

# Factors Facilitating Hand Hygiene Practices in Eateries of Coimbatore: A Cross-sectional Study

GAAYATHRI KRISHNAN<sup>1</sup>, DHARANIYA RATHINASABAPATHY<sup>2</sup>, GANESH KUMAR NATARAJAN<sup>3</sup>,  
 DIPIKA BALASUBRAMANIAN<sup>4</sup>, DINESH SHANKAR<sup>5</sup>, L EASWAR<sup>6</sup>, L FIRTHOUS FATHIMA<sup>7</sup>, AM GAYATHIRI<sup>8</sup>



## ABSTRACT

**Introduction:** Improper hand hygiene practices and eating at unsanitary eateries are a major cause for many of the life-threatening diseases. Although studies done in the past have focused on the hand hygiene of the restaurant staff, the customers' hand hygiene, which is equally, if not more important, has not been studied in detail.

**Aim:** To assess the factors facilitating hand hygiene for the customers as well as the general hygiene in the eateries of Coimbatore, Tamil Nadu, India.

**Materials and Methods:** A cross-sectional study was done in the eateries of Coimbatore in June 2017, after obtaining clearance from Institutional human ethics committee. A list of eateries was collected from a food delivery application and 30 of them were chosen by systematic random sample. The restaurants were further categorised into low, medium and high-price ranged eateries based on the price of a standard food item (coffee). As a mystery client, the restaurants were inspected and observations were noted in a hidden checklist, which was constructed for the purpose of this study. The checklist consisted of three major categories, the washing area (9 marks), the customer (7 marks) and the general hygiene of the restaurant (7 marks). There were 23 items in the checklist and each item, if present, was awarded a score of 1. No negative scoring was done. Hence, the

maximum score an eatery could get was 23 and minimum was zero. ANOVA test was applied to compare the scores of different types of eateries.

**Results:** The mean and standard deviation hygiene scores of the low, medium and high-cost eateries were  $7.7 \pm 4.05$ ,  $11 \pm 6.02$  and  $14 \pm 5.43$ , respectively. There was a significant difference in the (hygiene and sanitation) scores between low, medium and high-cost eateries ( $p$ -value=0.04). It was found that in lower priced restaurants, most of the restaurants failed to provide adequate facilities for hand hygiene. Medium and high price range eateries were similar in the fact that they scored better with regard to general hygiene and wash area facilities. Although none of the restaurants scored a full mark higher price ranged eateries had better wash area facilities. Customer hand hygiene practices were found to be subpar in all the three categories, even though facilities were present in some medium and high-end eateries.

**Conclusion:** It was noticed that in some of the lower end restaurants, facilities for hand hygiene were not adequate. It was also found that if adequate facilities for hand hygiene were present in a restaurant, there was a higher chance of a customer to utilise that. This was found to be true especially in higher priced restaurants. Hence, the importance of hand hygiene and awareness among customers should be emphasised.

**Keywords:** Customers, Hand washing, Health, Restaurants

## INTRODUCTION

Less than 200 years back, public knowledge regarding the spread of disease and hand hygiene practices was minimal, if at all existent. It was not until 1846, that a prominent Hungarian physician by the name of Dr. Ignaz Semmelweis, also known as the 'saviour of mothers' and the 'Father of infection control', discovered the importance of hand washing after drawing up the connection between the lack of hand hygiene practices in doctors and the alarming death rate of new mothers due to puerperal fever [1].

The Centre of Disease and Control (CDC) instituted national guidelines pertaining to hand wash and emphasised the importance of hand hygiene in breaking the chain of transmission of diseases, following a breakout of food borne illnesses in the United States in the 1980s [2]. Within India, where communicable disease runs rampant, hand wash has been found to be a simple, cost-effective way in reducing overall mortality and morbidity from simple diseases.

Diarrhoeal diseases represent a major health problem in developing countries. It is estimated roughly that death due to diarrhoeal diseases are about two million annually (1.7-2.5 million deaths), and stands third among all causes of infectious disease related deaths worldwide [3].

Most pathogenic organisms that cause diarrhoea are transmitted by the faecal-oral route. Faecal-oral transmission may be water borne,

food borne or direct transmission which implies an array of other faecal-oral routes such as via fingers, fomites or dirt which may be ingested by people [4]. A review of food borne disease outbreaks in India from 1980-2016 showed *Staphylococcus* sp, *E. coli*, *Yersinia enterocolitica* and Norwalk-like virus as some important microbial pathogens responsible for food borne gastroenteritis [5].

