Food Science and Quality Management
ISSN 2224-6088 (Paper) ISSN 2225-0557 (Online)
Vol.119, 2022

Hygiene Practices in the Restaurants of Dhaka North City Corporation, Bangladesh

Farzana Sultana Bari[1] Sharmin Islam[1] Sujit Moulik[1,3] Subarna Ghosh[1] Mohammad Asaduzzaman[4]
Mohammad Abdul Mannan[2] Abdus Salam Mondol[1*]
1.Department of Public Health Nutrition, Primeasia University, Dhaka, Bangladesh
2.Nutrition Policy Advisor, Meeting the Undernutrition Challenge (MUCH) FPMU, Ministry of Food, Bangladesh
3.The Leprosy Mission International, New DOHS, Mohakhali, Dhaka, Bangladesh
4.Department of Biochemistry and Molecular Biology, Noakhali Science and Technology University, Noakhali, Bangladesh
***Address for correspondence:** Dr. Md. Abdus Salam Mondol, PhD
Chairperson, Department of Public Health Nutrition, Primeasia University, Dhaka,
Star tower, 12 Kamal Ataturk Avenue, Banani C/A, Dhaka-1213
Phone: +88-02-9821499-501 (Ext 312) office
Cell: +8801868985107, Fax: +88-02-9820868
E-mail: abdus.mondol@primeasia.edu.bd

Abstract
Food safety in food establishments has been considered a global and increasing public health concern in developing countries like Bangladesh. Poor personal and environmental hygiene contributes to food contamination and results in food-borne diseases. This report represents the current hygienic state of middle-scale restaurants of Dhaka North City Corporation in Bangladesh. This study examines the prevailing environment, cleanliness, and hygiene practices of the randomly selected restaurants through on-site visiting. It was a cross-sectional observational study where a total of 134 restaurants were observed by taking the consent of the owner. The data were collected by a structured checklist where variables were categorized as acceptable, moderately acceptable, and unacceptable that denoting whether the restaurants perform all the hygiene practices properly or operate unhygienic activities on daily basis. However, the study revealed that most restaurants did not follow food hygiene practices whereas 12.7 % of restaurants were located beside unhygienic places, and 79.9 % didn't have toilet facilities. Nevertheless, the practices of food handlers were also very alarming because most of them did not follow proper dress codes while distributing food among customers. Overall, the study explored that only 9% of restaurants conduct healthy practices whereas 46.3% carried out both healthy and unhealthy practices and 44.7% operate mostly unhygienic practices. Therefore, the study findings will assist the policy makers and planners in designing interventions to improve the sanitary conditions of food establishments and aware the consumer as well.
Keywords: Food, Hygiene Practices, Restaurants of Dhaka North City Corporation, Bangladesh.
DOI: 10.7176/FSQM/119-05
Publication date: September 30th 2022

INTRODUCTION

Food with proper nutritional value, hygienic in quality and appropriate in quantity is essential for good health and active life. People need a balanced and hygienic diet containing different groups of foods such as carbohydrates, fats, proteins, vitamins, water, and minerals in appropriate proportion so that an individual is assured of obtaining the minimum requirements of all the required six nutrients (Swaminathan, 1985). However, over the past few decades, food production and consumption patterns have seen tremendously changed worldwide (Choi & Rajagopal, 2013). Research has shown that the number of meals eaten outside the home and the expenditure on these are increasing in many countries (Stubenitsky et al., 2000). The scenario is not also different in Bangladesh, particularly in its capital Dhaka. Due to the rapid urbanization of Dhaka city, along with the expansion of information technology and media, and the rise in income of the city dwellers, a lot of new restaurants are being opened almost everywhere in the city including the commercial and office areas in recent years (Huda & Hossain, 2009; Kearney, 2010; Taha et al., 2020). Many studies claimed that the selection of the restaurants for dining in Dhaka city depends on many factors like service speed of the restaurants, price of the food, brand reputation, food quality, cleanliness, hygiene, etc. (Harun & Ahmed, 2013; N. Islam & Ullah, 2010; Tabassum & Rahman, 2012; Tamanna, 2016).

Food service establishments were found to be the key sources of various food-borne diseases, as food can become contaminated at any point during processing, storage, and distribution (EFSA, 2018; Mead et al., 1999). In addition to this food is the major source of human exposure to pathogenic agents, both chemical (methyl mercury, lead, arsenic, dioxins, and aflatoxins) and biological (viruses, parasites, and bacteria) from which no

individual is spared (Havelaar et al., 2015). Various studies showed that between 70%-90% of the food products available in markets are contaminated in one way or the other (Mohiuddin, 2019). More than 76 percent of food items in the market were found adulterated in a random survey by the public health laboratory of the Dhaka City Corporation in 2004 (Rasul, 2013). Millions of people globally develop illnesses everyday as a result of consuming microbiologically and chemically contaminated food and water (Havelaar et al., 2015). It is assumed that more than one-third of the world population has been affected by food-borne diseases (Bager & Halgaard, 2002; Mohammed et al., 2020). In 2013 World Health Organization (WHO) estimated that around 2 million people in developing countries die due to food-borne diseases each year; whereas, 30% of people in developed countries have a medical condition from food-borne diseases each year (Havelaar et al., 2013). Like other developing countries, 30 million people in Bangladesh are suffering from foodborne illnesses each year (Food and Agriculture Organization of the United Nations, 2010). Consequently, food safety issues in food establishments have become one of the most widely discussed topics in Bangladesh.

