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Knowledge and Practices of Food Safety among Senior Secondary School Students of International School, Obafemi Awolowo University, Ile- Ife, Nigeria

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Abstract

Background: Food safety is a global public health concern. The problem of food safety not only affects human health but also causes the economic damage of nations. School children have been the foremost victim of food borne illnesses due to their unsafe behavior in food consuming. Knowledge and practices of food safety is very important among students since they are also consumers.

Objective: The objectives of this study were to assess the level of knowledge and practices of food safety; to investigate the association of certain demographic characteristics with the level of food safety knowledge and practices and to determine the correlation between the food safety knowledge and practices among senior secondary school students of International School, Obafemi Awolowo University, Ile-Ife, Osun State, Nigeria.

Methods: This is a cross- sectional study which used a pre-tested 27- item, purpose designed, self- administered questionnaires to collect information on knowledge and practices of the respondents on food safety. Data were collated and analyzed based on descriptive and inferential study design.

Results: The result showed that the total percentages of respondents with good level of food safety knowledge is 86.0% (339) with only 14.0% (55) respondents having poor food safety knowledge level as majority of the respondents 97.7% (385) also have high level of food safety practices with only 2.3% (9) of them having low practices on food safety. In addition, the result showed significant association between religion of the respondents and food safety knowledge scores and significant association between food safety practice scores and class of the students ($p < 0.05$). The results also showed significant correlation between food safety knowledge and practices of the students ($p < 0.05$).

Conclusion: It was, therefore, concluded that the senior secondary school students of International School, Obafemi Awolowo University, Ile- Ife, have good food safety knowledge and high food safety practices.

Keywords*: Food safety, knowledge, practices*

Introduction

Food safety is a vital issue which relates to the quality of food and producing, allocation as well as consumption avoiding the contaminated and deteriorated food (Prabhakar et al, 2010). Food safety is the inverse of food risk or can be described as the probability of not suffering some hazard from consuming a specific food (Henson and Traill, 1993). In general, food safety is public health precedence. This is due to the fact that millions of people get ill and leading many to die each year, as a consequence of consuming unsafe food (WHO, 2009). Food safety remains a critical issue with outbreaks of food-borne illness resulting in substantial costs to individuals, the food industry, community health systems, and to the economy in general (Egan et al., 2007). Currently, there is the spread of more than 200 diseases through food; and beyond, those foodborne illnesses are on the increase worldwide. Food safety, therefore, is a global concern.

Each year, millions of people worldwide suffer from food-borne diseases and illnesses resulting from the consumption of contaminated food, which has become one of the most

widespread public health problems in the contemporary world (Sanlier, 2009). The association of food poisoning outbreaks and the consumption of contaminated food are significant in many countries (Sanlier, 2009). In less developed countries like Nigeria, many people are poisoned because of the consumption of foods produced under unhygienic conditions; lack of hygienic education, contaminated waters; lack of cleaning; inappropriate food storage conditions and pesticide residue (Sanlier, 2008).The most common factors contributing to food-borne disease outbreaks include safe keeping of food (time/temperature), contaminated equipment, food from unsafe sources, poor personal hygiene, and inadequate cooking (Lynch et al, 2006; WHO, 1989). The customer surveys undertaken by FAO 2006, and other investigators revealed that the main consumers of street foods in most countries were other members of the informal sector, such as fellow hawkers and hustlers and casual wage laborers. Other important categories of customer were children and students, office workers, and housewives (FAO, 2010). Although the public is increasingly concerned about food-related risks, the rise in food poisoning cases suggests that people still make decisions of food consumption, food storage and food preparation that are less ideal from a health and safety perspective (McCarthy et al., 2007).

College students are one of the most at- risk population groups due to their unsafe behaviour in food consuming (Dong, 2015). It is also believed that young adults have inadequate knowledge about measures needed to prevent foodborne illnesses (Osaili et al, 2011). Students are captive customers who are usually incompetent to purchase food from external sources during six hours they are at school (Abdul Aziz et al, 2013). School children have been the foremost victim in many food poisoning cases (Abdul Aziz et al, 2013). Children with weakened immune systems are more at risk of getting ill from food poisoning than those who are in good health. Children are most vulnerable to foodborne diseases because their immune systems are not fully developed (McSwane et al, 2003). Food poisoning cases are usually reported among school students that involve in school canteens, hostel kitchens and food prepared under the supplementary food programme. The contributing factors in these outbreaks of food poisoning are improper storage or holding temperature and poor personal hygiene (Khor et al, 1998).