Eating out has become an integral part of life for many Indians. According to a survey by the National Restaurant Association of India (NRAI), notably, Indian consumers are eating out almost 6-7 times every month [6]. As such, the chances of acquiring a food borne illness is higher.

Of the 9040 food borne disease outbreaks that were reported to the CDC from 1998 to 2004 [7], 4675 (52%) were associated with restaurants or delicatessens (including cafeterias and hotels). One in 10 people or 600 million people in the world are susceptible to illness following consumption of food that has been contaminated, according to the WHO. It was noted that the mortality rate, due to these illnesses, was around 420,000 annually, often resulting in the loss of 33 million healthy life years-Disability Adjusted Life Years (DALYs) [8]. Diarrhoeal diseases are the most frequent illness resultant from the eating of infected food, causing 550 million people to fall ill and 230 000 deaths every year [8].

Cultural differences also play a part in the spread of communicable diseases. In India, Africa and the middle-east, the practice of eating with hands is quite common. The people of these regions may be at greater risk of contracting food borne related illnesses as opposed to their western counterparts.

Unclean hands are a major cause of the spread of diarrhoeal diseases in developing countries. The microbiota in our hands is very complex and varied. There are two categories of microbes that reside in our hands, the first type being resident flora- those that are present in our hands and help fight germs. Transient microbes, the second type, most of which are pathogenic, are those that colonise the superficial layers of the skin and can be eliminated by hand wash practices [4].

No part of the human body is free from microbes, so to say, microbes as part of the human body, is constant. Transient microbes, however, change according to the environmental conditions. Some of the microorganisms found are *Acinetobacter*, *Aerococcus*, *Bacillus*, *Clostridium*, *Corynebacterium*, *Micrococcus*, *Staphylococcus* and *Streptococcus* Spp, and *Candida* and *Malassezia* Spp; almost all of which are transmitted by faeco-oral route of transmission [4].

A study in Dhaka revealed a 2.6-fold reduction in diarrheal episodes in the intervention area following the practice of regular hand washing with soap and water [9]. In one meta-analysis, hand washing with soap has been shown to reduce diarrhoea risk by 31% and acute respiratory infection risk by 21% [10]. Washing with soap is more effective at hand decontamination than washing with water alone [11-13].

Thus, this study focussed more on the factors facilitating hand hygiene in customers rather than the food handlers, who are equally if not more important in the chain of transmission of disease. It was assumed, that there was no difference among the mean (sanitation and hygiene) scores of low, medium and high price range eateries.

## MATERIALS AND METHODS

This cross-sectional study was conducted in eateries of Coimbatore, for a period of one month in June 2017, regarding factors facilitating hand hygiene, after obtaining clearance from the institutional human ethics committee (Project no. 17/155). Using a popular food delivery application, as a reference search engine, 30 eateries inside Coimbatore Corporation, using Systematic Random Sampling (SRS) were selected at random. According to the cost of a standard food item (coffee), the eateries were categorised into low (Rs. 10-Rs. 30), medium (Rs. 30-Rs. 70) and high (more than Rs. 70).

**Inclusion criteria:** Only those restaurants and bakeries which sold coffee, the standard food item which was used to classify restaurants as low, medium and high price range were selected.

**Exclusion criteria:** Those restaurants, not selling coffee or selling coffee out of our price range, were excluded.

### Study Procedure

Mystery clients are defined by the Pathfinder International tool series as trained people (usually community members) who visit program facilities in the assumed role of clients, and then report (by completing a survey or through an interview) their experience [14]. As a 'mystery client', using a hidden checklist, all 30 restaurants under survey were visited, and the facilities available for hand hygiene, the general hygiene of the restaurant and whether the customers used the available facilities were observed in the pretence of drinking a cup of coffee.

