



Assessing the Knowledge, Behavior and Practices of Food Safety and Hygiene among Saudi Women in Eastern Province, Saudi Arabia

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Authors' contributions

This work was carried out in collaboration among all authors. Author FAB designed the study and wrote the first draft of the manuscript. Author WAA corrected the grammar and language and managed the literature review. Author AMG performed the statistical analysis and edited the review. All authors read and approved the final manuscript.

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ABSTRACT

Background: Unsafe food is a serious concern for human health and well-being and has surfaced as a burning issue worldwide.

Aims: The present work was aimed at assessing the awareness, behavior and practices of food safety and hygiene among Women in Eastern region of Saudi Arabia.

Methodology: A comprehensive questionnaire was designed for collecting required data. The questionnaire comprised mainly of three questions pertaining to food safety issue like (1) knowledge and attitude of food handling (buying, storage and serving food), (2) behavior and practices, (3) food safety knowledge & awareness. The data were analyzed for descriptive, frequency distribution and percentages using SPSS software.

Results: Findings indicated that 40% of the women purchased their foods and needs on weekly basis with high rate for the chicken (67.7%) and meat (57.9%), while 26.4% “weekly” utilize or cook vegetables and fruits. 96.2%, 97.4% and 98.3% of the women “always” washed their hands after touching raw chicken/meats and fish, while 48.9% utilized separate cutting boards/knives for raw chicken/meat and fish. However, 89.8% of respondent female rinse cutting boards, knives and plates used for chicken/meats and fish before using them for other food. Only 22.6% of the women “always” checked their fridge temperature (4°C), while 28.1% and 23.4% of the female believed that it was “safe” to leave hot or cold foods out of the fridge for more than 4 hours, respectively. 60% of women believed that it was safe practices to thaw food outside the fridge.

Conclusion: Majority of the women in Eastern region (>90%) were well aware of food safety and wash their hands, cutting boards, knives and plates. However, about 25% of the respondent’s female believed that it was “safe” to leave hot/cold foods out of the fridge for more than 4 hours, while 60% believed it was “safe” to defrost frozen foods outside the fridge.

Keywords: Food safety; food hygiene; knowledge; food borne illness; Saudi woman.

1. INTRODUCTION

Health is strongly connected to the food. So what you eat will actually affecting your health. Depending on that the food needs to follow the safety process from farm to fork. Thus, what is food safety? Food Safety (FS) is a wide term can cover many terms such as handling, storing as well as preparing foods to preventing or managing the infections related to the improper food safety and to provide a healthy diet that maintain the health of the community [1].

Furthermore, Food Hygiene referred to the measures and procedures that needs to ensure the quality of food safety from the first step (production) to the final step (consumption). Food hygiene can indicate to the contamination of food at any point of food safety line. In facts, the improper hygiene can lead to sever medical conditions it may result to death [2]. Unsafe food consumption can leading to many health problems that burdened the governments, organizations and health sectors. Now a days, many health organizations and sectors trying to doing their best to improve the safety and hygiene of foods. However, the occurrence of foodborne disease remains a health problem issue in most countries.

Previous and recent studies showed us widely informative information about the challenging on the food safety as well as the differences on the knowledge between people about food safety which can affect the community health. Poor knowledge, personal and environmental hygiene contributed significantly to food contamination and resultant foodborne diseases. In addition, improper handling and distribution of food as well has a potential effect [3]. Furthermore, the lack of knowledge and awareness of food safety can

lead to improper behavior of food handling, storage, processing and consumption of food that lead to many concerns about food borne illness and other diseases [4]. It has been reported that in many studies the lack of food safety knowledge and practices among the food handlers have been associated with highest percentage of foodborne diseases transmission [5-8]. And this can pose a significant public health problem. Moreover, according to WHO, the percentage of food borne illness is increasing for about 30% in many countries, specially industrialized countries [9]. However, previous studies mentioned that health and disease-related factors have correlation to food, attitude, knowledge, and practice [10].