The prevention of food borne illnesses requires educating food consumers on safe food handling practices (Jevsnik et al, 2008). Education must be provided to increase the level of knowledge. An efficient and continuous food safety education will enable consumers (children, youth, adults and the elderly) to learn the methods for preventing health threatening food safety problems and change their misguided habits (Sanlier, 2009). Knowledge of food safety is very important among students because they are also consumers (Turnbull-Fortune & Badrie 2014). Knowledge of food safety among school students should be developed in the early stage of age because they are the future food handlers. Food safety education requires basic training in safe food handling practices, preparation and storage of foods. Lifestyles such as student's eating habit could have an effect on his or her present health and well-being, as habit established during early childhood can continue into later life (Turnbull-Fortune & Badrie 2014).

There are many studies about the knowledge and practices of food safety which was done on different groups (Dong, 2015; Webb & Morancie, 2014; Giritlioglu et al, 2011; Sanlier, 2009; Musa & Akande, 2003). There are limited research findings to determine practices and knowledge of food safety among secondary school students in Nigeria. However, This study is, therefore, directed to investigate the knowledge and practices of food safety among senior secondary school students of International School, Obafemi Awolowo University, Ile-Ife, Nigeria as a case sample, to determine the association of certain demographic characteristics of the students with their food safety knowledge and practices and to determine whether there is correlation between their food safety knowledge and practices.

Significance of study

There is need to assess the food safety knowledge and practices of the students because of their unsafe behavior in food consuming which are more than other groups of people and thus be vulnerable to food poisoning and other food borne diseases. Furthermore, assessing their basic knowledge is essential for developing an effective health education programs on food safety. In addition, the findings from this study can also provide basic and useful information for policy makers on food safety interventions.

Statement of problem

Several studies have shown that prevention of food borne illnesses require educating food consumers on safe food handling practices. This food safety education would enable the consumers who are at risk to learn the methods of preventing health threatening food safety problems. However, prior to education, it is important to assess food safety issues relevant to consumers. Studies have shown that College students are one of the most at-risk population groups due to their unsafe behaviors in food consuming and that this category of students can be vulnerable to food poisoning and other food borne diseases in institutions such as schools and other places where food and drinks are served or sold. These students are vulnerable because their immune systems are not fully developed and there is a need to assess the level of their knowledge which will culminate to their food safety practices. Moreover, to the best of my knowledge, limited studies focused on young students have been found in the literature and formal studies conducted concerning food safety knowledge and practices of secondary school students in Ile- Ife, Nigeria is sparse. Food borne diseases have become serious public health problem in developing countries like Nigeria and people often affected are school children. Therefore, this study aimed at assessing food safety knowledge and practices of these senior secondary school students, investigate the association between their food safety knowledge and practices and certain demographic characteristics of these students and determine whether there is correlation between their food safety knowledge and practices.

Research questions

The major research questions for this study include the followings:

1. Do senior secondary school students of International School, OAU in Ile-Ife know about food safety?
2. Do senior secondary school students of International School, OAU in Ile-Ife engage in food safety practices?
3. Is there any association between food safety knowledge of these students and their socio-demographic characteristics?
4. Is there any association between food safety practices of these students and their socio-demographic characteristics?
5. Is there any correlation between food safety knowledge and practices of the senior secondary school students of International School, OAU?

Research objectives

1. To assess the knowledge of the senior secondary school students of International School, OAU, Ile- Ife on food safety.
2. To assess the practices of the senior secondary school students of International School, OAU, Ile- Ife on food safety.
3. To determine the association between food safety knowledge level and socio-demographic characteristics of senior secondary school students of International School, OAU, Ile- Ife.
4. To determine the association between food safety practices level and socio-demographic characteristics of senior secondary school students of International School, OAU, Ile-Ife.
5. To determine the correlation between food safety knowledge and practices of senior

secondary school students of International School, OAU, Ile- Ife.