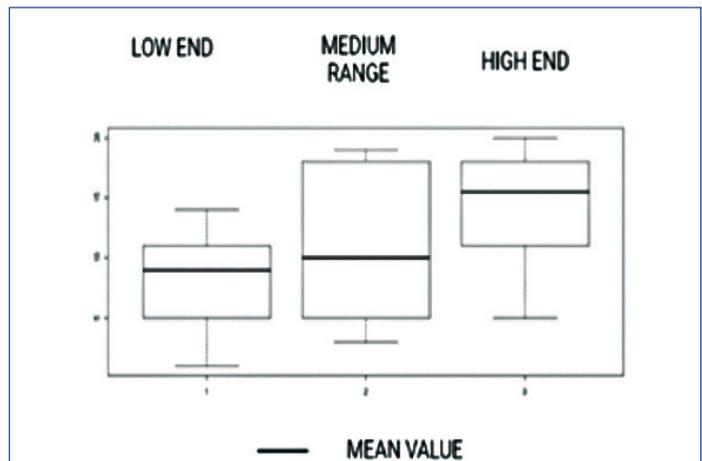
A checklist, created for the purpose of this study, was used in which the responses were marked in binary form- a 'yes' response scored 1 and a 'no' scored 0. The checklist was divided into 3 main headings with sub-questions under each- the wash area (9 marks), the customer (7 marks) and the general hygiene of the restaurant (7 marks). The maximum score an eatery could get was 23 and the minimum was 0 [Appendix1].

## STATISTICAL ANALYSIS

The cumulative scores of the eateries in the low, medium and high-price range eateries were taken and compared the means and standard deviations with each other. The scores were entered and analysed using 'R' software, version 7.5 and the ANOVA test was applied to see the differences between the scores of different types of eateries. Pearson correlation test was also used.

## RESULTS

The mean hygiene scores of the low, medium and high-cost eateries were 7.7±4.05, 11±6.02 and 14±5.43, respectively [Table/Fig-1]. Here, the 2 degree of freedom (dfs) were calculated as difference among all of the sample size (n=30; df =27) and within the groups (low, medium and high; n=3, df=2).



[Table/Fig-1]: Graphical representation of comparison of the cumulative (sanitation and hygiene) scores of low, medium and high end eateries.

After applying the ANOVA test, the p-value obtained by comparing the cumulative scores between the three categories of restaurant was found to be 0.04 and the F-value was 3.5273, which proved that the results were significant.

On correlating, the variables customer hand hygiene practices and the availability of adequate facilities showed that these two had a strong correlation (r=0.8, p=0.04).

None of the eateries ticked all the boxes on checklist with respect to hand hygiene facilities. In some of the lower end eateries, especially bakeries, facilities for hand washing was not provided. For example, with regard to availability of soap, 9 out of the 10 low-cost restaurants did not have a provision for soap since they did not have a wash area to begin with. Although higher priced eateries all had wash areas, only 6 out of 10 provided soap [Table/Fig-2].

Parameters assessed	Low price range	Medium price range	High price range
Washing area			
Is there a wash area?	+ [3/10]	+++ [6/10]	+++ [10/10]
Availability of wash basin?	+ [2/10]	++ [5/10]	+++ [10/10]
Are there any other means for hand hygiene other than wash basins Ex: mug and water in a bucket?	++ [5/10]	+ [4/10]	+ [2/10]
Is the washing area clean?	+ [3/10]	++ [5/10]	++ [5/10]
Adequate no. of wash basin? (8 for 20) [1]	+ [1/10]	++ [5/10]	++ [5/10]
Is there proper water supply?	+ [3/10]	++ [6/10]	++ [6/10]
Soap available?	+ [1/10]	++ [4/10]	++ [6/10]
Is there dryer/tissue?	+ [1/10]	+++ [8/10]	+++ [9/10]
Are there dustbins?	+ [2/10]	++ [5/10]	++ [6/10]
CUSTOMERS 3 in each restaurant [average of scores were taken]			
Are they washing hands before eating?	+ [0/3]	+ [1/3]	++ [2/3]
Are they washing hands after eating?	+ [1/3]	+ [1/3]	+++ [3/3]

Are they using both hands?	+ [1/3]	+ [1/3]	++ [2/3]
Are they using soap?	+ [0/3]	+ [1/3]	+ [1/3]
Are they using tissue/hand kerchief/sanitizer?	++ [2/3]	++ [2/3]	++ [2/3]
Time they take for washing? [30s]	+ [0/3]	+ [1/3]	++ [2/3]
Are they cautious not to touch the washing place?	+ [0/3]	+ [1/3]	+ [1/3]
General hygiene			
Are there insects/flies?	+++ [7/10]	++ [5/10]	++ [4/10]
Is there a pest-o-flash? [2]	+ [2/10]	+ [3/10]	++ [5/10]
Is the location hygienic? [3]	+ [3/10]	++ [5/10]	++ [6/10]
Do they clean the tables after each customer leaves the table?	+ [1/10]	+ [3/10]	++ [5/10]
Are the plates clean?	+ [2/10]	+ [4/10]	++ [5/10]
Are the servers wearing gloves?	+ [0/10]	+ [2/10]	++ [5/10]
Are the toilets clean? [4]	+ [1/10]	+ [2/10]	+++ [6/10]

