Bacteriological Analysis of Street Vended Food Panipuri in Mumbai Metropolitan Region

Deepa Ravi Hirani*

Department of Microbiology, Elphinstone College, M.G. Road, Fort, Mumbai 400 032, India

*Corresponding author

ABSTRACT

The present study undertaken to assess the bacterial analysis of masala ware and potato masala sold with panipuri in Mumbai, Maharashtra, India. Total ten samples from different zones of Coloba area of Mumbai were aseptically collected and analysed within one hour of procurement. Isolation, enumeration and identification of the bacteria were carried out following the standard procedure. The CFU counts of the panipuri water samples ranged from $4 \times 10^5$ to $6 \times 10^6$ cfu/ml. The viable aerobic bacterial load of samples of potato masala on NA ranged from $2 \times 10^7$ to $3 \times 10^9$ cfu/g, thus indicating a high rate of contamination. All samples of have high bacterial load of pathogenic bacteria such as Escherichia coli (50%), Salmonella typhi (30%), Salmonella paratyphi A (20%). The isolates in potato masala were identified as Escherichia coli (50%), Salmonella typhi (20%). The bacteriological analysis of the panipuri sold in Mumbai city constitutes an important potential hazard to human health and provision of health education to the vendors improves quality of panipuri.

Keywords
Panipuri, Street food, Bacteria, Masala

Accepted: 04 October 2019
Available Online: 10 November 2019

Introduction

India is famous for their unique street food and millions of people consume a wide variety of ready to eat street foods and beverage. In developing countries like India Street food contributes to 40% of daily diet of urban population (consumer international, 2011; Pma1). People who depends on these types of food are often more interested in its convenience rather than its safety, quality and hygiene. All types of foods are sold by street food vendors, they also provide variety and choice to customers. Consumption of this type of foods potentially increases the risk of food borne diseases caused by various pathogens. Usually vendors sold these foods by wheels barrows, trays mats, tables and make shift stalls consequently, they increasing the risk of food contamination (Ray and Mishra, 2014).
Food and Agriculture Organization defines street foods as ready to eat foods and beverages prepared and/or sold by vendors especially in streets and similar public places. In developing countries, drinks, meals and snacks sold by street food vendors are widely consumed by millions of people. In present times, people in urban parts of India are dependent on ready to eat street food which is easily available and economical as well (Madhuchhanda et al., 2012). The most popular street foods in India are Panipuri or Gol gappas and Papdi chaat among others (Madhuchhanda et al., 2012). The street vended foods are prepared under unhygienic conditions and displayed openly leading to a high degree of contamination water, common ingredient in panipuri is the critical factor in transmission of pathogen (Sharma and Mazumdar, 2014). The microbiological quality of street vended foods becomes important as food can act as a major source for transmission of food borne infections and intoxications. The most important mode of transmission for pathogenic microbes from food handlers to food isthe faecaloral route (Tomar et al., 2018). Microbial contamination of ready-to-eat foods sold by street vendors and hawkers has become a major health problem. Street food vendors are mostly uninformed of good hygiene practices (GHP) and causes of diarrhoeal diseases (Mensah et al., 2002), which can increase the risk of street food contamination (Bhaskar et al., 2004; Tambekar et al., 2009). From the initial contamination of raw foods with pathogenic bacteria to subsequent contamination by vendors during preparation; there are many factors that should be considered for the analyzing the hazards due to street foods (Mankee et al., 2003; Dawson and Canet 1991). The vendors can be carriers of pathogens like E. coli, Salmonella, Shigella, Campylobacter and S. aureus who eventually transfer these foods borne hazards to consumers. In most cases, running water is not available at vending sites; hands and utensils washing are usually done in one or more buckets, and sometimes without soap. Wastewaters and garbage’s are discarded nearby, providing nutrients for insects and rodents, which may carry food borne pathogens (Tambekar et al., 2011). This study was carried out to assess the bacteriological quality of a popular street food Panipuri to identify and isolate the risk factors in street food trade in Mumbai metropolitan city and recommended safety intervention, to ensure safe food practices.

