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Research Article

ANALYSIS OF BACTERIOLOGICAL PROFILE OF STREET VENDED FOODS AND UNDERSTAND THE PRACTICE OF FOOD HANDLING HYGIENE AMONG VENDORS

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ABSTRACT

Unlike many other developing countries, India lags behind in sanitary conditions in food processing environment and therefore the risk of food borne diseases that spread through street food remains high. To keep this in mind, the present investigation is to analyze the street foods for the presence of bacterial pathogens that are greater responsible for outbreak of food poisoning (infection and intoxications). The collected food samples were processed bacteriologically and found positive to *Salmonella*, *Shigella*, *Vibrio*, *Staphylococcus* and *Escherichia coli*. Out of 70 food samples collected from 5 different areas of a city, 10 food samples showed bacterial isolates. The isolates were *Salmonella typhimurium* (boiled egg bonda, kurma), *Shigella dysenteriae* (panipuri and sugarcane juice), *Escherichia coli* (water, grape juice and jigardhandha), *Staphylococcus aureus* (kurma and fruit salad) and *Vibrio cholerae* (buttermilk and chat). All the samples were subjected to *Campylobacter* isolate with selective culturing but there is no isolate was found during the study period. The study pointed out the lack of knowledge and practices about food hygiene and sanitary conditions among the street food vendors. Further the maintenance of appropriate hygiene and sanitation in and around the vicinity of the street stall would lessen the food contamination and outbreaks of food borne diseases.

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INTRODUCTION

Food and groceries are available on the street at very cheap cost than in a restaurant or a supermarket. Consumption of such foods is common among low socio-economic groups both in developed as well as developing countries. These foods are highly attracted by the public due to its taste and distinguishable by its local flavor are playing a significant role to consume by millions of people with cheap, accessible and nutritious food. They have also become important as well as essential for maintaining the food supply chain of the populations^{1,2}.

Street foods are generally sold from stands/ stalls (usually not permanent structures) on the pavement of busy streets in both urban and rural areas. Hence they provide an accessible source of food to the needy and poor people. Street food is prepared by the vendors at home or at the road side stalls. These food items include snacks such as crisps and drinks such as soft drinks; however cooked foods are also sold, frequently on site like idly, dosa, paani poori etc².

Increasing population has instigated rapid growth and change in food demands, thereby increasing the necessity of assurance

that food will not cause harm to the consumer when it is prepared and eaten or consumed according to its intended use. With the increasing pace of globalization and tourism, the safety of street food has become one of the major concerns of public health, and a focus for governments and scientists to raise public awareness of unsafe food. WHO estimates that food borne and waterborne diarrheal diseases taken together kill about 2.2 million people annually, 1.9 million of them are children³.

The risk of serious food poisoning outbreaks linked to street foods remains a threat in many parts of the world, with microbiological contamination being one of the most significant problems depending on the type of food and the method of preparation and conservation. Millions of people fall ill and many suffer from infections, serious disorders, long-term complications, various forms of cancers or even die⁴. Few epidemiological studies revealed that street foods contribute to a significant number of food poisonings⁵. Due to scarcity of data and lacunae in knowledge about food chains, there have been several documented cases of food poisoning outbreaks due to street foods.

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Microbiological status of such foods sold in street environment dependent on several factors including quality of raw materials used, handling and processing of food, ability of the microorganisms to survive the preservation and storage treatment and contamination in the post- process phase^{6,7}. The vending sites are self-allocated and are not planned with sanitary amenities. Foods are held in different ways before selling; fish are placed openly on the stalls and chips are held in cup boards next to the stalls while fruit salads are held in open bowls. After the food is prepared, it is not reheated to high temperatures before serving⁸. The stalls are poorly constructed and increase the exposure to contamination by dust and smoke on the road side⁹.

