**Original Research Article**

**KNOWLEDGE, ATTITUDE AND PRACTICE OF FOOD SAFETY AND HYGIENE AMONG UNDERGRADUATES AT THE UNIVERSITY OF NIGERIA, ENUGU**

**ABSTRACT**

**Introduction:** Foodborne diseases pose significant global health and economic burdens, particularly in low- and middle-income countries. Despite existing interventions, poor food safety knowledge, attitudes, and practices (KAP) persist, necessitating targeted assessments among high-risk populations such as university students.

**Objective:** This study evaluated KAP towards food safety and hygiene as well as factors contributing to these practices among undergraduates at the University of Nigeria, Enugu Campus (UNEC).

**Methods:** The study was a descriptive cross-sectional study of 417 undergraduate students across the faculties of Law, Business Management, and Environmental Sciences at the University of Nigeria, Enugu Campus. Data was collected using pre-tested, self-administered, structured questionnaire and a descriptive inferential analysis was done using Statistical package for social sciences (SPSS). Consent was obtained from all respondents.

**Results:** A total of 417 undergraduate students filled and submitted the form with a response rate of 100%. The mean age of the respondents was 21.93 ±2.39 SD years. Majority demonstrated good food safety knowledge (97%), positive attitudes (88.2%), and good practices (94.5%). Key gaps identified were consumption of food kept at room temperature for long periods (93.3%) and using the same cutting board for raw meat, poultry, seafood and vegetables (49.9%).

Male gender significantly predicted better practice (AOR = 2.98, 95% [CI: 1.256–4.969]). Religion marginally influenced knowledge (p = 0.045), while age, faculty, and accommodation type showed no significant associations.

**Conclusion:** Despite high levels of knowledge, attitude and good practices, our study identified gaps which highlights the need for institutional and policy-level interventions, including curriculum integration of food safety education and public awareness campaigns.

**Keywords:** Food safety, Hygiene, Knowledge, Attitude, Practice, Nigeria.

**INTRODUCTION**

Pathogenic agents in food, whether they are microbial – such as viruses, bacteria and parasites – or chemicals carry great risk to human health.[1] Food safety refers to the procedures used in handling, preparing, and storing food in a way that prevents contamination with these agents and subsequent food-borne diseases.[2] Food hygiene means a certain condition or measure that is needed to ensure the safety of our food from production to consumption [3]. Food borne diseases encompasses a wide range of illnesses from diarrhoea to cancers with most presenting as gastrointestinal issues, though they can produce neurological, gynaecological and immunological symptoms.[1]

According to World Health Organization (WHO) estimates, foodborne illnesses continue to pose a significant threat to global public health, particularly in low- and middle-income countries where inadequate food safety practices contribute to preventable morbidity, mortality, and economic strain. Each year, unsafe food causes an estimated 600 million illnesses and 420,000 deaths, resulting in loss of 33 million healthy life years (DALYs).[1]

Food can get contaminated during various stages of production, distribution, and storage. Measures usually undertaken to reduce foodborne outbreaks include frequent and correct handwashing, appropriate cleansing of kitchen surfaces, storage of food at suitable temperatures and the separation of raw and cooked food.[4]

As established, food borne diseases pose a great threat to the general population of which majority are young people.[5] Undergraduate students, majority of whom are young and are navigating independent living for the first time, often lack the knowledge, resources, or motivation to adhere to safe food handling practices, increasing their susceptibility to foodborne diseases.[6,7]

In Nigerian public universities, unregulated food vending systems dominate campus environments where students frequently encounter challenges like improper food storage, inadequate handwashing facilities, and limited awareness of contamination pathways.[8,9] Systematic challenges such as weak regulatory frameworks, limited access to clean water, and insufficient public health education exacerbate risks associated with contaminated food.[10]

Despite global efforts to mitigate foodborne diseases, continuous gaps exist between theoretical knowledge and practical implementation of food safety measures, especially among young adults in resource-limited contexts. College students in Ethiopia has been found to have overall low knowledge, attitude and practice towards food safety, noting that knowledge did not influence attitude and practices were significantly associated with factors like gender and year of study.[11] In a Tanzanian University, good food safety knowledge but not attitudes were associated with good food safety practices, but the overall score of food safety practice was bad.[12] Nigerian universities, characterized by dense student populations, communal living arrangements, and reliance on unregulated food vendors, represent critical yet understudied settings for assessing food safety behaviours.

While gender, age and educational disparities in food safety practices have been documented in other regions,[6,11,13,14] context-specific determinants among Nigerian undergraduates remain poorly understood. The COVID-19 pandemic has underscored the importance of hygiene practices, offering an opportunity to reinforce food safety protocols in our academic institutions.[4] However, without enough empirical evidence on Nigerian students’ KAP towards food safety and hygiene, targeted interventions remain elusive.

