20.4%)	0.546
21–23	147 (53.6%)	41 (44.1%)		210 (52.0%)	40 (47.1%)		151 (51.4%)	77 (49.9%)	
Above 23	72 (26.3%)	34 (36.6%)		100 (24.8%)	30 (35.3%)		76 (25.9%)	48 (30.6%)	
Family income									
>50000 BDT	41 (15.0%)	20 (21.5%)	0.185	57 (14.1%)	13 (15.5%)	0.829	42(14.3%)	25 (16.2%)	0.471
<25000 BDT	110 (40.3%)	29 (31.2%)		158 (39.2%)	30 (35.7%)		112(38.1%)	65 (42.2%)	
25000–50000 BDT	122 (44.7%)	44 (47.3%)		188 (46.7%)	41 (48.8%)		140(47.6%)	64 (41.6%)	
BMI (kg/m^2)									
Normal weight	171 (63.8%)	48 (52.2%)	**0.001**	248 (62.8%)	47 (56.6%)	**0.005**	192 (66.7%)	80 (52.3%)	**0.001**
Obesity	10 (3.7%)	12 (13.0%)		17 (4.3%)	12 (14.5%)		10 (3.5%)	18 (11.8%)	
Overweight	42 (15.7%)	22 (23.9%)		73 (18.5%)	15 (18.1%)		46 (16.0%)	32 (20.9%)	
Underweight	45 (16.8%)	10 (10.9%)		57 (14.4%)	9 (10.8%)		40 (13.9%)	23 (15.0%)	
Spending money/day for fried food									
1–10 BDT	62 (23.3%)	28 (30.4%)	0.394	104 (26.3%)	19 (22.9%)	0.973	74 (25.7%)	43 (28.1%)	0.893
11–20 BDT	87 (32.7%)	20 (21.7%)		109 (27.6%)	25 (30.1%)		81 (28.1%)	40 (26.1%)	
21–30 BDT	52 (19.5%)	17 (18.5%)		79 (20.0%)	19 (22.9%)		55 (19.1%)	33 (21.6%)	
31–40 BDT	23 (8.6%)	11 (12.0%)		37 (9.4%)	7 (8.4%)		33 (11.5%)	13 (8.5%)	
41–50 BDT	19 (7.1%)	8 (8.7%)		30 (7.6%)	6 (7.2%)		21 (7.3%)	10 (6.5%)	
More than 50 BDT	23 (8.6%)	8 (8.7%)		36 (9.1%)	7 (8.4%)		24 (8.3%)	14 (9.2%)	
Negative impact									
No	20 (7.3%)	8 (8.6%)	0.855	35 (8.7%)	5 (5.9%)	0.527	33 (11.2%)	7 (4.5%)	**0.025**
Yes	254 (92.7%)	85 (91.4%)		369 (91.3%)	80 (94.1%)		261 (88.8%)	150 (95.5%)	
Reasons of eating fried food									
Family tradition	102 (37.5%)	32 (34.8%)	0.547	157 (39.2%)	22 (25.9%)	0.052	116 (39.7%)	48 (30.8%)	0.167
For own test	122 (44.9%)	39 (42.4%)		180 (45.0%)	44 (51.8%)		128 (43.8%)	80 (51.3%)	
Social gathering	48 (17.6%)	21 (22.8%)		63 (15.8%)	19 (22.4%)		48 (16.4%)	28 (17.9%)	
Mostly taken fried food									
Burger	7 (2.6%)	2 (2.2%)	**0.027**	11 (2.7%)	0 (0.0)	0.284	6 (2.0%)	4 (2.6%)	0.336
Biryani	22 (8.1%)	10 (10.8%)		28 (7.0%)	11 (13.1%)		21 (7.2%)	18 (11.6%)	
Boots curry	71 (26.1%)	39 (41.9%)		118 (29.4%)	20 (23.8%)		92 (31.4%)	36 (23.2%)	
Chop	102 (37.5%)	27 (29.0%)		148 (36.8%)	31 (36.9%)		105 (35.8%)	57 (36.8%)	
Grill	0 (0.0)	1 (1.1%)		3 (0.7%)	0 (0.0)		2 (0.7%)	1 (0.6%)	
Peyaju	69 (25.4%)	14 (15.1%)		93 (23.1%)	22 (26.2%)		67 (22.9%)	38 (24.5%)	
Pizza	1 (0.4%)	0 (0.0)		1 (0.2%)	0 (0.0)		0 (0.0)	1 (0.6%)	

Note: Bold values are statistically significant.

