Assessment of Health, Nutrition Status, Lifestyle Patterns, Job Satisfaction Level, and Sanitation Practices of Food Handlers Working in University Residential Hall's Canteens of Bangladesh

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ABSTRACT: In Bangladesh, a notable number of people are engaged in food handling (preparing, serving and selling) jobs. Their dietary habits, lifestyle patterns and other behavioral factors are somewhat descending. The study aimed to identify the health status, nutrition status, lifestyle patterns, job satisfaction level and sanitation practices of food handlers working in student residential hall's canteens and messes at the University of Dhaka, Bangladesh. Data was collected through direct physical measurement and a standard questionnaire, which was translated into Bengali for ease of data collection. It was structured by focusing on data related to socio-demographics, dietary habits, awareness level of food and nutrition, lifestyle patterns, current job satisfaction level, family history and sanitation practice. Among the study participants, 11.0%, 8.7% and 2.0% of them were overweight, underweight, and obese, respectively. The study found that the BMI status of the food handlers was significantly associated with their age ($\chi2$ = 42.796, P < 0.001). 42.7% of participants had poor dietary habits ($\chi2$ = 2.586, P = 0.460), and half of the participants (50.7%) lifestyles were poor ($\chi2$ = 4.626, P = 0.201). Only 27.0% of participants were aware of the health risks associated with poor dietary habits and malnutrition. 83.0% of the participants were habituated to wearing shoes while doing their duty. 84.7% had access to hygienic bathroom and toilet facilities. 37.7% of study participants did not participate in regular outdoor physical activities. Only 46.3% of participants were satisfied with their job. A number of food handlers were found to be malnourished and experienced unfavorable health conditions. The associated authority should take it into consideration for the improvement of overall nutritional health status, lifestyle patterns, and overall, the job environment.

Key words: Food handlers, health, nutrition, sanitation, lifestyle pattern, job environment

INTRODUCTION

Health is more than just the absence of illness; it also involves whole physical, mental, and social well-being, according to the World Health Organization.[1] A significant part of the maintenance of good health

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and overall functionality is also provided by nutrition.[2] A person's nutritional status is typically the result of a variety of factors that interact with one another on various levels.[3] The nature and amount of food consumed are deeply associated with nutritional status. While a healthy eating regimen encourages illness prevention, growth and intellectual development as well as optimal health, a bad diet may result in various clinical conditions, including malnutrition.[4] Malnutrition, resulting from an

imbalance of energy, protein and other nutritional components, has negative impacts on body physiology and clinical outcomes.[5] Malnutrition is today a significant worldwide concern with a variety of negative effects. This clinical condition affects everyone, regardless of location, socioeconomic status, sex, family structure, communities, or countries.[6] It is well established that a person's lifestyle has a significant impact on their health. Sometimes, changing one's lifestyle is necessary to maintain good health. Lifestyle has various dimensions, including physical activity, nutrition, social relationships, daily activities and so on; all of these are closely related to one's health, affecting the quality of life.[7]

Bangladesh is one of those 36 countries that bear more than 90% of the world's malnutrition burden.[8] In this country, in search of a better quality of life, migrants from all of the country's districts congregate in the city of Dhaka.[9] Among many other reasons behind internal migration, a potential one is to search for jobs and most of them are involved mainly in arduous types of jobs.[10] Some of them are engaged in jobs like food preparation and serving. One notable location for food preparation and vending is the university's campus area.[11] But according to the study, Bangladeshi food handlers' understanding of and compliance with food safety regulations and hygiene maintenance are inadequate.[12] Those associated with food preparation and selling were not well trained on handling foods, and their hygiene practice was poor, including using bare hands and dirty utensils for food serving.[11] Most of the studies conducted in Bangladesh focusing on food safety and food handler practices highlighted mainly physical, chemical, and microbiological characteristics. Nutritional status, health conditions, life patterns and related awareness levels of food handlers were unprioritized in those studies. Individuals' limitations in these areas can affect their lifestyle and quality of life. Nutritional status is also a vital tool to understand people's health status and morbidity patterns, and this is equally important for people with a low sociodemographic profile.[13] Nutritional evaluation is a systematic process that helps in decision-making regarding the nature and causes of nutrition-related health complications.[14] An anthropometric assessment is a nearly essential technique in health-related research to assess a subject's nutritional status. One of the tools of anthropometric assessment that is frequently used to interpret nutritional health is the body mass index (BMI).[15]