Personal hygiene in restaurants and the implementation of hygiene standards for staff is the best way to gain the trust of customers (Maemunah, 2021). It is important for the food handlers to wash their hands well, have good personal hygiene, clean work attire, and carry out regular training to ensure that the food they handle and prepare is safe (Jeinie et al., 2016). In Bangladesh, one major food safety concern is unhygienic practices in food handling (Rifat et al., 2022). According to the World Health Organization (2006), "Hygiene refers to conditions and practices that help to maintain health and prevent the spread of diseases. On the other hand, food hygiene is the conditions and measures necessary to ensure the safety of food from production to consumption. Therefore, neatness, cleanliness, and maintaining hygiene is a fundamental requirements of every hospitality establishment to produce safe food for consumption (Käferstein & Abdussalam, 1999). Nevertheless, the majority of the activities including food storage, handling, and preparation are done in an extremely unhealthy environment in restaurants that may create an environment in which bacteria and other infectious agents are more easily transmitted (Fielding et al., 2001; G. M. R. Islam & Hoque, 2013).

World Health Organization claimed that food handling personnel play important role in ensuring food safety throughout the chain of food production and storage (World Health Organization, 1989). A study conducted in Bangladesh found widespread poor hygiene and food-handling practices in restaurants and among food vendors (Nizame et al., 2019). Another study carried out at Noakhali and reported that the majority of restaurant food handlers did not were protective clothing when touching and distributing unwrapped foods (Hashanuzzaman et al., 2020). Along with this, serving foods with bare hands is common practice in Bangladesh (Nizame et al., 2015). Moreover, study of Bahir Dar town indicated that most of the food items were infected with enteric bacteria and parasites. On top of that, various studies have claimed that poor knowledge and practice of hygiene and sanitation, lack of basic sanitary facilities in food service establishments, and negligence in safe food handling are major causes of poor sanitary conditions in food and drinking establishments (Abera Kumie et al., 2006; Okonko et al., 2009; World Health Organization, 2003). In addition to this, a USA-based study suggests that improper food handling practices contribute to about 97% of foodborne illnesses in food service establishments (Howes et al., 1996). Consequently, it's crucial to maintain personal hygiene to reduce food-borne illness.

In Bangladesh, many studies had been conducted regarding street food vendors, factors influencing the selection of restaurants, and the knowledge, attitude, and practice of food handlers (N. Islam et al., 2018; Khairuzzaman et al., 2014; Kundu et al., 2021; Nizame et al., 2015). Nonetheless, there is limited evidence regarding basic sanitary facilities and hygiene practices of restaurants in Bangladesh. Therefore, this study attempts to evaluate the hygiene practices of the middle-scale restaurants of Dhaka North City Corporation, Bangladesh by examining the prevailing environment and cleanliness practices. The study findings will promote a new concern among the policymakers, public health specialists, and consumers regarding the development and utilization of restaurant facilities that reduce the prevalence of foodborne illness in the country eventually.

MATERIALS & METHODS

***Study design*:** It was a cross-sectional observational study conducted from 14 May 2015 to 20 June 2016 at the restaurants of Dhaka North City Corporation. The data were collected by direct observation aided by a pre-structured checklist.

***Operational definition*:** A restaurant can be defined as a business establishment with a permanent structure, where staff prepare and serve food and are open for at least two meal services a day (Nizame et al., 2019). To be more specific the study selected middle-scale dining restaurants that have sitting arrangements for 25 to 50 persons at a time, affordable for serving middle-income customers.

***Study settings and sample*:** Dhaka North City Corporation of Bangladesh has 5 zones including Uttara, Mirpur-Pallabi, Gulshan, Mirpur-Kazipara, Gabtoli, and Kawranbazar. Firstly, zone-2 comprises of Mirpur-Pallabi and zone-5 comprising Kawranbazar were selected by using a simple random sampling technique. Thereafter, out of 17 wards of the selected 2 zones, 8 wards were selected randomly. The selected wards were ward numbers 4, 6,

7, and 15 from zone-2 and ward numbers 26, 32, 27, and 31 from zone-5. A total of 134 middle-scale dining restaurants that serve moderately-priced food in a casual atmosphere (80 from zone-2 and 54 from zone-5) were selected as the study sample.