2. MATERIALS AND METHODS

2.1 Research Design

2.1.1 Selection of respondents and data collection

A total of 230 subjects characterized Saudi females who’s responsible for preparing, helping and consuming of foods, aged from 18 and over, who living in Eastern province (Qatif, Dammam, Khobar), and agree to participant, were selected randomly and let them answering the questionnaire. But the subjects who did not meet the criteria were excluded.

Structured questionnaire given to the respondents to complete the data by their own, previously their given a consent form. The questionnaire method is popular for collecting data with fewer prices and time less. The method adopted from Turnbull-Fortune and Badrie, [11]. The questionnaire modified to be more suitable for study aim. However, the time for completion

the questionnaire ranged from 10 to 15 minutes. The questionnaire was considered many subsides that include Demographic status which includes: age, gender, economic status, educational level and householder.

The second part had the list of questions asked about food buying, habits, preparation and attitudes, that includes five questions about food shopping and preparation. The question usually includes 5 choices (everyday, weekly or more often, monthly or more often, less than monthly, and never). The third part consisted of 12 questions regarding food safety behavior and practices, which asking about the safety during handling and preparation in the kitchen. The question include 5 choices (always, most of the time, sometimes, rarely, and never). The fourth part had 6 questions regarding food safety knowledge and 5 questions were asked about safety awareness. The question include 3 choices (safe, neither safe or nor unsafe, and unsafe). The correct answer of the safety knowledge and awareness were given a score of 1 and the incorrect answer as 0. In the knowledge part, people who scored below 50th percentile of highest score were having poor knowledge, 50th-75th percentile - fair knowledge, >75th percentile - good knowledge. In the awareness part; people who scored below 50th percentile were following poor practice, 50th-75th percentile- fair practice, >75th percentile - good practice.

2.2 Ethical Consideration

The study was approved by *Institutional Review Board* – (IRB — 2018-03- 274) in Imam Abdulrahman bin Al- Faisal University – Dammam, Saudi Arabia.

- As volunteers giving all of the information about objectives with procedures of the study.
- They must write all the sources of the authors that used in each part of the study.
- Discriminating, degrading, and hard language, all of these clearly effectors shouldn't contain on the questionnaire.
- Any personal questions should be avoided or excluded from the questionnaire, and it should be collect the general information depending on the research questions.
- Each participant will be asked to sign a formal consent, which clarify the study that will be carried, patients refuse to sign will be excluded.

- A clear description of any benefits and risks associated with participation.

Present study materials in a form that can be well understood by the respondent.

2.3 Study Area

This is a cross-sectional study, was conducted on Saudi Adult females by survey distribution from December, 2018 to February, 2019 in Eastern province of Saudi Arabia which include (Qatif, Dammam, and Khobar). The sample size was calculated based on the precision of a study and proportional representation.

The sample size was calculated according to the following equation:

$$Z^2 * p * (1-p) / (c^2) [12].$$

Where: Z = Z value (e.g. 1.96 for 95% confidence level) P = expected prevalence (6.57%) (General Authority for Statistics, KSA, 2016) C = confidence interval, expressed as decimal, e.g. (0.05 = ± 5)

$$\begin{aligned} \text{Sample Size (SS)} &= \frac{3.84 \times 45 \times (100-45)}{25} \\ &= 380 \text{ subjects} \end{aligned}$$

The prevalence of adolescents is about = 45%, so the final total sample 209 subjects (Stats.gov.sa, 2018). The sample size will be 209 subjects plus 10% to overcome incomplete data or withdrawal subjects during the study. Finally, the total number will be 230 subjects.

2.4 Validity and Reliability Form of Questionnaire

Questionnaire was validated and reliable depend on the study under the title of "Practice, Behavior, Knowledge and Awareness of Food Safety among Secondary & Tertiary Level Students in Trinidad, West Indies". Authorized by Susan Turnbull-Fortune and Neela Badrie. published in 2014 jul,13 by journal of Food and Nutrition Sciences [11].

2.5 Data Processing and Analysis

The data were analyzed using SPSS version (23) for descriptive, frequency distribution and percentages.

