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Research Article

Knowledge, Attitudes, and Practices of Food Safety Among University Students in Bangladesh: Insights from a Cross-sectional Study

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Abstract

Foodborne diseases are a serious global health problem that makes people sick and sometimes causes death. This study aimed to investigate the current knowledge, attitudes, and practices regarding food safety among the students in Bangladesh. A cross-sectional, anonymous online survey was conducted from January to March 2024, involving 40 students from various disciplines. The findings showed that while all participants had basic food safety knowledge, there were significant gaps in their practical understanding. Only 45.7% of students were aware of the correct freezer temperature, and 42.9% correctly identified the safe cooking temperature. Although 88.1% of respondents expressed concern about food safety and recognized consumer unawareness and weak enforcement as major issues, their actual food-handling practices remained inconsistent. Only 34.1% regularly cleaned cutting boards after handling raw meat, and 80.5% did not consistently separate raw and cooked foods. These results highlight the urgent need for targeted educational interventions to bridge the gap between knowledge and practice. Strengthening food safety education among university students could promote safer food-handling behaviors, reduce the risk of foodborne illnesses, and contribute to improved public health outcomes.

Keywords

Foodborne Diseases, Public Health, University Students, Consumer Awareness, Risk Perception, Hygiene Practices

1. Introduction

Food safety has become an increasingly critical concern worldwide, affecting consumers, food industries, and regulatory authorities due to the risks associated with contaminated food. Unsafe food consumption can lead to foodborne illnesses, food poisoning, and malnutrition, all of which pose significant threats to human health. Certain groups, including infants, young children, pregnant women, the elderly, and individuals with weakened immune systems, are particularly vulnerable to these diseases [1]. In addition to its health implications, unsafe food also hinders socioeconomic development, negatively impacting national and global economies, tourism, and trade [2]. Foodborne diseases are a rising public health issue and account for a substantial proportion of morbidity and mortality worldwide [3, 4]. According to the World Health Organization (WHO), more than 200 diseases, ranging from diarrhea to cancer, are caused by consuming food con-

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taminated with harmful bacteria, viruses, parasites, or chemical substances. It is estimated that around 600 million people suffer from foodborne illnesses annually, resulting in 420,000 deaths and the loss of 33 million disability-adjusted life years (DALYs) worldwide [2].

Although foodborne diseases are a global concern, they are particularly prevalent in underdeveloped and developing countries. However, due to inadequate surveillance systems and complex reporting procedures, many cases go unreported. Individuals affected by foodborne illnesses may not seek medical attention, leading to underestimation of the actual burden [5, 6]. In Bangladesh, despite the limited number of studies on foodborne illness surveillance, estimates suggest that approximately 30 million people suffer from foodborne diseases annually due to harmful microorganisms [7]. Over the years, multiple outbreaks of foodborne illnesses have occurred among students in Bangladesh. For instance, a significant number of students from Mohsin Hall at the University of Dhaka and approximately 100 students from the Bangladesh University of Engineering and Technology (BUET) fell ill after consuming contaminated food at their respective cafeterias in 2015 and 2009, respectively [8, 9]. Additionally, in 2016, three students from a religious education institute in Narail died due to food poisoning-related illnesses [10]. However, there is currently no comprehensive data available on foodborne illness outbreaks directly affecting students or incidents linked to food handlers in Bangladesh.

Similar to many other countries, food consumption patterns among students in Bangladesh have undergone significant changes in recent years. Studies have shown that Bangladeshi students frequently consume local street foods such as singara, puri, and fuchka, along with fast food, sugary carbonated drinks, junk food, and fried food [11, 12]. These food items are commonly purchased from cafeterias, nearby restaurants, and street food vendors, increasing students' exposure to potential food safety risks [11, 12]. Foodborne diseases often arise due to improper food handling, both at home and in commercial establishments. Several factors contribute to foodborne disease outbreaks in developing countries, including limited knowledge of food safety, poor personal hygiene, inadequate infrastructure, improper food handling, unsafe water sources, inadequate food safety regulations, weak enforcement mechanisms, and unsafe household food preparation practices [13-18]. Among different population groups, students are particularly vulnerable to food safety hazards, as they frequently consume food from external sources, often without being aware of potential health risks [19]. In addition to direct contamination from unsafe handling, environmental pollution has emerged as a significant factor affecting food safety, particularly in aquatic organisms such as fish, which can accumulate harmful pollutants, heavy metals, and pesticide residues, thereby posing serious health risks to consumers [20-28]. Therefore, the student phase presents a crucial opportunity to instill food safety knowledge and develop essential skills for safe food handling. Educated consumers can play a vital role in enhancing food safety awareness, as they not only make informed food choices but also influence household food preparation practices in Bangladesh [29, 30].

