

Original Research Article

Prevalence, severity and risk factors of food allergy and food addiction among the people of Tangail district, Bangladesh

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Received: 14 July 2020

Revised: 03 September 2020

Accepted: 07 September 2020

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ABSTRACT

Background: Food allergy is an abnormal response of some particular foods triggered by the body's immune system. Food addiction which generally shares a similar neurobiological and behavioral framework with substance addiction like foods. The aim of this study was to evaluate common food items responsible for food allergy along with food addiction among Bangladeshi people.

Methods: A cross-sectional study among 699 participants in the Tangail district of Bangladesh was done to record the presence of food allergy and food addiction patterns. Chi-square tests and logistic regression analysis were performed to assess the association between different factors with food allergy and food addiction.

Results: It was found that brinjal was the most frequent food item responsible for 28.3% of people's food allergy. The main symptoms due to the food allergy were about 28.5% itching and 22.7% rash on the skin. According to this study, 50.4% of allergic patients took medicine and most of the allergic patients didn't seek medical advice. A maximum of 72.8% of allergic patients also had an addiction to food. Street foods like jhalmuri, fried foods were the general food addicted items covering 34.9%. Food-addicted participants with food allergies reported significantly more problems with foods, where obesity and heart disease are recognized as clinical effects due to having higher amounts of fat and sugar to these foods.

Conclusions: The study revealed some important determinants of food allergic and food addiction that will help to increase our knowledge for the greater interest of our health and further research.

Keywords: Bangladesh, Food allergy, Food addiction, Hypersensitivity, Immune system, Knowledge

INTRODUCTION

Food is an integral part of life, even though some foods are responsible for allergies and some may even lead to fatality.¹ Over 2000 years ago, Hippocrates has first recognized the adverse reactions to food who often addressed as the "Father of Medicine".² Food allergy is an adverse immune response reaction to food, especially proteins. This immunologic adverse reaction not to toxic contaminants or pharmacologic characteristics of the food; it may be due to metabolic disorders of the host or

idiosyncratic responses, such as lactase deficiency.³⁻⁵ Due to the immature immune system in childhood and/or the inappropriate food introductory practices, children are more likely to develop food allergies than adults.⁶ A current study revealed that about 20% of the adult population of developed countries and 40-50% of school-going children are suffered by different allergic problems.⁷

Food allergy expresses different kinds of symptoms on the skin including- itching, urticaria, eczema,

angioedema, dermatitis, as well as in the gastrointestinal tract including vomiting, abdominal cramping, nausea, diarrhea and in the respiratory tract disorder including rhinitis, asthma, laryngeal edema.⁸⁻¹¹ Anaphylactic shock is the most frightening symptom which is induced by a particular food that is acute in onset, occurring within minutes or hours, and without proper treatment, it may lead to death badly.^{12,13} Much other allergic disorder has been found in different organ systems that increase the risk of other allergic condition due to consuming allergic food items.^{14,15} These conditions could be minimized if proper strategies are taken followed by its early identification.¹⁶ About 49% perceive diet plays an important part in the control of their asthma was investigated by Melbourne Hospital.¹⁵

The most common allergenic foods are beef, cow's milk and dairy products, brinjal, hen's egg, prawn, peanuts, gluten-containing cereals (e.g., wheat, rye, barley), mustard sesame, soybeans, fish, nuts crustaceans, and shellfish.^{17,18} Cow's milk and eggs are recognized as the most common food allergens in the United States, while fruits and eggs in Europe and Middle East countries respectively.^{19,20} By changing the environmental lifestyle and adopting a westernized lifestyle increased the frequency of food allergy, as the western populations documenting the highest prevalence.^{21,22} Different genetic factors are also responsible for allergic reactions to food as having two or more family members with a history of allergy was more strongly predictive of food allergy in the child.²³

Food addiction could act in a similar way to other substance addictions, may have addictive potential and that some types of obesity and disordered eating may be the result of an addictive response to these foods.²⁴⁻²⁶ Yale food addiction scale (YFAS) is generally used to define and measure food addiction in humans by modifying the seven symptoms of substance dependence using the DSM-IV diagnostic criteria (The Diagnostic and Statistical Manual of Mental Disorders).²⁷ The seven symptoms assessed in the scale were (i) tolerance (consuming more to achieve desired effects), (ii) withdrawal symptoms (agitation, anxiety, or other physical symptoms experienced after cutting down on certain foods), (iii) larger amounts consumed than intended, (iv) persistent desire or unsuccessful attempts to cut down, (v) much time spent using or recovering from substance, (vi) continual use despite knowledge of consequences, (vii) activities are given up due to use of substance.^{25,28}

The food addicted person chronically consumes more food than they need to maintain health.²⁹ Food addiction is often associated with some adverse clinical characteristics like increased body weight, depression, anxiety, and substance abuse.³⁰ The purpose of this study was to determine the most common food allergens in children and adults with various allergic symptoms and

digestive problems along with food addiction in Tangail, Bangladesh.