3. RESULTS AND DISCUSSION

3.1 Food Buying Habits, Preparation and Attitudes

A total of 235 females in this cross-sectional study responded to well-designed questionnaires to measure self-knowledge about food safety, procurement, habits, preparations and attitudes (Table 1). In the responses of shopping, there was a preference for buying foods on a weekly basis, with 40% of females, and (70.25%) of these were females in age (18-33Y), 22.25% mid-age (34-44Y) and 7.5% for above 45-year-old (Fig. 1). The same results showed in the Turnbull-Fortune and Badrie study [11], who reported that a 42% of the females' preference purchasing foods weekly. While 38.3% of the respondents (n = 90) are purchasing their food on a monthly basis. This shows that, the most frequency of food shopping is weekly. While, they prepare, handle, or cooked raw food such as meats, chicken, fish, fruits & vegetables showed different practices on a day or a week basis. The most frequencies practices of chicken on a week basis is 67.7%, followed by meat 57.9% and fish 50.2%, while 61.7% for fruits & vegetables were observed on every day. However, 12.8% of respondents women (n =30) they never prepare, handle, or cooked raw fish, 6.0% (n=14), for both meat and chicken and 5.5% of for fruits & vegetables.

3.2 Food Safety Behavior and Practices

As shown in Table 2, the analysis of food safety behavior and practices showed that 96.2% of respondent's women wash hand after touching raw chicken, 97.4% after touching raw meats and 98.3% after touching raw fish. Most of participants they are always washing hands after touching raw meat (chicken, fish and red meat) which indicate good behavior and positive practices among respondents, and this finding agreed with Turnbull-Fortune and Badrie [11] report that 81% of female, 38% female and 49% male answers they are always wash hand after touching raw chicken, raw meat or fish respectively. Moreover, the analysis showed that, 48.9% of female always use separate cuttings boards or knives for just raw chicken meat, while 21.7% of female they never using cutting boards or knives for just raw chicken meat. This is line with Moreb, et al. [13]. Report that 51.2% for response report they always use sparest of the chopping board for raw meat and fresh fruit. As

well as, Turnbull-Fortune and Badrie, [11] report that 33% female and 24% male they are always use individual cutting board and knife for easy food type. But the opposite finding shown the Indian students didn't use a separate cutting board. The total percentage for females who always rinse cutting boards, knives and plates used for raw chicken before using them for other food 89.8% which indicted to good practice, [14]. In investigation regarding leaving hot and cold foods at room temperature for more than 4 hours, (43.9%) females rarely leaving cold foods at room temperature for more than 4 hours as the same percentage for never. On the other hand, (72.8%) females, they were responded that they never leaving hot foods at room temperature for more than 4 hours. As the same results shown in result by Turnbull-Fortune and Badrie, [11] 37% of response there are sometime leave cold food out of fridge for more than 4 hr. Redmond and Griffith [15] belief this practice can affect the behavior of the person. 40.9% of females sometimes back cooked meat to the same plate before cooking, unsafe behavior appeared here. This finding agreed with Kraus [16] which believing how much the behavior can affect the safety of food. Furthermore, in responses to defrost frozen foods outside the fridge always with 31.5% female, 72.9% aged group from 18-33 Y/O, 24.3% aged from 34-44 Y/O and 2.70% more than 45 Y/O. otherwise, the defrosting foods outside of the fridge increase the contamination chance. This result can observe low education regarding safety. On the other hand, in the study NWC Research-2006 [17] showed the opposite finding, they represented the 15% responding always, 33% sometimes, 19% never. Responses of cleaning the fridge 41.7% female always clean the fridge. This is good practice for preventing contamination and observes good understanding about the cleaning behavior. In another research, they reported the general cleaning about the serving area and eating area utensils is good practice and indicating to good understanding and knowledge about cleaning [17]. 23.4% in responding to check the fridge temperature (4°C) with never. This finding was supported by AL-Sahbib, Husain and Khan [18], they observe that majority of response was 61.8% never chick the fridge temperature. However, in the refrigerator, store raw meat, poultry and seafood below cooked or ready to eat food, the most respondents with 58.7% saying never. And this practice is high in 33.33% aged group 18-25 Y/O. This shows good practice for preventing cross contamination. WHO reported the good

practice can prevent the all shapes of contamination [19].