Assessing students' food safety knowledge, attitudes, and practices (KAP) is an essential step in public health research before developing targeted interventions. Although the KAP model has certain limitations regarding its rationale, evaluation methods, and scoring systems, it remains widely used for understanding food safety awareness, especially in preliminary investigations [31]. Several studies conducted in different countries, including Japan [32], China [33], Canada [34], Lebanon [35], Malaysia [16], and India [36], have reported varying levels of food safety knowledge, attitudes, and practices among student populations. However, research on this topic in Bangladesh remains scarce. Existing studies have primarily focused on food safety practices among chicken vendors, fish farmers, meat handlers, bakery workers, restaurant staff, and hospital food handlers [37-43]. Despite this, no formal study has been conducted to evaluate the food safety knowledge, attitudes, and preventive practices among university students in Bangladesh.

Therefore, this study aims to assess the level of food safety knowledge, attitudes, and practices among students at Atish Dipankar University of Science and Technology (ADUST), Bangladesh. Additionally, this research seeks to identify key factors influencing students' food safety behaviors and highlight existing gaps in their knowledge and practices. By understanding these gaps, the findings will contribute to designing effective educational interventions that enhance food safety awareness, promote proper food handling practices, and ultimately reduce the risk of foodborne illnesses among university students. Moreover, the insights gained from this study will aid in the development of strategies that encourage healthier dietary habits and strengthen overall public health initiatives related to food safety in Bangladesh.

2. Materials and Methods

2.1. Study Design and Participants

This study utilized a cross-sectional design to evaluate the food safety knowledge, attitudes, and practices (KAP) among students at Atish Dipankar University of Science and Technology (ADUST), Bangladesh. Data collection was performed through an anonymous online survey conducted from January to March 2024. The participants in this study were undergraduate and MBA students enrolled at ADUST during the 2024 academic year. A total of 40 students were selected using random sampling from various academic departments, ensuring a diverse and representative sample. Students who were unavailable or unwilling to participate were excluded from the study. Prior to participation, informed consent was obtained from all students.

A structured, self-administered questionnaire was designed to assess the students' food safety knowledge, attitudes, and practices. The questionnaire was developed by reviewing several validated instruments used in previous studies on food safety knowledge among student populations. The final version of the questionnaire was divided into three sections: sociodemographic characteristics, food safety knowledge, and food safety attitudes and practices. The sociodemographic section collected data on participants' age, gender, academic level, and previous exposure to food safety education. The food safety knowledge section consisted of close-ended questions, addressing key topics such as safe cooking temperatures, foodborne pathogens, and food spoilage. The food safety attitudes and practices section included questions about students' concerns regarding foodborne diseases and questions regarding their daily food handling practices.

2.2. Data Collection

Data were collected using an online survey platform (Google Forms), which was distributed via email and social media channels to eligible students. The survey was available for completion over a two-month period, from January to March 2024, with participants being given two weeks to complete the survey.

2.3. Data Analysis

Data analysis was performed using SPSS software (version 26.0). Descriptive statistics, such as frequencies, percentages, and means, were calculated to summarize the participants' sociodemographic characteristics, food safety knowledge, attitudes, and practices.

3. Results

The findings revealed that while all respondents demonstrated awareness of basic food safety principles, such as understanding the role of microorganisms in food spoilage, significant gaps were observed in practical knowledge. Specifically, only 45.7% of participants were aware of the correct freezer temperatures, and 42.9% knew the safe cooking temperatures for food.

Table 1. *Sociodemographic profile of study participants.*

Demographic variables	Category	Frequency (n)	Percentage (%)
Area	Dhaka	32	82.1
	Rajshahi	4	10.3
	Chottogram	1	2.6
	Khulna	2	5.1
Age	20-25 Years	36	92.3
	25-30 Years	3	7.7
Gender	Male	21	53.8
	Female	18	46.2
Education Level	Graduate	39	100.0
Religion	Islam	35	89.7
	Hinduism	4	10.3
Location of Educational Institution	Capital	32	82.1
	Division	7	17.9
Types of Fields of Study	Agriculture	29	74.4
	BBA	4	10.3
	Pharmacy	3	7.7
	Arts	3	7.7
Living Place During Study	Mess	32	82.1
	Hostel	3	7.7
	Hall	2	5.1

Demographic variables	Category	Frequency (n)	Percentage (%)
	With Family	2	5.1
	Undergraduate	24	61.5
	College	4	10.3
Father's Education	Graduate	4	10.3
	High School	4	10.3
	Illiterate	3	7.7
	High School	13	33.3
	College	14	35.9
Mother's Education	Undergraduate	7	17.9
	Illiterate	4	10.3
	Graduate	1	2.6

In terms of attitudes, the majority of respondents displayed positive views on food safety, with 88.1% expressing concern about food safety issues. Furthermore, many participants identified consumer unawareness and weak enforcement of food safety regulations as major challenges that hinder the improvement of food safety practices.