Literature review

Food safety is a global public health concern. The problem of food safety not only affects human health but also causes the economic damage of nations. Annually, Health Canada estimates 2.2 million cases of foodborne illness in Canada, bringing about $1.3 billion of social cost annually (Harris, 1997). In United States, foodborne infection affects between 6.5 and 33 million people, with medical costs and productivity losses that have been calculated at around 9.3 to $12.9 USD billion (Busby et al, 1996). In 1996, it is estimated that at least 9,578 inhabitants that children are in the majority suffered from serious Escherichia coli infections related to white radish sprouts in a Japanese epidemic (Caroline et al, 2005). Additionally, approximately 700,000 people die of water and food safety related reasons in the mere Asia-Pacific region each year. Furthermore, based on the statistics of Vietnam food administration (VFA), food poisoning affects more than 3,187 people in the only first half of 2013. It is obvious that the developing countries and the developed nations all suffer foodborne diseases and the incidence of those infections is increasing (Redmond et al, 2003). In the United State, estimation of food borne disease may result in 76 million illnesses, 325,000 hospitalization and 5000 deaths each year (Mead, et al, 1999) while in England and Wales, food borne diseases resulted in an estimated of 1.3 million cases, 21,000 hospitalizations and 500 deaths yearly (Adak et al, 2002). It is of good concern that World Health Organization (WHO, 2007) reported in the year 2005 that 1.8 million people died from diarrhoea one of vary foodborne diseases. For this reason, foodborne diseases have captured public awareness worldwide in recent years. The Ministry of Health Malaysia (MOH, 2007, 2009, 2010) reported that the incident rate for food poisoning was 26.04, 62.47 and 36.17 per 100,000 populations in 2006, 2008 and 2009 respectively. In line with such report, there was in fact an increase in number of episodes of foodborne outbreak reported by various states in Malaysia commonly outbreaks occurring in schools (Zain and Naing, 2002; WHO, 2008; Sharif and Al-Malki, 2010). Besides, an epidemiology study found out that since 1997, foodborne outbreaks increased 66.5% among school age group in Malaysia (Meftahuddin, 2002; Naing et al, 2007). Centre Disease Control and Prevention (CDC, 2000) identified five risk factors of food handling that add to foodborne illnesses which include improper cooking procedure, temperature abuse during storage, lack of hygiene and sanitation by food handlers, cross contamination between raw and fresh ready to-eat foods.

Nowadays, in spite of general knowledge about the importance of hygiene, the incidence of food borne illness is high. A FAO/WHO assessment in 1983 said that consumption of infected food caused most of the illnesses and the biggest expense around the world (Haapala & Probart, 2004). National and international surveys show that people still do not have appropriate knowledge of food safety. As a result, more and more countries organize educational courses to improve skills and knowledge regarding food safety (Haapala & Probart, 2004). Inadequate food safety laws, weak regulatory systems, lack of financial resources to invest in safer methods of cooking, inadequate knowledge of food borne diseases and their causes, improper handling of food and unhygienic environments among others have been identified as some of the causes of food borne diseases (Adebukola et al, 2015). Quick et al, 2013 reported that Middle schoolers had insufficient food safety knowledge even though most reported washing their hands before making a snack and washing fruits and vegetables before eating them.

Food safety knowledge and behavior among young adults have been studied in different parts of the globe. The result revealed that these groups of consumers are engaged in food safety behavior that put their health at risk for food borne diseases. A recent study showed that over 50% of the Saudi college students consumed raw eggs and raw white cheese and 34% believed that there is no risk of disease from eating cooked food kept at room temperature for one day if covered. About one third of the American college students reported eating fried eggs with soft yolks and about half reported eating raw cookie dough, and undercooked

chicken and hamburger. In Turkey, more than half of young consumers (Chapman et al, 2010) did not know that internal temperature of the food is the safest way to know if the meat was cooked well (Osaili et al, 2011).