This study was conducted by enrolling the food handlers to assess the health, nutrition status, lifestyle patterns, job satisfaction level and sanitation practices of the food handlers working in the Dhaka University Student Hall Canteen and Mess. No such type of comprehensive study is available in Bangladesh. Due to the scarcity of such reports, the government as well as related authorities of respective institutions are not properly aware of their health, nutritional level and job environment; this leads to including them as a backward community. The university authority and Bangladesh government will get insight into taking the necessary measures to improve their lifestyle. The findings will also be helpful in managing health, nutrition and related concerns in other institutions in the country.

METHODOLOGY

Study design. A descriptive cross-sectional study was designed and conducted by means of a structured questionnaire developed through judgmental validation with experts in the concerned field. The study was conducted from November 2023 to March 2024 by physically measuring and interviewing food handlers of different residential halls' canteens at the University of Dhaka to collect and analyze their socio-demographic characteristics, dietary habits, related awareness level, safety practices and lifestyles and health status.

Questionnaire development and validation. The questionnaire, segmented into four specific domains, was employed to interview and collect data from the study participants. The domains were: Section 1: socio-demographic data; Section 2: data on dietary habits, awareness and perception about the consumed foods; Section 3: data on lifestyle,

sanitation practices and job environment and Section 4: family history of illness data. A comprehensive review of existing relevant literature was conducted across multiple databases, including PubMed, MedlinePlus, etc., to develop the initial version of the questionnaire. The questionnaire was initially constructed in English and then translated into Bengali (the native language of the study participants) for easy conduct of the survey. To assure the validity of the questionnaire, it was initially sent to two academicians in the fields of pharmacy and statistics education who had previous experience working on similar studies. The experts were involved in reviewing each individual question, assessing the degree of clarity for each item and identifying any possibilities of vagueness in the wording or phrases employed, and their feedback was utilized to update the questionnaire. 10 primary participants were interviewed with the questionnaire, and the comprehensibility and consistency were found to be satisfactory. These participants' data were not included in the final data analysis.

Ethical approval and consent. Data collection was started after the study protocols had received ethical approval (Ref. No. Fa. Ph. E/027/23) from the 'Ethical Review Committee' of the Faculty of Pharmacy, University of Dhaka.

Study participants and data collection. After finalizing the questionnaire, data collection was initiated. A total of 300 participants were randomly selected through purposive sampling who worked in canteens in all nineteen residential halls of the University of Dhaka, Bangladesh, as staff or cooks. The exclusion criteria encompassed individuals with significant cognitive abnormalities and those who exhibited an inability to effectively interact with the interviewer. The interviews were conducted at the participants' workplace by undergraduate pharmacy students under the supervision of the authors. Before initiating the study, the interviewers underwent comprehensive training on the interview procedure and questionnaire under the guidance of the principal investigator to ensure consistency. The interview with the participants started after ensuring that all of them

were adequately informed about the objective and confidentiality of the study and had given their informed consent to participate in it. This enhanced the degree of trust and comprehension between the participant and the interviewer, hence ensuring more reliability in the responses provided.

Study measures and data analysis. All the questions in section 2 were closed questions with prelisted probable answers of either 'yes', 'no', 'sometimes' or 'neutral'. Any answer from the questionnaire that specified a correct dietary habit or positive awareness was scored with 1, while answers with improper as well as inconclusive responses ('neutral' or 'sometimes') were counted with 0. Hence, the scoring matrix was specific to each question or statement. For section 3, all the questions were designed in such a way that the prelisted answer options 'inadequate', 'marginally adequate' and 'adequate' indicated poor, okay, and good lifestyles and therefore scored with 0, 1 and 2, respectively. The total score for section 2 and section 3 ranged from 0 to 5 (dietary habit), 0 to 5 (awareness and perception about the consumed foods) and 0 to 18, respectively. A higher score in section 2 and section 3 indicated better dietary habits, greater awareness of foods and nutrition, and better lifestyles, respectively. The scores of the current study participants were classified into two levels with a cut-off value for each section, which was determined based on the median value.[16] The cut-off values were ≥3 for section 2 (both the dietary habit subsection and the perception and awareness subsection) and ≥11 for section 3. Therefore, participants were classified as having good (≥3/5) and poor (<3/5) dietary habits, good (≥3/5) and poor (<3/5) awareness levels of foods and nutrition and a good (≥11/18) and poor (<11/18) lifestyle.