METHODS

Study area and data collection

A descriptive, cross-sectional study was conducted by using a structured questionnaire developed from literature review and consultations with faculty members. This cross-sectional study was done on August 2019-January 2020. This comprised of the rural and urban parts of the Tangail district in Bangladesh. The approval for conducting this study was obtained from the Institution of Mawlana Bhashani Science and Technology University under the Department of Biotechnology and Genetic Engineering.

Sampling technique

The minimum sample size was estimated at 600 participants. However, a total of 699 participants were enrolled during the study period. These participants were chosen from households and educational institutions by systematic random sampling method. The questionnaire consisted of three main sections: (1) socio-demography (2) food allergy-related (24 items) and (3) food addiction-related (11 items). The questionnaire was translated from English to Bengali language when anyone fails to understand. Participants were asked about the presence or absence of food allergy symptoms. Then we provided the questionnaire to allergic patients, and they filled the questionnaire according to their allergic condition.

Statistical analysis

The data collected from the survey were analyzed by IBM SPSS version 20. Descriptive statistical analysis was used to provide estimates of population proportions with their respective 95% confidence intervals. Cross tabulations were performed with Chi-square tests to assess the statistical significance ($p < 0.05$). Logistic regression analysis was done to examine the association between different factors with food allergy and food addiction. Microsoft Excel version 2016 was used to draw graphs wherever appropriate.

RESULTS

Demographic factors

A total of 699 respondents were interviewed for this study and the obtained data was used for the primary analysis. Out of which 51.2% were males and 49.8% were females and most of them (51.8%) were lived in the village. The mean age of the participants was 29.35 ± 13.46 years. Around half (49.6%) of the participants were students, out of 382 (54.6%) had at least one family member with allergic problems (Table 1).

Table 1: Socio-economic characteristics of the participants.

Variables	N (%)
Gender	
Male	358 (51.2)
Female	341 (48.8)
Age in years (Mean±SD)	29.35±13.46
Living place	
Village	362 (51.8)
Semi town	171 (24.5)
Town	166 (23.7)
Literacy status	
No formal schooling	59 (8.4)
Primary	208 (29.8)
Secondary	116 (16.6)
H.S.C.	273 (39.1)
Graduate	37 (5.3)
Post graduate	6 (0.9)
Employment status	
Farmer	44 (6.3)
Laborer	32 (4.6)
Business	51 (7.3)
Govt. job	42 (6.0)
Non govt. job	36 (5.2)
Housewife	139 (19.9)
Student	347 (49.6)
Unemployed	8 (1.1)
Socio economic status	
Lower	84 (12)
Lower middle	231 (33)
Middle	340 (48.6)
Upper middle	43 (6.2)
Higher	1 (0.1)
Have family members with allergic problems	
Yes	382 (54.6)
No	317 (45.4)

Allergy symptoms and its caused foods

Of the 699 respondents, a total of 561 (80.3%) had heard about food allergy though all the participants had the symptoms of food allergy. When the participants were asked about the food allergens, most of them answered they were positive to more than one allergen. Under all studied patients, the most common foods responsible for food allergy was brinjal (28.3%) following hilsa fish (19%) and beef (17%). Most of the patients showed more than one symptom. Skin reactions, including itching (28.5%), rash (22.7%) are the most common symptoms among food allergy patients. Some participants also reported, facial itching (9.3%), throat swelling (2.4%) while 5.3% and 4.3% reported itching on the eyes and vomiting. In this study the allergic condition of the participants was not threatened at all; it could be potentially fatal in a minor group. Around two-thirds (63.4%) of the participants had a mild allergic condition (Table 2).

Table 2: Prevalence of self-reported food allergen, symptoms and allergic condition towards food allergy.