3.3 Food Safety Knowledge and Awareness

The investigation of the knowledge of food safety (Table.3) showed the knowledge about washing hand before touching, handling, and preparing food was mostly reported correct answer as “safe” with 94.9% of female in aged 18-25 Y/O. This result is in cross with Gong et al. [20], which showed the respondents not washing their hands before preparing food and they have poor knowledge about safety regarding to the washing hand before handling, touching and preparing food. On the other hand, AL-Sahbib, Husain and Khan [18], reported that there was a significant relationship between washing hand before handling food and reduce contamination. However, the data of this study showed the knowledge about the safety after touching raw chicken meat, or fish was mostly reported as “safe” with 96.3% female. This finding reported highly knowledge about the safety after touching raw chicken meat, or fish. Support that NWC Research-2006 [17] access the knowledge about washing hand after thought raw meat, the result found 66% of sample they though wash hand after thought meat and fish is safe. Furthermore, the knowledge of separating cutting board of knife for raw chicken or meat in this study also reported as “safe” with 89.8% female, most of them 70.14% aged from 18-33 Y/O, 24.17% aged from 34-44 Y/O, and 5.21% above 45Y/O.

Highly knowledge about the separating cutting board of knife for raw chicken or meat showed in this study especially in age group 18-33 Y/O. This result was line with NWC Research-2006 [16] which reported 50% from the respondents choose safe. Another study showed different results which mentioned that, when the respondents ask about the practice of cutting board of knife for raw chicken or meat, they were belief that is unhygienic practice with 99.6% [20]. The investigation about the knowledge for leaving hot and cold food in room temperature, 46.8% and 44.3% of the respondents felt that it was unsafe for good practice in food safety. Support the result Naeem et al. [21] 74.5% of participant report than leaving hot food at room temperature for more than 4 hr., unhygienic practice .The same result report by NWC Research-2006 [17], 48% of response thought leave hot Or cold foods at room temperature for more than 4 hours unsafe, Likely to see the good knowledge about the safety of leaving cold foods at room temperature for more than 4 hrs. These finding is in a line with Turnbull-Fortune and Badrie, [11] findings. The results supporting the finding in this study and reporting that, there was highly knowledge about food safety after touching raw meat, separating board, leaving hot and cold in room temperature more than 4 hrs. The last question is about the knowledge about defrosting frozen foods outside the fridge, and the most likely answers “safe” with 60%.support by NWC Research-2006 [16] reported 31% of respondents answered safe.