By clarifying barriers to safe food hygiene knowledge and practices, and identifying actionable predictors, this study aims to assess the overall knowledge, attitude and practices of undergraduate students at the University of Nigeria, Enugu Campus (UNEC) towards food safety and hygiene as well as to explore the relationship between their KAP and demographic characteristics. This would enable us provide valuable insights for effectively planning educational programmes and also identify available preventive measures that can be implemented to improve student’s food hygiene level.

**MATERIAL AND METHODS**

**Study Area, Design and Population**

This was a descriptive cross-sectional study conducted among the undergraduate students at the University of Nigeria Enugu Campus (UNEC), Enugu State, Nigeria which is classified as a low-income country according to the World Health Organization. It is a secondary campus under the University of Nigeria Nsukka and is located in the heart of Enugu city. The campus houses the faculties of Business Administration, Law, Environmental Studies, Basic Medical Sciences, Health Sciences, Dentistry and Medical Sciences. All of which are undergraduate courses, however, postgraduate courses are also offered by the faculties.

**Sampling and Sample Size**

A multi-staged sampling was used in selecting faculties, department and classes for this study. Stage 1 involved simple random sampling of seven faculties to get three faculties to be used for the research. The three faculties chosen were Law, Management and Environmental Sciences. Stage 2 involved the selection of one department in each selected faculty. This gave a total of three departments – the departments of Law, Accounting and Architecture. Stage 3 involved the selection of the class or level in each department to be used in the research using a stratified random sampling method.

The minimum sample size used was determined using the formula: n = (Z) 2 x P(1 – P) / d2

Where Z = 1.96 at 95% confidence level

P = 50% based on a previous study in Ethiopia in Africa[11]

d = 5% estimated margins of error

n = 1.962 × 0.5(1-0.5) /0.052

n = 384

An addition of 5% to make up for attrition: 5% of 384= 19.2

Minimum sample size=384+19.2=403.2.

Rounding it up, a sample size of **410** was be determined.

**Data Collection and Methods**

The data was collected with self-administered, pretested, structured questionnaire. Informed consent was obtained from all participants. Confidentiality and anonymity were assured.

 Questionnaires were distributed physically while students remained in lecture halls. The study was carried out over five (5) months. Measures were put in place to minimize all forms of survey research bias. The questionnaire contained four sections. The first section assessed socio-demographic characteristics of the respondents which included age, sex, marital status, religion, department, and year of study, living arrangements and cooking habits.

The second section assessed food safety knowledge of participants using 3-Point Likert scale of Yes, No and I don’t know to indicate if the respondent has any knowledge, no knowledge or unallied respectively.

The third section assessed the respondents’ attitude to food safety and hygiene. In this section, a 5-point Likert scale was used to assess their attitude; available responses ranged from Positive (Strongly agree, Agree, Neutral) to Negative (Strongly disagree, Disagree).

The fourth section assessed their food hygiene practices. In this section, a 5-point Likert scale was used to assess their practice; available responses ranged from Correct (Always, Most of the time, Sometimes) to Negative (Rarely, Never).

For the third and fourth sections, a range of score 1-5 was assigned with one as the lowest and five as the highest.

Questions were clear and unbiased.

**Eligibility Criteria**

Fully matriculated undergraduate students across all study levels of any faculty could participate in the research. This excludes postgraduate, diploma, certificates and part-time students

**Statistical Analysis**

Data analysis was carried out using Statistical package for Social Sciences (SPSS) version 20 by IBM. Descriptive analyses were conducted to determine frequencies and proportions of categorical variables in the total study sample. Chi-square tests was used for associations between socio-demographic characteristics of respondents and their KAP to food hygiene. Multivariable logistic regression for estimating the probability of significant KAP variables. Two independent analysts were employed to reduce systematic errors.

**Ethical Considerations**

Information obtained from the study was handled confidentially. Ethical approval was obtained from the Health, Research and Ethical Committee of the University of Nigeria Teaching Hospital, UNTH, Enugu, Nigeria. Personal identifications of respondents were precluded from the study tool. Respondents were informed that their participation was voluntary with verbal consent obtained from all participants. Participants were assured of their rights to withdraw from the study at any point, if desired.

**RESULTS**

A total of 417 responses were received from the undergraduate students with a response rate of 100%. **Table** **1** showed that majority (73.4%) of the respondents were within the age range of 20-24 years of age with a mean age of 21.93±2.39. The respondents were predominantly Christians, (97.4%) and 98.1% were single. A large proportion (82.7%) of the respondents resides in the school hostels. Most (61.6%) of the respondents prepare the meals they consume.

