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Original Research Article

Knowledge and practices of food hygiene among food handlers in plantation sector, Sri Lanka

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ABSTRACT

Background: Diseases related with consumption of contaminated foods are a common problem in worldwide. Food handlers play a major role in ensuring food safety and hygiene. Information about food hygiene in plantation sector of Sri Lanka is insufficient. This study was designed to assess the knowledge and practice of food hygiene among food handlers in tea plantation sector of Kandy, Sri Lanka.
Methods: A community based cross sectional study was conducted among food handlers in tea plantations in three tea plantations from July to September 2013. Information regarding food handling practices, knowledge and attitude of food hygiene and safety and medical treatments was obtained from food handlers using a structured questionnaire. The data was analyzed using SPSS version 20 statistical software.
Results: 375 food handlers from 18 to 63 years (mean 33.4 ± 7.2) were enrolled of which 88% of them were females. Out of total participants, 59.6% of the respondent had good knowledge of food practice and hygiene. Gender ($p = 0.044$), education level of food handlers ($p = 0.019$), and good medical practices ($p < 0.05$) were statistically significant with practice of food safety and hygiene.
Conclusions: Community - health education programs, promoting food hygiene and safety training should be implemented to improve the level of knowledge and practice of food hygiene.

Keywords: Food hygiene, Food handlers, Plantation sector, Sri Lanka

INTRODUCTION

An adequate wholesome food is essential to human beings for their existence.[1] However, food borne illnesses spread throughout the world due to consumption of contaminated food and therefore, be considered as a major health problem in worldwide and a significant cause of economic loss.[2] Food handlers play a vital role in ensuring food safety throughout the procedure of food preparation. It was estimated that millions of people become ill each year and thousands of them die after consuming contaminated foods due to poor food handling and safety methods of food handlers.[3]

Improper food handling, preparation and storage can result food contamination leading to food poisoning and food related diseases caused by intestinal parasites and pathogenic bacteria.[4] Involving infected people in food processing increases the risk of food contamination via fingers due to most microorganisms can survive underneath of fingernails.[5] Consumption of contaminated food is a major reason for more than half of diarrheal diseases in developing countries.[6] Therefore, knowledge and attitudes of food handlers' and hygiene practices directly affect food safety and hygiene in food establishments.[7]

Poverty, poor sanitary and food handling practices, lack of education and communicable diseases are prominent among food handlers in plantation sector in Sri Lanka. Very little information about food hygiene practices in plantation sector is available due to low number of studies has been conducted to assess food handling practices among adult population in the tea plantation sector of Sri Lanka. Therefore, the purpose of this study was to determine the practice and knowledge of food hygiene practices of food handlers in the plantation sector in Kandy district and made appropriate recommendations for the improvement of food safety and sanitary conditions.

METHODS

Study design and population

A cross-sectional descriptive study was conducted in tea plantations close to Hantane mountain range in Kandy district, Sri Lanka from July to September 2013. These study areas are one of the largest plantation areas in Kandy district and highly populated compare to other plantation areas. It is situated about 5 km away from Kandy and 120 km East from Colombo, the capital city of Sri Lanka. The educational status of adult population was poor people and lives with low sanitary and household facilities within very limited space. Streams and unprotected wells are main resources for drinking and other water requirements in this community. More than half of people have no latrine facilities and most of residents tend to go around bushy and forest areas for defecation. Most of food handlers are women in household level as most of men occupied outside from homes. In the present study all food handlers working in household level in this plantation area were used as the source of population. The sample size was calculated using a formula of $n = z^2pq/d^2$. It was estimated that 50% of food handlers had a good knowledge of food hygiene and safety due to lack of previous similar studies in Sri Lanka. 5% marginal error, 95% confidence interval was also taken to calculate the sample size. The calculated minimum sample size was 384. Then out of total food handlers, 384 were selected by simple random sampling method for the study.