Abbreviation: BDT, Bangladeshi Taka.

TABLE 2 Logistic regression analysis for finding potential factors associated with gastritis, cardiovascular (CVS) disorder and mental depression of the participants.

Variables	Having gastritis AOR (95% CI, *p* values)	Having CVS disorder AOR (95% CI, *p* values)	Having mental depression AOR (95% CI, *p* values)
Gender			
Female	-		-
Male	0.75 (0.46–1.21, $p = 0.237$)	**1.85 (1.10–3.21, $p = 0.024$)**	1.08 (0.73–1.63, $p = 0.698$)
Age (years)			
18–20	-		-
21–23	0.85 (0.46–1.64, $p = 0.622$)	1.19 (0.64–2.33, $p = 0.589$)	1.07 (0.65–1.78, $p = 0.798$)
Above 23	1.44 (0.74–2.86, $p = 0.284$)	1.88 (0.96–3.80, $p = 0.069$)	1.32 (0.76–2.32, $p = 0.324$)
Family income			
High (more than 50000 BDT)	-	-	-
Low (=25000 BDT)	-	-	-
Medium (25000–50000 BDT)	0.74 (0.39–1.41, $p = 0.352$)	0.96 (0.49–1.97, $p = 0.899$)	0.77 (0.43–1.38, $p = 0.370$)
BMI (kg/m^2)			
Normal weight (18.5–24.9)	-	-	-
Obesity (more than 30)	**4.27 (1.74–10.72, $p = 0.002$)**	**3.72 (1.64–8.27, $p = 0.001$)**	**4.32 (1.95–10.12, $p < 0.001$)**
Overweight (25–29.9)	**1.87 (1.01–3.41, $p = 0.044$)**	1.08 (0.56–2.01, $p = 0.804$)	1.67 (0.99–2.81, $p = 0.054$)
Underweight (less than 18.5)	0.79 (0.35–1.63, $p = 0.545$)	0.83 (0.36–1.73, $p = 0.642$)	1.38 (0.77–2.44, $p = 0.273$)
Spending money/day of eating fried food			
1–10 BDT	-	-	-
11–20 BDT	**0.51 (0.26–0.98, $p = 0.045$)**	1.26 (0.65–2.44, $p = 0.496$)	0.85 (0.50–1.45, $p = 0.550$)
21–30 BDT	0.72 (0.35–1.46, $p = 0.370$)	1.32 (0.65–2.66, $p = 0.441$)	1.03 (0.58–1.83, $p = 0.913$)
31–40 BDT	1.06 (0.44–2.44, $p = 0.894$)	1.04 (0.38–2.57, $p = 0.942$)	0.68 (0.31–1.40, $p = 0.306$)
41–50 BDT	0.93 (0.35–2.33, $p = 0.884$)	1.09 (0.37–2.86, $p = 0.860$)	0.82 (0.34–1.87, $p = 0.643$)
More than 50 BDT	0.77 (0.29–1.88, $p = 0.578$)	1.06 (0.39–2.65, $p = 0.897$)	1.00 (0.46–2.13, $p = 0.992$)
Knowing negative effect of taking fried food			
No	-	-	-
Yes	0.84 (0.37–2.08, $p = 0.683$)	1.52 (0.63–4.53, $p = 0.398$)	**2.71 (1.24–6.81, $p = 0.020$)**
Reasons of Eating fried food			
Family tradition	-	-	-
For your own taste	1.02 (0.60–1.75, $p = 0.945$)	**1.74 (1.01–3.08, $p = 0.049$)**	1.51 (0.98–2.35, $p = 0.065$)
Social gathering	1.39 (0.72–2.66, $p = 0.315$)	**2.15 (1.08–4.25, $p = 0.027$)**	1.41 (0.79–2.50, $p = 0.242$)
Different kinds of fried food which are taken most			
Burger	-	-	-
Biryani	1.59 (0.31–11.97, $p = 0.601$)	1.59 (0.31–11.97, $p = 0.601$)	1.29 (0.32–5.71, $p = 0.727$)
Boots curry	1.92 (0.44–13.33, $p = 0.429$)	1.92 (0.44–13.33, $p = 0.429$)	0.59 (0.16–2.41, $p = 0.430$)
Chop	0.93 (0.21–6.46, $p = 0.927$)	0.93 (0.21–6.46, $p = 0.927$)	0.81 (0.22–3.29, $p = 0.758$)
Peyaju	0.71 (0.15–5.10, $p = 0.688$)	0.71 (0.15–5.10, $p = 0.688$)	0.85 (0.23–3.50, $p = 0.811$)

Note: Bold values are statistically significant.