In some studies, it was found that clothes of 13.4% of street vendors were dirty, only 60% had short non-polished nails. About 40% were chewing tobacco during food handling and 73.3% of the vendors did not wiped their hands after every serving. Without formal education, the street food vendors lack knowledge on proper food handling and may play a role in transmission of food-borne pathogens. Street-vended foods can be a serious threat to public health by causing various acute and chronic food- borne illnesses through pathogenic microbes or toxic substances present in them. Most studies done on street foods in India and abroad clearly indicates that these foods are not meeting the microbiological standards and are contaminated with various pathogens like *E. coli*, *Vibrio*, *Salmonella*, *Listeria* etc^{10,11,12,13}.

The food borne illnesses are leading cause of morbidity and mortality worldwide¹⁴. Besides direct health consequences, these food borne illnesses can reduce the productivity and economic output, and also impose substantial stress on health care system. In order to prevent such outbreaks, the Government and local health care authorities should focus on

1. Educating the food handlers
2. Improving the environmental conditions under which the trade is carried out
3. Providing essential services to the vendors to ensure safety of their commodities
4. Identification of precise sources of microbial contamination to devise strategies to reduce further outbreaks¹³.
5. The main objective of this study is to determine the bacteriological profile of street vended food in order to improve the training about food handling techniques and its hygiene practices of the street vendors.

Experimental Section

Study area, population and design

The study was undertaken in Tiruchirapalli city where different types of street vended foods are prepared and sold by different means. A study questionnaire was prepared and pre-tested. The questionnaire contained two sections one, which was unbiased self-observation of the researcher who ticked the correct answer by observing the environment, personal hygiene of the vendor, types of food sold and method of food preparation and serving. These vendors have no legal license from the Corporation and hence would not give correct answer due to

fear. The second part contained the elution of answer from the vendors.

This is a cross-sectional and analytical study thereby five different localities in and around a Tiruchirapalli city was included. Among them, seventy food and water samples from platform vendors, cart vendors and hawkers. The institutional ethical clearance was obtained and written informed consent was obtained from the concerned street vendors before collecting the food sample. In addition, a self assessment on vendor’s hygiene behavior was carried out in each stall by simple interview.

Collection of food samples

A total of 70 food samples were collected from different locations and different shops. The details of various shops, areas and number of samples collected were depicted in figure 1. All food samples were serially numbered and collected in sterile containers which were transported in a cold box to the laboratory for processing within one to three hours^{15,16}. About 20-25g of the food samples which were categorized into processed, semi-processed and un-processed food, were taken with sterile spatulas, weighed separately and mixed with 180ml of buffered peptone water^{15,16}. Homogenisation of the food samples was done using sterile pestle and mortar. The water samples were centrifuged and the sediment was used to determine the presence of microorganisms.

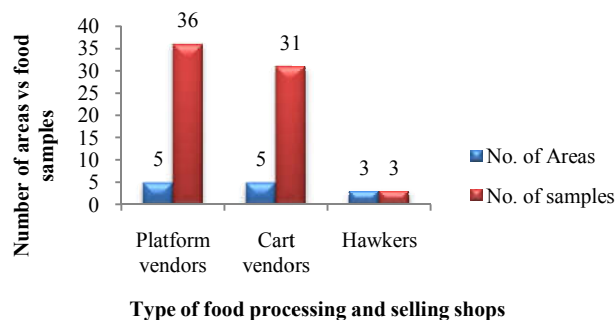


Figure 1 Details and types of shops, areas and food samples

Bacteriological processing

Microbiological analysis of the food samples collected was carried out for *Salmonella*, *Shigella*, *Vibrio*, *Staphylococcus*, *Escherichia coli* and *Campylobacter* by adopting standard bacteriological methods. All the culture (both enriched and selective media) and biochemical media were prepared freshly as per manufacturers guidelines in a sterile manner and used for the study (Table 1).

