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FOOD SAFETY RISKS ASSOCIATED WITH TERTIARY STUDENTS IN SELF-CATERING HOSTELS IN ACCRA, GHANA

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ABSTRACT

Young adults are observed to be at high risk of food borne diseases due to food mishandling. Evidence indicates that the risk of bacterial food-borne disease to young adults increases when food is prepared in communal kitchens, as in student accommodation, youth hostels and shared homes. This increase may be due to the number of individuals using the kitchens, the lack of feelings of responsibility and the differing standards of hygiene of the users of these kitchens. In Ghana most tertiary institutions are self-catering with limited kitchen facilities. Yet, little is known about the food safety knowledge and food safety practices of tertiary students. The objective of the study was to identify wrong food safety practices of tertiary students living in hostels with self-catering facilities and defects in their hostels that may expose students to food borne diseases. Questions were asked on the demographic characteristics, hand washing practices, separation of raw and cooked foods, cooking of foods, thawing and cooling of foods, consumption of high risk foods and the design and sanitation of hostels of 210 respondents from 4 tertiary institutions in Accra. Majority (66.67%) of respondents were within 21-30 years, 16.19% were within 15-20 years, 16.19% within 31-40 years and 0.95% above 40 years. The mean age of respondents was 21 years, A third (33.33%) of the sampled population followed each of the programs; health related programs, non health related science-based programs and

other programs. Female respondents were 50% as well as male respondents. This study found low levels of awareness of cross-contamination, high-risk food items and a worrying level of awareness of appropriate hand hygiene among students. Additionally, nonexistent or inadequate kitchen facilities were also reported from the hostels of respondents coupled with poor sanitation at some of the hostels. For a sustainable reduction of food borne diseases there is the need to embark on food safety education of all stake holders.

Keywords: Students, self-catering, awareness, food safety

INTRODUCTION

The World Health Organization (WHO) indicates that food borne diseases are perhaps the most widespread health problem in the contemporary world and an important cause of reduced economic productivity. As such, food borne diseases have become the major focus of public health policy worldwide to the extent that the prevention of food borne diseases is said to be a requirement for improvement of living standards globally **[1, 2]**. The most common food-related illnesses result from bacterial food infections and intoxications **[3]**. Whereas bacterial food borne infections are caused by the proliferation of bacteria, such as *Salmonella* and *Campylobacter jejuni* in the intestine of the host, bacterial food-borne intoxications result from toxins produced by bacteria such as *Staphylococcus aureus* and *Clostridium botulinium* **[4]**.

Abundant evidence exist **[5, 6]** regarding the number of cases, outbreaks, type of food and micro-organisms involved and the cost of food borne diseases to a nations economy as well as the potential negative impact of lack of food safety in a nation's food supply. It is estimated that up to 30% of the population in developed countries may be affected from food-borne disease each year and the incidence in less developed countries remain largely unknown **[7]**. According to **[8]** the total number of outpatient cases of food borne diseases reported in Ghana is about 420,000 per year, with an annual death rate estimated at 65,000 and a total costs to the Ghanaian economy at US $ 69 million.

It is required by consumers that government operate effective food control systems and to provide them with a safe, nutritious, high quality, abundant, affordable and varied food supply. However, consumers are often unaware of the major role they themselves have to play in effecting, prevention and control of food-borne illness. Many consumers are unaware or misinformed about how they can protect themselves from food-

borne diseases consequently food borne disease outbreaks at the home level is not uncommon. According to the Pan-American Institute for Food Protection and Zoonoses (INPPAZ), in the period 1995-1999, 41% of outbreaks could be traced to the homes of the victims, while only 6% were attributed to restaurants, 18% to other eating places and 4% to street vending **[9]**. Generally, some of the factors that contribute to outbreaks of bacterial food-borne disease in homes include obtaining food from unsafe sources; contaminated raw food items; improper food storage; poor personal hygiene during food preparation; inadequate cleaning of kitchen equipment and utensils **[10]**. Young adults and occasional food preparers are particularly observed to be guiltier for mishandling food as well as more likely not to wash their hands or take precautions to prevent cross-contamination when preparing meals and this may result in food borne disease **[11]**. Evidence indicates that the risk of bacterial food-borne disease also increases when food is prepared in communal kitchens, as in student accommodation, youth hostels and shared homes **[12]**. This increase may be due to the number of individuals using the kitchens, the lack of feelings of responsibility and the differing standards of hygiene of the users of these kitchens.

