Bacteriological safety of street foods in Chennai

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Abstract **- Street foods are on a rise in the country as they offer less expensive and a variety of foods to the consumer. It contributes to economic growth of the country and helps to meet the nutritional requirement of people but it has become an important public health issue due to widespread food borne diseases. The present study determined the status of food safety and hygiene practices followed by street food vendors in two areas of Chennai city namely Sowcarpet and Madipakkam by use of a structured questionnaire and an observational study and assessed the safety of some popular street foods viz. sugarcane juice, bhelpuri and panipuri in terms of microbial contamination with regard to total plate count, E.coli and Staphylococcus aureus. Thirty vendors were randomly selected and data on demographics, food safety and food handling practices was collected. The study revealed that most of the vendors were not following necessary personal hygiene measures and majority of the units were running without FSSAI registration or license. Vendors lack awareness about food borne illness and how it affects health of customers who consume unsafe food regularly. Prevalence of microbial contamination among selected street foods revealed that foods were heavily contaminated. The average total plate count of six samples were in unsatisfactory ranges (1, 30,830 cfu/g). E.coli was found to be highest in bhelpuri samples (16,000 cfu/g) whereas Staphylococcus aureus was highest (2800 cfu/g) in panipuri water. Contamination was high in the samples collected from Sowcarpet which could be attributed to the heavy traffic and busy streets that's always dusty and crowded with people contributing to contamination of food that is left open on the street side. Thus, the study ensures that there is an urgent need for imparting knowledge about safe and hygienic food handling practices to the street food vendors for a safer consumption of street foods.**

Index Terms **- Food borne illness, Food safety, Microbial contamination, Street food.**

I.INTRODUCTION

India is the seventh largest country with an area of 31.7 million square kilometres, the second most populous country and the second largest producer of food in the world. The task of ensuring that the food produced reaches 1.2 billion Indians is complex and involves a number of stakeholders. The diversity in Indian culture and changing needs of customers creates further complexity in the food production and distribution system in the country [1].

The changes taking place in people's life styles have caused the habit of eating outside because the consumers do not have time for cooking at home. The changes in consumption habits of the society, cultural interactions, fast living, and the contribution of women to work life are influencing and changing the nutrition style in crowded cities [2].

"Street-vended foods" or its equivalent "Street foods" are defined as foods and beverages prepared and/or sold by vendors in streets and other public places for immediate consumption or consumption later without further processing or preparation. This includes fresh fruits and vegetables, which are sold outside authorized market areas for immediate consumption [3].

In developing countries all over the world, street foods provide a wide range of nutrients, helping people to meet their nutritional needs. Desirable attributes of street foods such as ease of accessibility, variety in taste, choice and low cost make them an affordable option [4] .It is estimated that street foods contribute up to forty percent of the daily diet of urban consumers in developing countries [5].It is consumed by about 2.5 billion people worldwide on daily basis [6].

The people who sell these foods are referred to as street food vendors [7]. According to WHO (1989), food handling personnel play important role in ensuring food safety throughout the chain of food production and storage. Mishandling and disregard of hygienic measures on the part of the food vendors may

enable pathogenic bacteria to come into contact with and in some cases survive and multiply in sufficient numbers to cause illness in the consumer[8].

It has been estimated that each year 1.8 million people die as a result of diarrhoeal diseases and most of these cases can be attributed to contaminated food or water. Proper food preparation can prevent most foodborne diseases [9].

Food can be contaminated by microorganisms like species of Salmonella, Bacillus, E.coli, etc., which can cause serious food infections. Some microorganisms produce toxins in foods i.e. food intoxifications eventually leading to food borne illnesses. This is mainly due to the unhygienic practices while preparing food and serving [10].The vendors can be carriers of pathogens like E. coli, Salmonella, Shigella, Campylobacter and S. aureus who eventually transfer these food borne hazards to consumers [11].

Chennai, a popular metropolitan city, is one of the most crowded cities in India. In the recent years, industrialization has gone to peak which led to the massive labour power in the city. As a result the demand of inexpensive and easily available street foods has also risen. But hardly attempts have been made to monitor the safety in consumption of street foods [10].

The objectives of this study were to evaluate the food safety practices of street food vendors in Chennai during trade through a structured questionnaire and observational study and to assess the safety of some popular street foods (Bhel puri, Pani puri, Sugarcane juice) in terms of microbial contamination with regard to total plate count, E.coli and Staphylococcus aureus.

II METHODOLOGY

2.1 Study design

The status of food safety and hygiene practices followed by vendors of street foods in Chennai city was carried out during March-April 2021 with the help of survey research design [12].Information was collected from a sample of street vendors through their responses to questions.

2.2 Location of the study:

Chennai city was the prime location from where two areas namely Sowcarpet and Madipakkam were chosen. Sowcarpet is in the northern part of Chennai. It is a bustling commercial area of the city, where a range of wholesale markets are located. It is like the street food capital of Chennai. It's very much crowded and is famous for variety of foods like chats and lassi. Madipakkam is residential locality situated in south of Chennai. It is known for small outlets that provide tasty food. Two contrasting locations were chosen to analyse and compare the difference in safety aspect of street foods.

