

Microbial Profiling of Street Foods Available at Different Locations

Dr. Sandhya Tambekar Wanjari

Department of Microbiology,

Dhote Bandhu Science College,

Gondia – 441614, Maharashtra, India

Email: sandhyatambekar@rediffmail.com

Abstract

"Street foods" are described as a wide range of ready-to-eat foods prepared in public places, notably streets. Foods and beverages which are prepared and sold by the sellers on places like streets, and festival areas, and consumed by the consumers on the run are known as street food. These foods are alternatives to homemade food and are more affordable when compared with the food supplied at restaurants. The final preparation of street foods occurs when the customer orders the meal which can be consumed where it is purchased or taken. The present study aims to establish the hygienic status of street vended food and its impact. It is recommended that bring your own/homemade food, choose a clean and hygienic place (hotel, restaurant, vendor) for having street food, avoid street food in the rainy season or choose a safe place only, Venders must adopt good handling practices, Local government or the respective authorities must check the quality of street food from time to time and warn vendors to maintain it.

Keywords: Street vended foods, microbiological quality, hygienic practices, bacterial contamination, food safety

Introduction

The street food industry has played an important role in the cities and towns of many developing countries in meeting the food demands of urban dwellers. It feeds millions of people daily with a wide variety of foods that are relatively cheap and easily accessible but foods borne illnesses of microbial origin are a major health problem associated with it (WHO, 2002). The traditional methods of processing, improper handling, poor personal hygiene of vendors are the main cause of contamination in street-vended food and are subject to cross-contamination from various sources such as utensils, knives, raw foodstuffs, flies that sporadically landing on the foods, vendor's bare hand serving, and occasional food handling by consumers. Consumers who depend on such food are more interested in its convenience than in the question of its safety, quality, and hygiene (Paudyal *et al.*, 2017). There are reports of food-borne illness associated with the consumption of street vended foods at several places in India and elsewhere (Gawande *et al*, 2013, Lie *et al*, 2014). Thus, it is important to ensure food safety, as a public health measure toward reducing the mortality rate (Dardano, 2003). Street vended foods as it is ready-to-eat foods are highly demanded both by the sellers and consumers because of their tastes, availability, low cost, cultural and

social heritage connection, and serves to the major population those who are in the low-income group in the developing countries (Choudhary *et al*, 2011; Muzaffar *et al*, 2009; Muzaffar *et al*. 2009.).

Street foods are frequently associated with diarrhoeal diseases, due to improper use of additives, the presence of pathogenic bacteria, environmental contaminants, and improper food handling practices based on good manufacturing practices (GMPs) and good hygiene practices (GHPs). Vendors are often poor level education, unlicensed, untrained in food hygiene, work under crude unsanitary conditions, and lack knowledge about the causes of foodborne disease (Tambekar *et al*, 2008, Muyanja *et al*, 2011). Thus, potential health risks are associated with contamination of food by *Escherichia coli*, *Salmonella typhi*, *Pseudomonas* species, *Staphylococcus aureus*, *Proteus* species, and other species during preparation, post-cooking, and various handling stages (Das *et al*, 2010; Kirk *et al*, 2015; Mugampoza *et al*, 2013). The serving utensils used at the vending site are often contaminated with *Staphylococcus sp* which may originate from improper handling which perceives a major public health risk (Tambekar *et al*, 2009, Nurudeen *et al*, 2014, Mahale *et al*, 2008; Mahale *et al*, 2008). The present study deals with the microbiological analysis of the collected street food items, assesses the preparation, storage, and handling practices of the street food, safety aspects, and public awareness about street food consumption.

Materials and Methods:

Collection of Samples: During the study, 12 locations in the Gondia City, catering to different age groups and communities were chosen for the collection of samples and a total of 50 samples were analyzed in which aloo bhajia/ Bonda/ chaat (7), bhel/ chaat (2), bread pakoda (5), kachori (4), kanda bhajia/Vada (7), Mirchi bhajia (1), moong vada/ moongodi (4), Palak vada (1), pani puri (3), poha (6), samosa (7) were included. The samples were collected in a sterilized container and transported to the laboratory within 1 h on the same day.