***Variables and indicators of the study*:** The selected restaurants were on-site visited by taking consent from the owner or manager. The data collection instrument was a structured checklist followed by observation of the restaurant. The checklist consisted of important twenty-six variables including restaurant's location, dining space, ventilation, door system, floor, light, room temperature, hand washing facilities, availability of basins, waste food disposal facilities, cooked food handling system, availability of clean water container, location of toilet and cleanliness of toilet facilities, hair, fingernails, outer garments of a food handler, outer garments of the cooker, cleanliness of dresses of food handlers, cleanliness of table cover, plate, glass, spoon, plate cleaning towel, table wiping towel, manpower for table and late cleaning which were used to judge the restaurants.

An average of 30–40 minutes was taken to inspect every restaurant whereas all items listed in the checklist were inspected personally by the authors. Most of the variables were observed based on three categories namely acceptable, moderately acceptable, and unacceptable. Over and above the acceptable denotes that the practice was carried out safely and properly, moderately acceptable indicates that the practice was not done accurately while unacceptable concluded that the practice was not performed properly.

Each criterion was given a value of 2 for proper sanitary condition, 1 for moderately acceptable sanitation condition, and 0 if the sanitary condition is unacceptable. The answer of every variable was computed and the total value was 52. Finally, the individual restaurant was graded by dividing the sum by 52 and multiplying by 100, thus the percentage was calculated. On basis of the total value that each restaurant earned was graded into A, B, and C based on the range from 75 to 100, 40 to 74.9, and 0 to 39.9 respectively. Here, an "A" grade denotes high-quality restaurants where all health and hygiene practices were carried out properly. On the other hand, "B" grade restaurants are those where maximum health and hygiene practices were performed but some were not maintained properly. In the "C" category restaurants health and hygiene practices were not performed at all.

***Pre-testing of data collection questionnaire*:** At the beginning of the research work, the checklist was pre-tested in different restaurants to identify its limitation. After pre-testing, it was revised and corrected and then used for data collection in the selected study area.

***Statistical data analysis*:** All statistical analysis and other data processing were done by using SPSS 18.0 windows program. Microsoft Excel was also used for analysis and graphical presentation.

RESULT & DISCUSSION

Safety control measures on hygiene and food safety greatly contribute to the prevention and control of food-borne diseases if widely accepted and correctly implemented. Hence, this research reported the hygienic environment of medium-cost restaurants in north Dhaka city by observing the following parameters.

Infrastructural condition of the restaurants

Food establishments must maintain good repair and clean housing conditions to safeguard food against contamination (Gebre-Emanual, 1997). The study assessed the overall housing condition of the restaurant by observing its location, dining room space, ventilation, door system, lighting, and room temperature. The location or premises of the restaurant is one of the important factors that may possess an undeviating impact on the hygienic condition of the restaurant. This study found that only 44 % of restaurants were established in appropriate places whereas 12.7% were located beside open drains, garbage dumps, and water logging. This study finding is in line with another study conducted in Bangladesh in 2010 and found that most of the vending shops and carts of Bangladesh were located on the footpath, municipal drain, and near the sewerage system irrespective of areas surveyed (Faruque et al., 2010).

Researchers claimed that a lack of basic infrastructure, and inadequate sanitary practices in food establishments, can lead to foodborne diseases outbreak (Fielding et al., 2001; Kibret & Abera, 2012). It appeared in the study that only 11.2% of restaurants had a closed door system, whereas 36.6% of restaurants had no separate door for dining and culinary space and more than fifty percent (52.2%) had a door that was always kept open which arise a doubt in maintaining a healthy environment inside the restaurant. Though this food establishment was considered a middle scale, they don't have proper space inside the restaurants and the tables were decorated very close to one another. It seems that only 23.9% of restaurants have acceptable inner space while the sitting space of 32.1% of the restaurant is unacceptable.

Restaurants should be placed in ventilated places for maintaining a healthy environment. Preparing and distributing food in gloomy and unsanitary locations makes it susceptible to contamination by flies and other insects (Smith, 1986). Nevertheless, this study observed that the floor of 56% of restaurants was uncleaned whereas17.2% had no ventilation system. Moreover, 17.9%of the restaurant had no air conditioners or enough electric fans to control room temperature and most of the restaurants were not enlightened enough which may arise discomfort among customers while eating food and promote microbial growth as well [Table-1].

