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Knowledge, attitudes and practice regarding food safety of nursing students

Mst. Amena Khatun[1], Senora Ferdoush[1], ATM Rezaul Hoque[2*], Md. Farhanul Islam[2] and ANH Aronno[3]

[1]TMSS Nursing College, Bogura, Bangladesh; [2]Department of Economics, Hajee Mohammad Danesh Science and Technology University, Dinajpur, Bangladesh; [3]Faculty of Fine Arts, University of Development Alternative, Dhaka, Bangladesh.

***Corresponding email:** luizareza@yahoo.com

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Abstract

Food safety refers to ensuring that food does not cause harm when prepared and consumed as intended. It remains a major public health concern in both developed and developing countries, as food contamination continues to pose significant health and economic burdens. This cross-sectional study aimed to assess the Knowledge, Attitudes, and Practices (KAP) related to food safety among 185 nursing students at TMSS Nursing College, Bogura, Bangladesh. The majority of respondents were female (81.6%), aged 22 (48.6%), from rural areas (36.2%), and low-income families (51.4% earning 16,000–17,000 BDT monthly). While 75% of the students displayed positive attitudes toward food safety and reported good practices such as consuming family-cooked meals (38.9%), over half demonstrated poor knowledge of proper food. Family influences a prominent role in shaping food safety behavior. Although the results are consistent with national findings, where food safety knowledge adequacy stands at 47%, the study highlights an urgent need for curriculum reforms to incorporate structured food safety education. It recommends targeted policies, community outreach programs, and empowerment of nursing students to become effective advocates for food safety in resource-limited settings.

Keywords: Food safety, food hygiene, knowledge, attitudes, practice, nursing student

Introduction

Food safety, defined as the assurance that food will not harm consumers when prepared or consumed as intended, is a critical public health priority globally. Millions of people suffer from foodborne illnesses annually, leading to significant morbidity, mortality, and economic burdens, particularly in developing nations like Bangladesh. These challenges stem from unhygienic food production, improper storage, contaminated water, poor personal hygiene, and inadequate regulatory frameworks (Adak *et al.* 2002). Over 200 diseases are linked to unsafe food, with outbreaks driven by factors such as improper temperature control, contaminated equipment, and reliance on unsafe food sources. Vulnerable populations, including children and college students, face heightened risks due to immature immune systems, limited food safety knowledge, and dependence on institutional or street food (Caroline and Nadine 2005).

College students, particularly nursing students, are a high-risk group due to their frequent consumption of communal or externally sourced meals and gaps in practical food safety education. Studies highlight that young adults often lack awareness of contamination prevention, proper storage practices, and hygiene protocols, contributing to preventable outbreaks in settings like school canteens and hostels (Chapman *et al.* 2010). Despite growing public concern about food-related risks, disparities persist between theoretical knowledge and real-world practices, exacerbated by socioeconomic factors such as low income, rural residency, and cultural reliance on informal food systems.

The prevention of foodborne illnesses hinges on targeted education to instill safe food-handling behaviors. Continuous training is essential to empower consumers especially future healthcare providers like nursing students to adopt practices that mitigate health risks. Early education is critical, as habits formed during youth often persist into adulthood, influencing lifelong health outcomes. This study focuses on nursing students at TMSS Nursing College in Bogura, Bangladesh, who play a dual role as both consumers and future health educators. By assessing their knowledge, attitudes, and practices (KAP) regarding food safety, the research aims to identify systemic gaps in education and propose curriculum reforms, community engagement initiatives, and policy interventions. With this point in view the study was done to identify the socio demographic characteristics, knowledge level, attitudes toward maintaining and practices of food safety of the respondents.

Research methodology

The methodology serves as a critical framework to ensure systematic data collection and the derivation of reliable outcomes. By prioritizing methodological rigor, this study adopted strategies tailored to gather accurate insights and achieve valid conclusions.

Selection of the study area: A study on Knowledge, Attitudes, and Practices (KAP) regarding Food Safety among nursing students necessitates the selection of a setting where the research objectives can be effectively addressed. To achieve this, TMSS Nursing College, Bogura, was purposively chosen as the study area.

Target population: Students enrolled in Diploma in Nursing Science and Midwifery, Diploma in Midwifery, BSc in nursing (Basic) course (between 2018 to 2021 year) under TMSS Nursing College as per criteria.

