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Hygiene Practices and Food Safety Knowledge for Biological, Chemical and Physical Hazards

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Abstract: Food hygiene and safety are two related issues that have gained currency in most of the world's health conscious communities. People have become more conscious of the food they consume and are also increasingly vigilant about food safety considerations. The purpose of this study is to examine food hygiene practices and food safety perspectives among 18 students of aculinary degree program. Their knowledge of biological, chemical and physical hazardsthat may affect hygiene practices are recorded and described via their participation ina series of interviews, observations and photo taking at their workstations. The results show a lack of knowledge of potential food hazards that could contribute to poor food handling thus leading to food hygiene and safety issues.

Key words: Hygiene practices, food safety, hazards, culinary, Malysia

INTRODUCTION

Every year millions of individuals from all over the world were reported to suffer from foodborne diseases when consuming contaminated food (Giritlioglu *et al*., 2011). In 2012, Malaysia recorded approximately 56.6 incidents of foodborne diseases from a population of 100,000. These statistics reflect a violation of public food safety which could be the outcome of a lack of knowledge of Food Hygiene and Safety (FHS) and poor practices among food handlers (Abdul *et al*., 2012).

A casual approach to handling food on a regular basis, depending on the level of sanitation and process controls, processing methods, packaging, distribution and storage of foods and during cooking preparation and holding may create initial contamination. Environmental health hazards; biological, physical, chemical, biochemical and psychosocial also contribute to contamination.

A biological hazard is when food becomes contaminated by harmful bacteria, viruses or parasites (salmonella, hepatitis A and Trichinella) found in the air, food, water, soil, animals and the human body that can cause serious health problems (Satin, 2008). It is chemical when pesticides and other chemicals are applied onto raw materials or when chemicals including cleaners and sanitizers are used in the food manufacturing process. Finally, a hazard is physical when food is contaminated by extraneous materials (insects, hair, metal fragments and pieces of plastic, glass, or wood) which are foreign to the food itself. Multiple contaminations can also result from the mixing or blending of raw materials or ingredients of larger materials (Lammerding and Fazil, 2000).

In a situation where foodborne diseases are on the rise, ensuring the health of the community becomes even more critical and having access to hygiene practices and measures becomes a top priority. We assume that continued education and training in FHS would strengthen food handlers' knowledge and application of these practices and measures (Seaman, 2010). However, even with the growth of culinary schools and an increase in trained food handlers, food poisoning cases are still prevalent in commercial catering due mainly to poor handling practices (Clayton *et al*., 2002). Zain and Naing (2002) therefore suggest that learning, training and developing food safety certification examinations could be the most important elements in the process of confirming food handler's knowledge and skills about food safety and hygiene practice. As such their training should target changing all behaviors that are most likely to result in poor FHS. This study, therefore, develops a series of interviews and observations that would elicit and examine FHS knowledge on potential food hazards that influence actual hygiene practices. This information is crucial to a more effective training of future food handlers.

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MATERIALS AND METHODS

A qualitative mode of inquiry in the form of an interview, observation and photo taking was employed in this study. The interview attempted to explore and understand the beliefs, experiences, attitudes, behaviors and interactions of 20 years old culinary degree students of Universiti Teknologi MARA (UiTM) at Puncak Alam Campus. These students were selected as participants based on their competency in pursuing a culinary career. Also, by being in a culinary arts program, they master core technical skills in culinary apart from gaining learning experience, skills and knowledge particularly from their internship at commercial kitchens (Cullen, 2010; Muller *et al*., 2009). These students had come from different pre-university backgrounds; non-related culinary programs (STPM, an equivalent A level, foundation and matriculation) or culinary-related private and government programs.

The interview questions were adapted from a questionnaire by Manzano and emphasized perspectives from food hygiene practices and food safety, as well as knowledge of potential food hazards. The series of open questions were punctuated with a probing question regarding these perspectives as shown in Table 1. Observation and photo-taking were simultaneously employed to record activities at the workstation. This systematic ethnographic recording is a normal anthropological practice that allows for a detailed description of real life activities. For recording purposes, one unit of GoPro HERO4 Silver Edition and two units of SJCAM M10 WIFI series were used. To tap real workstation activities, one unit of DSLR model Nikon D90 was used. A 4 h observation session for each student took place 1 day in a week over a period of 6 weeks, making up a total of 72 h all together. The students involved were divided into six groups and action cameras were randomly placed on their heads to observe their implementation of FHS at the workstation. In an effort to reduce the bias effect of the study setting and students' abnormal behavior, a briefing was held prior to the observation while an orientation time of 15 min to 1 h was also organized to allow students to be more comfortable for the actual recording of their workstation activities.

RESULTS AND DISCUSSION

Throughout the interview session, informant profile categories comprised three components: sex, postgraduate status and Cumulative Grade Point Average (CGPA). For the interpretation, the group of informants is simplified and presented in Table 2.