Table 1: Infrastructural condition of the restaurants

	Criteria	Unacceptable (%)	Moderately acceptable (%)	Acceptable (%)
1	Location	12.7	43.3	44
2	Dining room space	23.9	44	32.1
3	Ventilation	17.2	58.2	24.6
4	Door	36.6	52.2	11.2
5	Floor	56	34.3	9.7
6	Light	24.6	46.3	29.1
7	Room temperature	17.9	69.4	12.7

Cleanliness and washing facilities of the restaurant

Researchers claimed that food poisoning is mainly caused by food handlers who do not have good sanitation habits, mainly due to the staff's failure to wash their hands when handling food (Cogan et al., 2002). In the present study food disposal system, cleanliness, and washing facilities were carefully observed. The study findings about hand washing facilities are similar to the studies conducted in Ethiopia where the majority of the restaurants had basins for customers to wash their hands (A Kumie & Zeru, 2007; Mendedo et al., 2017). However, this study revealed that the hand washing arrangement both for customers and staff of 42.5% of restaurants was very dirty and hand washing materials like soap and tissue were not available there. Furthermore, the study inspected the kitchen of the restaurants to look out for the waste food disposal facilities, cooked food handling practices, and availability of clean water containers. Likewise other studies (Abera Kumie et al., 2002; Mariam et al., 2000), this study finding indicates that while dining or service rooms tend to be clean and well repaired, food preparation areas and kitchens were unclean and not well repaired. M. Kibret and B. Abera (2012) found in their study that liquid and solid waste disposal system of reputed restaurants were not properly maintained. Similarly, this study revealed that only 11.2% restaurant disposes of the waste food in the covered bin while 45.5% restaurants use uncovered bin that is located beside food storage place. On top of that many restaurants were found to allow overflowed bins in the kitchen which was considered unacceptable. There are three most significant contributors to food-borne illnesses in restaurants include time-temperature abuse, personal hygiene, and cross contamination (US Food and Drug Administration, 2009). In the study area, only 20.9% of restaurants had acceptable storage facilities where the foods were covered and kept in a clean and dry environment by maintaining temperature. When it comes to the water container, 50% of the restaurants had clean water containers with proper lids while few of them leave their water container open which was considered unacceptable. Many studies had been conducted to measure the sanitary conditions of food establishments and found that most restaurants have toilet facilities for customers (Kibret & Abera, 2012; A Kumie & Zeru, 2007; Mendedo et al., 2017). On the other hand, this study noticed that 79.9% of restaurants did not have any toilet facilities for the customer, while toilets were found to be located very close to the food serving areas in 5.2 % of restaurants. Furthermore, the toilet facilities of 78.4% of restaurants were found in very unhygienic conditions [Table-2].

Table 2: Cleanliness and washing facilities of the restaurant

	Criteria	Unacceptable (%)	Moderately acceptable (%)	Acceptable (%)
1	Hand washing facilities	35.9	44	20.1
2	Availability of basins	42.5	47	10.4
3	Waste food disposal facilities	45.5	43.3	11.2
4	Cooked food handling	32.1	47	20.9
5	Availability of clean water container	4.5	45.5	50
6	Location of the toilet	79.9	5.2	14.9
7	Cleanliness of toilet facilities	78.4	9.7	11.9

Hygiene practices of food handler

Personal hygienic practices of food handlers rank among the major concerns that may potentially lead to foodborne outbreaks (Ahmed et al., 2017; Singh et al., 2018). In this study, the personal hygiene of food handlers was assessed in terms of head coverings, condition of fingernails, and maintaining proper dress code like wearing gloves, mask, and apron while handling food.

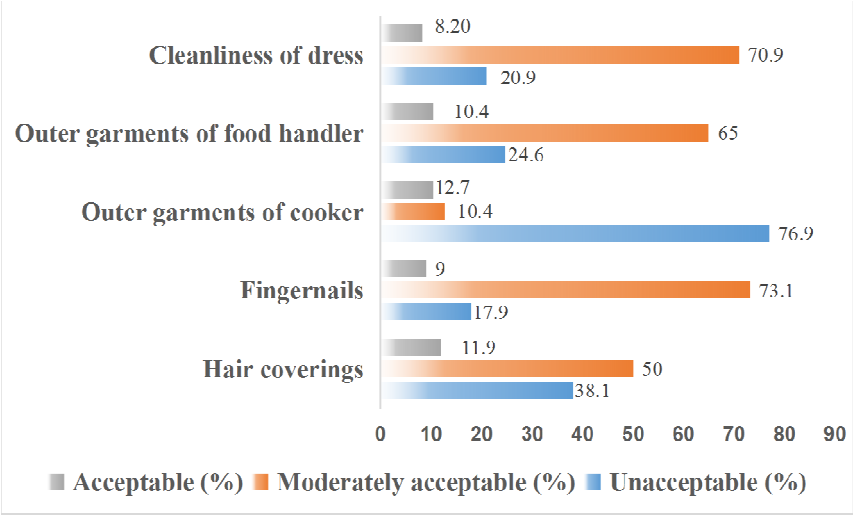

Figure 1: Hygiene practices of food handlers

The study investigated that most of the food establishment staff were not concerned about the food safety practices. The result of this study is consistent with the study of (Firdani, 2022; Kibret & Abera, 2012) where it is affirmed that the majority of the cooker was indifferent to covering their hair properly and used to keep long nails. Furthermore, in the study area, a major percentage of food handlers did not wear proper outer garments while 70.9% of them were found to be wearing dirty and uncleaned dresses. This study finding is similar to other study findings (Firdani, 2022; Ghosh et al., 2020; Singh et al., 2018) where it is claimed that food handlers did not use any protective equipment [Figure-1].