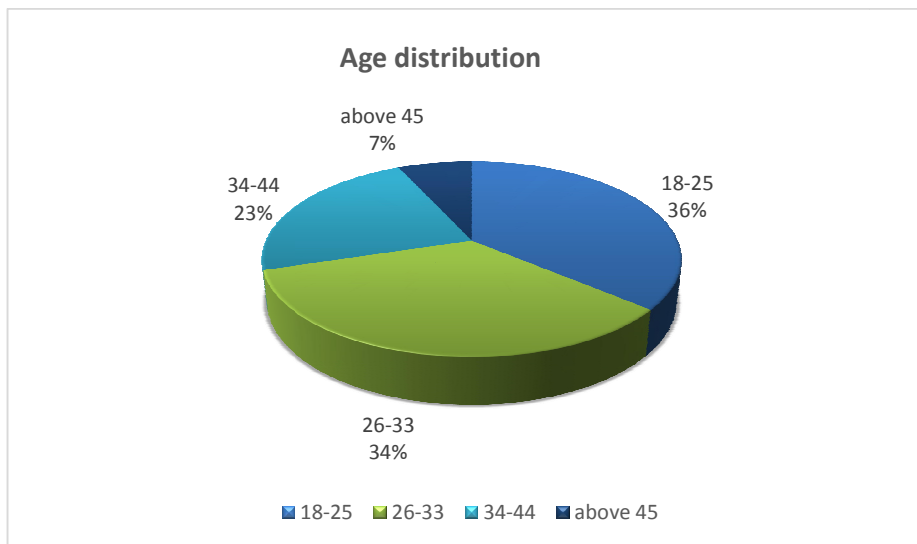


Fig. 1. Distribution of respondent’s ages

Table 1. Respondents' practices on food buying, habits, preparation & attitudes

Self-reported on food buying, habits, preparation & attitudes	Summary statistics. no. (%)					Total
	Every day	weekly or more often	monthly or more often	less than monthly	Never	
Food Shopping	26(11.1%)	94(40.0%)	90(38.3%)	22(9.4%)	3(1.30%)	235(100%)
How often do you prepare, handle or cook raw chicken?	41(17.4%)	159(67.7%)	18(7.7%)	3(1.3%)	14(6.0%)	235(100%)
How often do you prepare, handle or cook other raw meats?	11(4.7%)	136(57.9%)	52(22.1%)	22(9.4%)	14(6.0%)	235(100%)
How often do you prepare, handle or cook other raw fish	8(3.4%)	118(50.2%)	43(18.3%)	36(15.3%)	30(12.8%)	235(100%)
How often do you prepare, handle or cook other raw vegetables or Fruits?	145(61.7%)	62(26.4%)	15(6.4%)	10(4.3%)	13(5.5%)	235(100%)

Table 2. Respondents' practices on food safety behavior & practices

Self-reported on food safety behavior & practices	Summary statistics. no. (%)					Total
	Always	Most of time	Sometimes	Rarely	Never	
Wash your hands after touching raw chicken	226(96.2%)	7(3.0%)	0.0	2(0.9%)	0.0	235(100%)
Wash your hands after touching raw meats	229(97.4%)	5(2.1%)	0.0	1(0.4%)	0.0	235(100%)
Wash your hands after touching raw fish	231(98.3%)	3(1.3%)	1(0.4%)	0.0	0.0	235(100%)
Use separate cuttings boards or knives for just raw chicken /meat and fish	115(48.9%)	35(14.9%)	23(9.8%)	11(4.7%)	51(21.7%)	235(100%)
Rinse cutting boards, knives and plates used for raw chicken before using them for other food	211(89.8%)	14(6%)	2(0.9%)	0.0	8(3.4%)	235(100%)
Leave cold food room temperature out of the fridge for more than 4 hours	17(7.2%)	21(8.9%)	73(31.1%)	82(34.9%)	82(34.9%)	235(100%)
Put cooked meats back into the same plates used to store raw meats without washing them first	15(6.4%)	46(19.6%)	96(40.9%)	43(18.3%)	35(14.9%)	235(100%)
Leave hot foods at room temperature out of the fridge for more than 4 hours	7(3%)	12(5.1%)	19(8.1%)	26(11.1%)	171(72.8%)	235(100%)
Defrost frozen foods outside the fridge	74(31.5%)	60(25.5%)	14(6%)	14(6%)	33(14%)	235(100%)
I used to clean the fridge	98(41.7%)	67(28.5%)	57(24.3%)	9(3.8%)	4(1.7%)	235(100%)
I used to check the fridge temperature (4oC)	53(22.6%)	44(18.7%)	34(14.5%)	34(14.5%)	55(23.4%)	235(100%)
In the refrigerator, store raw meat, poultry and seafood below cooked or ready to eat food	18(7.7%)	11(4.7%)	35(14.9%)	33(14%)	138(58.7%)	235(100%)

Table 3. Food safety knowledge (N = 235)