The catering facilities of most tertiary institutions in Ghana have been privatized as such; most students cook their own meals in shared kitchens provided in university or privately owned hostels because meals provided by private caterers on their campuses are too expensive. In some situations, kitchens are not provided for students or the kitchen facility is inadequate. Overcrowding of students due to increased numbers further compounds the problem of limited kitchen space. Additionally, waste management in some student hostels is not the best; students are therefore exposed to a risk of food borne disease as result of varied factors. Yet, research in Ghana on food safety knowledge of tertiary students, their food handling practices and sanitary conditions of their hostels is very minimal. The attention has mainly been on restaurant operators and street food vendors. According to **[13]** educating the general public can quickly and significantly reduce the chances of contracting food-borne illnesses and the effects of outbreaks, improve public health and safety and reduce financial drainage of the health sector. In this regard, colleges and universities can be ideal settings for food safety interventions because students are still forming lifestyle patterns and they can

eventually become ambassadors in their communities **[14]**.

The objective of the study was to identify wrong food safety practices of tertiary students and defects in their hostels that may expose students to food borne diseases to be able to form a basis for appropriate food safety interventions.

MATERIALS AND METHODS

Study Area

Accra is the capital of Ghana as well as the Greater Accra region, one of the ten regions of the country. The highest number of tertiary institutions in Ghana are concentrated in Accra hence its selection for this study.

Study Population

The study population included university students, students of professional training institutions e.g. nursing training and polytechnic students. Samples were collected from four of the category of institutions described above with self-catering conditions i.e. where students prepared their own meals. The sample size was made up of 210 respondents.

Sampling Technique and Data Collection

A self-administered pre-tested questionnaire was used to collect data from randomly selected respondents. Questionnaires were explained to respondents after which they completed and delivered them instantly or at a later date. The data was collected in October, 2010.

The questionnaires contained a combination of closed and open-ended questions the first part of which bordered on the personal data of respondents (name, sex, gender, age, program of study). The second part of the questionnaire contained questions on personal hygiene and food handling and storage practices like hand - washing practices, washing of knives before and after use, separation of raw food from ready-to-eat foods, cooking practices, thawing and cooling of foods and consumption of raw eggs. The third part of the questionnaire contained questions on design and sanitation issues like the provision of kitchen facilities, how many people used the kitchen, do you share cooking utensils, do you have waste bins in your hostel, are they always covered, how often are they emptied etc. The responses to questions were categorized as either always, sometimes or never. A blank section was left in the questionnaire to allow the respondent to write his or her comments relevant to the questions. A Statistical Package for the Social Sciences (SPSS) was used to analyze data.

RESULTS

Results of the demographics of respondents, an evaluation of the personal hygiene of respondents, cooking, storage and eating practices of respondents and the design and sanitation of respondents' hostels are summarized in **Tables 1, 2, 3 and 4** respectively below.

Whereas majority (66.67%) of respondents were within 21-30 years, 16.19% were within 15-20 years, 16.19% within 31-40 years and 0.95% above 40 years **(Table 1)**. The mean age of respondents was 21 years. 33.33% of respondents followed health related (HR) programs as well as other programs and non health related science-based (NHRS) **(Table 1)**.

The results **(Table 2)** show that majority (62.86%) of respondents washed their hands before handling food and majority (71.90%) did so appropriately i.e. with soap and water, whereas 28.10% washed their hands with only water. Unfortunately, a sizable percentage 19.04%) of respondents did not wash their hands before handling food and 18.10% washed only sometimes. In terms of hand drying after washing, even though majority of respondents (55.24%) said they dried their hands 20.95% said they did not dry their hands after washing and 23.81%only dried sometimes **(Table 2)**. Out of those who indicated they dried their hands after washing the results **(Table 2)** indicate that only 13.25% did so with the appropriate method i.e. using disposable tissue paper. A disturbing percentage of in appropriate hand washing and hand drying after washing revealed in **Table 2** indicate a poor personal hygiene of some respondents worth noting.