All kinds of statistical data analyses were carried out using SPSS (IBM Statistical Product and Service Solutions), version 26.0. Categorical variables like age group, education level, monthly income level, number of siblings, etc. were investigated for descriptive statistics like frequency along with their valid percentage. Pearson chi-square ($\chi 2$) test was

performed between the BMI status of the participants and other categorical variables to investigate the significance of association between those variables. All the statistical tests performed were two-sided and used the 0.05 significance level.

RESULTS AND DISCUSSION

Socio-demographic characteristics of the study participants. The current study was conducted among 300 food handlers, the majority (77.7%) of whom were aged between 15 and 30 years (Table 1). 3.7% of the study subjects were below 15 years of age and only 0.3% of the subjects belonged to the >60 age group. The study also found that the majority (51.0%) of the food handlers completed primary education, whereas 11.0% and 2.7% of them pursued secondary and intermediate levels of education. 35.3% of the food handlers were unschooled. The majority (62.7%) of the study subjects had a monthly income of $46 USD (5,000 Taka BDT)-$92 USD (10,000 Taka BDT). Only 2.0% of the food handlers earned more than $138.0 USD (more than 15,000 Taka BDT) per month. 32.0%, 34.0%, 15.3% and 7.0% of the participants had two, three, four and more than four siblings, respectively.

Table 1. Socio-demographic characteristics of the study participants (enrolled food handlers).

	Characteristics	Frequency (%)
Age	<15	11 (3.7)
	15-30	233 (77.7)
	31-45	41 (13.7)
	46-60	14 (4.7)
	>60	1 (0.3)
Completed education level	Illiterate	106 (35.3)
	Primary	153 (51.0)
	Secondary	33 (11.0)
	Intermediate	8 (2.7)
Income level (monthly)	< ৳ 5,000 BDT (< $46.0 USD)	5 (1.7)
	৳ 5,000- ৳ 10,000 BDT ($46.0 USD-$92.0 USD)	188 (62.7)
	৳ 10,000- ৳ 15,000 BDT ($92.0 USD-$138.0 USD)	101 (33.7)
	> ৳ 15,000 BDT (> $138.0 USD)	6 (2.0)
Number of siblings	None	2 (0.7)
	One	33 (11.0)
	Two	96 (32.0)
	Three	102 (34.0)
	Four	46 (15.3)
	More than four	21 (7.0)

1 BDT = 0.0092 USD (March, 2024); BDT = Bangladeshi Taka; USD = United States Dollar.

BMI status and sociodemographic characteristics. Based on the measured BMI values, the study revealed that the majority (78.3%) of the food handlers who were enrolled in the study were of normal weight, whereas 11.0%, 8.7%, and 2.0% of them were overweight, underweight and obese, respectively (Figure 1).
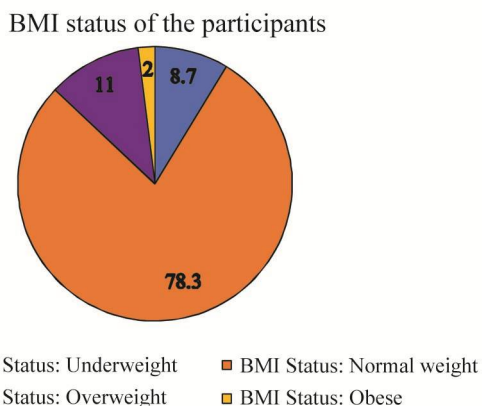
Figure 1. Distribution of the study participants according to the BMI status.

calculated BMI status was measured (Table 2). The study found that the BMI status of the food handlers is significantly associated with their age ($\chi^2 = 42.796$, $P < 0.001$). None of the participants aging more than 30 years were found underweight, whereas 18.2% and 10.3% from the <15 and 15-30 age groups, respectively, had a lower BMI than the normal value. On the contrary, 42.9% of participants in the 46-60 age group were overweight. However, no significant association was found for BMI status with other sociodemographic parameters like completed education level ($\chi^2 = 14.608$, $P = 0.102$), monthly income ($\chi^2 = 12.716$, $P = 0.176$) and number of siblings in the family ($\chi^2 = 7.227$, $P = 0.951$).