Collection of data

Before the commencement of the study, small group meetings were organized to explain the purposes of this study to all the selected food handlers with the help of regional health officers and written consents were obtained from each of the participants. An interviewer administrated structured questionnaire was used to collect socio-demographic characteristics, food handling practices, knowledge and attitudes of food safety and hygiene. Medical treatments were assessed by examining their medical reports and the awareness of food borne diseases was determined by the knowledge of transmission and symptoms of food borne diseases. Questionnaire was basically prepared in English and was translated to their native languages (Sinhala and Tamil) to get more reliable information from respondents.

Practice of food safety and hygiene

There were 9 questions based on the practice of food safety and hygiene of food handlers. A three - point score scale was used for the analysis of responses (3 points for always, 2 points for some times, 1 for never). A total of 27 maximum achievable points was used for practice of food hygiene among study subjects. A score of 0-15 marks out of maximum marks was graded as poor practice while a score of 16-27 marks (≥60%) was graded as good practice.

Statistical analysis

Data entered into Microsoft Excel sheet and then were transferred into the statistical package for social sciences (SPSS) version 20 for statistical analysis. Descriptive statistics were used including percentage, mean and standard deviation to describe the analyzed variables in this community. Chi square test was used to determine relationship between socio demographic characteristics, medication and the knowledge of food hygiene with the practice of food safety and hygiene among study subjects. A 95% confidence level was used and $P < 0.05$ was considered statistically significant.

Ethical consideration

Ethical approval was obtained from the ethical clearance committee, Faculty of Allied Health Sciences, University of Peradeniya, Sri Lanka. Written permission was also obtained from the administrations and health authorities of relevant tea plantations to conduct the study. Written consents were obtained from each participant before recruiting them to the study. All information provided by the respondents was kept confidential and analyzed only for research purpose.

RESULTS

Socio-demographic factors

A total of 375 food handlers in tea plantation areas (97.7% response rate) with the mean age were 33.4 ± 7.2 years participated for the study. The age range of the respondent was 18 - 63 years and the majority of them were females. Out of all respondents, 71% had completed only primary education and 13% had no any formal education. Most of the study subjects were unemployed, more than 5 years food handing experience and had low household income as shown in Table 1.

Food handling practices

Table 2 shows food hygiene practices of the participants. More than half of respondents never used proper hand

washing techniques with soap and water during the time of food preparing. However, majority of subjects engaged in hand wash with soap and water after defecation. 54% of individuals' cleaned food preparing equipment with disinfectants every time while 28% cleaned the workplace every time where food prepared.

Table 1: Socio-demographic characteristics of the food handlers.

Characteristics	Variables	Frequency	Percentage (%)
Gender	Male	44	11.7
	Female	331	88.3
Age (Years)	18 - 26	93	24.8
	27 - 36	109	29.1
	37 - 46	81	21.6
	47 - 56	57	15.2
	57 - 66	35	9.3
Educational state	No formal education	48	12.8
	Primary	267	71.2
	Secondary	54	14.4
	Tertiary	6	1.6
Occupational state	Employed	78	20.8
	Unemployed	297	79.2
Years of experience	≤ 5 years	97	25.9
	> 5 years	278	74.1
Monthly income	≤ Rs. 20000	254	67.7
	> Rs. 20000	121	32.3

Table 2: Practice of food hygiene among subjects.

Characteristics	Variables	Frequency	Percentage (%)
Hand washing with soap and water			
a) before and after preparing food	Always	43	11.5
	Sometimes	135	36.0
	Never	197	52.5
b) after defecation	Always	269	71.7
	Sometimes	74	19.7
	Never	32	8.5
Cleaning and sanitizing cutting surfaces before and after use	Always	107	28.5
	Sometimes	172	45.9
	Never	96	25.6
Cleaning and sanitizing food preparing equipment and tools before and after use	Always	204	54.4
	Sometimes	145	38.7
	Never	36	9.6
Clean of fingernails	Always	58	15.5
	Sometimes	239	63.7
	Never	78	20.8
Use of apron	Always	34	9.1
	Sometimes	77	20.5
	Never	264	70.4
Adequate protection of food from flies and dust	Always	58	15.5
	Sometimes	97	25.9
	Never	220	58.7
Use of proper waste disposal methods	Always	78	20.8
	Sometimes	111	29.6
	Never	186	49.6
Washing raw vegetables and fruits with treated water before eating	Always	89	14.9
	Sometimes	154	38.4
	Never	132	46.7