The participants' profile is made up of three categories: sex, graduate status and cumulative grade Point Average (CGPA). Culinary student participants (n = 18) consisted of 44.4% male and 66.6% female. Almost 40% of the sample had an average CGPA of 3.01 to 3.50 with the adopted final semester diploma students making up 55.6% (n = 10). There were two types of culinary students in the degree in culinary arts Management. The first group was the final semester students of a hospitality related diploma program absorbed and endorsed into the degree program by the University. The second group came from a completely different non-hospitality program and were expected to have very little knowledge of FHS.

Food hygiene at the workstation: The interview and review process yielded seven common FSHP themes:

- Wearing clean working garments while on duty
- Wearing acap or scarf
- Washing hands immediately before work or after
- Visitingthe toilet
- Removing all unsecured jewelry, watchesorother objects while on duty

Table 1: Hygiene practices and food safety perspectives

Open question	Probe question
Hygiene perspectives	
Do you wear aclean working garment?	If no, what is your reason?
Or Do you wash your apron?	
Do you wear acapor scarf in the kitchen?	If no, why not?
Do you always wash your hands before work?	Ifyes, do you follow proper hand-washing procedure?
Or Do you always wash your hands after usingthetoilet?	
Do you remove unsecured jewelry, watches, or any similarobjects while on duty?	If no, why?
Do you wear gloves while handling cooked food?	If yes, how frequently do you change your gloves?
Do you keep fingernails short, clean,and without nail polish?	If yes, why?
Food safety perspectives	
Can you explain a biological hazard during food preparation?	If yes, can you describe a specific example of a hazard?
During food preparation, what kind of chemical hazards exist?	Can you providean example of suchahazard?
What is a potential physical hazard during food preparation?	If yes, can you describe a correct example of a hazard?

Table 2: Participant characteristics

Characteristics	N = 18	Total sample
Sex		
Male	8	44.4
Female	10	66.6
CGPA		
≤2.00	0	0.0
2.01-2.50	2	11.1
2.51-2.00	5	27.8
3.01-3.50	7	38.9
3.51-4.00	4	22.2
Postgraduate		
STPM	3	16.6
Matrix/Asasi UiTM	3	16.6
Diploma another IPT	1	5.6
Diploma UiTM	1	5.6
Final adoption of semester Diploma	10	55.6

Table 3: Potential food hazard themes

Characteristics	N = 18	Total sample
Biological hazard	6	33.3
Harmful microbe	6	33.3
Bacteria	6	33.3
Viruses	2	11.1
Parasite	1	5.6
Salmonella	3	16.7
Hepatitis	1	5.6
Chemical hazard	8	44.4
Fertilizer	4	2.2
Detergent	5	26.8
Toxin	1	5.6
Physical hazard	14	77.8
Foreign object	14	77.8
Wood	10	55.6
Glass	12	66.7
Metal	13	72.2

Keeping fingernails short and clean without nail polish The following reasons were given by some participants who neglected implementingFHS:

- Assuming that the apron and kitchen pan were clean
- Assuming that the workstation did not supply enough gloves

Participants consistently reported that they did not wear gloves at the workstation as they were not provided with any or they did not come prepared with their own gloves. There were two significant differences. Theadopted final semester diploma students were more aware of thepreparationthey had to make for their workstation sessions. They also seemed more adaptable to situational needs and consulted lecturers on many aspects related to food preparation.

Potential hazards during food preparation: Thirteen potential food preparation hazard themes were identified based on the student's views of potential hazards. Table 3 shows 33% of biological hazards as harmful microbes and bacteria, 11.1% viruses and 5.6% of parasites. Two common harmful microbe species, *Salmonella* sp. (16.7%) and hepatitis (5.6%) were identified. Knowledge of potential hazards recorded as 77.8% for physical hazard and 44.4% for chemical hazard.

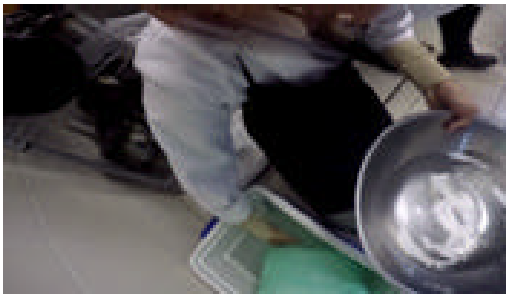

Fig. 1: Picking ice with bare hands

Biological hazards: Six participants accurately explained potential biological hazards. Participant A2 explained it as an outcome of cross-contamination due to the "transfer of harmful bacteria, viruses or parasites such as salmonella and hepatitis from food to food through the use of contaminated contact surfaces such as cutting boards and utensils". Participant B4 provided details on how a salmonella-infected chicken "is processed on the same cutting board as cooked food, thus transferring "the bacteria to the cooked item". Participant A concluded on the "difficulty of implementing a color-coding system for cutting board usage" as there are "limited resources at the workplace".