2.3 Selection of respondents:

For the purpose of the current study a set of criteria that are in-line with the Food Safety and Standards Authority of India (FSSAI) and National Policy on Urban Street Vendors were considered in identifying the prospective respondents: Petty Food Manufacturer was defined as the one who manufactures or sells any article of food himself or a petty retailer, hawker, itinerant vendor or temporary stall holder. (FSSAI, 2011) ; Street vendors could be stationary and occupy space on the pavements or other public/private areas, or could be mobile, and move from place to place carrying their wares on push carts or in cycles or baskets on their heads, or could sell their wares in moving buses(National Policy on Urban Street Vendors,2004). The target population constituted street food vendors in Sowcarpet and Madipakkam.

2.4 Data collection:

Hygiene and sanitation were determined by the use of structured questionnaire and an observational study.Thirty street food vendors operating in the major streets and markets were randomly selected for the interview to elicit information for the study. The survey tool containing thirty four questions which included close-ended questions on general information about shop,environmental sanitation, profile of vendor general food safety practices and personal hygiene of street vendors was administered.

2.5 Sample collection:

The most common and preferred street foods that are sold in these areas are Bhelpuri, Panipuri and Sugarcane juice. The food samples were collected in the packaging materials provided by the vendor and were transported to laboratory within an hour and analysis was done as soon as the samples reached the laboratory. For each food, one sample was collected from Madipakkam and one from Sowcarpet from a vendor chosen randomly. Sugar cane juice was collected without addition of ice cubes as they

additionally contribute to microbial load and could mislead the results. A total of six samples were collected for the three dishes from the thirty shops.

2.6 Microbiological Analysis:

The study analysed the microbial contamination of selected street foods namely Bhelpuri, panipuri, and sugarcane juice. The total plate count was analysed using IS 5402: 2012 (RA.2018) method and the common foodborne pathogens E.coli and Staphylococcus aureus were quantitatively determined following IS 5887 (Part 1):1976 (RA.2013) and IS 5887 (Part 2):1976 (RA.2013) procedures respectively.

2.7 Statistical Analysis

The raw data obtained from the survey was coded, tabulated and analysed using descriptive statistics of Microsoft Excel 2016 Statistical functions.

III RESULTS AND DISCUSSION

3.1 Profile of respondents

A total of thirty street food vendors participated in the present study from the two areas of the city viz. Sowcarpet (27 %), Madipakkam (73 %). The general information of the participants with regards to the demographic data like age, gender and educational level and type of food business are presented in the Table I. The majority of the respondents (73 %) were male. This is in agreement with the study done by Muinde and Kuri (2005) who reported that 60 % of the vendors surveyed in Nairobi were male.

Table. I Profile of street food vendors studied in Chennai

Characteristics	Sample =30	Frequency	Percentage of respondents
Age (years)	Below 25 25-50 Above 50	9 17 4	30.0 56.7 13.3
Gender	Male Female	22 8	73.3 26.7
Educational level	Illiterate Primary High school College	7 3 12 8	23.3 10.0 40.0 26.7
Type of vendor	Stationary Mobile	25 5	83.3 16.7
Location of vending unit	Madipakkam Sowcarpet	22 8	73.3 26.7

3.2 Profile of the shop:

Ninety percent of these street food vending systems are functioning without any license or registration from FSSAI. Most of them claim to have a corporation license, which highlights the need of spreading the knowledge and awareness about FSSAI to ultimate stakeholders. Many vending units had washing area near to the food preparation/serving unit (77 percent). Most (56 percent) of the food vending systems were located in unhygienic locations lacking a clean surrounding. These results were slightly different from that of Donkor et al., (2009) who said 60 percent of the food vendor sites were hygienic and clean.

Table. II Profile of the shop

Parameter	**No. of vendors**	**Percentage**
FSSAI registration/ license	3	10
Covering of the unit • Permanent cover • Covered with tent • Remains open	 14 - 16	 46.6 - 53.3
Seating capacity • Nil • Up to 5 person • Above 5 person	 23 7-	 76.6 23.4-
Average number of consumers • Below 30 • 30-60 • 60-90 • Above 90	 19 11 --	 63.3 36.6 --
Adequate light and ventilation	11	36.6
Clean handwashing area	7	23.4
Clean food contact surfaces	6	20
Clean and covered waste bins	9	30
Waste disposal method • On street • Drainage • Waste bin	 6 2 22	 20 6.66 73.3
Surrounding of the bin is free of food, grease, flies, pest and insects	11	36.6
Surrounding of vending site is clean	13	43.3

3.3 Personal hygiene of vendor

Eighty percent of the vendors avoided wearing mask during the Global pandemic time. This calls for strict regulatory actions by the Government. Food handlers should wear clean and proper clothing according to prevailing local standard ,70% of the respondents in this study wear clean clothes while food preparation. Even though, the respondents were aware of the use of aprons, hand gloves and head gears only 10% of them were found using these in their vending units. 90% of vendors avoided eating, smoking and chewing paan in food preparation.