Small number of subjects had the habits of trimming their fingers at regular interval, using aprons while food preparing and covering food protecting from rodents. In addition majority of food handlers do not use proper waste disposal system and proper cleaning method for raw vegetables before consuming. According to the criteria mentioned above in methodology part, 223 (59.5%) of studied food handlers were found to have good practice of food safety and hygiene. Gender of the respondents showed statistically significant relationship with practice of food safety and hygiene ($p < 0.05$). Similarly level of education of the food vendors, had statistical significant influence on the practice of food safety and hygiene as given in Table 3.

Table 3: Socio-demographic characteristics of the food handlers.

Characteristics	Variables	Level of practice		p value
		Good (%)	Poor (%)	
Gender	Male	20 (45.5)	24 (54.5)	0.044
	Female	203 (61.3)	128 (38.7)	
Age (years)	18 - 26	47 (50.5)	46 (49.5)	0.321
	27 - 36	66 (60.5)	43 (39.5)	
	37 - 46	52 (65.0)	28 (35.0)	
	47 - 56	37 (67.3)	18 (32.7)	
	57 - 66	21 (60.0)	14 (40.0)	
Educational state	No formal education	21 (43.8)	27 (56.2)	0.019
	Primary	158 (59.2)	109 (40.8)	
	Secondary	39 (72.2)	15 (27.8)	
	Tertiary	5 (83.3)	1 (16.6)	
Occupational state	Employed	40 (51.3)	38 (48.7)	0.098
	Unemployed	183 (61.6)	114 (38.4)	
Years of experience	≤ 5 years	52 (53.6)	45 (46.4)	0.211
	> 5 years	172 (61.9)	106 (38.1)	
Monthly income	≤ Rs. 20000	145 (57.1)	109 (42.9)	0.174
	> Rs. 20000	78 (64.5)	43 (35.5)	
	Total	223 (59.5)	152 (40.5)	

Table 4: Medicare practices of the subjects.

Characteristics	Variables	Level of practice		*p* value
		Good (%)	Poor (%)	
Regular medical checkup	Yes	25 (80.6)	6 (19.4)	0.012
	No	198 (57.5)	146 (42.5)	
Regular deworming	Yes	21 (87.5)	3 (12.5)	0.004
	No	202 (57.5)	149 (42.5)	
Provided medication when ill	Yes	177 (74.4)	61 (25.6)	<0.001
	No	46 (33.6)	91 (66.4)	
Isolated from work place when ill	Yes	104 (74.3)	36 (25.7)	<0.001
	No	119 (50.6)	116 (49.4)	
Cover skin cuttings with medications	Yes	54 (52.4)	49 (47.6)	0.088
	No	169 (62.1)	103 (37.9)	
	Total	223 (59.5)	152 (40.5)	

In Table 4 shows only small amount of food handlers in this community undergo regular medical checkup and taking anthelminthic drugs for deworming. Most of subjects stated that they have involved food preparing process while they were in ill conditions. However, more than half of respondents provided medications when they were ill. Majority of them showed good food hygiene habits and all of these four factors were statistically significant with food hygiene practices.

Knowledge of food hygiene and practice

The majority of food handlers had good knowledge of transmission and symptoms of food borne diseases and also most of food handlers believed that personal hygiene prevents food borne disease. In addition, most of them expressed that they believed microbes and rodents mainly cause to spread food borne diseases as in Table 5.

Table 5: Respondents' knowledge on food hygiene.