Materials and Methods

Study site and samples collection

Total of 10 Panipuri samples were collected from different vendors in and around Colaba, south Mumbai. Samples were collected during visits to the sites. Vending sites hygiene and salubrious status were determined by use of structured interview and through observations. The panipuri water, the liquid part served with panipuri and the potato masala, the solid part were collected separately in different pre-sterilized vials and were maintained in chilled state using coolants (ice pack) and analyzed after procurement.

Determination of pH of the sample

The pH of panipuri water and potato masala were determined using pH paper strip, directly at the vendor and confirmed using pH meter (Systronics-361) in the laboratory.

Bacteriological analysis

For analysis 1 ml Panipuri water sample was inoculated in to Mac-Conkey broth and incubated for 12-16 h at 37°C. The microbial growth was observed as turbidity in broth, and then sub cultured on the Thiosulfate-citrate-bile salts-sucrose agar (TCBS) and incubated
at 37°C for 24 hrs. After incubations, suspected colonies were identified based on their morphological, physiological and biochemical features using microscopic observation, standard biochemical methods and cultural characteristics on TCBS. Characterization and identification of the isolates were made through standard microbiological methods (Cruickshank et al., 1975; Collins and Lyne, 1970; Bhat and Myero, 1962; Holt et al., 2000).

**Results and Discussion**

In the present study total 10 Panipuri samples were collected from different public places of Colaba, Mumbai. Each sample was fragmented into two different segments (the liquid khatta pani and solid potato masala) and evaluated further. Vendors sell their samples on stands, carts or on improvised structures that are assembled every day on roadsides and share the area with several other street vendors. They cook/prepare these food items fully or partly at their homes and keep at ambient temperature, which stimulates the growth of the mesophilic organisms including food borne pathogenic bacteria. Further, none of the vendors use gloves or head caps during preparation and selling. The pH of the panipuri water samples were observed to be highly acidic ranging from 3 to 4.5 whereas the pH of panipuri mashed potato samples ranged from 5.5 to 6.8 at a temperature of 32°C. The high acidity of the panipuri water could be attributed to the addition of tamarind juice and other acidic ingredients to it.

The total aerobic bacterial load was determined separately for liquid and solid parts of the samples collected, through spread plate method. The CFU counts of the panipuri water samples ranged from $4 \times 10^5$ to $6 \times 10^6$. The viable aerobic bacterial load of samples of potato masala on NA ranged from $2 \times 10^7$ to $3 \times 10^9$ cfu/g, thus indicating a high rate of contamination. The isolates were subjected to a series of biochemical tests that is carbohydrate fermentation, indole, methyl red, Voges Proskauer, citrate, triple sugar iron, and lysine decarboxylase. The isolates were identified using Bergey’s manual of determinative bacteriology, 9th edition.

The isolates in the panipuri water samples were identified as *Escherichia coli* (50%), *Salmonella typhi* (30%), *Salmonella paratyphi* A (20%) respectively. The isolates in potato masala were identified as *Escherichia coli* (50%), *Salmonella typhi* (20%). The panipuri water showed high load of *Escherichia coli* followed by *Salmonella typhi* and *Salmonella paratyphi* A. The panipuri potato masala showed high load of *Escherichia coli* followed by *Salmonella typhi*.

The contamination in panipuri is high because of the conditions under which it is prepared and sold. In most cases running water is not available at vending sites and thus hand and dish washing are usually done in stagnant waters in buckets and sometimes without soap which results in contamination from hands and utensils.

Vendors usually prepare and serve the food with bare and unwashed hands which is one of the most potable sources of contamination (Das et al., 2010). Waste water and garbage are discarded nearby in addition to unhygienic food handling increase the contamination.

The street food is not very much protected from flies, which may possibly get contaminated with food borne pathogens. Street foods are frequently associated with diarrheal diseases due to improper handling and serving practices. Cross contamination of street foods is also increased by unsanitary processing and preservation (Table 1 and 2).
Table 1: Cultural and biochemical characterisation isolates from Panipuri water

