

## Original Research Article

# Hand hygiene in food handlers working in canteens of an educational institution in Eastern India

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## ABSTRACT

**Background:** Food borne diseases are a worldwide problem of great magnitude in terms of human sufferings and economic cause. One of the important category directly relating to food safety concerns are the food handlers. This study was conducted to assess the knowledge and self-reported food safety practices of food handlers regarding food safety and hand hygiene and bacteriological analysis of hand hygiene of food handlers working in the canteen.

**Methods:** The demographic data was collected on a structured questionnaire and the hand swabs were cultures as per standard protocol.

**Results:** The study was conducted on 29 food handlers and 93.1% were males. A positive correlation was observed between the variables 'knowledge' and 'self-reported food safety practices of food handlers with the socio-demographic data. The association between detection of different microorganisms and different knowledge and practices were a significant finding in 95% confidence limit ( $p < 0.001$ ) on applying two tailed Z-test.

**Conclusions:** This study is exploratory in nature and can act as a base study of the relationship between hand sanitation and knowledge attitude and practice of food handlers.

**Keywords:** Bacteriological analysis, Food handlers, Hand hygiene

## INTRODUCTION

Food borne diseases are a worldwide problem of great magnitude in terms of human sufferings and economic cause. Food borne disease can be defined as "any disease usually either infectious or toxic in nature, caused by agents that enter the body through ingestion of food".<sup>1</sup> The World Health Organization (WHO) indicated that each year as many as 600 million people in the world fall ill of which 420,000 die after consuming contaminated food.<sup>2</sup> The repeated occurrence of foodborne disease has led to an increase in global concern about food hygiene and safety among food handlers.<sup>3</sup> Foodborne disease

could be due to microbial pathogens, naturally produced toxins, or other chemicals that have entered the food supply chain.<sup>4</sup> Food borne diseases may be due to many factors in the food delivery system. One of the important category directly relating to food safety concerns are the food handlers. Food handler is any person who handles food regardless whether he actually prepares or serves it. During the preparation of food products, food handlers play a key role in hygienic-sanitary control and may be responsible for the promotion of food-borne disease episodes.<sup>5</sup> Transmission may occur from contaminated food source or the food handlers are themselves the source of microorganisms.

This study was conducted with the following objectives such as to assess the knowledge and self-reported food safety practices of food handlers regarding food safety and hand hygiene; and bacteriological analysis of hand hygiene of food handlers working in the canteen.

**METHODS**

**Study area description**

The study was conducted in 5 different canteens of an educational institute All India Institute of Hygiene and Public Health in Kolkata, India. The Institute is a post graduate research institute with a mandate of teaching, training and research. The Institute has 4 different campuses of which three (3) are present in urban area and one (1) in the rural area. The Institute has a staff strength of around 300 and a student strength of around 100. These canteens were instrumental in serving food to the students and staffs of the Institute.

**Study design and period**

The study was designed as a prospective cross-sectional study conducted on all 29 food handlers working in 5 different canteens of All India Institute of Hygiene and Public Health (AIHH and PH), Kolkata. The Study was conducted over a period of 6 months from November 2014 to March 2015. All the 29 food handlers were included in the study as access to all was attainable and all 29 food handlers were working in the canteens at the designated time period. There were no exclusion criteria for this project. The Ethical clearance was received from the Institution ethics committee.

**Tools used for study**

The demographic profile and knowledge of food handlers were assessed by a structured questionnaire in a face to face interview. The structured questionnaire was first prepared in English and then translated into local language, Bengali. The presence and absence of knowledge was only assessed and any scoring was not applied. The practises followed by the food handlers were assessed by observing them during their work. This observation was done without informing the food handlers so that they followed their normal routine. The Hand swabs were collected by sterile swab sticks and transported quickly to the Department of Microbiology AIHH and PH in nutrient broth medium. The swab sticks were cultured in Nutrient agar, MacConkey agar, Blood agar and Mannitol salt agar media. The isolates were identified by cultural characteristics, gram stain, motility and different biochemical tests following standard procedures.<sup>6</sup>

**Data analysis**

All data was collected and analysed statistically. First descriptive analysis of this study was done. All questions

about knowledge on food borne diseases were in a three answer format of yes, no and do not know. All questions pertaining to self-reported practises were scored on a three point Likert scale with options for agree, uncertain and disagree. Statistical analysis was carried out using EpiInfo software Version 3.5.1 (CDC Atlanta, USA). The significant level of 5% was adopted. A z-test was performed to verify the existence of correlation between knowledge on food safety and self-reported practices of food safety. Further a Chi square test was performed to check association between knowledge and sociodemographic variable and self-reported practices and socio demographic variable.