Variables	N (%)
Heard about food allergy	
Yes	561 (80.3)
No	138 (19.7)
Foods responsible for allergy	
Beef	119 (17)
Hilsa fish	132 (18.9)
Milk	25 (3.6)
Egg	12 (1.7)
Brinjal	198 (28.3)
Prawn	66 (9.4)
Poultry chicken	18 (2.6)
Arum	47 (6.7)
Malabar spinach	65 (9.3)
Okra	17 (2.4)
Symptoms	
Itching of the throat	55 (7.9)
Itching of the mouth	65 (9.3)
Hives	41 (5.9)
Lip or tongue swelling	21 (3)
Dyspnoea	29 (4.1)
Diarrhea	9 (1.3)
Swelling of the throat	17 (2.4)
Difficulty swallowing	13 (1.9)
Abdominal pain	23 (3.3)
Rash in skin	159 (22.7)
Itching on skin	199 (28.5)
Vomiting tendency	30 (4.3)
Anaphylaxis	1 (0.1)
Itching on the eyes	37 (5.3)
Allergic condition	
Acute	120 (17.2)
Chronic	102 (14.6)
Severe	34 (4.9)
Mild	443 (63.4)

Table 3: Regression analysis on demographic factors associated with knowledge of food allergy.

Variable	B	OR	95% CI	P value
Age	0.011	1.011	0.988-1.035	0.338
Gender	-0.236	0.790	0.483-1.290	0.346
Education	-0.598	0.550	0.436-0.695	<0.001***
Occupation	0.096	1.100	0.943-1.284	0.224
Marital status	0.976	2.653	1.191-5.910	0.017**
Living place	-0.305	0.737	0.531-1.023	0.068
Socioeconomic status	-0.511	0.600	0.450 - 0.800	<0.001***

*CI=confidence interval *OR=odd ratios, *p<0.05, **p<0.01, ***p<0.001.

A significant association was found between the degree of knowledge and level of education among respondents (p<0.001; OR=0.550, 95% CI=0.436-0.695). There was no significant association between age, gender, and living place with the level of knowledge. There was also a

positive association between the knowledge level with socio-economic status ($p < 0.001$; $OR = 0.600$, $95\% CI = 0.450-0.800$) (Table 3).

Long-term effects

Sometimes, the long-term effects of food allergy might be life-threatening like anaphylaxis. When asked about the long-term effects, 42.3% (296) had no effect followed by 15.3% (107) rash and 26.9% itching (Figure 1).

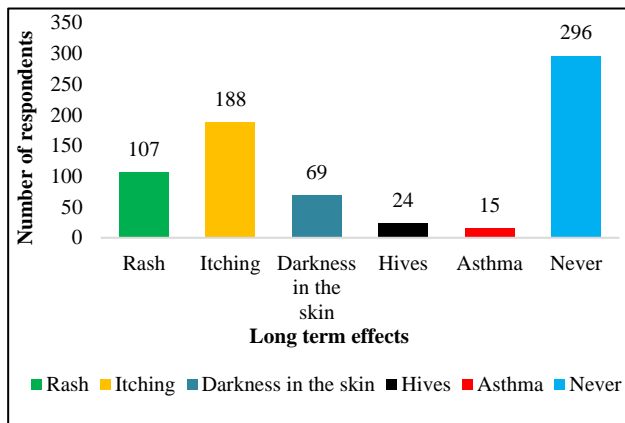


Figure 1: Long-term effects of food allergy.

Practice related to food allergy prevention

The extent of attitude and preventive practices regarding food allergy were summarized in Table 4. The majority of the participants only avoid allergic food when they suffered from allergy and only 25% of participants tried to avoid the foods responsible for allergy. Half of the food allergy sufferers took medicine to relief from this

problem where only 38% sought medical advice from doctors. Although most participants did not participate in a diagnostic test, the most (19.6%) common diagnostic tool was a blood test (specific IgE) followed by skin prick test (4.9%) and oral food challenge (1.9%). Chi-square test was used to determine the association between allergic conditions and the participant’s attitude to get rid of allergy. Avoiding allergic food, taking medicine, sought medical advice from doctors all of the three factors were significantly associated with the allergic condition ($p < 0.001$) (Table 5).

Table 4: Attitude and preventive measures of food allergy.