The association of different sociodemographic characteristics of the study participants with their

Table 2. Association of different sociodemographic characteristics with BMI status.

Characteristics	BMI Status				χ^2	P value
	Underweight (%)	Normal Weight (%)	Overweight (%)	Obese (%)		
Total	26 (8.7)	235 (78.3)	33 (11.0)	6 (2.0)		
Age						
<15	2 (18.2)	9 (81.8)	0 (0.0)	0 (0.0)	42.796	<0.001
15-30	24 (10.3)	189 (81.1)	16 (6.9)	4 (1.7)		
31-45	0 (0.0)	29 (70.7)	10 (24.4)	2 (4.9)		
46-60	0 (0.0)	8 (57.1)	6 (42.9)	0 (0.0)		
>60	0 (0.0)	0 (0.0)	1 (100)	0 (0.0)		
Education level						
Illiterate	13 (12.3)	77 (72.6)	15 (14.2)	1 (0.9)	14.608	0.102
Primary	8 (5.2)	130 (85.0)	12 (7.8)	3 (2.0)		
Secondary	5 (15.2)	21 (63.6)	5 (15.2)	2 (6.1)		
Intermediate	0 (0.0)	7 (87.5)	1 (12.5)	0 (0.0)		
Income level (monthly)						
< $46.0 USD	1 (20.0)	4 (80.0)	0 (0.0)	0 (0.0)	12.716	0.176
$46.0-$92.0 USD	20 (10.6)	150 (79.8)	16 (8.5)	2 (1.1)		
$92.0-$138.0 USD	5 (5.0)	75 (74.3%)	17 (16.8%)	4 (4.0%)		
> $138.0 USD	0 (0.0)	6 (100.0)	0 (0.0%)	0 (0.0)		
Number of siblings						
None	0 (0.0)	2 (100)	0 (0.0)	0 (0.0)	7.227	0.951
One	1 (3.0)	27 (81.8)	4 (12.1)	1 (3.0)		
Two	11 (11.5)	74 (77.1)	8 (8.3)	3 (3.1)		
Three	10 (9.8)	79 (77.5)	11 (10.8)	2 (2.0)		
Four	3 (6.5)	36 (78.3)	7 (15.2)	0 (0.0)		
More than four	1 (4.8)	17 (81.0)	3 (14.3)	0 (0.0)		

The BMI status of the participants was calculated and their overall nutritional pattern and lifestyle-related factors were evaluated in the study. More than twenty percent of the study participants were found to be malnourished (underweight, overweight, and obese). Among the participants, the highest percentage of underweight was found among those who were under 15 years old, followed by the groups

of 15 to 30 years old. Besides, the percentage of overweight food handlers was higher in the relatively older age group. A study conducted in India revealed similar findings, where underweight was higher among younger participants and overweight was higher among older participants.[17] In the study, most of the underweight participants belonged to a relatively lower income group. In contrast, most of the obese or overweight participants belonged to a relatively higher income group. The association between income level and BMI status is justified by published reports.[17,18] It is suggestive that the respective authority should address proper measurements to look after relatively lower-aged food handlers with a lower level of monthly income.

Individuals with only a primary education or no education had a higher likelihood of being underweight in comparison to those with a college degree or higher education, who were more likely to become overweight.[19] The findings were non-linear in this study; malnourished participants of both types

were relatively higher among those who completed secondary education and were illiterate. This might result from other contributing factors that should be monitored to prevent malnutrition. The percentage of underweight people who have more siblings was higher than that of those who have fewer siblings.[20] But no such results were found in this study regarding the association between the number of siblings and BMI status.

Dietary habit, awareness and perception of consumed foods and nutrition. The study demonstrates that 20.0% of the food handlers skip meals due to excessive workload or time constraints, and only 14.3% of the participants consume snacks regularly (Table 3). Although only 27.3% of the food handlers have regular protein-rich foods (e.g., meat, fish, eggs, legumes) for breakfast, 75.0% of them consume such high-protein diets regularly in lunch and other meals. However, only 14.7% of the study participants have fruits and vegetables in their daily meals.