Whereas majority (64.76%) of respondents indicated they washed their hands after handling raw meat when cooking 27.62% did not and 7.62% said they washed sometimes **(Table 3)**. This finding indicated a sizable proportion (those who did not wash and those who only sometimes washed) of respondents were exposed to cross contamination from handling raw meat. In terms of washing fresh produce before cooking, even though majority (68.57%) of respondents indicated they washed their fresh produce before cooking, 15.24% of respondents indicated they did not wash and 16.19% indicated they washed only sometimes **(Table 3)**. The sum of those who did not wash their fresh produce and those who only washed sometimes (31. 41%) were at a higher risk of contacting food borne diseases associated with fresh produce. The results (Table 3) also showed that 53.81% of respondents used the same knife for raw and ready to eat food items. As to whether the

knife was given proper sanitization in-between use, 31.43% of respondents did not clean the knife in any way and 8.75% only wiped it with a towel **(Table 3)**. The risk of cross contamination from raw produce to ready to eat produce per the use of the same knife was therefore high. In looking at segregation of food during refrigeration, a slim majority (51.90%) of respondents refrigerated separately their fresh produce from ready-to-eat foods in the fridge, 34.29% always refrigerated them together and 13.81% separated them only sometimes **(Table 3)**. This indicated a disturbingly high risk associated with cross contamination of ready to eat produce from raw produce during storage. With regard to heating of leftover food before eating, 66.67% of respondents indicated they warmed their leftover food before eating. It is worrying to note however that 19.05% indicated they did not warm their food before eating and 14.29% said they warmed their food but not always. Result of the risk associated with eating raw eggs was worrying, whereas a slim majority (53.33%) of respondents indicated they did not eat raw egg in any form, 36.19% and 10.48)% indicated they ate raw eggs always and sometimes respectively **(Table 4)**.

The availability of adequate kitchen space and facilities has a positive effect on the acquisition and spread of food borne diseases. The results in Table 4 indicate that majority (53.33%) of respondents did not have kitchens provided for them in their hostels and out of the minority (46.67%) who had kitchens in their hostels only 16.67% indicated they had their own kitchens with the rest sharing kitchen facilities with 2 or more other students **(Table 4)**. For example, 52.86% of respondents indicated they shared kitchen space with more than ten other students and 20.95% with 3 or less other students **(Table 4)**. Respondents without kitchens may either resort to cook their meals in the open corridors of their hostels or in their bed rooms. This group of respondents together with the majority who shared kitchen facilities was exposed to a higher risk of food borne pathogens from environmental contamination and from other students.

With respect to dustbins, even though majority (72.86%) of respondents said their dustbins were always covered, disturbing percentages of 18.10% and 9.08% did not cover their dustbins and covered their dustbins only sometimes respectively **(Table 4)**. Similarly, whiles dustbins in the hostels of majority of respondents (73.81%) were emptied regularly, 22.38% of respondents indicated their dustbins were not emptied regularly and 3.81% indicated their dustbins

were rarely emptied **(Table 4)**. The results revealed a poor environmental situation at the hostels that could enhance the spread of food borne disease.

Table 1: Respondents Personal Data

Total N0/ (%)	Respondents age group (N0/(%)			
	15-20	21-30	31-40	Above 40
210 (100)	34 (16.19)	140(66.67)	34(16.19)	2 (0.95)
	Respondents sex			
	Male	Female		
210 (100)	105(50)	105(50)		
	Respondents program of study			
	HR	NHRS	Others	
210 (100)	70 (33.33)	70 (33.33)	70 (33.33)	

HR- Health related, NHRS- Non health related science

Table 2: Assessment of Personal Hygiene of Respondents

Total No./(%)	Washing of hands before cooking		
	Yes	No	Sometimes
210 (100)	132(62.86)	40(19.04)	38(18.10)
	How respondents washed their hands		
	With water alone	With water & soap	
210 (100)	59(28.10)	151(71.90)	
	Drying of hands after washing		
	Yes	No	Sometimes
210 (100)	116(55.24)	44(20.95)	50 (23.81)
	What respondents dry their hands with		
	Hand towel	Disposable tissue	Kitchen cloth
166(100)	93(56.02)	22(13.25)	49(27..71)