***Table 1: Socio-demographic characteristics of the respondents (n=417)***

|  |  |  |
| --- | --- | --- |
| Socio-demographic variables | Frequency (n=417) | Percent |
| *Age in years* |  |  |
| *15 – 19* | 53 | 12.7 |
| *20 – 24* | 306 | 73.4 |
| *25 – 29* | 54 | 12.9 |
| *30 – 34*  | 4 | 1.0 |
|  *Mean ± SD = 21.93 ±2.39* |  |  |
| *Gender* |  |  |
| *Male* | 179 | 42.9 |
| *Female* | 238 | 57.1 |
|  |  |  |
| *Marital status* |  |  |
| *Married* | 6 | 1.4 |
| *Single*  | 409 | 98.1 |
| *Co-habiting* | 2 | 0.5 |
|  |  |  |
| *Religion* |  |  |
| *Christianity* | 406 | 97.4 |
| *Islam* | 4 | 1.0 |
| *Traditional Religion* | 3 | 0.7 |
| *Atheism* | 4 | 1.0 |
|  |  |  |
| *Faculty/Dept* |  |  |
| *Law*  | 101 | 24.2 |
| *Environmental* | 123 | 29.5 |
| *Management* | 198 | 46.3 |
|  |  |  |
| *Year of Study* |  |  |
| *1* | 44 | 10.6 |
| *2* | 70 | 16.8 |
| *3* | 79 | 18.9 |
| *4* | 162 | 38.8 |
| *5* | 62 | 14.8 |
|  |  |  |
| *Accommodation Type* |  |  |
| *School hostel* | 345 | 82.7 |
| *Off campus* | 72 | 17.3 |
|  |  |  |
|  |  |  |
| *Cooking habits* |  |  |
| *Purchase from vendors* | 111 | 26.6 |
| *Cooks their own food* | 257 | 61.6 |
| *Both* | 49 | 11.8 |

As can be inferred from **Table 2**, the majority of the respondents have good knowledge of food safety (97.4%) and most (98.3%) of the respondents were aware of food poisoning. A higher (57.8%) proportion of the respondents have never experienced food poisoning because most (64.7%) of them knew how to prevent food poisoning.

***Table 2: Level of Knowledge of Food Safety and Hygiene among the respondents (n=417)***

|  |  |  |
| --- | --- | --- |
| Variables  | Yes | No |
|  | *Freq (%)* | *Freq (%)* |
| *Awareness of food poisoning* | **410(98.3)** | **7(1.7)** |
| *Experienced food poisoning* | **176(42.2)** | **241(57.8)** |
| *Awareness of prevention of food poisoning* | **270(64.7)** | **147(35.3)** |
| *Using gloves while handling food reduces the risk of food contamination.* | **254(60.9)** | **163(39.1)** |
| *Food poisoning can have health and economic effects on the society.* | **394(94.5)** | **23(5.5)** |
| *Children, pregnant women and older individuals are more at risk of food poisoning.* | **326(78.2)** | **91(21.8)** |
| *Hand washing before cooking reduces the risk of food contamination.* | **405(97.1)** | **12(2.9)** |
| *Washing of hands after handling raw food prevents food-borne diseases.* | **346(83.0)** | **71(17.0)** |
| *Diarrhoea can be transmitted through contaminated food.* | **357(85.6)** | **60(14.4)** |
| *Micro-organisms can be found on the surface of human skin, nose and mouth of healthy handlers.* | **351(84.2)** | **66(15.8)** |
| *Personal hygiene can prevent food contamination.* | **398(95.4)** | **19(4.6)** |
| *Contaminated water can be a vehicle for food-borne disease transmission.* | **383(91.8)** | **34(8.2)** |
| *Storing raw and cooked food together can cause contaminate of food.* | **275(65.9)** | **142(34.1)** |
| *Food handler having diarrhoea, flu and sore throat can cross contaminate food* | **350(83.9)** | **67(16.1)** |
| *Leftover food smelling good is still safe to eat.* | **130(31.2)** | **287(68.8)** |
| *Dishing, serving and tasting food with unprotected hands can cross contaminate food* | **353(84.7)** | **64(15.3)** |
| *Unkept and dirty nails can easily spread bacteria* | **404(96.3)** | **13(1.7)** |
| *Uncovered abrasion or cuts on fingers and hands can cause cross contamination of food* | **372(89.2)** | **45(10.8)** |
| *Food-borne illness can be acquired from consumption of contaminated food.* | **401(96.2)** | **16(3.8)** |
| *Inadequate cooking of raw food like meat, chicken and vegetable can cause outbreak of food-borne illness.* | **368(88.2)** | **49(11.8)** |
|  |  |  |
| *Over all knowledge* | **Good**  | **Poor**  |
|  | **406(97.4)** | **11(2.6)** |

**NB:** Good = Yes; Poor = No and I don’t know

**Table 3** indicated that the majority (88.2%) of the respondents have a positive attitude to food safety however, only a meagre 17.3% believed that reheating food could cause cross contamination. All the respondents agreed that knowledge about food safety is important.