| Sample No. | Cultural characteristics (cfu/ml) | Biochemical Tests | Probable microorganism |
|------------|----------------------------------|-------------------|------------------------|
|            | NA | McA | TCBS | Xylose | Maltose | Indole | Methyl Red | Voges Prouskauer | Citrate | TSI | MDB |
| 1          | 5x10<sup>6</sup> | LF | NG | AG | AG | + | + | - | - | Acid slant/ Acid butt, Gas, no H<sub>2</sub>S | + | *Escherichia coli* |
| 2          | 4x10<sup>5</sup> | LNF | NG | A | A | - | + | - | - | Alk slant/ Acid butt, No Gas, H<sub>2</sub>S | + | *Salmonella typhi* |
| 3          | 3x10<sup>6</sup> | LF | NG | AG | AG | + | + | - | - | Acid slant/ Acid butt, Gas, No H<sub>2</sub>S | + | *Escherichia coli* |
| 4          | 2x10<sup>6</sup> | LF | NG | AG | AG | + | + | - | - | Acid slant/ Acid butt, Gas, No H<sub>2</sub>S | + | *Escherichia coli* |
| 5          | 6x10<sup>6</sup> | LNF | NG | - | AG | - | + | - | - | Alk slant/ Acid butt, Gas, No H<sub>2</sub>S | - | *Salmonella paratyphi A* |
| 6          | 2x10<sup>6</sup> | LNF | NG | A | A | - | + | - | - | Alk slant/ Acid butt, No Gas, H<sub>2</sub>S | + | *Salmonella typhi* |
| 7          | 6x10<sup>6</sup> | LF | NG | AG | AG | + | + | - | - | Acid slant/ Acid butt, Gas, No H<sub>2</sub>S | + | *Escherichia coli* |
| 8          | 5x10<sup>6</sup> | LF | NG | AG | AG | + | + | - | - | Acid slant/ Acid butt, Gas, No H<sub>2</sub>S | + | *Escherichia coli* |
| 9          | 3x10<sup>6</sup> | LNF | NG | A | A | - | + | - | - | Alk slant/ Acid butt, No Gas, H<sub>2</sub>S | + | *Salmonella typhi* |
| 10         | 4x10<sup>5</sup> | LNF | NG | - | AG | - | + | - | - | Alk slant/ Acid butt, Gas, No H<sub>2</sub>S | - |
| Sample No. | Cultural characteristics | Biochemical Tests | Probable microorganism |
|-----------|---------------------------|-------------------|------------------------|
|           | MA | TCBS | Xylose | Maltose | Indole | Methyl Red | Voges-Proskauer | Citrate | TSI | MDB |
| 1         | 5x10^8 | LF | NG | AG | AG | + | + | - | - | Acid slant/ Acid butt, Gas, no H_2S | + | *Escherichia coli* |
| 2         | 4x10^7 | NG | NG | - | - | - | - | - | - | - | - | - | *Salmonella typhi* |
| 3         | 3x10^8 | LF | NG | AG | AG | + | + | - | - | Acid slant/ Acid butt, Gas, No H_2S | + | *Escherichia coli* |
| 4         | 2x10^9 | LF | NG | AG | AG | + | + | - | - | Acid slant/ Acid butt, Gas, No H_2S | + | *Escherichia coli* |
| 5         | 2x10^7 | NG | NG | - | - | - | - | - | - | - | - | - | *Salmonella typhi* |
| 6         | 5x10^8 | LNF | NG | A | A | - | + | - | - | Alk slant/ Acid butt, No Gas, H_2S | + | *Salmonella paratyphi A* |
| 7         | 4x10^8 | LF | NG | AG | AG | + | + | - | - | Acid slant/ Acid butt, Gas, No H_2S | + | *Escherichia coli* |
| 8         | 3x10^9 | LF | NG | AG | AG | + | + | - | - | Acid slant/ Acid butt, Gas, No H_2S | + | *Escherichia coli* |
| 9         | 3x10^7 | NG | NG | - | - | - | - | - | - | - | - | - | *Salmonella paratyphi A* |
| 10        | 2x10^8 | LNF | NG | A | A | - | + | - | - | Alk slant/ Acid butt, No Gas, H_2S | - | *Salmonella typhi* |
The results of this study clearly show that the street-vended food is contaminated with different pathogenic bacteria and this is because proper hygienic practices are not followed while handling the food material or utensils used for food preparation or serving. The presence of these bacteria in food can pose potential risk to human health. Poor personal hygiene, improper handling, and storage practices of foods are the factors which are associated with contamination of street-vended foods in Mumbai. Provision of health education to the vendors and enforcing implementation of appropriate hygienic practices would improve bacteriological quality of street vended foods. Regular monitoring of the street food is suggested as this will help improve their quality.