Table 3: Evaluation of Cooking, Storage and Eating Practices of Respondents

Total No./(%)	Washing of hands after handling raw meat when cooking			
	Yes	No	Sometimes	
210 (100)	136 (64.76)	58(27.62)	16 (7.62)	
	Washing of fresh produce before cooking			
	Yes	No	Sometime	
210 (100)	144(68.57)	32(15.24)	34 (16.19)	
	Use of same knife for raw and ready to eat food items			
	Yes	No	Sometimes	
210 (100)	113(53.81)	66 (31.43)	31 (14.76)	
	Treatment given to knife in between use of raw and ready to eat food			
	washing with soap and water	Rinsing with water	Wiping with towel	No satization
210 (100)	82 (39.05)	44 (20.95)	18 (8.75)	66 (31.43)
	Separation of fresh produce from ready to eat food in a refrigerator			
	Yes	No	Sometimes	
210 (100)	109 (51.90)	72 (34.29)	29 (13.81)	
	Warming of leftover food before eating			
	Yes	No	Sometimes	
210 (100)	140 (66.67)	40 (19.05)	30 (14.29)	
	Do you eat raw egg in any form			
	Yes	No	Sometimes	
210	76(36.19)	112(53.33)	22(10.48)	

Table 4: Design and Sanitation of Respondents' Hostels

Total No/(%)	Do you have a kitchen in your hostel?				
	Yes	No			
210 (100)	98(46.67)	112(53.33)			
	How many students share the same kitchen in your hostel?				
	1-3	4-6	7-10	More than10	Have own
210 (100)	44 (20.95)	18 (8.57)	2 (0.95)	111 (52.86)	35(16.67)
	Are the dustbins in your hostel always covered?				
	Yes	No	Sometimes		
210 (100)	153 (72.86)	38 (18.10)	19 (9.08)		
	How often are the dustbins in your hostel emptied?				
	Regularly	not regularly	Rarely		
210 (100)	155 (73.81)	47 (22.38)	8 (3.81)		

DISCUSSIONS

This study found the mean age of respondents to be 21 years **(Table 1)**. This finding is in agreement with **[15, 16]** that young adults are less than 35 years and that food safety intervention programs should be directed towards this age group. The current study also found that majority of respondents washed their hands with the appropriate methods before handling food suggesting a high level of personal hygiene amongst students. Similar findings were made by **[17, 18]** who all had majority of respondents indicate to them that they always washed their hands before handling food. The reasons for this high level of personal hygiene amongst respondents may have been due to a high level of awareness of the risk of food borne diseases associated with low level of personal hygiene. A disturbing percentage of inappropriate hand washing with only water and drying with unclean kitchen towel after washing was however observed in this Study **(Table, 2)**. Even though this group of respondents who did not wash their hands and dry appropriately was in the minority, it should be a matter of concern since the role of hands in transmission of disease has been established]. Evidence **[19]** indicate that poor hand washing practices inevitably lead to retention on the hands of bacterial and viral pathogens, which are obtained from handling raw produce or from toilet activities. Consequently, prepared ready-to-eat foods or other members of the household who are in contact may be contaminated by these pathogens. According to **[20]**, proper hand washing procedures include not only water, but the use of water as hot as the hands can comfortably stand. The hands are moistened, soaped thoroughly, and latter to the elbow, scrubbed thoroughly, a brush is used for nails, the hands are then rubbed together using friction for 20 seconds, rinsed thoroughly under running water, and dried using single service towels or hot air dryer. Respondents who did not wash their hands appropriately may not have been aware of the appropriate method of hand washing. before handling food.

Dedication of separate utensils like knifes to ready-to-eat food and raw food items or proper washing with sanitization of those utensils after use has been observed to reduce cross contamination of ready-to-eat food items **[21]**. Results of this study **(Table 3)** discovered that majority (53.81%) of respondents used the same knife for both raw fresh produce and ready-to-eat food items. Disturbing percentages of 31.43% did not apply any treatment to the knife in-between use, 20.95% rinsed with only water and

8.75% wiped the knife with a towel which may not be washed regularly. The risk of food borne infection from cross contamination among respondents was therefore high. Possibly respondents may not have been fully aware of the associated risk.