***Table 3: Attitude towards Food safety and Hygiene among the respondents (n=417)***

|  |  |  |
| --- | --- | --- |
| Variables | Positive  | Negative  |
|  | *Freq (%)* | *Freq (%)* |
| *Washing hands after going to the toilet prevents cross contamination* | **396(95.0)** | **21(5.0)** |
| *Knowledge about food safety is important to you* | **417(100.0)** | **0(0.00)** |
| *Consumption of expired food can cause food-borne illness* | **363(87.1)** | **54(12.9)** |
| *Defrosted food should not be frozen again* | **97(23.3)** | **320(76.7)** |
| *I do not worry about getting food poisoning from the food I eat* | **105(25.2)** | **312(74.8)** |
| *Cooking cutlery should be properly sanitised to prevent cross contamination* | **370(88.7)** | **47((11.3)** |
| *Food and personal hygiene training is important to you* | **390(93.5)** | **27(6.5)** |
| *Clean hand towels should be used to wipe hands after washing* | **375(89.9)** | **42(10.1)** |
| *Safe food handling is part of my responsibility* | **375(89.9)** | **42(10.1)** |
| *It is important to read food label before purchase* | **364(87.3)** | **53(12.7)** |
| *Reheating food could cause cross contamination* | **72(17.3)** | **345(82.7)** |
| *Proper cooking of food could prevent contamination* | **372(89.2)** | **45(10.8)** |
| *Eggs should be properly washed before cooking or frying* | **280(67.1)** | **137(32.9)** |
| *Frequent hand washing helps to prevent food-borne disease* | **373(89.4)** | **44(10.6)** |
| *Chopping different meat on the same cutting board should be avoided.* | **128(30.7)** | **289(69.3)** |
| *I believe good personal hygiene can prevent food borne illnesses* | **382(91.6)** | **35(8.4)** |
| *Food preparation areas must be cleaned before and after preparing food.* | **296(71.0)** | **121((29.0)** |
| *Towel used in the toilet can be used in the kitchen.* | **56(13.4)** | **361(86.6)** |
| *Towel used to clean food contact surfaces should be used to clean hands.* | **56(13.4)** | **361(86.6)** |
|  |  |  |
| Overall attitude  | **Positive**  | **Negative**  |
|  | **368(88.2%)** | **49(11.8)** |

**NB:** Positive = Agree, Strongly Agree and Neutral; Negative = Disagree and Strongly Disagree

**Table 4** specified that the majority (94.5%) of respondents exhibit good practice of food safety. Most (92.6%) of them wash their hands before and after cooking which is an important indicator of food safety practice in our environment. Washing of fruits and vegetables before consumption is a practice by 98.3% of respondents. 93.5% practice washing and rinsing of cutting boards, knives, and plates used for raw meat before using them for other foods. 95.7% report washing their utensils before beginning the cooking process while 71.0% responded positive to covering their wounds using bandage and using gloves.

Key gaps included consumption of food kept at room temperature for long periods (93.3%) and practices that can predispose to cross-contamination, (49.9%) which involved using the same cutting board for raw meat, poultry, seafood and vegetables.

***Table 4: Practice of Food safety and Hygiene among UNEC students (n=417)***

|  |  |  |
| --- | --- | --- |
| Variables | Correct  | Incorrect  |
|  | *Freq (%)* | *Freq (%)* |
| *Washing hands before and after cooking* | **386(92.6)** | **31(7.4)** |
| *Consumption of food kept at room temperature for long* | **389(93.3)** | **28(6.7)** |
| *Using hand to cover mouth while coughing or sneezing* | **377(90.4)** | **40(9.6)** |
| *Tasting and dishing out food with unprotected hands* | **298(71.5)** | **119(28.5)** |
| *Washing fruits and vegetables before eating* | **410(98.3)** | **7(1.7)** |
| *Reading labels with the use by and/or expiry date of packaged food before purchasing* | **371(89.0)** | **46(11.0)** |
| *Reading conditions for use and storage of packaged food* | **323(77.5)** | **94(22.5)** |
| *Washing eggs before cooking or frying them* | **417(100.0)** | **0(0.0)** |
| *Washing and rinsing cutting boards, knives, and plates used for raw meat before using them for other foods* | **390(93.5)** | **27(6.5)** |
| *Washing cooking utensils before beginning to cook* | **399(95.7)** | **18(4.3)** |
| *Wearing accessories like rings, bracelets when cooking food* | **156(37.4)** | **261(62.6)** |
| *Using an apron while cooking* | **95(22.8)** | **322(77.2)** |
| *Washing hands After counting money,* | **214(51.3)** | **203(48.7)** |
| *Using the same cutting board for raw meat, poultry, seafood and vegetables* | **208(49.9)** | **209(50.1)** |
| *Washing hands before handling raw foods* | **339(81.3)** | **78(18.7)** |
| *Washing hands after using the toilet* | **399(95.7)** | **18(4.3)** |
| *Covering cuts with bandage and using gloves* | **296(71.0)** | **121(29.0)** |
| *Storing left over food in the refrigerator* | **336(80.6)** | **81(19.4)** |
| *Protecting raw food from rodents and insect* | **392(94.0)** | **25(6.0)** |
| *Keeping short nails to ensure food safety* | **348(83.5)** | **69(16.5)** |
|  |  |  |
| Over all Practice  | **Correct**  | **Incorrect**  |
|  | **394(94.5)** | **23(5.5)** |

Regarding the association between the sociodemographic characteristics of the respondents and their KAP towards food safety, **Table 5** indicated that there was a statistically significant association between total knowledge score and religion (p=0.045) while other variables were not significant.