Self-reported on food safety knowledge, based on the question response to safe, unsafe, no response	Summary statistics			
	Safe	Not sure	Unsafe	Total
Wash your hands before handling food and often during food preparation	233(94.9%)	8(3.4%)	3(1.3%)	235(100%)
Wash your hands after touching raw chicken meat, or fish	231(96.3%)	2(0.9%)	2(0.9%)	235(100%)
Use separate cuttings boards or knives for just raw chicken meat	211(89.8%)	22(9.4%)	2(0.9%)	235(100%)
Leave hot foods out of the fridge for more than 4 hours	66(28.1%)	59(25.1%)	110(46.8%)	235(100%)
Leave cold food out of the fridge for more than 4 hours	55(23.4%)	76(32.3%)	104(44.3%)	235(100%)
Defrost frozen foods outside the fridge	141(60%)	53(22.6%)	41(17.4%)	235(100%)

Table 4. Responses to food safety awareness (N = 235)

Food safety awareness	Yes	No
	n (%)	n (%)
Can you remember, seeing, hearing or reading any information about food safety?	166(70.6%)	69(29.3%)
Can you remember, seeing, hearing or reading any information about food poisoning	173(73.6%)	62(26.4%)
Do you know many food poisonings could be resulted from lack of food safety and hygienic practices?	229(97.4%)	6(2.6%)
Do you feel that you fully understand all the issues surrounding the safe buying, transporting, serving and storing food?	115(48.9%)	120(51.1%)
Have you ever had any formal training in food safety or food preparation?	43(18.3%)	192(81.7%)

The last finding on this article is about self-reported on food safety awareness (Table 4), showed in the first and second questions, > 70% of the respondents had heard or read information about food safety and food poisoning. These results indicate that most of the respondents had a good awareness about food safety and food poisoning information. The following question was to know the respondent's awareness about food poisoning could be resulted from lack of food safety and hygienic practices and the results reported 97.4% of respondents believe and know that. So this finding show us most respondents were aware of the hazard regarding unsafety of food such poisoning. However, the respondents of 48.9% felt that they were fully understand all the issues surrounding the safe buying, transporting, preparing, cooking, serving and storing food. These results illustrate that almost about 50% of respondents feel that they fully understand how to practice food safety properly at all stages of food production. This finding supported by urnbull-Fortune and Badrie, [11]. Which find that,

the respondents have aware about food safety and hygiene. Finally, the last question was training in food safety or food preparation? Interestingly, more than 80% of the respondents did not attend or receive any workshop or training on food safety and this appear how food safety practices and workshops were ignore and most people feel of uninterested regarding present on this area of education which supporting that food safety practices still not having enough education for public regarding their important of the community.

4. CONCLUSION

A total of 235 women in this cross-sectional study responded to questionnaires to measure self-knowledge about food safety knowledge and awareness, attitude and practices, as well as food buying practices, preparation and services. Most women (>80%) have almost good knowledge and awareness, with >90% had a good practice of handwashing, cutting boards washing, knives and plates. However, 28.1% and

23.4% of the respondent's female believed that it was "safe" to leave hot/cold foods out of the fridge for more than 4 hours, respectively; while 60% believed it was "safe" to defrost frozen foods outside the fridge. The strengths of this study is that the authors clearly observed, the honesty regarding the woman answers, the age group which is suitable to the study aim and questions in the questionnaire, easy to assess to the females, low cost regarding this study. One of the limitation of this study is the sample size is limited in the number; in future we should to makes into account other cities in Eastern Province. On the other hand, the self-reported studies usually leading to over estimation to the self-correct practice. Further studies in this field are recommended.

CONSENT

Authors have declared that written informed consent was obtained from the participants.