**[Table/Fig-2]:** Data presentation of the parameters assessed in Low, Medium and high price range eateries.

The values of individual parameters in each category of restaurant were assessed and values were assigned based on the majority.

+ :not available/present [4 and below out of 10; or 0 and 1 out of 3[for customers]];

++ : sometimes available/present [5/10; or 2/3 for customers]; +++ : available/present [6 or above out of ; and 3/3 for customers]

## DISCUSSION

Hand washing is like a do-it-yourself vaccine. Good hand hygiene is an extremely simple but efficacious technique that has proven time and again to be a break in the chain of transmission of multiple infectious diseases. Although numerous studies have been done on the food handlers, it was pertinent to note that, the customers, who also play an important role in disease transmission hadn't been studied adequately. Surprisingly, it was noted that many restaurants did not offer adequate facilities for hand hygiene and thus hindering the customers' hand hygiene practices.

A meta-analysis conducted by Aiello AE et al., confirmed that, irrespective of the development status of a country, hand-hygiene interventions are efficacious for preventing gastrointestinal illnesses [10].

With the emergence of the Food Safety and Standards Authority of India (FSSAI) and new food safety regulations, a study conducted in Chennai, Tamil Nadu showed lacunae in the knowledge among food handlers. Manes MR et al., observed that the overall mean knowledge score was almost 50% and knowledge gaps related to hand hygiene, proper food cooking and holding temperatures, and cross contamination were identified [15]. A similar study done in Chicago, revealed that the mean overall knowledge score regarding hand hygiene practices in food handlers, was only 72% and substantial knowledge gaps related to cross contamination, cooking, and holding and storage of food were identified [16]. These data provide an insight on the targets for educational interventions to remedy knowledge gaps in food handlers in order to prevent food poisoning from restaurants. It is the responsibility of the restaurant and its staff to ensure a safe eating experience for their customers. Hence, a well-educated staff can be a key in ensuring the presence of adequate facilities.

With the availability of facilities, more people tended to utilise those studies. Luby SP et al., in Bangladesh showed interventions that improve the presence of soap and water at the designated place to wash hands would be expected to improve hand washing behaviour and health (OR: 2.1) [17]. Thus, a customer at a restaurant may feel inclined to wash their hands before dining if they see a wash area with adequate facilities. These findings are consistent with studies of handwashing in hospitals that concluded that hand hygiene was improved when equipment and supplies were present that made it easier to wash hands [17-21].

It is thus vital that not only the food handlers but also the customers should be educated on the importance of such a simple measure

of personal hygiene which is not only efficient and cost effective but hardly takes two minutes of their time.

Addressing barriers to handwashing, including sink accessibility, availability of soap and clean water, are of utmost importance. Many of the eateries under the study did not even provide the bare requirement to practice hand hygiene like soap and clean water. Thus, it should be mandated that all eateries, no matter the price range, should provide adequate facilities for hand hygiene. Because, the provision of clean water and a simple soap by itself is a motivation for the customers to wash their hands. Hence, awareness among the customers should be increased as their hand hygiene, plays an essential role in interrupting the chain of transmission of disease.

Eating out has become a necessary evil in today's world. However, it is practically impossible to carry soap and clean water wherever we go. Although customers could carry a pocket sized hand sanitizer with them, many fail to do so. Hence, it's the responsibility of the restaurants to provide the means to promote healthy hand hygiene practices for their customers.

## Limitation(s)

The sample size chosen for this study was limited and confounding variables like age, sex and socio-economic class of customers, etc., were not considered. Further studies with a larger sample size and these variables can be conducted in future.