Characteristics	Variables	Level of practice		p value
		Good (%)	Poor (%)	
Awareness of food borne diseases	Yes	188 (58.0)	136 (42.0)	0.152
	No	35 (68.6)	16 (31.4)	
Microbes cause food borne diseases	Yes	98 (53.5)	85 (46.5)	0.256
	No	114 (59.4)	78 (40.6)	
Rodents can spread food borne diseases	Yes	166 (68.3)	77 (31.7)	<0.001
	No	57 (43.2)	75 (56.8)	
Heating kills microbes and their toxins on food	Yes	90 (62.9)	53 (37.1)	0.407
	No	136 (58.6)	96 (41.4)	
Reduces the risk of food contamination by				
a) Refrigeration	Yes	152 (55.9)	120 (44.1)	0.679
	No	60 (68.9)	43 (31.1)	
b) Usage of clean hands and water	Yes	103 (56.0)	81 (44.0)	0.177
	No	120 (62.8)	71 (38.2)	
c) Protective clothing	Yes	73 (61.9)	45 (38.1)	0.522
	No	150 (58.4)	107 (41.6)	
d) Separating cooked food from raw food	Yes	158 (55.8)	125 (44.2)	0.630
	No	54 (58.7)	38 (41.3)	
e) Cleaning food preparation area with detergents	Yes	96 (58.5)	68 (41.5)	0.746
	No	127 (63.1)	84 (36.9)	
f) Keeping diseased persons away from food preparation	Yes	116 (57.4)	86 (42.6)	0.325
	No	108 (61.8)	65 (38.2)	
	Total	223 (62.4)	152 (37.8)	

DISCUSSION

Food handlers in this study were in 18-63 age range and most of them were in 27-36 age group. Similar findings were reported in Nigeria, Slovenia and Malaysia indicating that majority of them was middle aged people less than 50 years.[8-10] In the present study, we found that majority of the respondents completed only primary education and 12.8% had no any formal education. This is not surprising because most of food handlers in this society were females. According to Demographic and health survey in 2006, 19.9% of female household population had no formal education while 39.2% completed only primary school education in the plantation sector in Sri Lanka.[11] They may be less knowledgeable about proper food hygiene and also about the transmission and spread of food borne diseases. Similar findings were documented in Ethiopia that high number of female food handlers had low educational background.[12] In the present study, level of education of study subjects significantly associated with their food hygiene practices. This is similar to some reports in India and Bangladesh identified that educational status of food handlers affect their food handling practices.[13,14] Most of food handlers had an experience of more than 5 years in this study. This is the result of more women involve food processing activities from their teenage life in this community. However, gender was found to be significant factor for food practices of the subjects. Knowledge of food hygiene among female is higher than men in this community because female concern more about health in their family members.

In the present study, 59.6% of the food handlers had good knowledge of food hygiene and safety which is similar to report of Malaysia (54.7) and in Nigeria (56.3%).[10,15] However, this is in contrast with results of a Thailand which was found 15.2% of food handlers had good food hygiene practices.[16] Pathogenic organisms from infected food handlers can be transmitted to food via fecally contaminated hands, infected skin lesions, naso-pharyngeal secretions or fomites. Poor hand hygiene practices have been identified as a major source for foodborne outbreaks worldwide.[17] Proper hand washing with soap can remove transient micro flora from the hands and prevent gastrointestinal infections.[18] In the present study, majority of respondents had no practices of wash hands with soap and water while food handling process. Similar results have been reported in Nigeria which was only 21% of subjects had a practice of proper hand washing with soap and water. Although hand washing only with water can reduce the burden of normal flora, it cannot remove all type of pathogenic micro-organisms. Therefore, improper hand washing could be a major reason for high prevalence of food borne diseases present in the plantation sector. However, 88% of them confirmed that they wash hands with soap after defecation. This prevents the contamination of fecal

microorganisms with fingers of food handlers after using latrines. During the period of food preparing, hands should be dried due to moisture facilitates the transfer of pathogenic organisms.[19] However, majority of subjects expressed that they do not consider about the moisture of their hands while food preparing and serving.