Knowledge is defined as the capacity to acquire, retain and use information. It is also a mixture of comprehension, experience, discernment and skill (Ibrahim, 1995). It is a complicated construction characterized by the structure and the content of the information stored in the memory (Brucks, 1986). Practice is regarded as the application of rules and knowledge that leads to action (Ibrahim, 1995). Food safety knowledge is important to prevent food borne illness (Chapman et al, 2010). Vladimirov (2011) point outs the correlation of positive behaviour, attitudes and continued education of food handlers towards the maintenance of safe food handling practices. Earlier studies conducted on adults have also indicated that food safety knowledge tends to increase with age and practice: females have higher scores than males, and younger respondents show the greatest need for additional food safety education (Bruhn & Schutz, 1999; Byrd-Bredbenner et al., 2007; Rimal et al., 2001; Unusan, 2007). The need for enhanced food safety education started to be recognized in developed countries with the launch of national initiatives to find ways to educate consumers effectively, especially youngsters and adults who prepare food (Haapala & Probart, 2004). Better educated consumers often recognize the importance of food safety and younger respondents have shown the greatest need for additional education on food safety (Bruhn & Schutz, 1999; Li-Cohen & Bruhn, 2002; Sudershan et al., 2007). Learning about basic knowledge and practices of young consumers is essential for the development of effective health education programs in Nigeria. An efficient and continuous food safety education will enable consumers (children, youth, adults and the elderly) to learn the methods for preventing health threatening food safety problems and change their misguided habits (Sanlier, 2009).

Methods

Research design, study area and population

A cross- sectional study was conducted in December 2016 on food safety knowledge and practices of senior secondary school students of International School, Obafemi Awolowo University (OAU), Ile- Ife, Osun State, Nigeria. The study was carried out in International School, Obafemi Awolowo University, a well-known and reputable private secondary school of the University in Ile-Ife town. Ile-Ife is an ancient city of Yoruba land situated in Osun State which is located in the South- Western part of Nigeria. The study population consisted of the secondary school students' boys and girls in the senior secondary one, two and three (SS1, SS2, and SS3) of the College.

Data collection

Information was collected from respondents by means of a pre-tested 27- item, purpose designed, self- administered anonymous questionnaire containing closed ended questions.

The questionnaire was divided into three major sections: Section A contained 7 items focusing on socio-demographic characteristics of the senior secondary school students. Section B contained 10 items focusing on questions related to knowledge of the senior secondary school students on food safety while section C contained 10 items focusing on questions related to food safety practices of the senior secondary school students of the College. All these questions were modified from the previous studies (Lamidi, 2016; Osaili et al, 2010; Sanlier, 2010; Mohd et al, 2009). Answers were graded by assigning 1 point for the right answers and 0 point for the wrong answers given to the questions on food safety knowledge. Scores regarding food safety knowledge range from 0 to 10. The cut off point for scores regarded as poor for food safety knowledge is 4 (≤ 4)out of 10 while from 5(≥ 5) out of 10 is regarded as good food safety knowledge. Answers to the questions on food safety practices were graded as follows: 'almost never', 1 point, 'sometimes', 2 point, 'often'. 3 point and 'always', 4 point. Scores regarding food safety practices vary from 10 to 40. The cut off point for scores regarded as low for food safety practice is 19 (≤ 19) out of 40 while

from 20 ($\geq$ 20) out of 40 is regarded as high food safety practice. Each questionnaire takes approximately 4 minutes to administer.

Sample size determination

The minimum sample size was calculated using the **Leslie and Kish formula** for descriptive studies $\mathbf{N = P\ (1\text{-}P)\ Z^2/D^2}$ where N is the minimum sample size needed; D is the level of error that can be tolerated (0.05 absolute precision) and P, the estimated proportion of food safety knowledge among college students from a previous study (Osaili et al, 2011) was 33.9% i.e. p= 0.34. Z is the standard variation corresponding to confidence level. At confidence level of 95%, Z= 1.96. Therefore,

$N = 0.34(1\text{-}0.34)\ 1.96^2/0.05^2$

N= 345. To give allowance for an anticipated non-response rate of 10% (35 respondents), the sample size was increased by 35 to make **380** respondents. A total of 420 questionnaires were then taken to the school to be distributed for the study.