Table 3. Distribution of study participants according to dietary habits, awareness and perception of foods and nutrition.

Variables	Scoring matrix	Frequency n (%)		
		Yes	Sometimes/ neutral	No
Dietary habits				
Often skip of meals due to workload or time constraints.	Y = 0, N = 1	60 (20.0%)	N/A	240 (80.0%)
Regular consumption of snacks.	Y = 1, S = 0, N = 0	43 (14.3%)	223 (74.3%)	34 (11.3%)
Protein-rich foods (e.g., meat, fish, egg, legumes) in breakfast.	Y = 1, S = 0, N = 0	82 (27.3%)	180 (60%)	38 (12.7%)
Protein-rich foods (e.g., meat, fish, egg, legumes) in meals other than breakfast.	Y = 1, S = 0, N = 0	225 (75.0%)	70 (23.3%)	5 (1.7%)
Fruits and vegetables in daily meals.	Y = 1, S = 0, N = 0	44 (14.7%)	234 (78.0%)	22 (7.3%)
Awareness				
Aware of the nutritional value of the consumed foods.	Y = 1, Ne = 0, N = 0	48 (16.0%)	219 (73.0%)	33 (11.0%)
Aware of the health risks associated with poor dietary habits and malnutrition.	Y = 1, Ne = 0, N = 0	81 (27.0%)	195 (65.0%)	24 (8.0%)
Aware of personal nutritional status through recent medical interventions.	Y = 1, N = 0	61 (20.3%)	N/A	239 (79.7%)
Perception				
Satisfaction with the food quality.	Y = 1, Ne = 0, N = 0	259 (86.3%)	26 (8.7%)	15 (5.0%)
Satisfaction with the nutrition balance of consumed food.	Y = 1, Ne = 0, N = 0	77 (25.7%)	198 (66.0%)	25 (8.3%)

Y = Yes, N = No, S = Sometimes, Ne = Neutral.

Regarding the awareness level, only 16.0% of the participants were aware of the nutritional value of the consumed foods. Additionally, only 27.0% of the participants were familiar with the health risks associated with poor dietary habits and malnutrition. 20.3% of the participants were aware of their personal nutritional status through recent medical interventions. 86.3% of the participants were satisfied with the quality of the food and 66.0% of them were neutral while responding to the question about their satisfaction with the nutrition balance of the food they consumed.

Dietary protein deficiencies result in numerous conditions by affecting human metabolic profiles (such as dyslipidemia and hyperglycemia) and aggravate nutrient deficiencies, such as vitamin A and iron deficiencies. This also causes poor growth, cardiovascular dysfunction and an increased risk of infectious diseases.[21] In this study, only a small number of participants in our survey ate breakfast consisting of items high in protein. It suggests that the dietary habits of the food handlers need to be brought about in the right way. Additionally, of the food handlers in the current study, very few of them reported eating fruits and vegetables. But the consumption of a sufficient number of fruits and vegetables is required to prevent the development of chronic obstructive pulmonary disease, coronary heart disease and hypertension. A diet low in fruits and vegetables is thought to be the cause of almost 2.7 million fatalities per year.[22] Consequently, in order to lower the risk of various diseases and maintain a healthy, balanced diet, authorities must take the appropriate action to guarantee the presence of fruits and vegetables in food handlers' daily meals.

Very few of the participants were aware of the nutritional value of the consumed foods and it was more shocking that three-fourths of them were neutral in this regard. A Spanish report revealed a similar outcome by showing significantly lower food science knowledge among food handlers.[23] Moreover, roughly two out of three participants in this study were not conscious of the health risks associated with

malnutrition. So, it can be hypothesized that they are susceptible to clinical conditions related to malnutrition. A survey from Maharashtra, India, showed that food handlers suffer from diseases associated with malnutrition.[24] The authority should take proper decisions to prevent their health deterioration.

Lifestyle, sanitation, and job environment. Among the participants, 31.3% had the habit of smoking (Table 4). Only 0.3% of the study participants had adequate (> 8 hours) sleep after a day's work and 97.7% of the participants had no weekly holiday at all. Only 7.3% of the food handlers could regularly (daily) engage in outdoor sports or similar activities.