Logistic regression analysis showed that none of the sociodemographic variables was statistically significant to influence the overall knowledge or attitude towards food safety and hygiene among the respondents.

**Knowledge:** Religion - (AOR 0.253; 95% [CI: 0.029 – 2.166]); Faculty - (AOR 34000; 95% [CI: 0.000 – α]).

**Attitude:** Religion: (AOR 0.127; 95% [CI: 0.752 – 11.487]); Accommodation type (AOR 0.511; 95% [CI 0.195 – 1.336])

***Table 5: Association between socio-demographic characteristics of respondents and their knowledge, attitude and practice towards food safety and hygiene. (n=417)***

|  |  |  |  |
| --- | --- | --- | --- |
| **Variable** | **Overall knowledge** | Overall attitude | Overall practice |
|  | **Good** | **Poor** | ***χ2* test** | **p value** | **Positive** | **Negative** | ***χ2* test** | **p value** | **Correct** | **Incorrect** | ***χ2* test** | **p value** |
| **Age in years** |  |  |  |  |  |  |  |  |  |  |  |  |
| 15 – 19 | 51(12.6) | 2(18.2) | **2.711\*** | 0.438 | 49(13.3) | 4(8.2) | 1.644 | 0.650 | 52(13.2) | 1(4.3) | **2.023\*** | 0.568 |
| 20 – 24 | 300(73.9) | 6(54.5) | 268(72.8) | 38(77.6) | 288(73.1) | 18(78.3) |
| 25 – 29 | 51(12.6) | 3(27.3) | 47(12.8) | 7(14.3) | 50(12.7) | 4(17.4) |
| 30 – 34  | 4(1.0) | 0(0.0) | 4(1.1) | 0(0.0) | 4(1.0) | 0(0.0) |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Gender** |  |  |  |  |  |  |  |  |  |  |  |  |
| Male | 175(43.1) | 4(36.4) | 0.199\* | 0.656 | 158(42.9) | 21(42.9) | 0.000 | 0.992 | 165(41.9) | 14(60.9) | 3.199 | 0.074 |
| Female | 231(56.9) | 7(63.6) | 210(57.1) | 28(57.1) | 229(58.1) | 9(39.1) |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Marital status** |  |  |  |  |  |  |  |  |  |  |  |  |
| Married | 6(1.5) | 0(0.0) | **0.221\*** | 0.895 | 5(1.4) | 1(2.0) | **0.406\*** | 0.816 | 6(1.5) | 0(0.0) | 0.476 | 0.788 |
| Single  | 398(98.0) | 11(100.0) | 361(98.1) | 48(98.0) | 386(98.0) | 23(100.0) |
| Co-habiting | 2(0.5) | 0(0.0) | 2(0.5) | 0(0.0) | 2(0.5) | 0(0.0) |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Religion** |  |  |  |  |  |  |  |  |  |  |  |  |
| Christianity | 396(97.5) | 10(90.9) | 8.026 | **0.045\*\*** | 360(97.8) | 46(93.9) | 6.789 | 0.079 | 383(97.2) | 23(100.0) | 0.660 | 0.883 |
| Muslim | 3(0.7) | 1(9.1) | 2(0.5) | 2(4.1) | 4(1.0) | 0(0.0) |
| Traditional Religion | 3(0.7) | 0(0.0) | 3(0.8) | 0(0.0) | 3(0.8) | 0(0.0) |
| Atheist | 4(1.1) | 0(0.0) | 3(0.8) | 1(2.0) | 4(1.0) | 0(0.0) |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Faculty/Dept** |  |  |  |  |  |  |  |  |  |  |  |  |
| Law  | 94(23.2) | 2(18.2) | 6.665 | 0.083 | 84(22.8) | 12(24.5) | 2.204 | 0.531 | 90(22.8) | 6(26.1) | 3.744 | 0.299 |
| Environmental | 123(30.3) | 0(0.0) | 112(30.4) | 11(22.4) | 120(30.5) | 3(13.0) |
| Management | 189(46.5) | 9(81.8) | 172(46.8) | 26(53.1) | 184(46.7) | 14(60.9) |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Year of Study** |  |  |  |  |  |  |  |  |  |  |  |  |
| **1** | 42(10.3) | 2(18.2) | 3.525 | 0.620 | 39(10.6) | 5(10.2) | 4.683 | 0.456 | 39(9.9) | 5(21.5) | 10.065 | 0.073 |
| **2** | 70(17.2) | 0(0.0) | 62(16.8) | 8(16.3) | 70917.8) | 0(0.0) |
| **3** | 77(19.0) | 2(18.2) | 66(17.9) | 13((26.5) | 76(19.3) | 3(13.0) |
| **4** | 156(38.4) | 6(54.5) | 142(38.6) | 20(40.8) | 149(37.8) | 13(56.5) |
| **5** | 58(15.0) | 1(9.1) | 59(16.0) | 3(6.1) | 60(15.3) | 2(8.7) |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
|   |  |  |  |  |  |  |  |  |  |  |  |  |
| **Accommodation Type** |  |  |  |  |  |  |  |  |  |  |  |  |
| School hostel | 336(82.8) | 9(81.8) | **0.007\*** | 1.000 | 301(81.8) | 44(89.8) | 1.939 | 0.164 | 326(82.7) | 19(82.6) | 0.000 | 0.987 |
| Off campus | 70(17.2) | 2(18.2) | 67(18.2) | 5(10.2) | 68(17.3) | 4(17.4) |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Cooking habits** |  |  |  |  |  |  |  |  |  |  |  |  |
| Cook own food | 108(26.6) | 3(27.3) | 0.077 | 0.962 | 97(26.4) | 14(28.6) | **1.453\*** | 0.484 | 103(26.1) | 8(34.8) | 3.978 | 0.137 |
| Vendor | 250(61.6) | 7(63.6) | 230(62.5) | 27(55.1) | 247(62.7) | 10(43.5) |
| Both | 48(11.8) | 1(9.1) | 41(11.1) | 816.3) | 44(11.2) | 5(21.7) |