Sampling method: Purposive sampling technique was undertaken. Purposive Sampling Technique (PST) was employed to select participants based on predefined criteria relevant to the study objectives. One hundred and eighty-five students were purposively selected, as sample, in the study who met the aforesaid inclusion criteria. The sample size has been calculated applying the single population proportion formula, using a proportion of 0.5 and expected margin of error=0.05, based on the following formula-

The formula for calculation of sample size is:

$$n = \frac{Z^2 pq}{d^2}$$

Where:

- $Z = 1.96$
- p is the (estimated) proportion of the population which has the attribute in question,
- q Is 1 – p.
- d is the desired level of precision (i.e. the margin of error)

When proportion of the population is not available, it is accepted as 50% (0.5). Therefore, prevalence in this study was taken as 50%. Now let's say we want 95% confidence, and at least 5 percent precision. A 95 % confidence level gives us Z values of 1.96, per the normal tables, so we get,

$$n = \frac{(1.96)2 \times 0.5 \times 0.5}{(0.05)^2} = 384$$

Therefore, the calculated sample size is 384. But in this study, 185 respondents have been interviewed as sample because of academic research, time consuming and constrain of cost of sampling and purposive method of sampling has been applied to select the respondents from study population.

Data collection: Two types of data were used in the study: primary and secondary data. Primary data were collected through face-to-face interview using a pre-tested, self-administered anonymous questionnaire containing open and closed-ended questions. Whereas secondary data were collected from different government and non-government publications. The study was conducted during January 2023 to June 2023.

Data analysis: Data was obtained with the help of questionnaire was cleaned and coded by the SPSS data entry form and data was analyzed using SPSS software (IBM) version 23. Descriptive analysis was done based on variables of the study. A 5-points Likert scale was used to assess the perception of the students.

Results and discussion

A cross-sectional study was conducted among nursing students to know food safety knowledge, attitude and practice.

Socio-demographic characteristics: Table 3.1 presents the socio-demographic characteristics of the respondents. Most respondents (48.6%) were 22 years old, with females forming the majority at 81.6%. Among them, 56.8% are enrolled in the Diploma in Nursing Science and Midwifery, followed by 41.1% in BSc in Nursing (Basic). The majority are 2nd-year students (54.6%). Regarding basic education, 50.8% studied in village schools. In terms of monthly family income, 51.4% fall within the 16,000–17,999 BDT range. Concerning place of residence, most respondents (36.2%) live in villages.

Table 1. Distribution of the respondents by their socio-demographic characteristics

Socio-demographic characteristics	Category	Frequency (f)	Percentage (%)
Age of the respondent	19 years	2	1.1
	20 years	28	15.1
	21 years	65	35.1
	22 years	90	48.6
Gender	Male	34	18.4
	Female	151	81.6
Nursing course	Diploma in Nursing Science and Midwifery	105	56.8
	Diploma in Midwifery	2	1.1
	BSc in Nursing (Basic)	76	41.1
	BSc in Nursing (Post Basic)	2	1.1
Class of responding students	First Year	5	2.7
	Second Year	101	54.6
	Third Year	1	0.5
	Fourth Year	78	42.2
Basic education background	Village	94	50.8
	Town	71	38.4
	Hostel	9	4.9
	Paying guest	11	5.9
Monthly average income (BDT)	≥15,000	31	16.8
	16,000 – 17,999	95	51.4
	18,000 – 19,999	25	13.5
	≥20,000	34	18.4
Place of residence	Village	67	36.2
	Town	57	30.8
	Hostel	59	31.9
	Paying guest	2	1.1

Food safety and food source characteristics: Table 2 presents additional socio-demographic information of the respondents, showing that the majority (62.7%) received food safety information from family members, followed by friends (18.4%). A large portion (74.6%) participated in food preparation, while 25.4% did not. In terms of cooked food sources, 38.9% depended on meals prepared by family, 30.3% consumed hostel food, 18.4% cooked for themselves, and 12.4% ate from local canteens. These findings reflect the significant influence of family in both food safety education and meal provision. Parallel results were cited by Osaili *et al.* (2011).