Table 1 Enriched and Selective media for culturing food borne bacterial pathogens

Bacteria	Enriched media	Selective media	Colony morphology
<i>Salmonella</i>	Selenite F broth	<i>Salmonella</i> – <i>Shigella</i> agar	Pale colonies with black centres
<i>Shigella</i>	Selenite F broth	<i>Salmonella</i> – <i>Shigella</i> agar	Pale colonies without black centres
<i>Vibrio</i>	Alkaline peptone water	Thiosulphate citrate bile salt agar	Yellow to green colonies
<i>Staphylococcus aureus</i>	Salt broth	Mannitol salt agar	Golden yellow colonies
<i>Escherichia coli</i>	Salt broth	Eosin methelene blue agar	Metallic sheen colonies
<i>Campylobacter</i>	<i>Campylobacter</i> enrichment broth with lysed horse blood	Blood agar	Non haemolytic, grey and mucoid colonies

Antibiotic Susceptibility test

Antibiotic susceptibility testing was done using Muller Hinton agar with an inoculum that matched 0.5 McFarland’s standard by standard disc diffusion method. Interpretation of zone diameters was done following CLSI 2014 recommendations. A gallery of antibiotics including ciprofloxacin, cotrimaxazole, cefotaxime, ceftriaxone, chloramphenicol, ampicillin, Cefaperazone + Sulbactam, Piperacillin + Tazobactam, gentamycin, norfloxacin, erythromycin, doxycycline, ceftoxitin, linezolid, vancomycin and clindamycin were included in this study for analyzing the sensitivity and resistance pattern of isolated bacterial pathogens.

RESULTS AND DISCUSSION

As a result, the water source used by a platform vendor in area 1 from which *Escherichia coli* was isolated, was used for preparation of grape juice in the same street shop by the same platform vendor, hence the same bacteria was isolated from it. *Shigella dysenteriae* was isolated from a hawker selling paanipuri. From Area 2, *Staphylococcus aureus* was isolated from watermelon sold by a cart vendor and *Escherichia coli* was isolated from jigardandha sold by a platform vendor. From area 3, *Vibrio cholerae* was isolated from buttermilk sold by a cart vendor and sugarcane juice sold by a platform vendor, *S. dysenteriae* was isolated. The significant finding in area 4 is *Salmonella typhimurium* was isolated from boiled egg bonda sold by a cart vendor. *V. cholerae* was isolated from chat sold by a cart vendor and *S. aureus* was isolated from dosa sold by a platform vendor from area 5. The individual descriptions of street vendors, cart vendors and hawkers, their areas, number of samples and bacteriological analysis were impregnated in table 2, 3 and 4 respectively. The overall area wise bacterial isolates were depicted in figure 2, 3, and 4 respectively.

Table 2 Platform vendor wise food sample collection and bacterial isolation

S. No.	Food (each one sample per area)	Bacteria isolated for food samples				
		Area 1	Area 2	Area 3	Area 4	Area 5
1	Grape Juice	<i>E. coli</i>	-	<i>E. coli</i>	-	-
2	Water	<i>E. coli</i>	-	-	-	<i>E. coli</i>
3	Idli	-	-	-	-	-
4	Red chutney	-	-	-	-	-
5	Jigardandha	-	<i>E. coli</i>	-	-	-
6	Ice cream	-	-	-	<i>S. typhimurium</i>	-
7	Butter milk	-	-	-	-	-
8	Badam Milk	-	-	-	-	<i>S. aureus</i>
9	Sugar Cane juice	<i>E. coli</i>	-	<i>S. dysenteriae</i>	<i>E. coli</i>	<i>E. coli</i>
10	Kurma	-	-	-	-	<i>S. aureus</i>
11	Coconut chutney	-	<i>E. coli</i>	-	<i>E. coli</i>	-
12	Dosa	-	-	-	-	-
13	Sambar	-	-	-	-	-