***\*\*= significant p-value χ2= chi-square value***\*= significant chi-square value

Gender was the only statistically significant variable in influencing good food safety practice as outlined in **Table 6**. Being a male influences good practice of food safety about 2.5 times more than being a female. Male: (AOR 2.5; 95% [CI: 1.256 – 4.969]). Other sociodemographic variables were not statistically significant to influence the overall good practice towards food safety among the undergraduates. Year of study: (AOR 0.576; 95% [CI: 0.196 – 1.098]); Cooking habits (Vendor AOR 0.1.463; 95% CI: [0.453 – 4.722])

***Table 6: Determinants of practice (Logistic regression for practice)***

|  |  |  |  |
| --- | --- | --- | --- |
| **Variable** |  |  | **95% CI for AOR** |
|  | **AOR** | **Sig** | **Lower** | **Upper** |
| **Gender**  |  |  |  |  |
| Male Female  | 2.4981 | 0.009\* | 1.256 | 4.969 |
| **Year of study**  |  |  |  |  |
| 1-3 | 0.576 | 0.080 | 0.196 | 1.098 |
| 4-5 | 1 |  |  |  |
| **Cooking habits**  |  |  |  |  |
| Vendor  | 1.463 | 0.524 | 0.453 | 4.722 |
| Self-cooking  | 2.807 | 0.071 | 0.915 | 8.606 |
| Both  | 1 |  |  |  |

**Sig <0.05**

**DISCUSSION**
In this our cross-sectional survey of KAP of food safety and hygiene among undergraduate students in UNEC, overall, 97.4% had good knowledge, 88.2% had positive attitudes, and 94% had good food safety practices.

It is noteworthy that the respondents were predominantly 20–24 years old (73.4%), with a mean age of 21.93 ± 2.39 years, and 57.1% were female, mirroring gender distributions seen in Kuwait.[6] Nearly all (82.7%) lived on campus and 61.6% purchased food from campus vendors.
The students exhibited an encouraging knowledge level on food safety, in contrast to reports of poor awareness in Ethiopia,[11] Kuwait,[6] Lebanon,[15] and Kenya.[7] Hand-washing was almost universally recognized (97.1%) as a preventive measure. The co-habitation with health-science peers in school hostels may have amplified this high score. No significant relationship emerged between age and knowledge (p=0.438), consistent with findings in Bulgaria,[16] although older students in Canada[5] and Spain[17] have outperformed younger cohorts elsewhere. Similarly, gender (p=0.656), year of study (p=0.652), and accommodation (p=1) bore no significant effect, whereas a modest but significant link with religion (p=0.045) likely reflects the Christian majority.
It was reassuring to note that 88.2% of respondents held correct attitudes toward food hygiene. This diverges from findings in Kuwait[6], Bulgaria[16], Malaysia[18], and Saudi Arabia,[19], where high knowledge did not translate into positive attitudes. Over half agreed on the critical role of hand washing, contrasting sharply with Ethiopian students.[11]
A robust 94% achieved good practice scores, in line with Bulgaria,[16] and Palestine,[20] but far above the low scores reported in Ethiopia[11] and the USA.[13] Though no significant gender correlation was found here (r=0.074), other settings — Lebanon,[15] Kuwait,[6] the USA, [13] Ethiopia,[11,21] and Canada[5,22] — have shown females practicing more safely. Age, study level, marital status, and faculty likewise had no obvious impact. Notably, 49.9% saw no harm in using the same cutting board for raw meat, poultry, seafood and vegetables at the same time — a practice that may elevate microbial cross-contamination risks. It is alarming that consumption of food kept at room temperature for long periods (93.3%) was the norm.