## CONCLUSION(S)

It is vital that all restaurants provide facilities for hand hygiene. None of the restaurants that were visited was awarded a full score. Thus, there is scope for improvement in all eateries. It was noticed that in some of the lower end restaurants, facilities for hand hygiene were not adequate. It was also found that if adequate facilities for hand hygiene were present in a restaurant, there was a higher chance of a customer to utilise that. This was found to be true especially in higher priced restaurants. Carrying with them, a bottle of sanitizer or utilising the adequate facilities at restaurants can be a game changer in healthy living and prevention of infectious diseases. Hence, the importance of hand hygiene and awareness among customers should be emphasised.

## Acknowledgement

Authors would like to thank their mentor Dr. M. Sivamani, Professor, Community Medicine, PSGIMS&R, for his constant support and guidance without which this project would not have been possible.

## REFERENCES

- [1] Mathur P. Hand hygiene: Back to the basics of infection control. *Indian J Med Res.* 2011;134(5):611-20.
- [2] CDC guideline for handwashing and hospital environmental control, 1985. *Today's OR Nurse.* 1986;8(4):26-37.
- [3] Kosek M, Bern C, Guerrant RL. The global burden of diarrhoeal disease, as estimated from studies published between 1992 and 2000. *Bull World Health Organ.* 2003;81:197-204.
- [4] Park K. *Epidemiology of Communicable Diseases: Acute Diarrhoeal Diseases.* Park's textbook of Preventive and Social Medicine. 20<sup>th</sup> ed. Jabalpur: Bhanot Publisher; 2009, Pp.196.
- [5] Vemula SR, Kumar Naveen R, Polasa K. Foodborne diseases in India- A review. *British Food Journal.* 2012;114:661-80.
- [6] Angula FJ, Jones TF. Eating in restaurants: A risk factor for food borne disease? *Clinical Infectious Diseases.* 2006;43(10):1324-28.
- [7] Hannah Gould L, Kelly A, Walsh MPH, Antonio R, Vieira DVM, Karen Herman M, et al. Surveillance for foodborne disease outbreaks- United States, 1998 2008 [Internet]. *Cdc.gov.* 2013 [cited 2021 Jul 6]. Available from: <https://www.cdc.gov/mmwr/preview/mmwrhtml/ss6202a1.htm>.
- [8] Havelaar AH, Kirk MD, Torgerson PR, Gibb HJ, Hald T, Lake RJ, et al. World Health Organization global estimates and regional comparisons of the burden of foodborne disease in 2010. *PLoS Med.* 2015;12(12):e1001923.
- [9] Shahid NS, Greenough WB 3<sup>rd</sup>, Samadi AR, Huq MI, Rahman N. Hand washing with soap reduces diarrhoea and spread of bacterial pathogens in a Bangladesh village. *J Diarrhoeal Dis Res.* 1996;14(2):85-89.
- [10] Aiello AE, Coulborn RM, Perez V, Larson EL. Effect of hand hygiene on infectious disease risk in the community setting: A meta-analysis. *Am J Public Health.* 2008;98(8):1372-81.

[11] Fiore AE. Hepatitis A transmitted by food. Clin Infect Dis. 2004;38(5):705-15.  
 [12] Ejemot RI, Ehiri JE, Meremikwu MM, Critchley JA. Hand washing for preventing diarrhoea. Cochrane Database Syst Rev. 2008;1:CD004265.  
 [13] Amin N, Pickering AJ, Ram PK, Unicomb L, Najnin N, Homaira N, et al. Microbiological evaluation of the efficacy of soapy water to clean hands: A randomized, non-inferiority field trial. Am J Trop Med Hyg. 2014;91(2):415-23.  
 [14] Boyce C, Neale P. Using mystery clients: A guide to using mystery clients for evaluation input. Pathfinder International Tool Series. 2006:01-20.  
 [15] Manes MR, Kuganatham P, Jagadeesan M, Laxmidevi M, Dworkin MS. A step towards improving Food Safety in India: Determining baseline knowledge and behaviors among restaurant food handlers in Chennai. J Environ Health. 2016;78(6):18-25; quiz 117.  
 [16] Manes MR, Liu LC, Dworkin MS. Baseline knowledge survey of restaurant food handlers in suburban Chicago: Do restaurant food handlers know what they need to know to keep consumers safe? J Environ Health. 2013;76(1):18-26; quiz 67.  
 [17] Lubya SP, Halder AK, Tronchet C, Akhter S, Bhuiya A, Johnstone RB. Household characteristics associated with handwashing with soap in rural Bangladesh. Am J Trop Med Hyg. 29;81(5):882-87.  
 [18] Sallis JF, Owen N, Fisher EB. Ecological models of health behavior. Glanz K, Rimer BK, Viswanath K, eds. Health Behavior and Health Education. San Francisco, CA: Josey-Bass. 2008; 465-85.  
 [19] Bischoff WE, Reynolds TM, Sessler CN, Edmond MB, Wenzel RP. Handwashing compliance by health care workers: The impact of introducing an accessible, alcohol-based hand antiseptic. Arch Intern Med. 2000;160(7):1017.  
 [20] Manun'Ebo M, Cousens S, Haggerty P, Kalengaie M, Ashworth A, Kirkwood B. Measuring hygiene practices: A comparison of questionnaires with direct observations in rural Zaire. Trop Med Int Health. 1997;2(11):1015-21.  
 [21] Cairncross S, Shordt K, Zacharia S, Govindan BK. What causes sustainable changes in hygiene behaviour? A cross-sectional study from Kerala, India. Soc Sci Med. 2005;61(10):2212-20.