Table 2. Distribution of the respondents by their food safety information and food source characteristics

Characteristic	Category	Frequency (f)	Percentage
Sources of food safety information	Family	116	62.7
	Friend	10	5.4
	Hostel	34	18.4
	Health care provider	17	9.2
	Mass media	8	4.3
Helping in preparing food	Yes	138	74.6
	No	47	25.4
Sources of cooked food	Hostel	56	30.3
	Canteen	23	12.4
	Own cooked	34	18.4
	Family cooked	72	38.9

Nature of response against statements related to personal hygiene: Table 3 highlighted participants' responses to personal hygiene. Overall, 69.2% of respondents demonstrated adequate knowledge by correctly answering at least 7 out of 10 questions, while 30.8% answered incorrectly. Most participants (90.3%) understood the concept of personal hygiene, 72.4% knew the WHO-recommended handwashing duration, and 88.6% recognized proper handwashing moments. Additionally, 84.3% identified signs of poor hygiene, 89.2% acknowledged handwashing's role in a healthy lifestyle, and 71.4% knew the recommended handwashing frequency. However, only 29.7% understood the consequences of not washing hands regularly. While 80% knew how often to change undergarments and 77.3% were aware of the recommended tooth brushing frequency, just 9.2% could correctly identify the primary cause of hepatitis virus transmission.

Level of food storage knowledge: Table 4 depicted the responses of 185 participants to various questions related to food safety. Among them, 30.3% correctly identified the temperature at which frozen food should be kept, 13.5% knew that raw meat should be stored in a refrigerator, and 56.2% identified the ideal temperature range for pathogen growth. Additionally, 21.1% correctly answered how many times leftovers can be reheated, while 84.9% identified the basic steps for proper handwashing.

Table 3. Distribution of the respondents by their nature of response against statements related to personal hygiene

Aspects/Issues	Yes (f (%))	No (f (%))
Personal hygiene (brushing teeth, washing hair, taking shower)	167 (90.3%)	18 (9.7%)
Wash hands for 40–60 seconds as recommended by WHO	134 (72.4%)	51 (27.6%)
Washing hands after using toilet, wiping nose, handling food waste	164 (88.6%)	21 (11.4%)
Unhealthy habit (sharing food, bathing, drinking boiled water, etc.)	156 (84.3%)	29 (15.7%)
Washing hands to kill bacteria, to smell nice, to keep skin soft	165 (89.2%)	20 (10.8%)
Wash hands twice per day, once per week	132 (71.4%)	53 (28.6%)
Wash regularly to avoid odor, dry skin, and tiredness	55 (29.7%)	130 (70.3%)
Changing undergarments (once/week, twice/month, every day, etc.)	148 (80.0%)	37 (20.0%)
Brushing teeth at least once/twice per day, once per week, or month	143 (77.3%)	42 (22.7%)
Prevent hepatitis by not sharing needles and contaminated water	17 (9.2%)	168 (90.8%)
Average Percentage	69.2%	30.8%

Table 4. Distribution of the respondents by their type of answer in food storage knowledge (positive/negative)

Knowledge Area	Positive Answer (f (%))	Negative Answer (f (%))
Correct temperature that frozen food should be kept at	56 (30.3%)	129 (69.7%)
Store raw meat at the bottom of the refrigerator	25 (13.5%)	160 (86.5%)
Maintain food at safe temperatures	104 (56.2%)	81 (43.8%)
Only reheat leftovers once to prevent foodborne illness	39 (21.1%)	146 (78.9%)
Wash with water, soap, rinse, use towels, and dry hands	157 (84.9%)	28 (15.1%)
Dry hands to prevent spreading germs, avoid dripping water, and ensure utensil grip	99 (53.5%)	86 (46.5%)
Knowledge about bacteria (e.g., growth in warmth, survival needs, effect of freezing)	90 (48.6%)	95 (51.4%)
Ideal temperature ranges for a refrigerator	41 (22.2%)	144 (77.8%)
Identify food items most likely to contain bacteria (e.g., frozen raw chicken)	143 (77.3%)	42 (22.7%)
Conditions required for bacterial growth (e.g., water, food, warm temperature)	112 (60.6%)	73 (39.4%)
Knowledge about a beef burger is properly cooked	88 (47.7%)	97 (52.3%)
Food contaminated with foodborne bacteria may look and taste normal	13 (7.0%)	172 (93.0%)
Average Percentage	43.6%	56.4%

About 53.5% understood the reason for drying hands after washing, and 48.6% answered correctly about bacteria. Furthermore, 22.2% knew the ideal fridge temperature, 77.3% identified the type of food most likely to contain bacteria, and 60.6% recognized the conditions bacteria need to grow and multiply. Also, 47.7% correctly answered how to determine if a beef burger is properly cooked, while only 7% knew the characteristics of food contaminated with food poisoning bacteria.