**RESULTS**

The study was conducted on 29 food handlers and 93.1% were males. They were mostly middle aged. 79.3% came from rural background and 44.82% had primary education. 75.86% were suffering from diseases of which non-communicable diseases were present. 75.87% food handlers were engaged in both preparing and serving of food (Table 1).

**Table 1: Distribution of the demographic parameters of the food handlers.**

Demographic variables	Number (%) (n=29)
<b>Age (years)</b>	
0-15	1 (3.45)
16-30	5 (17.24)
31-45	9 (31.03)
46-60	11 (37.93)
>61	3 (10.34)
<b>Sex</b>	
Male	27 (93.1)
Female	2 (6.9)
<b>Place of living</b>	
Urban	6 (20.7)
Rural	23 (79.3)
<b>Educational status</b>	
Illiterate	5 (17.24)
Primary education	13 (44.82)
Secondary education	6 (20.7)
Graduate	5 (17.24)
<b>Economic status (monthly income)</b>	
<Rs. 5000	16 (55.17)
Rs. 5000- Rs. 10,000	6 (20.7)
Rs. 10,000-Rs 20,000	3 (10.34)
>Rs. 20,000	4 (13.79)
<b>Health status of food handlers</b>	
Presence of disease	22 (75.86)
Absence of disease	7 (24.14)
<b>Service delivered by food handlers</b>	
Preparation of food	2 (6.9)
Cleaning	3 (10.34)
Prepared food serving	2 (6.9)
Multifunctional	22 (75.87)

**Table 2: Distribution of correct answers on food handlers' knowledge.**

Percentage of correct answers on food handlers knowledge	Number (%) (n=29)
Knowledge regarding food borne diseases	21 (72.41)
Knowledge regarding transmission of food borne diseases	11 (37.93)
Knowledge regarding use of piped water	18 (62.06)
Knowledge regarding covering up of cooked food	23 (79.31)
Knowledge regarding storing of food in refrigerator	27 (93.1)
Knowledge regarding washing of utensils in hot water	8 (27.58)
Knowledge regarding rodent infestation	18 (62.09)

The highest percentage per month in this study was that of knowledge regarding storing of food in refrigerator. However knowledge regarding washing of utensils in hot water (27.58%) and transmission of food borne diseases (37.93%) showed a low percentage (Table 2).

**Table 3: Distribution of correct answers to food handlers self-reported practices.**

Percentage of correct answers to each question of self-reported practices of food handlers	Number (%) (n=29)
Are you removed from your duties when you are sick?	2 (6.89)
Do you put finger in your nose while working?	6 (20.68)
Do you lick your fingers while working?	8 (27.58)
Do you use soap for hand washing after use of washroom?	7 (24.13)
Do you use stored water for hand washing?	9 (31.03)
Do you practice washing of vegetables before preparing food?	29 (100)
Do you practice washing of utensils during preparation and storage of food?	29 (100)

The distribution of correct answers regarding self-reported practices where practice of washing vegetables before preparing food and washing utensils during preparation and storage of food scored 100%. The duties of food handlers were strenuous and most of them continued with their duties when they were sick and only 6.89% availed leave on reporting sick (Table 3)

A positive correlation was observed between the variables 'knowledge' and 'self-reported food safety practices of food handlers with the socio-demographic data (Table 4).

**Table 4: Results of Chi square test for association (p-value) between knowledge and self-reported practices and social demographic characteristics.**

Demographic Characteristics	Knowledge (p value)	Self-reported practices (p value)
Age (46-60 years)	0.01578	0.0053
Sex (Male)	0.1936	0.0015
Place of living (rural)	0.1936	0.0157
Educational status (Primary education)	0.0015	0.0053
Economic status (<Rs. 5000)	0.000003	0.041
Health status of food handlers	0.01578	0.00001
Service delivered by food handlers (multifunctional)	0.1936	0.00001

The distribution of different microorganisms in the hand washing of the food handlers are shown in this table. *Staphylococcus aureus*, *Klebsiella* was detected in 3.44% and *Pseudomonas spp.* in 10.34%. The association between detection of different microorganisms and different knowledge and practices were a significant finding in 95% confidence limit (p<0.001) on applying two tailed Z-test. (Table 5).