Sample analysis: For analysis 1 g of food was diluted with 10 mL sterile distilled water. From this diluted sample, 0.5 mL was inoculated in 4.5 mL MacConkey broth and incubated for 4-5 h. The microbial growth observed as turbidity in broth was then subcultured on the Cysteine Lactose Electrolyte Deficient agar (CLED) and incubated at 37°C for 24 h. Tentative identification of isolates was made by gram staining, motility, oxidase test, and cultural characteristics on CLED such as yellow-colored colonies of lactose fermenting *E.coli*, greenish color colonies of *Proteus* spp., greenish-blue or blue colonies of *Ps. aeruginosa*, mucoid yellow to whitish-blue colonies of *Klebsiella* spp. and deep yellow opaque colonies of *S. aureus* (Hi-Media Manual, 2003). Confirmation of various bacterial pathogens was made by subculturing on Xylose Lysine Deoxycholate Agar (XLD agar; M1108, Himedia, Mumbai), *Salmonella-Shigella*-agar (S-S agar M108, Himedia, Mumbai) for *Salmonella* spp, Mannitol salt agar for *Staphylococcus aureus*, Cetrimide Agar for *Pseudomonas* spp., MacConkey agar for other enteric pathogens and various special biochemical tests. The confirmation of pathogens was made whenever necessary with standard methods shown in Hi media Laboratories manual, Mumbai, India. Along with street

vended food samples, information, or data on season, place, and site of shop, time of collection, the hygienic status of vendor and their servants, methods of food preparation, and hygienic condition of the vending site were collected and correlate these data with bacterial contamination in food.

Result and Discussion

Samples	No. of Sample	Percent of Contamination
Bacterial Contaminated	34	68.0
Not Contaminated	16	32.0
Total	50	100

In developing countries, drinks, meals, and snacks sold by street food vendors are widely consumed by millions of people. These street foods provide an affordable source of nutrients to many sectors of the population. Street-vended foods are well appreciated by consumers, because of their taste, low price, and availability at right time. However, street foods are frequently associated with diarrheal diseases due to their improper handling and serving practices, which can increase the risk of street food contamination (Barro *et al.*, 2006; WHO, 2002; Bhaskar *et al.*, 2004). The present study aims to establish the hygienic status of street vended food and its impact on street foods contamination. In the present study, a total of 50 street food samples were collected from different shops in Gondia City to isolate pathogenic bacteria. A total of 102 microorganisms were isolated from street food samples collected. Table. 1. illustrates the bacterial quality of street food samples collected from the Gondia city market. A total of 50 street foods samples were selected out of which 34 (68.0%) samples indicated the presence of pathogenic microorganisms, whereas 16 samples (32.0%) did not show the presence of pathogenic microorganisms in it.

Type of sample	<i>S. aureus</i>	<i>E. coli</i>	<i>Ps. aeruginosa</i>	<i>Salmonella spp.</i>	<i>Proteus spp.</i>	Total
Aloo bhajia/ Bonda/ Chaat	0	2 (5%)	1 (3%)	0	0	3 (1%)
Bhel/ Chaat	2 (13)	1 (5%)	6 (17%)	1 (9%)	1 (9%)	11 (12%)
Bread pakoda	1 (7%)	1 (5%)	3 (8%)	1 (9%)	0	6 (7%)
Kachori	1 (1%)	0	2 (2%)	0	0	3 (1%)
Kanda bhajia/Vada	1 (7%)	0	1 (3%)	0	0	2 (2%)
Mirchi Bhajia	1 (7%)	0	2 (3%)	1 (9%)	0	3 (3%)
Moong vada/ Moongodi	4 (27%)	6 (32%)	7 (19%)	2 (18%)	23 (18%)	21 (23%)