On the contrary, 83.0% of the participants were habituated to wearing shoes while doing their duty. 84.7% had access to hygienic bathroom and toilet facilities. Proper dress code during handling foods was followed by 59.3% of the participants. 52.3% had no access to any recreation. 20.7% of them faced adverse conditions (physical abuse/abusive language etc.) in their workplace. 72.0% were not satisfied with their sleeping area and overall, only 46.3% of the participants were satisfied with their job.

The 'American academy of sleep medicine and sleep research society' recently reported that between 7 and 9 hours of sleep were necessary to maintain sound health in adults between the ages of 18 and 60.[25] In the study, more than half of the study participants experienced inadequate sleep duration. Inadequate sleep duration is associated with many comorbidities.[26] For instances cardiovascular disease, including coronary heart disease, stroke and hypertension as well as other comorbidities like depression, type 2 diabetes, obesity and poor cognition etc.[26] The majority of the participants are at risk of developing those clinical conditions this way, and there is a great need to interrupt it. A relatively long rest period on weekends is more important for keeping workers healthy.[27] But nearly all food handlers didn't get a single holiday in a week. So, collectively, most of them are susceptible to physical

and mental health problems due to inadequate sleep duration and a lack of required holidays. It is proven that mental health problems in working populations are prevalent in many countries.

Table 4. Distribution of participants according to their lifestyle, sanitation, and job environment.

Variables	Scoring matrix	Frequency n (%)		
		Inadequate / No	Marginally adequate/ sometimes/ neutral	Adequate/ yes
Smoking	Y = 0, N = 1	206 (68.7%)	N/A	94 (31.3%)
Number of weekly holidays	I (None) = 0, M.A. (1 day) = 1, A (2 days) = 2	293 (97.7%)	5 (1.7%)	2 (0.7%)
Regular engagement in outdoor sports or similar activities	I (Never) = 0, M.A. (Sometimes) = 1, A (Everyday) = 2	113 (37.7%)	165 (55.0%)	22 (7.3%)
Clothing	I = 0, M.A.= 1, A = 2	201 (67.0%)	65 (21.7%)	34 (11.3%)
Shoes wearing while working	Y = 1, S = 0, N = 0	21 (7.0%)	30 (10.0%)	249 (83.0%)
Access to hygienic bathroom and toilet facilities	Y = 1, N = 0	46 (15.3%)	N/A	254 (84.7%)
Dress code for handling foods	Y = 1, S = 0, N = 0	98 (32.7%)	24 (8.0%)	178 (59.3%)
Hygiene maintaining while handling foods	I = 0, M.A.= 1, A = 2	52 (17.3%)	115 (38.3%)	133 (44.3%)
Access to recreation (e.g. watching TV, indoor games etc.)	Y = 1, N = 0	157 (52.3%)	N/A	143 (47.7%)
Adverse conditions (physical abuse/abusive language etc.) in the workplace	Y = 1, N = 0	238 (79.3%)	N/A	62 (20.7%)
Satisfaction with sleeping area	Y = 1, N = 0	216 (72.0%)	N/A	84 (28.0%)
Sleeping hours after a day of work	I (<6 hours) = 0, M.A. (6-8 hours) = 1, A (>8 hours) = 2	176 (58.7%)	123 (41.0%)	1 (0.3%)
Job satisfaction	Y = 1, Ne = 0, N = 0	60 (20.0%)	101 (33.7%)	139 (46.3%)

I = Inadequate, M.A. = Marginally adequate, A = Adequate, Y = Yes, N = No, S = Sometimes, Ne = Neutral, N/A = Not applicable.

The importance of participation in regular physical exercise is well established.[28] Many global health problems like hypertension, depression, obesity and anxiety, can be easily mitigated through regular physical activity.[28] Physical exercise also reduce the morbidity and mortality from various cardiovascular disease.[28] But in the study, even one of the ten participants didn't participate in regular physical activity, indicating the vulnerability of the participants to various clinical conditions.