However, when evaluating food safety practices, discrepancies between knowledge and behavior were evident. A significant portion of participants, 34.1%, reported consistently cleaning cutting boards after handling raw meat, while 80.5% of respondents admitted to inconsistently separating raw and cooked foods during food preparation.

Table 2. *Score distribution to food safety knowledge questions.*

Questions on food safety-related activities	Multiple-choice responses	Responses (%)
Are you familiar with food safety?	Yes	40(100)
	No	0(0)
Are you familiar with antimicrobial resistance?	Yes	26(65.7)
	No	14 (34.3)
Is Food decay caused by microorganisms (viruses, bacteria, fungi, etc.)?	Yes	40(100)
	No	0(0)
Which of those people has lowest chance of contracting food poisoning?	Teenagers/Young adults	40 (100)
Which of these individuals should NOT prepare food for other people?	A person with severe acne	16(40)
	A person with diarrhea	21(51.4)
	A person with HIV	3(8.6)
Which lifestyle do you believe to be the healthiest?	Balance Diet	26(65.7)
	Take many dietary Supplements	5(13.3)
	Control body weight moderately	8(20)
Which of the following statement is correct regarding the food expiration date?	Expired food can't be eaten	37(91.4)

Questions on food safety-related activities	Multiple-choice responses	Responses (%)
	Expired food can be eaten as long as it appears good	2(5.7)
	Exparied food can be eaten as long as it appears good	1(2.9)
When you cut raw meat and need to use the knife again what do you do?	You rinse the knife with cold water	32(80)
	You rinse the knife with soap and water	8(20)
In the fridge (not freezers) of your house, where should the raw meat be stored?	Lowest shelf	33(82.9)
	At any place	7(17.1)
When is the best time to purchase frozen food, raw milk and raw fish or meat?	At the end of the shopping	32(80)
	It dose not matter	7(17.1)
	At the end of the shopping	1(2.9)
What is the proper way to wash fruits and vegetables?	Wash them under running water	32(80)
	Dip them in water and salt	8(20)
How should one wash their hands before cooking or eating?	Wash hands with soap and water	40(100)
The temperature range in which the majority of disease-causing bacteria can grow	20-40 C	13(31.4)
	40-60 C	7(17.1)
	5-60 C	9(22.9)
	20-60 C	2(5.7)
	Don't know	9(22.9)
What Is the recommended temperature for freezers?	Don't Know	10(25.7)
	18 C or below	18(45.7)
	0 C	11(28.6)
What is the recommended temperature for fridges?	12 C	18(45.7)
	4 C	14(34.3)
	Don't Know	8(20)
In the refrigerator, how long should leftover food be kept?	5-7 Dasy	3(8.6)
	3-4 Days	19(48.6)
	5-7 Days	13(31.4)
	I don't know	5(11.4)
Food must be cooked to the following internal temperature in order to be safe to consume	52 C	10(25.7)
	74 C	17(42.9)
	121 C	6(14.3)
	I don't know	7(17.1)
What is the recommended minimum duration for hand washing?	10s	29(71.4)
	20s	11(28.6)

Table 3. *Score distribution to food handling attitude questions.*

Questions on food safety-related activities	Multiple-choice responses	Responses (%)
Attitude on the matter of food safety	Concerned	35(88.1)
	Not Concerned	3(7.1)
	Very Concerned	2(4.8)
The status of food safety in our country	Good	35(88.1)
	Very poor	3(7.1)
	Very Good	2(4.8)
The current causes of several issues with food safety	Absence of legal enforcement	10(23.8)
	Consumer unawareness	17(42.9)
	Lack of cooperation between food safety organizations	7(16.7)
	The roles and responsibilities of relevant departments are unclear.	4(9.5)
	Driven by the interests of the production and sale of enterprise.	3(7.1)
Food safety should be ensured by taking the necessary steps	Improving the national awerness of food safety	14(35.7)
	Strict enforcement of the law	12(31.0)
	Strengthening national legislation	13(33.3)
The participant's top concerns regarding food safety	The use of food additives	7(16.7)
	Pesticide residues	16(40.5)
	Heavy metals and microbe pollution	8(19.0)
	Transfer of plasticizers in food containers and packaging materials	7(16.7)
	All of the above	3(7.1)