Palak vada	3 (20%)	3 (16%)	5 (14%)	1 (9%)	5 (45%)	17 (18%)
Pani puri	4 (12%)	2 (11%)	2 (6%)	0	1 (9%)	9 (5%)
Poha	1 (1%)	2 (11%)	1 (3%)	2 (9%)	0	5 (4%)
Samosa	2 (13%)	4 (21%)	9 (25%)	4 (36)	2 (18%)	21 (23%)
Total	20 (19.8%)	19 (18.8%)	39 (37.6%)	12 (11.9 %)	12 (11.9%)	102 (100%)

A total of 50 street vended food samples were analyzed, and a total of 102 enteric bacterial pathogens were isolated and identified. The most prominent bacterial pathogens were *P. aeruginosa* (37.6%) followed by *S. aureus* (19.8%), *E.coli* (18.8%), *Salmonella* spp (11.9%), and *Proteus* spp (11.9%) (Table 2). Tambekar *et al*, (2009) observed the high incidences of *Pseudomonas* spp in street food samples; while in the present study, *Pseudomonas* spp. was 37.6%. which might be due to poor personal hygiene of vendors and utensils and a slime layer or biofilm on the utensils as these utensils represent an important source of street food contamination. The cloth used in cleaning dishes represents a hazard to the safety of foods (Muyanja *et al*, 2011). In the present study, the presence of *E.coli* was 18.8% which might be through contaminated water supplies or by food handlers through poor hand washing or contamination of utensils and the absence of good manufacturing, handling, and serving practices (Tambekar *et al*, 2008).



Various street food vendors

The *S. aureus* contamination was 18.8% in street foods samples which might occur through infected wounds, running hands through hair or scratching the scalp, cuts, burns, and dirty clothing of the vendors. In the present study, the contamination of *Salmonella* and *Proteus* spp was 11.9% each in street vended food, which was due to contaminated water, sewage,

soil, handling of food by infected workers, vendors, and consumers in the marketplace (Nurudeen *et al*, 2014).

The food, which was prepared already and kept showed more contamination (75%) than food prepared on time (25%). The demand for kachori and samosa was more, hence prepared them in larger numbers as well quite before serving. These foods were prepared at home and place in uncovered conditions at vending sites as a result of which more dust and soil particles adhered to them. Pohe, Bread pakoda, Kachori, Kanda bhajia/Vada, Mirchi Bhajia showed minimal bacterial contamination, as these food items were prepared freshly and consumed mainly in the morning. In the morning there was less traffic and crowded in the market at the vending site. The cloth used in cleaning dishes represents a hazard to the safety of foods (Kirk *et al*, 2015). The most dominating organism in the monsoon season was *E.coli*, which may occur due to human sewage or contaminated water as fecal matter gets mixed with water and causing more contamination of *E. coli* in the monsoon. This bacterial contamination might be due to dirty clothing, improper cleaning of glasses and dishes, unhygienic handling and serving practices, contaminated hands of the vendor, lack of knowledge of hygienic practices, and safety of food products (Tambekar *et al.*, 2008).

Conclusion:

The study demonstrated the unhygienic quality of the most popular types of street vended food. Hundred and two bacterial pathogens were isolated and identified in which the most prominent organism was *Pseudomonas aeruginosa*, *S. aureus*, and *E.coli*. The contamination of food mainly occurred due to poor personal hygiene, environmental exposure, and improper handling & washing of utensils and Foods are stores in uncovered conditions. Running water is not available at vending sites and dishwashing is usually done in the same buckets without soap. Materials used for wrapping such as leaves, old newspapers, and reusable polythene bags also led to contamination of street food.

Recommendations

Though the street food is being prepared on daily basis and in some cases its preparation in hot oil may decontaminate the food (equals to sterilization) and could be safe for consumption but the improper handling and unhygienic practices may lead to the contamination of pathogenic bacterial which are harmful to the consumer.