Cleanliness of the catering sets

Inappropriate dishwashing practices contribute to the transmission of various diseases such as TB, influenza, typhoid, and other feco-oral diseases (Guzewich, 2017; World Health Organization, 2003). The study observed the cleanliness of tableware including table covers, plates, glass, and spoons, and found most of them very uncleaned. The study result indicates that the food contact surfaces like tables of the eating establishment were not cleaned at least daily which is consistent with the study findings of Kumar et al.,(2021). All equipment needs to be thoroughly cleaned and disinfected to prevent the spread of pathogens (Satow et al., 2009). One of the most widely used and accepted methods of food utensil washing method is the three-compartment sink or washing basin, which can be used to wash, rinse and sanitize food utensils and equipment (Guzewich, 2017; Nwadike, 2016). But in the study, it had been seen that restaurant staff did not rinse the catering sets, especially plates, glass, and spoons which are considered moderately acceptable. As well as the street food vendors, this study also found restaurant food handlers use unclean equipment (Farhana et al., 2020) Besides this, foodstuffs were found to be attached to the catering sets which was considered unacceptable because this practice may allow bacterial growth. Nevertheless, while visiting the restaurants the researchers noticed that most of the food handlers carry a towel on their shoulders. It has been seen that food handlers use the same towel to clean plates and tables from time to time which is remarkably unhygienic. In fact, there was a shortage of manpower in 38.1% of restaurants and the same person was found to work as a cleaner and food distributor in 5.2 % of restaurants [Table-3].

Table 3: Cleanliness of the catering sets

	Criteria	Unacceptable (%)	Moderately acceptable (%)	Acceptable (%)
1	Cleanliness of table cover	23.1	47	29.9
2	Cleanliness of Plate	21.6	48.5	29.9
3	Cleanliness of glass	11.9	61.2	26.9
4	Cleanliness of spoon	17.2	55.2	27.6
5	Plate cleaning towel			
6	Table wiping towel	45.5	43.3	11.2
7	Manpower for table and plate cleaning	5.2	38.1	56.7

Grading of the restaurants

The study assessed the sanitary condition of a total of 134 middle-scale restaurants by investigating infrastructural conditions, cleanliness and washing facilities, Cleanliness of the tableware, and hygiene practices of food handlers of the restaurants.

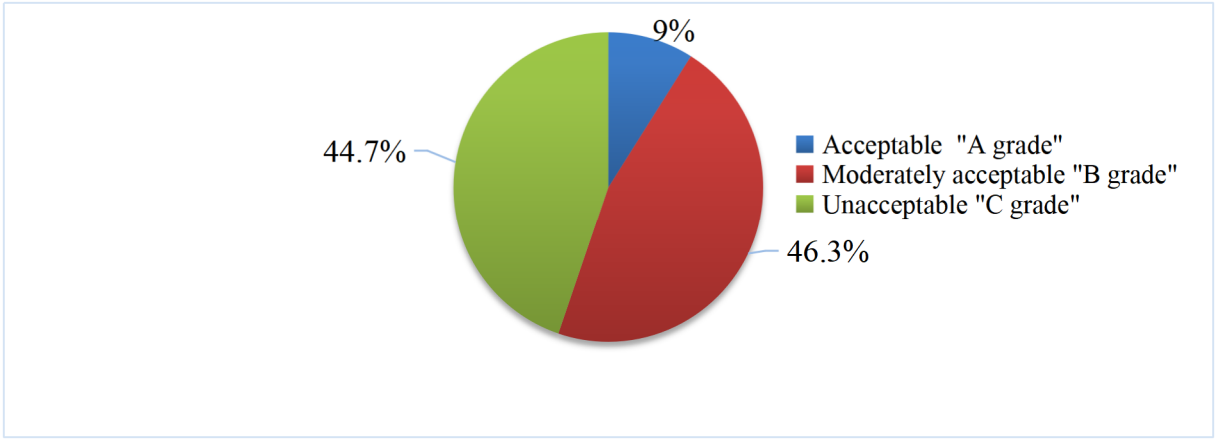

Figure 2: Grading of the restaurants (N=134)

The study found only 9% of establishments are in acceptable condition, 46.3% is in moderately acceptable condition and a major percentage (44.7%) of the restaurant was in an unacceptable condition and graded, as A, B, and C respectively (Figure-2). Literally, it was a pilot study conducted to add to the existing limited evidence by reporting the manifestation of unhygienic practices in the restaurants of Dhaka North City Corporation. Researchers may use this method to grade other food establishments located in the big cities of Bangladesh. These grading cards can be used to aware the customer about the cleanliness practices of the restaurants.