ETHICAL APPROVAL

Authors hereby declare that the questionnaire and the study were approved by the committee of Institutional Review Board (IRB) "No. IRB 2018-03- 274" in Imam Abdulrahman Bin Faisal University (IAU), Dammam, Saudi Arabia.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Food safety: A handbook for Namibian Volunteer Leaders. *Fao.org*; 2018. [Accessed 23 December 2018] Available:<http://www.fao.org/docrep/008/a0104e/a0104e08.htm>
2. Food Safety and Hygiene. World Health Organization; 2018. [Accessed 23 December 2018] Available:http://www.who.int/foodsafety/areas_work/food-hygiene/en
3. Angelos J, Arens A, Johnson H, Cadriel J, Osburn B. One health in food safety and security education: Subject matter outline for a curricular framework. *One Health*. 2017;3:56-65.
4. Liu A, Niyongira R. Chinese consumers food purchasing behaviors and awareness of food safety. *Food Control*. 2017;79:185-191.
5. McIntyre L, Vallaster L, Wilcott L, Henderson S, Kosatsky T. Evaluation of food safety knowledge, attitudes and self-reported hand washing practices in FOODSAFE trained and untrained food handlers in British Columbia, Canada. *Food Control*. 2013;30(1):150-156.
6. Fawzi M, Sham M. Food safety knowledge and practices among women working in Alexandria University, Egypt. *The Journal of the Egyptian Public Health Association*. 2009;84(1-2):95-117.
7. Mendagudali R, Akka K, Swati I, Shedole D, Bendigeri N. Knowledge, attitude, and practices of food safety among women of Khaza bazar, the urban field practice area of KBN Institute of Medical Sciences, Kalaburagi, Karnataka. *International Journal of Medical Science and Public Health*. 2016;5(3):516.
8. Modiwala A, Wavare R, Deshpande A, Kantharia S. Assessment of awareness about keys of safer food among teaching and non-teaching staff in tertiary care center: A cross sectional study. *International Journal of Community Medicine and Public Health*. 2018;5(5): 2021.
9. Mediacentre. World Health Organization; 2018. [Accessed 23 December 2018] Available:<http://www.who.int/mediacentre/factsheets/fs237/en/>
10. Lazou T, Georgiadis M, Pentieva K, McKevitt A, Iossifidou E. Food safety knowledge and food-handling practices of Greek university students: A questionnaire-based survey. *Food Control*. 2012;28(2): 400-411.
11. Turnbull-Fortune S, Badrie N. Practice, behavior, knowledge and awareness of food safety among secondary & tertiary level students in Trinidad, West Indies. *Food and Nutrition Sciences*. 2014;05(15):1463-1481.
12. Bartlett JE, Kotrlik JW, Higgins CC. Organizational research: Determining appropriate sample size in survey research. *Information Technology,*

- Learning and Performance Journal. 2001;19(1):43-50.
13. Moreb N, Priyadarshini A, Jaiswal A. Knowledge of food safety and food handling practices amongst food handlers in the Republic of Ireland. Food Control. 2017;80:341-349.
 14. Mendagudali R, Akka K, Swati I, Shedole D, Bendigeri N. Knowledge, attitude, and practices of food safety among women of Khaza Bazar, the urban field practice area of KBN Institute of Medical Sciences, Kalaburagi, Karnataka. International Journal of Medical Science and Public Health. 2016;5(3):516.
 15. Redmond EC, Griffith CJ. Consumer food handling in the home: A review of food safety studies. Journal of Food Protection. 2003;66:130-161.
 16. Kraus S. Attitudes and the prediction of behavior: A meta-analysis of the empirical literature. Personality and Social Psychology Bulletin. 1995;21(1):58-75.
 17. NWC Research. Consumer awareness and knowledge study. Melbourne; 2006.
 18. Al-Shabib N, Husain F, Khan J. Study on food safety concerns, knowledge and practices among university students in Saudi Arabia. Food Control. 2017;73:202-208.
 19. Food Safety and Food Borne Illness Fact Sheet No. 237. World Health Organization; 2007.
[Accessed 2 September 2019]
Available:http://foodhygiene2010.files.wordpress.com/2010/06/who-food_safety_fact-sheet.pdf
 20. Gong S, Wang X, Yang Y, Bai L. Knowledge of food safety and handling in 454 households: A survey of food handlers in Mainland China. Food Control. 2016;64:45-53.
 21. Naeem N, Raza S, Mubeen H, Siddiqui S, Khokhar R. Food safety knowledge, attitude, and food handling practices of household women in Lahore. Journal of Food Safety. 2018;38(5):12513.

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