Small number of food handlers had a habit of cleaning and sanitizing of food cutting surfaces every time. This is in contrast with a study in Trinidad, 45% of the food handlers cleaned and sanitized their cutting boards.[20] Studies in Nigeria and Kenya showed that unclean equipment and work premises affect food handling practices.[4,21] Therefore, proper cleaning of food preparing places and utensils are more important factors to reduce the spread of food borne diseases.

In this study, we found that very low proportion of the respondents had well-trimmed fingernails. Several pathogenic micro-organisms such as *Campylobacter*, *E. coli* and *Salmonella* can survive beneath fingernails and therefore always fingernails should be kept clean and short to prevent the pathogens transmit to foods.[22,23] Hair also should be kept clean and tidy as it can be a source of cross contamination of pathogens. Low proportion of this community had a habit of wearing hair restraints and protective clothing while food preparing which is inconsistent with studies in Nigeria reported that low percentage of food handlers used hair protection methods.[24,25] Aprons prevent foods contact with our body and reduce the risk of cross contamination of foods. However, very little number of participants had a practice of wearing aprons while food preparing. Aprons should be clean and light colored. Wearing unclean aprons also increase the risk of transmits pathogenic organisms into food.

Eating raw vegetables have been identified as a source of outbreak of giardiasis.[26] Present study shows high number of food handlers have no a habit of cleaning raw foods with treated water. Poor food handling of infected people is a major risk of contamination of raw vegetables and fruits because no proper methods to control pathogens on raw vegetables before consuming. Purified water should be used for drinking purposes due to many types of pathogenic organisms can survive in untreated water. It was reported that chlorinated water can destroy Salmonellae.[27] There was no proper chlorinated water drainage system and the awareness programs of food security in the study area. Therefore majority of this community used untreated water to clean raw food. This could be another reason to increase the prevalence of infectious diseases in plantation sector.

Medical examination of food handlers is necessary to ensure that communicable diseases are not associated with food handlers. It is more important to decrease outbreaks of food borne diseases. Recent studies found that contamination of food handling causes 10% to 20% of food borne disease outbreaks worldwide. Present study shows only 8% of the food handlers had been undergone medically examination at regular pattern. Poor health care services and high cost of laboratory tests were major reasons to discourage people from medical screening at regular pattern. In addition, very low numbers of food handlers are getting anthelminthic drugs at regular interval. Several studies have been documented that high prevalence of intestinal parasitic infections present among children in the plantation sector of Sri Lanka.[28-30] Due to close relationship between children and their mothers, majority of women in this community may harbor intestinal parasites in their gastrointestinal tract. However when disease conditions expressed, most of correspondents take treatments as other communities do. Streptococci and Staphylococci are commonly transmitted via infected skin lesions on exposed body parts. In addition, aerosolisation has been identified as a mode of transmission of some vital outbreaks such as Norovirus.[31] Therefore adequate covering of these infected lesions by colored waterproof dressings is important to ensure the reduction of cross contamination of foods. In addition, food handlers with purulent discharges should not contact with food because they also a potential source of food contamination.

In our study, majority of our study subjects were aware of food borne illnesses which is similar to results in Ethiopia and Nigeria.[15,32] The proper training of food handlers is a most effective process to reduce the risk of contamination of foods. The large proportion of food handlers expressed that they had never been trained on food handling and preparation. The lack of good food hygiene in the present study indicates that inadequate training of food handling principles may negatively affect to improve food hygiene and safety practices. However majority expressed that they got many knowledge about food hygiene practices and the awareness of food borne diseases from their elders, society and also from mass media. Although most of the respondents had an idea of good food hygiene practices can reduce the risk of food borne diseases they do not have a scientific knowledge of how those food practices contribute to reduce food related diseases.

CONCLUSION

40% of food handlers do not follow good food hygiene methods. Proper training of food hygiene practices promoting good personal hygiene and regular medications should be implemented to enhance the knowledge of food handing and food borne diseases among food handlers in the plantation sector, Sri Lanka.

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