Logistic regression identified male gender as the sole significant predictor of good practice (AOR 2.5; 95% [CI: 1.256–4.969]). Other sociodemographic variables did not reach statistical significance, suggesting that targeted interventions should focus on bridging the gender gap in food safety behaviours.

**Strengths and Limitations**

The strength of this study is that we were able to use a pre-tested, structured questionnaire which exhausted assessments on knowledge, attitude and practice on food safety among university students at UNEC. The multi-stage, random sampling frame allowed for greater representativeness while the 100% response rate further strengthens our prevalence estimates.

The study had several limitations. First, the study was conducted on only one campus of the university, which might affect generalizability to other universities in the region and the whole country, secondly the study did not comprise the qualitative component. Lastly, self-reporting of food safety knowledge, attitude, and practice may not reflect students’ actual food safety knowledge, attitude, and practices due to non-response, recall bias and social desirability bias.

**CONCLUSION**

The respondents demonstrated high levels of food‐safety knowledge (97.4%), which was reflected in their positive attitudes (88.2%) and strong self‐reported practices (94.5%). However, 38.3% still rely on external food vendors and 42.2% have experienced at least one episode of food poisoning, suggesting that perceived and actual behaviours may diverge. Religion was modestly associated with knowledge (p = 0.045), and male gender independently predicted better practice (AOR 2.5; 95% [CI: 1.256–4.969]). Key gaps identified were consumption of food kept at room temperature for long periods (93.3%) and using the same cutting board for raw meat, poultry, seafood and vegetables (49.9%).

Though the overall KAP scores here are high and encouraging, these findings underscore that there is still need to embed mandatory, hands-on food-safety modules within the curriculum across all levels of education and to scale up multimedia food hygiene campaigns to bridge the gap between awareness and everyday behaviour.

**DISCLAIMER (ARTIFICIAL INTELLIGENCE)**

Author(s) hereby declares that no generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

**ETHICS APPROVAL AND CONSENT TO PARTICIPATE**

Ethical clearance was obtained from the Health, Research and Ethical Committee of the University of Nigeria Teaching Hospital, UNTH, Enugu, Nigeria.

**AVAILABILITY OF DATA AND MATERIAL**

Additional data from the research project could be made available by the author on request.

**CONSENT FOR PUBLICATION**

Participation was voluntary, and the purpose of the research was explained to each respondent. Informed consent was obtained before inclusion into the study and also anonymity of participants was ensured.

**COMPETING INTERESTS DISCLAIMER:**

Authors have declared that they have no known competing financial interests OR non-financial interests OR personal relationships that could have appeared to influence the work reported in this paper.