Chemical hazards: The interview revealed different participant reactions tothe hazardous use of detergent. According to Participant E14, "careless rinsing of cookware or utensils can cause severe damage or injury becauseof immediate or long-term exposure". Participant E17 illustrated how "microbes in fish produce toxins which will make thefish unsafe for consumption if it is not cleaned or cooked properly". The participant further explained that "if the bacterium produces toxin, it will be a biological hazard but is also chemical reaction as it producestoxins".

Physical hazards: Fourteen interview participants categorized physical hazard as any potentially harmful extraneous matter (wood, glass and metal) not usually found in food. "The source of thehazard is often easy to identify visually and does not need a specific test or special kit for identification" (Participant C9). Such foreign objects could cause a serious injury if consumers accidently consume it and "if such an incident getsreported, it would be a huge problem for me" (Participant B4).

Observation and hands-on activities: The students' reactions during the observation process seemed normal and unaffected by the presence of the observer. This was verified by their lecturer and the lab assistants. Figure 1

Fig. 2: Using the wrong color-coded cutting board for slicing seafood

shows participant B5 picking ice with bare hands despite having access to the utensil specifically designed for it. Figure 2, on the other hand, demonstrates participant A2's poor implementation of FHS which may lead to cross-contamination. The use of the green chopping board (for vegetables and fruits) to process seafood was done out of convenience and not because other colored chopping boards were not provided by the organization. It seemed easier to stick to one board per station. Although food produced by this workstation was meant only for display and learning purposes, correct hygiene and food safety practices were expected to be followed for all lab activities.

This study presents insights into the implementation of FHS at work by understanding culinary students' food hygiene attitudes and knowledge of potential hazards. It also identifies individual behaviors and practices that may lead to FHS issues.

Crucial to the prevention of most types of foodborne illnesses is the continuous education and training of food handlers directly involved in the preparation and processing of food (Djekic *et al*., 2014). This study reveals that the culinary students under investigation lack knowledge of basic food hygiene and practices which could ultimately lead to potential food hazards. This finding is consistent with that of Osaili *et al*. (2013)'s food handlers in catering establishments. Although these students showed initiative at ensuring top notch hygiene practices, the male students somehow displayed a tendency to neglect some hygiene practices, particularly that of their uniform. Three other participants also neglected their aprons and kitchen pants which apparently did not require washing since they felt that they were still clean.

The results also indicate that 33% of the students were accurate about microbiological hazards, 44% about chemical hazards and 78% about physical hazards. Surprisingly, the majority of the participants (61.1% students with a CGPA above 3.01), who could be considered knowledgeable in culinary, did not possess knowledge of correct hygiene practices and in fact had poor knowledge of foodborne pathogen which may lead to unintentional cross contamination. Several activities that could lead to cross-contamination (Fig. 1 and 2) were also detected. This finding is consistent with studies by Hassan and Dimassi (2014). Others like Bruhn and Schutz (1999), Frewer *et al*. (1994) and Redmond and Griffith (2003) found some similarity with the food handlers that they investigated. Their handlers thought they knew how to handle food safely but their self reported food handling behaviors did not support the assumption. Unfortunately, in most cases, this can be analyzed as food hygiene training that does not translate into positive food handling behaviours or behavioural change in the workplace (Seaman, 2010). Also, safe food handling practices learnt during food hygiene training requires the handler to use the available resources by applying the knowledge and skills into real practices. Therefore, competent lecturers supported by sufficient facilities play a role in shaping culinary practitioners with responsibility towards improving FHS to a new level.

CONCLUSION

This study exemplifies a new dimension of preventive foodborne illness where the crucial input is derived from people with knowledge and experience in the culinary field. The data on the students' perceived knowledge, current attitudes and actual workplace practices would provide useful information for the setting up of a more comprehensive FHS procedure and training.

This study concludes that culinary students need to have an in-depth knowledge of potential hazards especially biological hazards in comparison to chemical and physical ones. Correct work habits need to be instilled in these students early or at least at the lab classes which should prepare them to be fully ready to implement FHS at work. The careless attitude displayed by the participants of this study would have to be consciously corrected and therefore requires continuous on-going lab observation by both lecturers and laboratory staff alike.

Food operators too need to be constantly reminded of the importance of strictly using kitchen facilities that are made available in the designated work area. As this study discovered a high number of food preparing operators bringing in their own gloves to work, they therefore need to have a more comprehensive practical knowledge of potential areas of cross-contamination. This

is especially crucial when personal belongings come into contact with food during the actual food processing process. A self-checklist incorporating various checkpoints would also discipline students into developing a more wholesome attitude towards every stage of their learning of FHS and work practices. To ensure that these future food handlers are on top of FHS, they need to translate their learning and training at the lab into meaningful and desirable practices at the workplace.

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