Variables	N (%)
Try to avoid allergic foods	
Yes	178 (25.5)
No	250 (35.8)
Sometimes	271 (38.8)
Problem faced after avoiding allergic foods	
Yes	121 (17.3)
No	578 (82.7)
Taking medicine	
Yes	352 (50.4)
No	347 (49.6)
Consult with doctor	
Yes	267 (38.2)
No	432 (61.8)
Diagnosis	
Skin prick test	34 (4.9)
Blood test	137 (19.6)
Patch test	2 (.3)
Oral food challenge	13 (1.9)
Never	513 (73.4)

Table 5: Association of preventing practices of food allergy with the allergic condition.

Variable	Allergic condition				Chi-square	P-value
	Acute	Chronic	Severe	Mild		
Try to avoid allergic foods						
Yes	36 (30%)	21 (20.6%)	13 (38.2%)	108 (24.4%)	24.387	<0.001***
No	31 (25.8%)	54 (52.9%)	6 (17.6%)	159 (35.9%)		
Sometimes	53 (44.2%)	27 (26.5%)	15 (44.1%)	176 (39.7%)		
Taking medicine						
Regularly	24 (20%)	15 (14.7%)	2 (5.9%)	24 (5.4%)	92.646	<0.001***
Sometimes	26 (21.7%)	55 (53.9%)	10 (29.4%)	103 (23.3%)		
Only when feeling uncomforted	64 (53.3%)	23 (22.5%)	17 (50%)	215 (48.5%)		
Never	6 (5%)	9 (8.8%)	5 (14.7%)	101 (22.8%)		
Consult with doctor						
Yes	69 (57.5%)	37 (36.3%)	16 (47.1%)	145 (32.7%)	25.837	<0.001***
No	51 (42.5%)	65 (63.7%)	18 (52.9%)	298 (67.3%)		

Addiction to food

While all participants in this study suffered from food allergies, most participants also reported their addicted

behavior to food when they were asked about their food addiction. Around 72% (95% $CI = 1.24-1.30$) reported having an addiction to different food items.

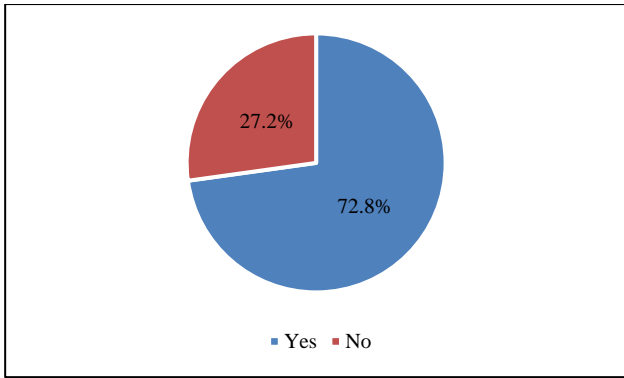


Figure 2: Percentage of food addicted person to different food items.

Prevalence of food addicted items

Addictive food items usually act like drugs such as high salt and sugary fast food, street foods. Among the respondents, most of the students were more addicted to street food like jhalmuri, fried foods than the other participants. A total of 34.9% (244) respondents were addicted to jhalmuri, fried foods and 27.2% didn't have any comment (Figure 3).

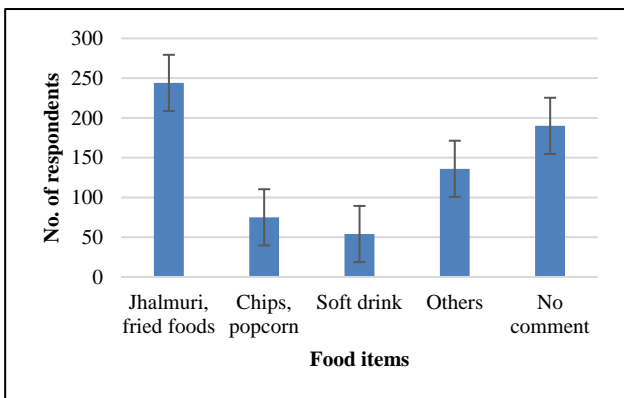


Figure 3: The frequency of the addicted food items.

Knowledge, attitude and practice (KAP) level

Half of the respondents (49.5%; 346/699) ate large quantities of foods at one time, and 47% of the respondents had the tendency to eat addicted food items even though they were not hungry. Although most

participants (78%) were aware of the clinical effects of food addiction, only 28% tried to avoid eating these foods excessively (Table 6).

Table 6: Knowledge, attitude and practice towards food addiction.