Sampling method

Each secondary class level from SSI to SS3 has four arms. A simple random sampling technique was employed to select a minimum of 140 senior secondary school students at random from each class level (i.e. 140 from SS1, 140 from SS2 and 140 from SS3) of the senior classes of International School, OAU, Ile-Ife with age ranges from 12 – 20 years to make a total of 420 students to participate in the study. Of the 420 questionnaires distributed, 394 (response rate of 94%) were returned and used for the analysis. Each respondent was provided with an assurance of confidentiality of information provided in the questionnaire.

Data analysis

The completed questionnaires were collated, analyzed and presented using descriptive statistics of simple percentages and frequency distribution. All statistical analyses were performed using the Statistical Package for the Social Sciences, Version 22.0 (SPSS, Inc., Chicago, IL, USA). Means and standard deviation were used to present the scores of food safety knowledge and practices of the students. Chi-square test was performed to test for differences in socio-demographic and academic variables between students who passed the food safety knowledge questions and those who failed. Findings with a P-value < 0.05 were considered to be statistically significant. Analysis was stratified by gender to show how responses to the variables of knowledge and practices on food safety differ for males and females. Also inferential statistics of Chi squares was used to determine the association between socio- demographic variables and food safety knowledge and also between socio-demographic variables and food safety practices of the respondents. Inferential statistics of Person product moment correlation coefficient was used to determine the correlation between food safety knowledge and practices of senior secondary school students of International School, OAU, Ile- Ife.

Results

Demographic characteristics of the study population

A total number of 394 senior secondary school students of International School, Obafemi Awolowo University participated in the study with a very close percentage distribution between the males (49.2%) and females (50.8%) respondents. Majority of the respondents (51.3%) were between the ages of 12 and 14 years. The result also showed that the percentage distribution of the students in their various classes were very close as we have 32.7% in SSI, 32% in SS2 and 35.3% in SS3. Largest percentages of them were Christians (79.2%) as shown by the result. The results also showed that largest percentages of them were Yoruba tribe (91.4%), living with parents (95.2%) and having their mother educational level being 12 or more years (91.6%) as shown in Table1

Table 1. Demographic Characteristics of the study population

Socio- demographic characteristics	Number of respondent N	Percentage (%)
Age:		51.3
12- 14	202	48.0
15- 17	189	0.8
18- 20	3	100.0
Total	394	51.3
Gender:		49.2
Male	194	50.8
Female	200	100.0
Total	394	49.2
Class:		32.7
SS1	129	32.0
SS2	126	35.3
SS3	139	100.0
Total	394	32.7
Religion:		79.2
Christianity	312	20.6
Islam	81	0.3
Traditional	1	100.0
Total	394	79.2
Tribe:		91.4
Yoruba	360	3.6
Igbo	14	0.5
Hausa	2	4.6
Others	18	100.0
Total	394	91.4
Household Composition:		95.2
Living with parents	375	1.8
Living alone	7	3.0
Parents separated	12	100.0
Total	394	95.2
Mother educational level:		8.4
< 12 years	33	91.6
12 years or more	361	100.0
Total	394	8.4

Food safety knowledge levels of the respondents

To determine the level of food safety knowledge, scoring for each question is assessed for correctness and the total score obtained is between 0- 10. The total percentages of respondents with good level of knowledge of food safety scoring between 5- 10 of the total score is 86% (339) and only 14% (55) respondents have poor level of knowledge of food safety with total food knowledge scores between 0-4 (as in Table 2a). The mean of the food safety knowledge score of the respondents was calculated to be 6.44± 1.657. Table 2b shows the total number and the percentages of correct responses given by the senior secondary school students of International School, OAU on the whole questionnaire on food safety knowledge. Only (15.5%) of the respondents knew that they should look at the expiry date to understand if the

milk is safe or not for consumption. More than half (59.6%) of the respondents knew that it is wrong to eat tinned food if the cover of the tin is bloated or tight. 52.5% of the respondents know that the safest way to control if meat has been cooked well is to check its internal temperature with a food thermometer as 60.4% of the respondents knew that the internal temperature of chicken must be high for safe cooking. The result also showed that 68.3% of the students knew that pasteurized milk can be stored at refrigerator temperature for a maximum of 3 days in its unopened box as 52.5% of the students gave the right answer to the question on the most suitable temperature (4–7 ^{0}C) at which bacteria grows and 86.5% of the students responded correctly to the question about how to clean cutting- boards. Less than half (42.6%) of the respondents knew that raw chicken, fish and meat should not contact each other as majority of them (88.8%) knew that bacteria transmitted from hands to food can result in the growth of harmful microorganisms in food. Also, 45.4% of the respondents knew that holding hands under cold tap water before touching food so as to get rid of bacteria is not enough.