Abbreviation: BDT, Bangladeshi Taka.

findings were supported by several prior studies.[24,25] Maliha suggested avoiding fried, greasy, and acidic meals during Ramadan to keep away peptic ulcers.[26] Furthermore, our study supported that negative impacts of fried food are significantly associated with mental health depression. Almost the same outcomes had emerged in other studies that indicate that the frequency of fried food consumption was associated depression.[27]

Moreover, not only fried food adversely affect the CVS system, but it also contributes to cancer development.[28] Evidence indicates an increased likelihood of developing chronic diseases, including hypertension with a higher frequency of consuming fried foods, specifically at a rate of four or more times every week.[8] Cooking food through frying leads to an oxidation process that raises the presence of trans-fatty acids in the food, which in turn correlates with an elevated risk of hypertension.[8] The excessive intake of fried foods has been linked to various types of cancers such as those affecting the colon, rectum, breast, kidney, and pancreas.[29] Based on the existing evidence, it is sensible to suggest completely avoiding fried foods or indulging in them only occasionally to moderately while following a wholesome eating plan that includes ample fruits, vegetables, whole grains, and limited sodium and red or processed meat intake.[8,30] Besides, artificial intelligence (AI) is a swiftly advancing domain with unparalleled possibilities for advancement and utilization in various healthcare sectors. AI can be utilized in creating healthcare apps that connect with body sensors. These apps or devices could give individuals feedback and suggestions regarding their dietary choices.[31,32]

4.1 | Future research

However, the research still has certain significant gaps that need to be addressed in future studies. These gaps encompass aspects such as assessing the variations in consumption of fried foods before and post-Ramadan, understanding the impact of adhering to the religious month on key health outcomes, and examining alterations in the frequency and quantity of fried food consumption. Furthermore, investigating the potential connection between health conditions and fasting during Ramadan could also be a subject for forthcoming research.

5 | CONCLUSION

It is evident that those who consumed fried foods during Ramadan were observed to have physical ailments such as gastritis, mental melancholy, and CVS disorders. The study uncovered significant relationships between BMI and gastritis, CVS disorders, and mental disorder. In Ramadan, the consumption of fried foods according to personal preference and engaging in social gatherings were notably linked to CVS diseases. Additionally, being aware of the adverse effects of consuming fried foods was connected to experiencing mental distress. Recommendations included consuming more fruits and vegetables, avoiding artificial colors, and consuming less fried and salty food. In addition, maintaining a healthy diet and staying hydrated should be emphasized.

KEYWORDS

Bangladesh, cardiovascular disorders, fried food consumption, gastritis, mental depression, Ramadan month

AUTHOR CONTRIBUTIONS

Safayet Jamil: Conceptualization; resources; validation; writing—original draft. **Md. Jamal Hossain**: Conceptualization; formal analysis; software; supervision; validation; writing—review and editing. **Morshed Alam**: Validation; visualization; writing—original draft. **Quazi Istiaque Bari**: Data curation; formal analysis; resources; validation; visualization. **Mahdi Hasan**: Data curation; formal analysis; investigation; methodology. **Husain Rakib Swadhin**: Data curation; resources; software; validation; visualization. **Asma Akhter**: Data curation; formal analysis; validation; visualization. **Md. Salman Sohel**: Resources; software; validation; visualization. **Md. Emdadul Hasan Mukul**: Project administration; Resources; software; validation; visualization. **Habib Mohammad Ali**: Resources; software; validation; visualization. **Md. Rabiul Islam**: Investigation; methodology; resources; validation; visualization; writing—review and editing.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The manuscript includes all the required data to support the findings. Further raw data is available from corresponding author upon reasonable request. All authors have read and approved the final version of the manuscript and the corresponding author had full access to all of the data in this study and takes complete responsibility for the integrity of the data and the accuracy of the data analysis.

TRANSPARENCY STATEMENT

The lead author Md. Jamal Hossain affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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