Table 4. *Score distribution to food handling practice questions.*

Questions on food safety-related activities	Multiple-choice responses	Responses (%)
Examine food packaging labels or expiration dates before making a purchase	Always	23(58.5)
	Sometimes	17(41.5)
	Never	0(0)
Eat food that has gone bad and past its expiration date	Always	40(100)
	Sometimes	0(0)
	Never	0(0)
Check for information on food safety while making purchases online	Always	31(78.0)
	Sometimes	9(22)
	Never	0(0)
Store food according to food labels	Always	19(48.8)
	Sometimes	17(41.5)

Questions on food safety-related activities	Multiple-choice responses	Responses (%)
	Never	4(9.8)
Hand-wash before consuming any meal	Always	26(65.9)
	Sometimes	14(34.1)
	Never	0(0)
Consume food kept at room temperature for long	Always	8(19.5)
	Sometimes	32(80.5)
	Never	0(0)
Wash and rinse cutting boards, knives and plates used for raw meat before using them for other food	Always	14(34.1)
	Sometimes	23(58.5)
	Never	3(7.3)
Store uncooked meat or poultry apart from cooked food	Always	8(19.5)
	Sometimes	32(80.5)
	Never	0(0)
Wash dishes with detergent and water or in a dishwasher after preparing food and before new usage	Always	36(90.2)
	Sometimes	4(9.8)
	Never	0(0)
Keep flies, insects and rodents away from both cooked and raw food?	Always	35(87.8)
	Sometimes	5(12.2)
	Never	0(0)

These findings highlight the need for targeted educational initiatives to address the gaps between knowledge, attitudes, and actual food safety practices. The study suggests that improving food safety education and awareness can help align participants' practices with their understanding and attitudes toward food safety.

4. Discussion

The findings of this study reveal notable gaps between knowledge, attitudes, and practices (KAP) regarding food safety, which align with trends observed in similar research worldwide. While participants demonstrated a high level of theoretical knowledge in fundamental areas, such as food spoilage and hand hygiene, there was a significant disparity in practical knowledge. For instance, only 45.7% of participants were aware of the correct freezer temperature of -18 ℃, and only 42.9% knew the appropriate cooking temperature of 74 ℃. These results suggest that while students are familiar with the basic concepts of food safety, they lack the practical understanding necessary for effectively preventing foodborne illnesses.

In terms of attitudes, 88.1% of participants expressed concern about food safety, which reflects a positive mindset towards the importance of maintaining food safety. However, this favorable attitude did not consistently translate into safe food handling practices. Only 34.1% of participants reported regularly cleaning cutting boards after handling raw meat, and 19.5% reliably separated raw and cooked foods. This inconsistency in practice is concerning, as improper handling of food can significantly increase the risk of contamination and foodborne illness.

These results are consistent with similar studies conducted in countries, where a strong theoretical understanding of food safety was also observed, but food safety practices remained suboptimal [44]. In these studies, despite recognizing the risks associated with improper food handling, participants did not always implement the recommended safety measures in their daily routines.

The persistent gap between knowledge and action highlights the need for more targeted interventions that emphasize the practical application of food safety knowledge. It is not enough to simply raise awareness; food safety education must focus on equipping individuals with the skills to translate theoretical knowledge into consistent, safe practices.

Additionally, the role of regulatory enforcement cannot be overlooked. Stricter food safety regulations and more robust enforcement mechanisms are necessary to ensure that safe handling practices are not only understood but also adhered to.

Overall, this study underscores the importance of a multifaceted approach to improving food safety, combining education, practical training, and regulatory oversight to foster safer food handling behaviors among students and the broader community.

5. Conclusions

This study reveals a gap between food safety knowledge, attitudes, and practices among participants. While theoretical knowledge was strong, practical food safety practices were inconsistent. The findings highlight the need for focused educational programs and stricter regulatory enforcement to ensure that food safety knowledge translates into safer handling behaviors, ultimately reducing foodborne illness risks.

Abbreviations

KAP	Knowledge, Attitudes, and Practices
ANOVA	Analysis of Variance

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Author Contributions

Md Wahidul Islam: Conceptualization, Supervision
Md Mohibul Hasan: Data analysis, Writing original draft
Syeda Naima Zannat: Data collection, Methodology
Samira Islam Resmi: Review & editing

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Conflicts of Interest

The authors declare no conflicts of interest.

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