Table 2a. Food safety knowledge levels of the respondents

Scores	Grade	N	%
0-4	Poor	55	14.0
5-10	Good	339	86.0
Total		394	100.0

Table 2b. Responses to food safety knowledge questions

Questions	Correct answers		Incorrect answers	
	N	%	N	%
1. You should test milk rather than look at its expiry date to understand if it is safe or not. Yes or No? (No)	61	15.5	333	84.5
2. It is wrong to eat tinned food if the cover of the tin is bloated or tight. Yes or No? (Yes)	235	59.6	159	40.4
3. The safest way to control if meat has been cooked well is to check its internal temperature with a food thermometer. Yes or No? (Yes)	207	52.5	187	47.5
4. Internal temperature of chicken must be high for safe cooking. Yes or No? (Yes)	238	60.4	156	39.6
5. Pasteurized milk can be stored at refrigerator temperature for a maximum of 3 days in its unopened box. Yes or No? (Yes)	269	68.3	125	31.7
6. The most suitable temperature (4–7 ^{0}C) at which bacteria grows is the temperature of the	207	52.5	187	47.5

refrigerator. Yes or No? (No)				
7. If a cutting-board will be used to cut different types of food such as vegetables and meat, you should clean the board with a clean towel to prevent bacterial growth. Yes or No? (Yes)	341	86.5	53	13.5
8. Raw chicken, fish and meat should not contact each other. Yes or No? (Yes)	168	42.6	226	57.4
9. Bacteria transmitted from hands to food can result in the growth of harmful microorganisms in food. Yes or No? (Yes)	350	88.8	44	11.2
10. It is enough to hold your hands under cold tap water before touching food so as to get rid of bacteria. Yes or No? (No)	179	45.4	215	54.6

Food safety practices level of the respondents

The results showed that majority of the respondents (385) have high level of practices on food safety with total score of 97.7%%. Only 2.3% (9%) respondents have low practices on food safety as in Table 3a. The calculated mean and standard deviation of food safety practices score of the respondents are 30.10± 5.159 with the scores ranging from 0 -40. Food safety practices of the senior secondary school students are presented in Table 3b. The result showed that 73.6% of the students always ensure purchasing food that is clean and in fresh condition and 64.5% always wash their hands before preparing and eating food at home while 28.7% always wash their hands before eating food in the school canteen/restaurant. The results also showed that 44.2% of the students always check the expiry date on the food packages before purchase, 43.7% always do not eat raw or uncooked eggs and foods made from raw eggs and 57.6% always put the easy-to-spoil foods into the refrigerator as soon as they buy them. In addition, 21.1% always taste food to see if it is safe or not and 31.5% always dry their hands with paper towel or tissue after washing them. Besides, a very large percentage (86%) always eat meat after it has been cooked well and do not consume raw meat while approximately one- third (34.3%) of the respondents always prefer to reheat the leftovers by using microwave oven.

Table 3a. Food safety practices level of the respondents

Scores	Grade	N	%
0-19	Low	9	2.3
20-40	High	385	97.7
Total		394	100.0

Table 3b. Responses to food safety practices questions

Practices	No Response (%)	Almost never (%)	Sometimes (%)	Often (%)	Always (%)
1. I always ensure purchasing food that is clean and in fresh condition.	0.8	1.8	9.1	14.7	73.6
2. I wash my hands before preparing and eating food at home.	0.5	2.0	15.2	17.8	64.5
3. I wash my hands before eating food in the school canteen/restaurant.	1.3	12.4	37.6	20.1	28.7
4. I check the expiry date on the food packages before purchase.	1.0	4.6	27.2	23.1	44.2
5. I do not eat raw or uncooked eggs and foods made from raw eggs.	1.0	27.2	18.5	9.6	43.7
6. I put the easy-to-spoil foods into the refrigerator as soon as I buy them.	0.8	4.6	16.5	20.6	57.6
7. I taste food to see if it is safe or not.	0.8	24.6	36.0	17.5	21.1
8. I dry my hands with paper towel or tissue after washing it.	0.3	16.0	32.5	19.8	31.5
9. I eat meat after it has been cooked well, I do not consume raw meat.	0.3	4.8	3.6	5.3	86.0
10. For leftovers, I prefer to reheat it by using microwave oven.	0.5	17.0	23.9	24.4	34.3