With respect to the risk of cross contamination of ready-to-eat food from fresh food items, the study found in Table 3 that majority (51.9%) of respondents refrigerated their fresh produce separately from ready-to-eat foods but a high percentage of respondents (34.29%) did not and (13.81%) did so only sometimes. This finding is in agreement with **[18]** who in similar studies found majority of respondents in some tertiary institutions in South Africa indicate to them that they separately stored their ready-to-eat food from fresh produce. Respondents who did not separate their food items and those who only did so sometimes may either have not been aware of the associated risk or they did not have enough space for refrigeration. According **[22]** contaminated or uncooked raw foods can cause harmful microorganisms to be passed to safe foods and cause a food borne illness. Evidence **[23]** reveals that 80,000 enteric infections could be prevented each year in US households, resulting in savings of $138 million based on reduction of cross-contamination and improvement in personal hygiene

Contrary to **[24]** the study revealed **(Table 3)** that a sizable percentage of respondents (36.19%) ate raw eggs or consumed raw eggs 'sometimes' (10.48%). This finding suggests that the risk of acquiring food borne disease through consumption of raw eggs was high.. Respondents may not have been well informed about the risks associated with eating raw eggs. According to **[25]** consumers should never eat raw eggs or foods that contain raw eggs because eggs are an excellent breeding ground for microbial activity. They can become internally contaminated through a hen with *Salmonella* organisms in her ovary or oviduct or from absorbing bacteria through its pores. *Listeria monocytogenes*, has also been observed on whole eggs, unfortunately this organism is capable of surviving and thriving under refrigerated temperatures **[26]**. The effect of these pathogens is particularly serious for the very young, elderly, or the immuno – compromised

The handling of left-over foods is a high-risk action in a domestic kitchen. High bacteria counts (>106 cfu/g) were observed in 7,3% of left-over food samples collected from domestic kitchens **[27]** Bacteria found in

these samples included Enterobacteriaceae and *Bacillus cereus.* In agreement with **[18]**, this study observed that majority (66.67%) of respondents warmed their leftover food always before eating. However, it is worrying to note that 19.05% of respondents did not warm their left over before eating and 14.29% indicated they only sometimes warmed their left over **(Table 3)**. Pressure of academic work in terms of meeting datelines generally, may have been the reason for some respondents not heating their leftover food before eating or they may not have been aware of the associated risk.

Environmental hygiene is equally important for food safety as personal hygiene **[13]**. Most animals found in unclean environments carry pathogens to food as natural carriers or as vectors. For example evidence links some reptiles to salmonellosis **[28]**, flies to cholera **[29]** and insects to a wide variety of diseases. An unclean environment can therefore result in the outbreak of food borne diseases. The study in Table 4 revealed a poor environmental situation at some hostels that could enhance the spread of food borne disease. This was as a result of dustbins not being covered and/or not being emptied regularly. Even though majority (72.86%) of respondents said their dustbins were always covered, 18.10% did not cover their dustbins and 9.08% sometimes covered their dustbins **(Table 4)**. Similarly, whiles dustbins in the hostels of majority of respondents (73.81%) were emptied regularly, 22.38% of respondents indicated their dustbins were not emptied regularly and 3.81% indicated their dustbins were rarely emptied **(Table 4)**. The risk of food borne contamination from the environment was therefore observed to be worrying especially because of mounting evidence that diseases related to inadequate sanitation and poor hygiene are among the highest causes of illness and death in developing countries.

Majority (53.33%) of respondents did not have kitchens provided for them in their hostels, additionally out of the minority (46.67%) who had kitchens in their hostels only 16.67% indicated they had their own kitchens **(Table 4)**. 52.86% of respondents shared kitchen space with more than ten other students suggesting kitchen space was mostly unavailable or inadequate. Respondents who did not have kitchens may have resorted to preparing their meals in open spaces in the corridors of their hostels open to contamination or in their bedrooms. Overcrowding of ten or more respondents in one kitchen also exposed respondents to cross contamination from other occupants.

CONCLUSION

This study, generally found low levels of awareness of cross-contamination, high-risk food items and a worrying level of awareness of appropriate hand hygiene among students even though the levels varied in terms of gender and program of study. Additionally, nonexistent or inadequate kitchen facilities were also reported from the hostels of respondents coupled with poor sanitation at some of the hostels. For a sustainable reduction of food borne diseases there is the need to embark on education of all stake holders (students, hostel developers and university authorities). Food safety education can be incorporated to the orientation of every group of new students; standards regarding adequate kitchen facilities in hostels should also be enforced and finally waste management at the hostels should be regularly supervised.

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