**PARTICULARS OF CONTRIBUTORS:**

1. Ex-MBBS Student, Department of Community Medicine, PSG IMSR, Chennai, Tamil Nadu, India.
2. Ex-MBBS Student, Department of Community Medicine, PSG IMSR, Coimbatore, Tamil Nadu, India.
3. Ex-MBBS Student, Department of Community Medicine, PSG IMSR, Coimbatore, Tamil Nadu, India.
4. Ex-MBBS Student, Department of Community Medicine, PSG IMSR, Coimbatore, Tamil Nadu, India.
5. Ex-MBBS Student, Department of Community Medicine, PSG IMSR, Coimbatore, Tamil Nadu, India.
6. Ex-MBBS Student, Department of Community Medicine, PSG IMSR, Coimbatore, Tamil Nadu, India.
7. Ex-MBBS Student, Department of Community Medicine, PSG IMSR, Coimbatore, Tamil Nadu, India.
8. Ex-MBBS Student, Department of Community Medicine, PSG IMSR, Coimbatore, Tamil Nadu, India.

**NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:**

Dr. Gaayathri Krishnan,  
 17, Residency Dhanam [1b] Mandavel Ipakkam, Mandaveli,  
 Chennai-600028, Tamil Nadu, India.  
 E-mail: gaays30@gmail.com

**PLAGIARISM CHECKING METHODS:** [Jain H et al.]

- Plagiarism X-checker: Jun 05, 2021
- Manual Googling: Jul 09, 2021
- iThenticate Software: Jul 15, 2021 (10%)

**ETYMOLOGY:** Author Origin

**AUTHOR DECLARATION:**

- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? No
- For any images presented appropriate consent has been obtained from the subjects. No

Date of Submission: **May 24, 2021**  
 Date of Peer Review: **Jun 21, 2021**  
 Date of Acceptance: **Jul 10, 2021**  
 Date of Publishing: **Aug 01, 2021**

**APPENDIX 1**  
**Checklist**

	YES [1 point]	NO [0 points]	NOT APPLICABLE [0 points]
<b>WASHING AREA</b>			
Is there a wash area?			
Availability of wash basin?			
Are there any other means?			
Is the washing area clean?			
Adequate no. of wash basin? (8 for 20) [1]			
Is there proper water supply?			
Soap available?			
Is there dryer/tissue?			
Are there dustbins?			
<b>CUSTOMERS 3 in each restaurant [average of scores were taken]</b>			
Are they washing hands before eating?			
Are they washing hands after eating?			
Are they using both hands?			
Are they using soap?			
Are they using tissue/hand kerchief/sanitizer?			
Time they take for washing?			
Are they cautious not to touch the washing place?			
<b>GENERAL HYGIENE</b>			
Are there insects/flies?			
Is there a pest-o-flash? [2]			
Is the location hygienic? [3]			
Do they clean the tables after each customer leaves the table?			
Are the plates clean?			
Are the servers wearing gloves?			
Are the toilets clean? [4]			

1. Wash Basins at 8 for 20 were calculated as an approximate average based on Park textbook of community medicine [4]  
 2. Pest-O-flash is an electric fly trapper. Presence of this at restaurants were made note of since flies are a major cause of disease transmission  
 3. The general cleanliness of the restaurant and the surrounding environment  
 4. In the absence of toilet at the restaurant, zero marks were awarded for that category [not applicable category]