Association between socio-demographic characteristics and food safety knowledge level of the students

The association between socio- demographic characteristics and food safety knowledge level of the students is shown in Table 4.Using Pearson Chi- square test, significant association was found only between religion and food safety knowledge scores of the respondents among other socio-demographic variables considered in this study ($p< 0.05$). There was no significant association between food safety knowledge scores and age, gender, class, tribe, household composition and mothers' educational level of the respondents ($p> 0.05$).

The association between socio- demographic characteristics and food safety practices level of the students

The association between socio- demographic characteristics and food safety practice level of the students is shown in Table 5. Also, using Pearson Chi- square test, significant association was found between food safety practice scores and class of the respondents among the socio-demographic variables considered in this study ($p< 0.05$). There was no significant association between food safety practice scores and age, gender, religion, tribe, household composition and mothers' educational level of the respondents ($p> 0.05$).

Table 4. The association between socio- demographic characteristics and food safety knowledge level of the students

Variable	Total knowledge scores		p- value
	Poor	good	
Age:			
12-14	16.3	83.7	0.319
14-17	11.6	88.4	0.789
18- 20	-	100.0	0.104
Gender:	14.4	85.6	0.043
Male	13.5	86.5	0.772
Female	13.2	86.8	0.085
Class:	19.0	81.0	0.836
SS1	10.1	89.9	
SS2	13.5	86.5	
SS3	14.8	85.2	
Religion:	100.0	-	
Christianity	13.6	86.4	
Islam	21.4	78.6	
Traditional	-	100.0	
Tribe:	16.7	83.3	
Yoruba	13.6	86.4	
Igbo	-	100.0	
Hausa	33.3	66.7	
Others	15.2	84.8	
Household composition:	13.9	86.1	
Living with parents			
Living alone			
Parents separated			
Mothers educational level:			
< 12 years			
12 years or more			

Correlation between food knowledge and food safety practice scores of the respondents

Table 6 shows the correlation between food knowledge and food safety practice scores of the senior secondary school students considered in the study. The result showed that there was a small, positive correlation between the two variables [$r = 0.134$, $n = 394$, $p < 0.05$]. Correlation is significant at the 0.01 level when $p = 0.008$.

Table 5. The association between socio- demographic characteristics and food safety practices level of the students

Variable	Total practice scores		p- value
	low	High	
Age:			
12-14	2.5	97.5	0.938
14-17	2.1	97.9	0.290
18- 20	-	100.0	0.012
Gender:	3.1	96.9	0.981
Male	1.5	98.5	0.462
Female	0.8	99.2	0.338
Class:	5.6	94.4	0.764
SS1	0.7	99.3	
SS2	2.2	97.8	
SS3	2.5	97.5	
Religion:	-	100.0	
Christianity	1.9	98.1	
Islam	7.1	92.9	
Traditional	-	100.0	
Tribe:	5.6	94.4	
Yoruba	2.1	97.9	
Ibo	-	100.0	
Hausa	8.3	91.7	
Others	3.0	97.0	
Household composition:	2.2	97.8	
Living with parents			
Living alone			
Parents separated			
Mothers educational level:			
< 12 years			
12 years or more			

Table 6. Correlation between food knowledge and food safety practice scores of the respondents

Correlations

		Food safety practice scores	Food safety knowledge score
Food safety practice scores	Pearson Correlation	1	.134[xx]
	Sig. (2-tailed)		.008
	N	394	394
Food safety knowledge score	Pearson Correlation	.134[xx]	1
	Sig. (2-tailed)	.008	
	N	394	394

**. Correlation is significant at the 0.01 level (2-tailed).

Discussion

This study was conducted to assess the food safety knowledge and practices of the senior secondary school students of International School, OAU, Ile- Ife and to determine the association that exists between food safety knowledge level and between food safety practices level and socio-demographic characteristics of these students and also to determine if any correlation exists between their food safety knowledge and practices. Food safety is a global

public health concern. The problem of food safety not only affects human health causing food borne illnesses but also causes the economic damage of nations. Knowledge of food safety is very important among students since they are also consumers (Turnbull-Fortune and Badrie, 2014).