Food contamination knowledge: Table 5 outlines the food safety practices of 185 respondents. About 36.2% believed that food cooked on the outside is fully done inside, and only 5.9% reported washing poultry before cooking. Over half (55.7%) identified chicken as a salmonella risk, while 74.6% considered it acceptable to thaw perishable foods on the kitchen counter or in the sink. A significant majority (90.8%) acknowledged handwashing as a key preventive measure against contamination, and 94.6% emphasized separating raw and cooked foods. However, only 29.7% were aware that pregnant women, infants, seniors, and immunocompromised individuals face greater risks of foodborne illness. Furthermore, 68.1% understood that food should be refrigerated or frozen within two hours, 84.9% believed eggs should be cooked until firm, and 55.7% thought boiling sauces, soups, and gravies when reheating was unnecessary. Results of the present study are comparable with those of Naing *et al.* (2007).

Attitude in food safety: Table 3.6 highlights the respondents' attitudes toward food safety, indicating strong awareness of hygienic practices. Most participants agreed that covering the mouth while coughing or sneezing helps prevent contamination (68.1% strongly agree, 23.2% agree), and 66.5% believed that wearing rings or watches during cooking is unsafe. A large majority (82.2%) acknowledged that handling food without gloves can lead to contamination, and 87% emphasized the importance of handwashing after touching body parts. Additionally, 84.3% supported separating raw and cooked foods, and 82.7% recognized that long or painted nails may spread pathogens. Hand hygiene was widely accepted as vital in preventing foodborne illnesses (89.8%), and 81.6% noted that utensils could transmit pathogens. Furthermore, 86.5% viewed personal hygiene as essential, 59.5% believed food handlers with hand abrasions should not prepare food, and 81% identified hands as a major source of bacteria and microorganisms.

Table 5. Distribution of the respondents by their type of answer on food contamination knowledge

Activities	Positive Answer (f (%))	Negative Answer (f (%))
Check that food is cooked thoroughly on the inside, not just the outside	67 (36.2%)	118 (63.8%)
Wash poultry and chicken pieces before cooking them	11 (5.9%)	174 (94.1%)
Handle chicken carefully, as it usually carries *Salmonella* bacteria	103 (55.7%)	82 (44.3%)
Thaw perishable food like frozen chicken and beef on the kitchen counter or in the sink	138 (74.6%)	47 (25.4%)
Wash hands to prevent contaminating food	168 (90.8%)	17 (9.2%)
Keep raw foods and cooked foods separate	175 (94.6%)	10 (5.4%)
Protect pregnant women, infants, seniors, and immunocompromised individuals from foodborne illness	55 (29.7%)	130 (70.3%)
Refrigerate or freeze food within two hours or less after cooking or buying from the store	126 (68.1%)	59 (31.9%)
Cook eggs until the yolk and white are firm	157 (84.9%)	28 (15.1%)
Avoid bringing sauces, soups, and gravy to a boil while reheating	103 (55.7%)	82 (44.3%)
Average Percentage	59.6%	40.4%

Table 6. Knowledge related to attitude in food safety

Statement	Strongly disagree (f, %)	Disagree (f, %)	Neutral (f, %)	Agree (f, %)	Strongly agree (f, %)
Covering the mouth during coughing and sneezing avoids contamination of food	0 (0.0%)	2 (1.1%)	14 (7.6%)	43 (23.2%)	126 (68.1%)
Wear a ring or watch while cooking	8 (4.3%)	24 (13.0%)	30 (16.2%)	77 (41.6%)	46 (24.9%)
Touching food directly without gloves during serving induces contamination	11 (5.9%)	9 (4.9%)	13 (7.0%)	81 (43.8%)	71 (38.4%)
Wash hands after touching any part of the body	6 (3.2%)	9 (4.9%)	9 (4.9%)	70 (37.8%)	91 (49.2%)
Process raw food separately from cooked food	0 (0.0%)	13 (7.0%)	16 (8.7%)	91 (49.2%)	65 (35.1%)
Keep fingernails short and unpainted to avoid contaminating food with pathogens	9 (4.9%)	16 (8.6%)	7 (3.8%)	70 (37.8%)	83 (44.9%)
Maintain proper hand hygiene to prevent foodborne illnesses	6 (3.2%)	5 (2.7%)	8 (4.3%)	67 (36.2%)	99 (53.6%)
Keep food utensils clean to prevent the spread of pathogens	2 (1.1%)	17 (9.2%)	15 (8.1%)	80 (43.2%)	71 (38.4%)
Maintain personal hygiene to control foodborne diseases	11 (6.0%)	2 (1.1%)	12 (6.5%)	38 (20.5%)	122 (66.0%)
Do not handle food if abrasions are on hands	10 (5.4%)	22 (11.9%)	43 (23.2%)	86 (46.5%)	24 (13.0%)
Keep hands clean as they are where most bacteria and microorganisms originate	18 (9.8%)	12 (6.5%)	5 (2.7%)	53 (28.6%)	97 (52.4%)
Average percentage	3.99%	6.44%	8.55%	37.12%	44.00%