Characteristics	N (%)
Eating large quantities of foods at one time	
Yes	346 (49.5)
No	353 (50.5)
Ever hidden food	
Yes	187 (26.8)
No	512 (73.2)
Eat even if you were not hungry	
Yes	330 (47.2)
No	369 (52.8)
Eating in secret	
Yes	152 (21.7)
No	547 (78.3)
Clinical effects of food addiction	
Yes	548 (78.4)
No	151 (21.6)
Try to avoid eating large quantities of food	
Yes	195 (27.9)
No	504 (72.1)

In the binary logistic regression analysis of the associations between having addiction on food and the participant's attitude of the study group (Table 7), we found increased odds of having the attitudes among the participants about food addiction if the participants ate large quantities of foods at one time (OR: 11.528; 95% CI: 6.522-20.377) or ate even if they are not hungry (OR: 2.509; 95% CI: 1.528-4.118) or eating in secret (OR: 2.639; 95% CI: 1.259-5.528). No significant association was found for preventive practices.

Education has an impact on knowledge about the clinical effects of food addiction. A significant association was found between the degree of knowledge and level of education among respondents. Participants with a qualification of post-graduation (100%) were more than two times more knowledgeable as compared to the illiterate (50.8%). While persons with qualifications of intermediate (H.S.C) were 1.7 times more knowledgeable than illiterates (Table 8).

Table 7: Regression analysis on different characteristics associated with food addiction behaviour.

Variables	B	OR	95% CI	P value
Eating large quantities of foods at one time	2.445	11.528	6.522-20.377	<0.001***
Ever hidden food	0.565	1.759	0.968-3.195	0.064
Eat even if you are not hungry	0.920	2.509	1.528-4.118	<0.001***
Eat in secret	0.970	2.639	1.259-5.528	0.010**
Try to avoid eating large quantities of food	-0.186	0.830	0.480-1.437	0.506
Searching foods when unavailable at home	0.225	1.252	0.764-2.051	0.373

Table 8: Association of knowledge about clinical effects of food addiction with educational qualification.

Variables	Educational Qualification						Chi-Square	P- value
	Illiterate	Primary	S.S.C.	H.S.C.	Graduate	Post-graduate		
Knowledge about clinical effects of food addiction								
Yes	30 (50.8%)	146 (70.2%)	98 (84.5%)	235 (86.1%)	33 (89.2%)	6 (100%)	50.960	<0.001***
No	29 (49.2%)	62 (29.8%)	18 (15.5%)	38 (13.9%)	4 (10.8%)	0 (0%)		
Clinical effects								
Heart disease	12 (38.7%)	43 (29.7%)	26 (26.5%)	38 (16.2%)	7 (21.2%)	1 (16.7%)	74.662	0.001***
Diabetes	6 (19.4%)	17 (11.7%)	19 (19.4%)	30 (12.8%)	7 (21.2%)	0 (0%)		
Digestive problem	0 (0%)	8 (5.5%)	9 (9.2%)	47 (20%)	1 (3%)	1 (16.7%)		
Malnutrition	2 (6.5%)	7 (4.8%)	3 (3.1%)	19 (8.1%)	1 (3%)	1 (16.7%)		
Obesity	8 (25.8%)	52 (35.9%)	30 (30.6%)	57 (24.3%)	8 (24.2%)	2 (33.3%)		
Kidney/liver disease	1 (3.2%)	4 (2.8%)	2 (2%)	13 (5.5%)	3 (9.1%)	1 (16.7%)		
Hypertension	1 (3.2%)	5 (3.4%)	6 (6.1%)	15 (6.4%)	5 (15.2%)	0 (0%)		
High cholesterol	0 (0%)	3 (2.1%)	3 (3.1%)	11 (4.7%)	1 (3%)	0 (0%)		
Others	0 (0%)	6 (4.1%)	0 (0%)	5 (2.1%)	0 (0%)	0 (0%)		

DISCUSSION

In the past 2 decades, food allergy has emerged as a 'second wave' of the allergy epidemic after the rise in asthma and rhinitis.^{21,31} Peanut, soybean, cow's milk, egg, fish, crustacean shellfish, wheat, and tree nuts as the eight most common food allergens were recognized by the US Food and Drug Administration.³² Besides these 8 foods, beef in China, rice in Thailand, sesame in Singapore, pork, seafood, and peaches in Korea, bananas in Saudi Arabia and Egypt, apples, tomatoes, and crab in Zimbabwe, peanuts and pineapples in Ghana, shrimp and oranges in Mexico, and corn in Brazil are important food items that were responsible for causing the allergy.³³ The variance of allergy-causing food items varies in different countries depends on the food habits, genetic factors, and culture of the inhabitants.³⁴ The Bangladeshi population has distinctive food habit that is different from other countries.