The sex distribution in this study had more female respondents than male respondents. This is in contrast to similar studies conducted by Lamidi (2016) and Norazmir et al, 2012 which reported male respondents higher in number than female respondents.

The result also showed higher Christian respondents and Yoruba respondents than any other religion and tribes respectively. This result can be explained by the fact that the sampled private school reflects the dominant religion being practiced in the community and is located in Yoruba land. This invariably shows that the study environment will usually reflect the characteristics of the study population.

Majority of the students considered in this study have good level of knowledge on food safety. This study is in line with a related study conducted by Osaili et al, 2011 who rated the food safety knowledge of their respondents to be excellent/good. The result is also in line with that of Norazmir et al, 2012 who obtained that their respondents have a good knowledge on food safety which is about 88.7% (354) and only 0.3% respondents take in poor level of knowledge. It is also in line with that of Lamidi, 2016 who obtained that his respondents have a good knowledge on food safety which is about 65.8% (269) of all the respondents.

The result in this study also showed that majority of the respondents (385) have high level of practices on food safety with total score of 97.7% and only 2.3% (9) respondents have low practices on food safety. The percentage obtained by Norazmir et al, 2012 in their study was 79.1% which was lower than the one obtained in this study. Also, the percentage obtained by Lamidi, 2016 in his study was 65.8% which was lower than the one obtained in this study.

The outcome of this study also showed that significant association was found only between religion of the respondents and food safety knowledge scores. Lamidi (2016) on the contrary in his study found a significant association between mothers' educational level and food safety knowledge scores. Osaili, et al (2011) on the contrary in their study showed that there was strong association between college status, students major and self -rated food safety knowledge and food safety knowledge score.

The result also showed that significant association was found between food safety practice scores and class of the respondents in this study. However, Lamidi, 2016 found a significant association between food safety practice and age, gender, class and household composition of the respondents in his study.

Finally, there was significant correlation between food safety knowledge and food safety practices of the students. This is similar to the result of Norazmir et al, 2012 which showed correlation between food safety knowledge and practices on food safety indicating a small positive correlation with [$r = 0.148$, $n = 221$, $p<0.05$] for Sekolah Tinggi Arab Maahad and [$r = 0.053$, $n = 178$, $p<0.5$] for Sekolah Menengah Kebangsaan Gelang Patah.

Limitation of the study

This study is not without some limitations. One, the study is based on self- reported information and thus is subject to self- report bias. To correct this, effort was made to reduce the impact of this bias by making the questionnaire a guided self- administered process. Two, the students used for this study were drawn mainly from a private high school in Ile-Ife and therefore the outcome of the study cannot be generalized as they are not true representatives of all the secondary school students in Ile-Ife.

Conclusion

The outcome of this study reveals that majority of the senior secondary school students considered in this study have good level of food safety knowledge and have high level of food safety practices. Also, the study shows a significant association between religion and food safety knowledge scores and significant association between food safety practice scores and

class of the senior secondary school students. Lastly, in this study, there was significant correlation between food safety knowledge and food safety practices of the students.

Recommendation

In view of the above conclusion, the followings are therefore recommended:

1. Attention should be given to the monitoring and evaluating food safety practices among International School, OAU College students as some of the students still have poor food safety knowledge scores.
2. There is need for continuous educational programs to improve the food safety practices of these students as it has been shown that class is associated to their food safety practice.
3. There is need to develop a state policy regarding education on food safety to be given to the schools on the practices of these young students who are also consumers as they are at risk of food borne diseases and they can be protected by the government.
4. Food safety knowledge and practices of these private college students can be compared with those in the public or rural secondary schools so that the results can become generalized.
5. Food safety knowledge and practices of students from other Colleges for the entire Ile-Ife town in a larger way can also be conducted.

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