CONCLUSION

The restaurant industry is one of the fast-growing service-oriented industries in Bangladesh. To ensure the quality of the restaurant, it is essential to assess the hygienic condition that prevails in the restaurant. On that basis, the present study was undertaken to find out the hygiene practices in the selected restaurants. The finding of this study revealed that the infrastructure of the restaurants, catering sets, hand washing facilities, and food disposal system was in unacceptable condition. This may create a chance of contamination of food, as well as food-borne diseases. Furthermore, toilet facilities were very poor in most of the restaurants. The study graded the present sanitary conditions of the restaurants into the category of A, B, and C based on maintenance of hygienic practices. Findings showed that a few restaurants were in A grades while the majority of them were in B and C grades. It affirms that there is scope for improving the hygienic condition in B-grade restaurants at an acceptable level through counseling and low-cost interventions. In addition, C-graded restaurants in the study area need to be monitored seriously by the concerned authority.

However, the data collectors observed the environment of the restaurants taking consent from the restaurant's owner. This kind of observation after disclosing the objective to the owner may influence the practices of the staff. Still, the study demonstrates most of the restaurants carried very unhygienic practices. Therefore, this study suggests that public health specialists arrange training programs for food handlers as they were found to practice unhygienic behaviors. Though this study could not afford to conduct any kind of microbial test, it recommends carrying out future microbial investigations of environmental and food samples to identify specific hygiene practices that cause food-borne illness. Overall, the study explored vital information regarding hygienic practices in food establishments that would help policymakers and planners in designing interventions to improve the sanitary conditions of food and drinking establishments.

ACKNOWLEDGEMENT

The authors gratefully acknowledge Primeasia University, Department of Public Health Nutrition for the opportunity they had to conduct this study. The authors express their heartfelt thanks to late Professor Dr. M A Mannan for his technical support and guidance. The authors would like to convey their heightened appreciation to the owners, managers, and staff of the establishment's handlers for their interest and full participation shown in the study.

REFERENCES

Ahmed, Z., Afreen, A., Hassan, M. U., Ahmad, H., Anjum, N., & Waseem, M. (2017). Exposure of food safety knowledge and inadequate practices among food vendors at Rawalpindi; the fourth largest city of Pakistan. *Journal of Food and Nutrition Research*, *5*(1), 63–73.

Bager, F., & Halgaard, C. (2002). *FAO/WHO Global Forum of Food Safety Regulators*.

Choi, J. H., & Rajagopal, L. (2013). Food allergy knowledge, attitudes, practices, and training of foodservice workers at a university foodservice operation in the Midwestern United States. *Food Control*, *31*(2), 474–481.

Cogan, T. A., Slader, J., Bloomfield, S. F., & Humphrey, T. J. (2002). Achieving hygiene in the domestic kitchen: the effectiveness of commonly used cleaning procedures. *Journal of Applied Microbiology*, *92*(5), 885–892.

EFSA. (2018). The European Union summary report on trends and sources of zoonoses, zoonotic agents and food-borne outbreaks in 2017. *EFSa Journal*, *16*(12).

Farhana, Z., Sutradhar, N., Mustafa, T., & Naser, M. N. (2020). Food safety and environmental awareness of street food vendors of the Dhaka University campus, Bangladesh. *Bangladesh Journal of Zoology*, *48*(1), 181–188.

Faruque, Q., Haque, Q. F., Shekhar, H. U., & Begum, S. (2010). Institutionalization of healthy street food system in Bangladesh: A pilot study with three wards of Dhaka City Corporation as a model. *National Food Policy Capacity Strengthening Programme (NFPCSP)*, *7*, 1–84.

Fielding, J. E., Aguirre, A., & Palaiologos, E. (2001). Effectiveness of altered incentives in a food safety inspection program. *Preventive Medicine*, *32*(3), 239–244.

Firdani, F. (2022). Knowledge, Attitudes and Practices of Hygiene and Sanitation Implementation on Food Handlers. *Jurnal Kesehatan Lingkungan Indonesia*, *21*(2), 131–136.

Food and Agriculture Organization of the United Nations. (2010). The State of Food Insecurity in the World Addressing food insecurity in protracted crises 2010 Key messages. In *Notes*. http://www.fao.org/docrep/013/i1683e/i1683e.pdf

Gebre-Emanual, T. (1997). Public food service establishment hygiene. *Food Hygiene: Principles and Methods of Foodborne Diseases Control with Special Reference to Ethiopia. Faculty of Medicine, Department of Community Health Addis Ababa University*.

Ghosh, S., Nurain, N., Hasan, M. F., Raihan, M. M., & Akter, F. (2020). Identification of Coliform in common street food and associated factors of contamination in Noakhali, Bangladesh: A cross-sectional study. *Methodology*.

Guzewich, J. (2017). WHO Initiative to Estimate the Global Burden of Foodborne Diseases. 2011. *Accessed August*.

Harun, M. A., & Ahmed, F. (2013). Maniruzzaman.(2013). Customer Hospitality: The Case of Fast Food Industry in Bangladesh. *World Journal of Social Sciences*, *3*(6), 88–104.