Participants domains based on scoring matrix. Based on the scoring matrix, participants were divided into different domains (Table 5). 57.3% of the food handlers had a good dietary habit and the other 42.7% of them displayed a poor dietary status. However, no significant association was found between such dietary habits and the BMI status of the participants ($\chi 2$ = 2.586, P = 0.460). About half of the participants (50.7%) lifestyle, sanitation practices, and job environment were poor ($\chi 2$ = 4.626, P = 0.201). Family history of malnutrition was present among 21.3% of the participants ($\chi 2$ = 1.320, P = 0.724); on the contrary, chronic illness in the family history was reported by 38.7% of the participants ($\chi 2$ = 3.895, P = 0.273). This study also found that 60.7% of the food handlers displayed a poor level of awareness and perception about foods and nutrition, whereas only 39.3% of the participants had a good level of awareness. However, no significant association was found between such awareness and the BMI status of the participants (χ^2 = 0.234, P = 0.972).

Table 5. Association of different domains of characteristics with the BMI status of study participants.

Characteristics	BMI Status				Total (%)	χ^2	P value
	Underweight (%)	Normal weight (%)	Overweight (%)	Obese (%)			
Dietary habit							
Poor	9 (7.0)	99 (77.3)	16 (12.5)	4 (3.1)	128 (42.7)	2.586	0.460
Good	17 (9.9)	136 (79.1)	17 (9.9)	2 (1.2)	172 (57.3)		
Awareness and perception of foods and nutrition							
Poor	16 (8.8)	143 (78.6)	19 (10.4)	4 (2.2)	182 (60.7)	0.234	0.972
Good	10 (8.5)	92 (78.0)	14 (11.9)	2 (1.7)	118 (39.3)		
Lifestyle, sanitation practices, and job environment							
Poor	13 (8.6)	113 (74.3)	22 (14.5)	4 (2.6)	152 (50.7)	4.626	0.201
Good	13 (8.8)	122 (82.4)	11 (7.4)	2 (1.4)	148 (49.3)		
Family history of malnutrition							
Present	4 (6.3)	50 (78.1)	9 (14.1)	1 (1.6)	64 (21.3)	1.320	0.724
Absent	22 (9.3)	185 (78.4)	24 (10.2)	5 (2.1)	236 (78.7)		
Family history of chronic illness							
Present	7 (6.0)	90 (77.6)	17 (14.7)	2 (1.7)	116 (38.7)	3.895	0.273
Absent	19 (10.3)	145 (78.8)	16 (8.7)	4 (2.2)	184 (61.3)		

A notable number of participants' dietary habits, lifestyle patterns and awareness of foods and nutrition were below standard in the study. All of these make them live in an unfavorable environment. To improve the overall conditions of food handlers, these findings should be considered by the associated authority and used for the development of similar types of jobholders.

Limitations. There are some limitations to this study. The study was conducted involving food handlers working in a single university area. As the majority of the food handlers working in such areas are male, the findings were confined to a single gender. Even after these limitations, the findings would help to take proper measurements that could be useful in decision-making when it comes to health and nutrition-related aspects, as no studies have found about the nutritional status, health conditions, life patterns and related awareness levels of food handlers in Bangladesh.

CONCLUSION

Based on the findings of the study, it can be concluded that a notable number of people working as food handlers in Bangladesh are malnourished. Food quality and related health issues are addressed in most of the reports. The health, nutrition and lifestyle of food handlers get relatively less priority from the concerned researchers, but these are directly and indirectly associated with those health and food safety parameters. Dietary habits, lifestyle patterns, and awareness were poor among a number of food handlers. Proper training should be arranged to raise their overall awareness level. The health status, dietary habits and lifestyle patterns of food handlers and other jobholders in the respective area should be considered by the associated authority. More research should be conducted so that the findings can help to make scientific and reliable decisions for the improvement of food handles and others with similar socioeconomic conditions.

CONFLICTS OF INTEREST

All the authors declare that they have no conflict of interest.

ACKNOWLEDGEMENT

AUTHORS' CONTRIBUTIONS

Md. Sabbir Hossain: Conception, Methodology, Writing- Original draft; **Kazi Milenur Rahman Prattay:** Data analysis; **Al-Ashiqur Rahman Alif:** Data collection; **Sowkat Jahan Shipa:** Writing- Original draft; **Md. Raihan Sarkar:** Conception, Supervision, Writing- Review; and **Md. Rasul Karim:** Writing- Original draft.

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