There was no established data on food allergy among the people of Bangladesh. This study set out to compare self-reported food allergy knowledge, the available food responsible for food allergy, symptoms, family background, and different correlations based on food allergy.³⁵ Some aspects of food allergy management (e.g. educating patients about food avoidance, recognizing signs and symptoms, understanding definitions) were well rated to avoid food allergy.³⁶ In this study, we found that almost 55% of the participants had a family history of allergy. A previous population-based study in Kolkata, 63.18% of patients had a family history of allergy.³³

The survey result showed that brinjal was found to be the most allergenic food item (28.3%), followed by beef and hilsa fish, about 17% and 18.9% responsible for food allergy. In a previous study in Kolkata, India, about 33.3% were sensitive to prawn, 43.42% to brinjal, and 20.6% to beef among 16 to 40 years aged patients.³⁴ A

recent study done in Lebanon showed that the most common food allergens were strawberry (16%) followed by eggs (19%) and nuts (16%).¹ In a study in the United Arab Emirates, seafood and nuts were the most common food allergens.³⁷

In this study, the most common symptoms of food allergic reactions were skin manifestations. About 28.5% and 22.7% of people were suffering from itching and rash on the skin as a symptom of food allergy. Skin manifestations were also the most frequently stated symptoms in similar studies conducted in Taiwan, Korea.^{9,38} Other symptoms also being noticed among the respondents were itching on the throat about 7.9%, vomiting tendency 4.3%, hives 5.9% and dyspnoea 4.1%. A study conducted in Lebanon, 86% of the food allergy sufferers suffered from skin reactions, including hives, itching, and redness and 30% reported facial swelling.¹ Diarrhea, difficulty swallowing, abdominal pain, and anaphylaxis also being observed in allergic patients. About 63% of the allergic patients experienced a mild allergic condition. In a study in Kuwait, similar findings were also reported among the students with probable food allergy.³⁹ Although there was no permanent solution to get relief from food allergy except avoiding these foods, only 25% of participants tried to avoid the foods responsible for allergy.

In this study, among the patients of food allergy, we tried to find out whether they were food addicted or not and find out the general addicted food items. However, the majority (72%) of the respondents reported that they had an addiction to different food items. Different previous studies indicated that the most common symptom of food addiction was "the persistent desire or unsuccessful attempts to cut down foods."²⁵ Among 47% population had the same symptom found in this study. Food addiction-like overeating tendency has been linked to overweight and obesity with their adverse health consequences, including insulin resistance and diabetes mellitus,

hypertension, and cardiac disease.⁴⁰ Despite the fact that 78% of participants were aware of these effects, only 26% tried to avoid these foods.

This study suggested meaningful outcomes in that additional allergenic foods should be designated to ensure safe food service for the family especially children should advocate for a better allergy labelling system to inform and protect people. Future studies could use information about the prevalence and types of food allergy among another region of Bangladesh to develop effective educational programs and implement preventive measures on food-related allergies.

Limitation of the study was that due to a lack of knowledge, most people do not have proper knowledge about food allergy and food addiction as well as their harmful effects on health. Based on self-reported symptoms, the food allergy was diagnosed and not by laboratory investigations. Further research is needed to identify the role of genetic factors regarding food allergy.

CONCLUSION

Food allergies are recognized as a growing problem in the western world as well as in developing countries nowadays. This survey will be increasingly important to understand and assess the interplay between food allergy and food addiction in order to protect and identify appropriate sources of foods for sensitized sub-populations. Brinjal was recognized as the most frequent allergic food item responsible for various allergic conditions like skin reactions. This study also concluded the general symptoms and other qualitative and quantitative analyses that help to reduce the rate of allergic conditions and ensure a better food menu for the family. In addition, the study revealed, human food addiction behaviour, identification of common items of addictive food, physiological effects, and attitudes of concern with food addiction. This study can be helpful for people to avoid addicted food and enjoying a better life.

ACKNOWLEDGEMENTS

The authors would like to thank all the participants for their cooperation in taking part in this study.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Irani C, Maalouly G. Prevalence of self-reported food allergy in Lebanon: a middle-eastern taste. *Int Scholar Res Notices*. 2015;2015.
2. Sampson HA. Food allergy. Part 1: immunopathogenesis and clinical disorders. *J Allerg Clin Immunol*. 1999;103(5):717-28.