**REFERENCES**

1. World Health Organization (WHO). WHO estimates of the global burden of foodborne diseases: Foodborne disease burden epidemiology reference group 2007-2015. Genève, Switzerland: World Health Organization; 2016. <https://www.who.int/health-topics/foodborne-diseases#tab=>
2. Food and Agriculture Organization. Climate change: Unpacking the burden on food safety. Rome, Italy: Food & Agriculture Organization of the United Nations (FAO); 2020. <https://doi.org/10.4060/ca8185en>
3. Morris JG Jr. How safe is our food? Emerg Infectious Diseases. 2011;17(1):126–8. <http://dx.doi.org/10.3201/eid1701.101821>
4. Osaili TM, Al-Nabulsi AA, Taybeh AO. Food safety knowledge, attitudes, and practices among Jordan universities students during the COVID-19 pandemic. Front Public Health. 2021; 9:729816. <http://dx.doi.org/10.3389/fpubh.2021.729816>
5. Courtney SM, Majowicz SE, Dubin JA. Food safety knowledge of undergraduate students at a Canadian university: results of an online survey. BMC Public Health. (2016) 16:1–16. <10.1186/s12889-016-3818-y>
6. Ashkanani, Fatemah, Husain, Wafaa, A Al Dwairji, Maryam, Assessment of Food Safety and Food Handling Practice Knowledge among College of Basic Education Students, Kuwait, *Journal of Food Quality*, 2021, 5534034, 10 pages, 2021. <https://doi.org/10.1155/2021/5534034>
7. Imathiu, Samuel. Assessment of Food Safety Knowledge, Beliefs and Attitudes of Undergraduate Students at a Kenyan University: Results of an Online Survey. European Journal of Agriculture and Food Sciences. 2020; 2(4):85. [10.24018/ejfood.2020.2.4.85](https://doi.org.10.24018/ejfood.2020.2.4.85)
8. Omotayo, S.K. (2012). Food safety and hygiene practices of food vendors on Obafemi Awolowo University Campus, Ile Ife, Nigeria. <https://ir.oauife.edu.ng/handle/123456789/4296>
9. Ofuebe JI. Food Hygiene Practices Among Food Vendors in University of Nigeria Nsukka Campus: Implication for Consumer Protection. IJoHKHE. 2023;1(1). <https://journals.aphriapub.com/index.php/IJoHKHE/article/view/2302>
10. STOP Cholera: Strengthening Water, Sanitation and Hygiene (WaSH) in Nigeria. 2022. Nigeria Centre for Disease Control and Prevention (NCDC)
11. Azanaw J, Dagne H, Andualem Z, Adane T. Food safety knowledge, attitude, and practice of college students, Ethiopia, 2019: A cross-sectional study. Biomed Res Int. 2021:6686392. Available from: <https://www.hindawi.com/journals/bmri/2021/6686392/>
12. Masiku, Gt.T., Mwijage, K.F., Ryoba, N.L. et al. Knowledge, attitude, and food safety practices among university students in Kilimanjaro region, northern Tanzania. Discov Public Health 2024; 21(136) . <https://doi.org/10.1186/s12982-024-00252-4>
13. Green E. J. and Knechtges P. L., Food safety knowledge and practices of young adults, Journal of Environmental Health. 2015; 77(10):18–24. Available from: <https://pubmed.ncbi.nlm.nih.gov/26058218/>
14. Islam, M. N., Hassan, H. F., Amin, M. B., Madilo, F. K., Rahman, M. A., Haque, M. R., Aktarujjaman, M., Farjana, N., & Roy, N. Food safety and handling knowledge and practices among university students of Bangladesh: A cross-sectional study. Heliyon, 2022; 8(12), e11987. <https://doi.org/10.1016/j.heliyon.2022.e11987>
15. Hassan HF, Dimassi H. Food safety and handling knowledge and practices of Lebanese university students. Food Control [Internet]. 2014; 40:127–33. Available from: <http://ssu.ac.ir/cms/fileadmin/user_upload/Mtahghighat/tfood/asil-article/a-z/Food-safety-and-handling-knowledge-and-practices-of-Lebanese-university-students_2014_Food-Control.pdf>
16. Stratev D, Odeyemi OA, Pavlov A, Kyuchukova R, Fatehi F, Bamidele FA. Food safety knowledge and hygiene practices among veterinary medicine students at Trakia University, Bulgaria. J Infect Public Health [Internet]. 2017 [cited 2022 Jan 22];10(6):778–82. Available from: <https://pubmed.ncbi.nlm.nih.gov/28188117/>
17. Garayoa R, Córdoba M, García-Jalón I, Sanchez-Villegas A, Vitas AI. Relationship between consumer food safety knowledge and reported behavior among students from health sciences in one region of Spain. J Food Prot. 2005;68(12):2631–6. Available from: <http://dx.doi.org/10.4315/0362-028x-68.12.2631>
18. Abdul-Mutalib N-A, Abdul-Rashid M-F, Mustafa S, Amin-Nordin S, Hamat RA, Osman M. Knowledge, attitude and practices regarding food hygiene and sanitation of food handlers in Kuala Pilah, Malaysia. Food Control. 2012; 27(2):289–93. <http://www.ssu.ac.ir/cms/fileadmin/user_upload/Mtahghighat/tfood/asil-article/amuzesh-Behdasht->Ghaza/Knowledge\_\_attitude\_and\_practices\_regarding\_food\_hygiene\_and\_sanitation\_of\_food.pdf
19. Sharif L, Al-Malki T. Knowledge, attitude and practice of Taif University students on food poisoning. Food Control. 2010; 21(1):55–60. <http://dx.doi.org/10.1016/j.foodcont.2009.03.015>
20. Zyoud S, Shalabi J, Imran K, Ayaseh L, Radwany N, Salameh R, et al. Knowledge, attitude and practices among parents regarding food poisoning: a cross-sectional study from Palestine. BMC Public Health. 2019;19(1):586. <http://dx.doi.org/10.1186/s12889-019-6955-2>
21. Mekasha T, Neela S, Kumela D. Food safety knowledge, practice and attitude of food handlers in traditional hotels of Jimma Town, southern Ethiopia. Annals Food Science and Technology. 2016; 17(2):507–17.
22. Nesbitt A, Majowicz S, Finley R, Marshall B, Pollari F, Sargeant J, et al. High-risk food consumption and food safety practices in a Canadian community. J Food Prot. 2009;72(12):2575–86. Available from: <https://pubmed.ncbi.nlm.nih.gov/20003742/>