References

- [1] Campos, J., Gil, J., Mourão, J., Peixe, L., & Antunes, P., (2015). "Ready-to-eat street-vended food as a potential vehicle of bacterial pathogens and antimicrobial resistance: an exploratory study in Porto region, Portugal," *International Journal of Food Microbiology*, 206:1–6.
- [2] Choudhury, M., Mahanta, L., Goswami, J., Mazumder, M. and Pegoo, B. (2011), Socio-economic profile and food safety knowledge and practice of street food vendors in the city of Guwahati, Assam, India. *Food Control* 22: 196-203.

- [3] Dardano, C., (2003). Caribbean regional working group on street food vendors. Report of FAO, PAHO and BNSI. (Online) Available: ftp:ftp.fao.org/es/esn/food/caribbean_report.pdf
- [4] Das, A., Nagananda, GS., Bhattacharya, S., & Bhardwaj, S., (2010). Microbiological Quality of Street-Vended Indian Chaat Sold in Bangalore. *Journal of Biological Sciences*, 10: 255-260.
- [5] Gawande, HA., Mishra, AA., Shukla, RN., Jain, J., (2013). Socio-economic profile of street food vendors and quality evaluation of Samosa and Panipuri in Allahabad City (UP), India. *International Journal of Agriculture and Food Science Technology*. 4 (3):275-80.
- [6] Kirk, MD. Sara M. PirRobert E. Black, Marisa Caipo, John A. Crump, Brecht Devleesschauwer, Dörte Döpfer, Aamir Fazil, Christa L. Fischer-Walker, Tine Hald, Aron J. Hall, Karen H. Keddy, Robin J. Lake, Claudio F. Lanata, Paul R. Torgerson, Arie H. Havelaar, Frederick J. Angulo (2015), World Health Organization Estimates of the Global and Regional Disease Burden of 22 Foodborne Bacterial, Protozoal, and Viral Diseases, 2010: A Data Synthesis. *PLoS Med* 12(12): e1001921. pmid:26633831
- [7] Liu, ZR., Zhang, GY., & Zhang, XM., (2014) Urban Street foods in Shijiazhuang City, China: current status, safety practices, and risk-mitigating strategies. *Food Control*. 41(1):212–8.
- [8] Mahale, DP., Khade RG., & Vaidya, VK. (2008). Microbiological Analysis of Street Vended Fruit Juices from Mumbai City, India. *Internet J. Food Saf.*, 10: 31-34.
- [9] Muyanja, C., Nayiga, L., Brenda, N., & Nasinyama, G., (2011). “Practices, knowledge and risk factors of street food vendors in Uganda,” *Food Control*, 22(10):1551–1558.
- [10] Muzaffar, AT., Huq, I., & Mallik, BA., (2009). Entrepreneurs of the streets: an analytical work on the street food vendors of Dhaka city. *International Journal of Business and Management*. 4 (2): 80-88.
- [11] Nurudeen, AA., Lawal, AO., Ajayi, SA., (2014). A survey of hygiene and sanitary practices of street food vendors in the Central State of Northern Nigeria. *Journal of Public Health and Epidemiology*. 19;6 (5):174-81.
- [12] Paudyal, Kiran & Baral, Himlal & Lowell, Kim & Keenan, Rodney. (2017). Ecosystem services from community-based forestry in Nepal: Realising local and global benefits. *Land Use Policy*. 63. 342-355. 10.1016/j.landusepol.2017.01.046.
- [13] Tambekar DH, Jaiswal VJ, Dhanorkar DV, Gulhane PB. and Dudhane MN, 2008. Identification of microbiological hazards and safety of ready-to-eat food vended streets of Amravati City, India. *Journal of Applied BioSciences* 7: 195 - 201.
- [14] Tambekar, DH., Murhekar, SM., Dhanorkar, DV., Gulhane, PB., and Dudhane, MN., (2009). Quality and safety of street vended fruit juices: a case study of Amravati city, India. *Journal of Applied Biosciences*. 14: 782-787.
- [15] World Health Organization. Food Safety Team. (2002). Essential safety requirements for street-vended foods, Revised edition. World Health Organization. <https://apps.who.int/iris/handle/10665/63265>.