References

Bhaskar J, Usman M, Smitha S, and Bhat GK. (2004). Bacteriological profile of street foods in Mangalore. Indian Journal of Medical Microbiology. 22: 97-197.

Bhaskar J, Usman M, Smitha S, Bhat GK. (2004). Bacteriological profile of street foods in Mangalore. Indian J Med Micribiol. 2004; 22:197–197

Bhat P, Myero RM (1962). Standard methods and procedures used in the bacteriology laboratory of Vellore Christian Medical College Hospital for isolation and identification of organisms belonging to the family Enterobacteriaceae. Indian J Med Res 50(4):559–566

Collins CH, Lyne PM (1970) Microbiological methods. Butterworths, London

Consumer International. (n.d.). “Serving up street food in the global south”. available at: http://streetfood.org (accessed April 27, 2014), 2011.

Cruickshank R, Duguid JP, Marmion BP, Swain RHA (1975). Medical microbiology. Churchill Livingstone, London

Das A, Nagananda GS, Bhatacharya S, Bharadwaj S. (2010). Microbiological quality of street vended Indian Chaats sold in Bangalore. J Biol Sci. 2010; 10:255–260.

Dawson RJ, and Canet C. (1991). International activities in street foods. Food Control. 2: 135-139.

Holt JG, Kreig NR, Sneath PHA, Steley JT, Williams ST (2000). Bergey’s manual of determinative bacteriology. Williams and Wilkins, Philadelphia

Madhuchhanda Das, Chandi C.RathC,and U.B. Mohapatra. Bacteriology of a most popular street food (Panipuri) and inhibitory effect of essential oils on bacterial growth J Food Sci Technol. 2012 Oct; 49(5): 564–571

Mankee A, Ali S, Chin A, Indalsingh R, Khan R, Mohammad F, Reheman R, Sooknanan S, Tota-Maharaj R, Simeon D, and Adesiyyun AA. (2003). Bacteriological quality of doubles sold by street vendors in Trinidad and the attitudes, knowledge and perceptions of the public about its consumption and health risk. Food Microbiology. 20: 631-639

Mensah P, Manu DY, Darko KO, and Ablordey A. (2002). Streets foods in Accra, Ghana: how safe are they? Bulletin of World Health Organization. 80(7): 546-554.

Mensah P., Owusu-Darko K., Yeboah-Manu D., Ablordey A., Nkrumah F.K., Kamiya H. (1999).The role of street food vendors in the transmission of enteric pathogens in Accra, Ghana Med. J., 33:19-29

Rajesh Singh Tomar, Monika Gupta, Shuchi Kaushik, Raghvendra Kumar Mishra, (2018).Bacteriological Quality of Panipuri in Historical Gwalior City (MP), India Asian Journal of Pharmaceutics 12(1): S328.
Ray M.K and Mishra P.K., (2014). A Preliminary Study of Fungi on Panipuri Sold in Different Areas of Dhubri Town, Assam. Trends in Biosciences, 7(11), 991-993.

Sharma I, Mazumdar J A. (2014). Assessment of bacteriological quality of ready to eat food vended in streets of Silchar city, Assam, India. Indian J Med Microbiol; 32:169-71

Tambekar D H, Kulkarni R V, S D Shirsat and D G Bhadange. (2011). Bacteriological Quality of Street Vended Food Panipuri: A Case Study of Amravati City (Ms) India. Bioscience Discovery, 2 (3), 350-354.

Tambekar DH, Jaiswal VJ, Dhanorkar DV, Gulhane PB, Dudhane MN (2008) Identification of microbiological hazards and safety of ready-to-eat food vended in streets of Amravati city. Indian J Appl Biosci 7:195–201.

How to cite this article:
Deepa Ravi Hirani. 2019. Bacteriological Analysis of Street Vended Food Panipuri in Mumbai Metropolitan Region. Int.J.Curr.Microbiol.App.Sci. 8(11): 115-121.
doi: https://doi.org/10.20546/ijcmas.2019.811.014