Hashanuzzaman, M., Bhowmik, S., Rahman, M. S., Zakaria, M. U. M. A., Voumik, L. C., & Mamun, A.-A. (2020). Assessment of food safety knowledge, attitudes and practices of fish farmers and restaurants food handlers in Bangladesh. *Heliyon*, *6*(11), e05485.

Havelaar, A. H., Cawthorne, A., Angulo, F., Bellinger, D., Corrigan, T., Cravioto, A., Gibb, H., Hald, T., Ehiri, J., & Kirk, M. (2013). WHO initiative to estimate the global burden of foodborne diseases. *The Lancet*, *381*, S59.

Havelaar, A. H., Kirk, M. D., Torgerson, P. R., Gibb, H. J., Hald, T., Lake, R. J., Praet, N., Bellinger, D. C., De Silva, N. R., & Gargouri, N. (2015). World Health Organization global estimates and regional comparisons of the burden of foodborne disease in 2010. *PLoS Medicine*, *12*(12), e1001923.

Howes, M., McEwen, S., Griffiths, M., & Harris, L. (1996). Food handler certification by home study: Measuring changes in knowledge and behavior. *Dairy, Food and Environmental Sanitation: A Publication of the International Association of Milk, Food and Environmental Sanitarians (USA)*.

Huda, M. M., & Hossain, T. (2009). Consumer attitude towards restaurants in Dhaka City: AN empirical study. *ASA University Review*, *3*(2), 115–125.

Islam, G. M. R., & Hoque, M. M. (2013). Food safety regulation in Bangladesh, chemical hazard and some perception to overcome the dilemma. *International Food Research Journal*, *20*(1), 47.

Islam, N., Mustafi, M. A. A., Ahmed, M. S., Rashid, M. M., Kabir, M. A. U., & Nazrul, T. (2018). Factors influencing the selection of restaurant for dining in Dhaka City of Bangladesh. *Global Journal of Management and Business Research*, *18*(7), 30–38.

Islam, N., & Ullah, G. M. (2010). Factors affecting consumers' preferences on fast food items in Bangladesh. *The Journal of Applied Business Research*, *26*(4), 131.

Jeinie, M. H., Sharif, M. S. M., Saad, M., & Nor, N. M. (2016). Food safety and hygiene practice among hotel in Malaysia: Qualitative approach. *Environment-Behaviour Proceedings Journal*, *1*(3), 150–155.

Käferstein, F., & Abdussalam, M. (1999). Food safety in the 21st century. *Bulletin of the World Health Organization*, *77*(4), 347.

Kearney, J. (2010). Food consumption trends and drivers. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *365*(1554), 2793–2807.

Khairuzzaman, M. D., Chowdhury, F. M., Zaman, S., Al Mamun, A., & Bari, M. (2014). Food safety challenges towards safe, healthy, and nutritious street foods in Bangladesh. *International Journal of Food Science*, *2014*, 9.

Kibret, M., & Abera, B. (2012). The sanitary conditions of food service establishments and food safety

knowledge and practices of food handlers in Bahir Dar town. *Ethiopian Journal of Health Sciences*, *22*(1), 27–35.

Kumar, S., Dudeja, P., Shankar, P., & Kaur, S. (2021). Food safety in eating establishments: Assessing conformance of eating establishments to food safety and standards regulations. *Indian Journal of Community Medicine: Official Publication of Indian Association of Preventive & Social Medicine*, *46*(4), 697.

Kumie, A, & Zeru, K. (2007). Sanitary conditions of food establishments in Mekelle town, Tigray, north Ethiopia. *Ethiopian Journal of Health Development*, *21*(1), 3–11.

Kumie, Abera, Genete, K., Worku, H., Kebede, E., Ayele, F., & Mulugeta, H. (2002). The sanitary conditions of public food and drink establishments in the district town of Zeway, Southern Ethiopia. *Ethiopian Journal of Health Development*, *16*(1), 95–103.

Kumie, Abera, Mezene, A., Amsalu, A., Tizazu, A., & Bikila, B. (2006). The sanitary condition of food and drink establisment in Awash-Sebat Kilo town, Afar Region, Ethiopia. *Ethiopian Journal of Health Development*, *20*(3).

Kundu, S., Banna, M. H. Al, Sayeed, A., Akter, S., Aktar, A., Islam, M. A., Proshad, R., & Khan, M. S. I. (2021). Effect of vendors' socio-demography and other factors on hygienic practices of street food shops. *Journal of Foodservice Business Research*, *24*(4), 445–456.

Maemunah, I. (2021). Implementation of Cleanliness, Health and Environmental Sustainability Guidelines in Restaurants around the Southern Java Crossing Route in Ciamis Regency. *Budapest International Research and Critics Institute (BIRCI-Journal): Humanities and Social Sciences*, *4*(2), 2635–2642.

Mariam, S. T., Roma, B., Sorsa, S., Worku, S., & Erosie, L. (2000). Assessment of sanitary and hygienic status of catering establishments of Awassa Town. *Ethiopian Journal of Health Development*, *14*(1), 91–98.