Table 7. Habits related to practice towards food safety (*n* = 185)

Statement	Never 1 (f, %)	Rarely 2 (f, %)	Sometimes 3 (f, %)	Most of the time 4 (f, %)	Always 5 (f, %)
Washing hands with soap and water before handling and cooking food	0 (0.0%)	2 (1.1%)	17 (9.2%)	33 (17.8%)	133 (71.9%)
Covering hands when having a cut or sore before preparing food	22 (11.9%)	8 (4.3%)	50 (27.0%)	39 (21.1%)	66 (35.7%)
Washing hands with soap and water after touching raw meat, poultry, and seafood	2 (1.1%)	10 (5.4%)	20 (10.8%)	24 (13.0%)	129 (69.7%)
Washing plates used for raw meat, poultry, and seafood before using for cooked food	1 (0.5%)	22 (11.9%)	37 (20.0%)	125 (67.6%)	0 (0.0%)
Avoid using same cutting board/knife for raw meat, poultry, seafood, and vegetables	30 (16.2%)	17 (9.2%)	51 (27.6%)	44 (23.8%)	43 (23.2%)
Washing countertops or oven tops with hot, soapy water after food preparation	21 (11.4%)	22 (11.9%)	58 (31.4%)	41 (22.2%)	43 (23.2%)
Washing hands after using the toilet	5 (2.7%)	3 (1.6%)	15 (8.1%)	10 (5.4%)	152 (82.2%)
Washing hands after counting money	23 (12.4%)	24 (13.0%)	46 (24.9%)	43 (23.2%)	49 (26.5%)
Avoid touching food with dirty hands	13 (7.0%)	2 (1.1%)	19 (10.3%)	29 (15.7%)	122 (65.9%)
Average Percentage	7.0%	6.6%	18.8%	23.3%	44.3%

Practice towards food safety: Table 7 presents the food safety practices of 185 nursing students, showing that most (71.9%) always washed their hands with soap before handling food, and 69.7% did so after touching raw meat. However, only 35.7% consistently covered cuts before food preparation, while 11.9% never did. Although 67.6% washed plates used for raw food before reuse, just 23.2% always avoided cross-contamination with utensils and regularly cleaned countertops with hot, soapy water, whereas 11.4% never followed this practice. High compliance was noted in handwashing after toilet use (82.2%) and money handling (65.9%), with most students avoiding food handling with unclean hands. The respondents were mainly 22-year-old female students from village schools and lower-middle-income families, enrolled in the Diploma in Nursing Science and Midwifery. Food safety knowledge was primarily acquired from family, and meals were typically home-cooked. Despite gaps in areas such as food storage, students showed average understanding of contamination, positive attitudes, and generally good food safety practices. Quick (2013) cited similar trends of findings.

Conclusion

Foodborne illnesses continue to pose a serious global health threat, largely due to poor food handling and hygiene practices during preparation, especially in households, small eateries, and street food settings. This study evaluated the food safety knowledge, attitudes, and practices of 185 nursing students at TMSS Nursing College, Bogura, particularly in relation to food purchasing, preparation, and storage. Most participants were 22-year-old female students enrolled in Diploma in Nursing Science and Midwifery or Basic BSc Nursing programs, coming from lower-middle-class families with diverse educational and residential backgrounds. Although family served as the primary source of food safety information and students typically consumed home-cooked or hostel meals, significant gaps in their knowledge especially regarding personal hygiene and food storage were evident. However, the majority demonstrated average knowledge, positive attitudes, and good practices, highlighting the need to strengthen food safety education and awareness among future healthcare professionals.

Recommendations

i. Initiatives must be taken by the Healthcare Program to identify the barriers that operate in the utilization of food safety.

ii. Awareness raising health education and health service programs are required to improve knowledge on food safety.

iii. Frequent and scheduled awareness program for nursing students.

iv. Encourage nurses to attend containing education in form of workshops conferences, training Programs and review update nursing care related to food safety.

v. Further studies can be conducted to make more clear views and to plan for future on food safety.

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