3. Le TT, Nguyen DH, Vu AT, Ruethers T, Taki AC, Lopata AL. A cross-sectional, population-based study on the prevalence of food allergies among children in two different socio-economic regions of Vietnam. *Pediatr Allerg Immunol*. 2019;30(3):348-55.
4. Han Y, Kim J, Ahn K. Food allergy. *Korean J Pediatr*. 2012;55(5):153.
5. Gupta RS, Kim JS, Barnathan JA, Amsden LB, Tummala LS, Holl JL. Food allergy knowledge, attitudes and beliefs: focus groups of parents, physicians and the general public. *BMC Pediatr*. 2008;8(1):36.
6. Neeland MR, Koplin JJ, Dang TD, Dharmage SC, Tang ML, Prescott SL, et al. Early life innate immune signatures of persistent food allergy. *J Allerg Clin Immunol*. 2018;142(3):857-64.
7. Voloshin S, Smoldovskaya O, Feyzkhanova G, Arefieva A, Pavlushkina L, Filatova T, et al. Patterns of sensitization to inhalant and food allergens among pediatric patients from the Moscow region (Russian Federation). *PLoS One*. 2018;13(3):e0194775.
8. Morita Y, Iwakura H, Ohtsuka H, Kohno Y, Shimojo N. Milk allergy in the neonatal intensive care unit: comparison between premature and full-term neonates. *Asia Pac Allerg*. 2013;3(1):35-41.
9. Choi Y, Ju S, Chang H. Food allergy knowledge, perception of food allergy labelling, and level of dietary practice: a comparison between children with and without food allergy experience. *Nutr Res Pract*. 2015;9(1):92-8.
10. Skypala IJ, Venter C, Meyer R, Nicolette WD, Fox AT, Groetch M, et al. The development of a standardised diet history tool to support the diagnosis of food allergy. *Clin Translat Allerg*. 2015;5(1):1-0.
11. Venter C, Laitinen K, Vlieg-Boerstra B. Nutritional Aspects in diagnosis and management of food hypersensitivity- the dietician's role. *J Allerg*. 2012;2012.
12. Nowak-Wegrzyn A. New perspectives for use of native and engineered recombinant food proteins in treatment of food allergy. *Immunol Allerg Clin North Am*. 2007;27(1):105-27.
13. Gupta R, Siracusa M, Yarbrough M, Smith B. Parental therapy preferences for children with food allergy. In: *Annals of allergy asthma and immunology*. 360 Park Ave South, New York, NY 10010-1710 USA: Elsevier Science Inc. 2016;117(5):S104.
14. Fiocchi A, Brozek J, Schünemann H, Bahna SL, Von Berg A, Beyer K, et al. World Allergy Organization (WAO) diagnosis and rationale for action against cow's milk allergy (DRACMA) guidelines. *World Allerg Organ J*. 2010;3(4):57-161.
15. Hodge L, Yan KY, Loblay RL. Assessment of food chemical intolerance in adult asthmatic subjects. *Thorax*. 1996;51(8):805-9.