Mead, P., Slutsker, L., Griffin, P., & Tauxe, R. (1999). Food-related illness and death in the United States reply to Dr. Hedberg. *Emerging Infectious Diseases*, *5*(6), 841–842.

Mendedo, E. K., Berhane, Y., & Haile, B. T. (2017). Factors associated with sanitary conditions of food and drinking establishments in Addis Ababa, Ethiopia: Cross-sectional study. *Pan African Medical Journal*, *28*, 1–10. https://doi.org/10.11604/pamj.2017.28.237.13734

Mohammed, A.-M., Padhi, B. K., Shameel, M., Elkhalifa, A. M. E., Tahash, M., Chandramohan, S., & Hazazi, A. (2020). Assessment of foodborne illness awareness and preferred information sources among students in Saudi Arabia: a cross-sectional study. *Food Control*, *112*, 107085.

Mohiuddin, A. K. (2019). The mysterious domination of food/Drinking water contaminants and adulterants in Bangladesh. *PharmaTutor*, *7*(1), 42–58.

Nizame, F. A., Alam, M. U., Masud, A. A., Shoab, A. K., Opel, A., Islam, M. K., Luby, S. P., & Unicomb, L. (2019). Hygiene in restaurants and among street food vendors in Bangladesh. *The American Journal of Tropical Medicine and Hygiene*, *101*(3), 566.

Nizame, F. A., Nasreen, S., Halder, A. K., Arman, S., Winch, P. J., Unicomb, L., & Luby, S. P. (2015). Observed practices and perceived advantages of different hand cleansing agents in rural Bangladesh: ash, soil, and soap. *The American Journal of Tropical Medicine and Hygiene*, *92*(6), 1111.

Nwadike, L. (2016). *Volunteer Quantity Cooking Safety*.

Okonko, I. O., Ogun, A. A., Adejoye, O. D., Ogunjobi, A. A., Nkang, A. O., & Adebayo-Tayo, B. C. (2009). Hazards analysis critical control points (HACCP) and Microbiology qualities of Sea-foods as affected by Handler's Hygiene in Ibadan and Lagos, Nigeria. *African Journal of Food Science*, *3*(1), 35–50.

Rasul, C. H. (2013). Alarming situation of food adulteration. *Bangladesh Medical Journal Khulna*, *46*(1–2), 1–2.

Rifat, M. A., Talukdar, I. H., Lamichhane, N., Atarodi, V., & Alam, S. S. (2022). Food safety knowledge and practices among food handlers in Bangladesh: A systematic review. *Food Control*, *142*(2022), 109262.

Satow, Y. E., Inciardi, J. F., & Wallace, S. P. (2009). Factors used by restaurant customers to predict sanitation levels. *Journal of Foodservice Business Research*, *12*(2), 170–179.

Singh, A. K., Singh, N. P., & Chaturvedani, A. K. (2018). Food safety and hygiene practices among street food vendors in Noida, Uttar Pradesh, India. *International Journal of Current Microbiology and Applied Sciences*, *7*(9), 2340–2347.

Smith, A. (1986). Pets and vectors in an urban environment. In *Joint FAO/WHO expert consultation on food protection for urban consumers*. Food and Agriculture Organization of the United Nations Rome.

Stubenitsky, K., Aaron, J. I., Catt, S. L., & Mela, D. J. (2000). The influence of recipe modification and nutritional information on restaurant food acceptance and macronutrient intakes. *Public Health Nutrition*, *3*(2), 201–209.

Swaminathan, M. (1985). *Essentials of food & Nutrition, Vol, II, Ganesh & Co*. Madras.

Tabassum, A., & Rahman, T. (2012). Differences in consumer attitude towards selective fast food restaurants in Bangladesh: An implication of multiattribute attitude model. *World Review of Business Research*, *2*(3), 12–27.

Taha, S., Osaili, T. M., Saddal, N. K., Al-Nabulsi, A. A., Ayyash, M. M., & Obaid, R. S. (2020). Food safety knowledge among food handlers in food service establishments in United Arab Emirates. *Food Control*, *110*, 106968.

Tamanna, M. K. (2016). Consumers' Interest in Fast Food Items-A Study on Sylhet City of Bangladesh. *The International Journal of Business & Management*, *4*(3), 315–320.

US Food and Drug Administration. (2009). FDA report on the occurrence of foodborne illness risk factors in selected institutional foodservice, restaurant, and retail food store facility types. *Public Health Services*.

World Health Organization. (1989). *Health surveillance and management procedures for food-handling personnel: report of a WHO consultation [held in Geneva from 18 to 22 April 1988]*. World Health Organization.

World Health Organization. (2003). *Looking back : looking ahead : five decades of challenges and achievements in environmental sanitation and health*. http://www.who.int/iris/handle/10665/42752

World Health Organization. (2006). *The health of the people: The African regional health report*. World Health Organization.