**Table 5: Distribution of different microorganisms in hand washing of food handlers.**

Type of microorganism	Number (%) n=29	P value
Aerobic spore bearers	18 (62.069)	Z value=1.3, two-sided p value=0.1936
<i>Staphylococcus aureus</i>	1 (3.44)	Z value=-5.014, two-sided p value=0.00000534
<i>Escherichia coli</i>	6 (20.68)	Z value=-3.157, two-sided \ p value=0.001595
<i>Klebsiella spp.</i>	1 (3.44)	Z value=-5.014, two-sided p value=0.00000534
<i>Pseudomonas spp.</i>	3 (10.34)	z value=-4.271, two-sided p value=0.00001946

**DISCUSSION**

This study is different as it involved food handlers working in canteens of an educational institute. As canteens of educational institute works on a no profit or no loss basis the study assumes significance to the attitude and practices of food handlers. Most of the food handlers in this study were males aged 46 to 60 years. This is similar to the study from University of Saudi Arabia involving restaurant handlers where all

participants were men with an average age of 26 to 35 years.<sup>7</sup> The level of education completed proves to be an important factor in regards to food safety, as food handlers need to understand the importance of hand hygiene and disease transmission.<sup>8</sup> The monthly income of 55.1% food handlers were less than Rs. 5000 per month. Regarding professional characteristics most of the participants were used to work in all sections i.e. preparation, cleaning and serving. According to Freitas et al the level of education completed is an important indicator of work quality, quality of life and growth potential of employees.<sup>9</sup> So low level of education in the present study could have an impact of the behaviour pattern regarding hand hygiene. Freitas et al had also observed that most of the food handlers were sales people.<sup>9</sup> But in our research the food handlers worked as multifunctional workers thereby working in all sections of canteen management. Cunha et al evaluated knowledge of food handlers from street food kiosks, beach kiosks, restaurants and school meal services in Brazil observing participants knowledge level at 64% which is lower than the finding of this study.<sup>8</sup> The knowledge about transmission of diseases was only 37.90% in this study. Questions related to hand washing and disinfection showed 24.13% compliance in our study.

According to Codex Alimentarius Commission (2003) improper food handling is one of the main causes of food contamination with poor hand hygiene representing a major risk factor.<sup>10</sup> A positive correlation was found between knowledge and self-reported practices with demographic variables where age, sex, education status and health status of food handlers were most important. Similar results were presented by other researchers like Kunadu et al where logistic regression analysis of models showed statistically significant in which explanatory variable was the level of education.<sup>11</sup>

A microbial assessment was done to determine the hand hygiene of food handlers. This reflects the real practices of proper food handling and safety procedures. Organisms such as *Staphylococcus aureus*, *Escherichia coli*, *Klebsiella spp* and *Pseudomonas spp*. were detected. On applying two-sided Z test the presence of microorganisms were significant in the hand washing of food handlers. Though the microbial picture was bleak, organisms like *Salmonella* was not detected.<sup>12</sup>

There are several limitations in this study. These results are on a very limited number of food handlers who had taken part in the study. Therefore the findings do not represent the entire scenario. But this study is exploratory in nature and can act as a base study of the relationship between hand sanitation and knowledge attitude and practice of food handlers. This assessment of hand hygiene in food handlers is an important tool for quality management of food processing in the canteens and will also provide an improvement of food handling process by the food handlers.

## CONCLUSION

This study was conducted in 29 food handlers working in different canteens of an educational institute. Data from this study provide an insight into inadequacies in knowledge and practices of food handlers. As safe practice is extremely important in food handlers' activity, need for educational programs are advocated. Continuous education of food handlers is needed for control of food borne diseases and prevention of outbreak among consumers in food industry. Moreover the current finding showed a need to review the effectiveness of knowledge of food safety and to induce a real change in safe food handling practices. More studies are required to look into factors that inhibit the transfer of knowledge into food safety behaviour.

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