16. Nitin J, Revathi P, Shradha NH, Vaibhav J, Kowshik K, Manoharan R, et al. Prevalence, severity and risk factors of allergic disorders among people in south India. *Afr Health Sci*. 2016;16(1):201-9.
17. Boye JI. Food allergies in developing and emerging economies: need for comprehensive data on prevalence rates. *Clin Translat Allerg*. 2012;2(1):25.
18. Peters RL, Gurrin LC, Dharmage SC, Koplin JJ, Allen KJ. The natural history of IgE-mediated food allergy: can skin prick tests and serum-specific IgE predict the resolution of food allergy? *Int J Environ Res Public Health*. 2013;10(10):5039-61.
19. Ahanchian H, Jafari S, Behmanesh F, Haghi NM, Nakhaei AA, Kiani MA, et al. Epidemiological survey of pediatric food allergy in Mashhad in Northeast Iran. *Electron Phys*. 2016;8(1):1727.
20. Prescott SL, Pawankar R, Allen KJ, Campbell DE, Sinn JK, Fiocchi A, et al. A global survey of changing patterns of food allergy burden in children. *World Allerg Organ J*. 2013;6(1):1-2.
21. Lee BW, Shek LP, Gerez IF, Soh SE, Van Bever HP. Food allergy- lessons from Asia. *World Allerg Organ J*. 2008;1(7):129.
22. Lee AJ, Thalayasingam M, Lee BW. Food allergy in Asia: how does it compare? *Asia Pac Allerg*. 2013;3(1):3-14.
23. Koplin JJ, Allen KJ, Gurrin LC, Peters RL, Lowe AJ, Tang ML, et al. The impact of family history of allergy on risk of food allergy: a population-based study of infants. *Int J Environ Res Public Health*. 2013;10(11):5364-77.
24. Gearhardt AN, Boswell RG, White MA. The association of “food addiction” with disordered eating and body mass index. *Eat Behav*. 2014;15(3):427-33.
25. Pursey KM, Stanwell P, Gearhardt AN, Collins CE, Burrows TL. The prevalence of food addiction as assessed by the Yale Food Addiction Scale: a systematic review. *Nutrients*. 2014;6(10):4552-90.
26. Ziauddeen H, Fletcher PC. Is food addiction a valid and useful concept? *Obes Rev*. 2013;14(1):19-28.
27. Gearhardt AN, Corbin WR, Brownell KD. Preliminary validation of the Yale food addiction scale. *Appetite*. 2009;52(2):430-6.
28. Lent MR, Eichen DM, Goldbacher E, Wadden TA, Foster GD. Relationship of food addiction to weight loss and attrition during obesity treatment. *Obesity*. 2014;22(1):52-5.
29. Pedram P, Wadden D, Amini P, Gulliver W, Randell E, Cahill F, et al. Food addiction: its prevalence and significant association with obesity in the general population. *PLoS One*. 2013;8(9):e74832.
30. Avena NM, Rada P, Hoebel BG. Sugar and fat bingeing have notable differences in addictive-like behavior. *J Nutr*. 2009;139(3):623-8.
31. Prescott S, Allen KJ. Food allergy: riding the second wave of the allergy epidemic. *Pediatr Allerg Immunol*. 2011;22(2):155-60.
32. Leung TF, Yung E, Wong YS, Lam CW, Wong GW. Parent-reported adverse food reactions in Hong Kong Chinese pre-schoolers: epidemiology, clinical spectrum and risk factors. *Pediatr Allerg Immunol*. 2009;20(4):339-46.
33. Dey D, Ghosh N, Pandey N, Bhattacharya SG. A hospital-based survey on food allergy in the population of Kolkata, India. *Int Arch Allerg Immunol*. 2014;164(3):218-21.
34. Mandal J, Das M, Roy I, Chatterjee S, Barui NC, Gupta-Bhattacharya S. Immediate hypersensitivity to common food allergens: an investigation on food sensitization in respiratory allergic patients of Calcutta, India. *World Allerg Organ J*. 2009;2(1):9-12.
35. Maslin K, Meyer R, Reeves L, Mackenzie H, Swain A, Stuart-Smith W, et al. Food allergy competencies of dieticians in the United Kingdom, Australia and United States of America. *Clin Translat Allerg*. 2014;4(1):37.
36. Fiocchi A, Burks W, Bahna SL, Bielory L, Boyle RJ, Cocco R, et al. Clinical use of probiotics in pediatric allergy (CUPPA): a world allergy organization position paper. *World Allerg Organ J*. 2012;5(11):148-67.
37. John LJ, Ahmed S, Anjum F, Kebab M, Mohammed N, Darwich H, et al. Prevalence of allergies among university students: a study from Ajman, United Arab Emirates. *ISRN Allerg*. 2014;2014.
38. Wu TC, Tsai TC, Huang CF, Chang FY, Lin CC, Huang IF, et al. Prevalence of food allergy in Taiwan: a questionnaire-based survey. *Intern Med J*. 2012;42(12):1310-5.
39. Ali F. A survey of self-reported food allergy and food-related anaphylaxis among young adult students at Kuwait University, Kuwait. *Med Principle Pract*. 2017;26(3):229-34.
40. Iffland JR, Preuss HG, Marcus MT, Rourke KM, Taylor WC, Bureau K, et al. Refined food addiction: a classic substance use disorder. *Med Hypothes*. 2009;72(5):518-26.

Cite this article as: Ali MR, Talukder AH, Molla MT, Alam NE, Faruque MO, Mohiuddin AKM, et al. Prevalence, severity and risk factors of food allergy and food addiction among the people of Tangail district, Bangladesh. *Int J Community Med Public Health* 2020;7:3810-7.