Table III Personal hygiene practices followed by street food vendors

Parameter	Yes	No
Use of aprons, disposable hand gloves and head covers while preparing and serving of foods	3	27
Proper use of mask	6	24
Vendor wears clean clothes	21	9
Vendor touching hair, face, and nose while handling food	25	5
Vendor handles mobile phones while handling cooked food	20	10
Vendor smokes or chews paan in the food preparation or the service areas	3	27
Vendors sneezing on food	10	20
Vendor handles food and money without washing hands in between	25	5

3.4 Food handling practices

In most units (60%) food were prepared on street side amidst the city crowd and traffic. 60% of the vendors cooked the food and stored them several hours before sale The preparation of food long before its consumption, improper storage conditions, inadequate cooling and reheating, contaminated processed food, and undercooking were identified as the key factors in the handling of food that contributed to food poisoning outbreaks (Roberts, 1982; WHO, 1989).Respondents were using newspapers for packaging foods like masala vada, bajji etc. and served such foods with bare hands.

Table.IV Food handling practices

Parameter	Frequency	Percentage
Place of preparation of food		40
• Inside stall	12	
• On street side	18	60
Time of food preparation		
• Long before eating	18	60
• Just before eating	12	40
Presence of flies on food	19	63.3
Proper cleaning of utensils	14	46.6
Serving material to consumer		
• Plastic	7	23.3
• Stainless steel	14	46.6
• Bamboo plates	-	-
• Newspapers	9	30
Packaging material to consumer:		
• Polythene covers	9	30
• Aluminium foil boxes	8	26.6
• Plastic boxes	7	23.3
• Newspapers	6	20

3.5 Microbial contamination in street vended foods:

Present study also revealed that contamination were high in the samples collected from Sowcarpet that could be attributed to the heavy traffic and busy streets that are always crowded contributing to contamination of food that were left open on street side.

Table.V Microbial load of street foods in Sowcarpet

Sample	Total plate count (cfu/g)	*E.coli*(cfu/g)	*Staphylococcus aureus*(cfu/g)
Sugarcane juice	3,20,000	3,200	<10
Bhelpuri	1,40,000	16,000	1,800
Panipuri water	54,000	<10	2,800

Table.VI Microbial load of street foods in Madipakkam

Sample	Total plate count (cfu/g)	*E.coli* (cfu/g)	*Staphylococcus aureus*(cfu/g)
Sugarcane juice	1,30,000	1,300	<10
Bhelpuri	1,20,000	5,300	1,400
Panipuri water	21,000	<10	<10

Sugarcane juice :

Presence of E.coli indicates faecal contamination of sugarcane juice suggesting possible risk of infection involved with drinking such sugarcane juice regularly. Possible sources of microbial contamination have been acknowledged as poor hygienic handling, raw material, ice, inappropriate cleaning of the sugar cane press knives, interaction surfaces, seller's hands and airborne contamination [13].Sugarcane juice also

attracts flies that may contaminate the juice. These juices with no additional treatments have been a possible source of bacterial pathogens particularly Salmonella and E. coli [14].

Bhelpuri:
Samples of bhelpuri were heavily contaminated with both E.coli and Staphylococcus aureus. Presence of E.coli may be attributed to the poor quality of water used in the preparation of chutneys and presence of Staphylococcus aureus may be attributed to improper food handling practices by the vendors. E coli is an indicator of faecal contamination [15].
S. aureus contamination is mainly associated with improper handling of cooked or processed foods, followed by storage under conditions which allow growth of S. aureus and production of the enterotoxin [16].

Panipuri:
Present study revealed masala water used in the preparation of panipuri had high levels of total plate count but E.coli was absent. This is in contrary to Tambekar et al., 2011; Yadav et al., 2019 who reported 40% of their panipuri samples were contaminated with E.coli. According to WHO (2006) E. coli are rarely found in water in the absence of faecal pollution. The entry of staphylococci in the samples may be due to severe contamination through handling [17].

IV SUMMARY AND CONCLUSION

In today's fast moving world where there is cutthroat competition in every field, survival of fittest has become a reality. Lifestyle of people have changed. In nuclear families where both men and women are, working little time is left for cooking so they opt to eat anywhere and everywhere. This led to the rapid growth of street food system. Many studies found that there is a positive correlation between consumption of street food and food poisoning. Government should take the responsibility of imparting knowledge about safe and hygienic food handling practices to the street food vendors and should monitor their actions.
Efforts should be taken to improve the environmental conditions under which the trade is carried out, providing essential services to the vendors to ensure safe trade practices. Knowledge regarding Food Safety and Standards Authority of India (FSSAI) and its functions should be familiarized to all the street food vendors. Thus, the study ensures that there is an urgent need for creating awareness about good hygienic practices among vendors for a safer consumption of street foods.

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