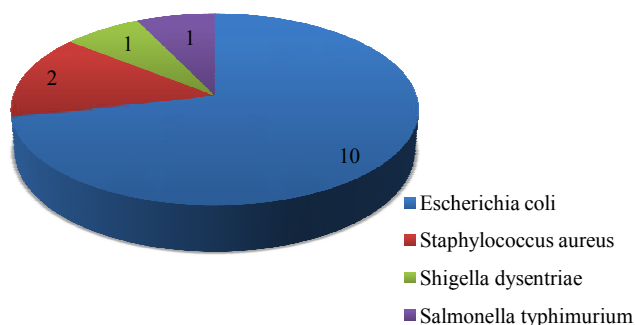


Figure 2 Bacteriological isolation pattern of Area 1 food samples

Table 3 Cart vendor wise food sample collection and bacterial isolation

S. No.	Food (each one sample per area)	Bacteria isolated for food samples				
		Area 1	Area 2	Area 3	Area 4	Area 5
1	Butter Milk	-	-	<i>V. cholerae</i>	-	<i>E. coli</i>
2	Salads	<i>E. coli</i>	<i>S. aureus</i>	-	-	-
3	Samosa	-	-	<i>E. coli</i>	-	-
4	Panipuri and chat items	-	<i>E. coli</i>	-	-	<i>V. cholerae</i>
5	Bonda, Bajji and vada	-	-	-	<i>S. typhimurium</i>	-
6	Jigardandha	-	-	<i>E. coli</i>	-	-
7	Dosa	-	-	-	-	-
8	Sambar	-	-	-	-	-

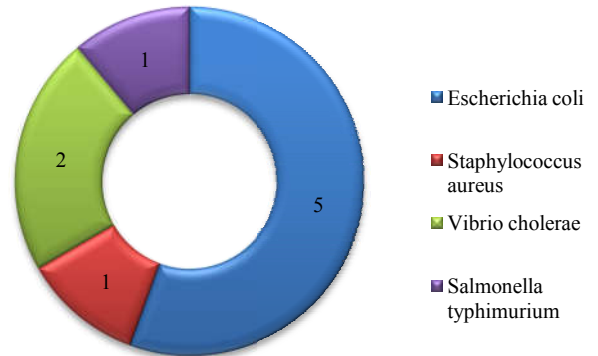


Figure 3 Bacteriological isolation pattern of Area 2 food samples

Table 4 Hawker wise food sample collection and bacterial isolation

S. No.	Food (each one sample per area)	Bacteria isolated for food samples				
		Area 1	Area 2	Area 3	Area 4	Area 5
1	Panipuri	-	-	<i>E. coli</i>	<i>S. dysenteriae</i>	-
2	Samosa	-	-	<i>E. coli</i>	-	<i>E. coli</i>

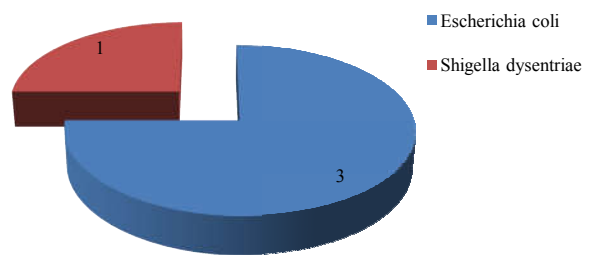


Figure 4 Bacteriological isolation pattern of Area 3 food samples

The comparative analysis of various food items and bacterial isolates was done and described in table 5, *Escherichia coli* was isolated among 18 food samples including grape juice, drinking water, jigardandha, buttermilk, sugarcane juice, coconut chutney, salads, samosa and paanipoori. *Salmonella typhimurium* and *Shigella dysenteriae* were found among two samples each in ice cream and bonda, and in sugar cane juice and paanipuri respectively. *Vibrio cholerae* was isolated from 2 food samples including buttermilk and paanipoori. The isolation rate of *Staphylococcus aureus* was possible from 3 food samples like badam milk, kuruma and salads.

Table 5 Comparison of food samples Vs Bacterial isolates

Food sample	No. of areas collected	Category	No. of isolates	Bacterial Isolate
Grape juice	5	Semi-processed	2	<i>Escherichia coli</i>
Water	5	Un-processed	2	<i>E. coli</i>
Jigardandha	3	Semi-processed	2	<i>E. coli</i>
Ice cream	2	Processed	1	<i>S. typhimurium</i>
Badam milk	5	Processed	1	<i>S. aureus</i>
Buttermilk	5	Semi-processed	2	<i>Vibrio cholerae</i> - 1; <i>E. coli</i> - 1
Sugarcane juice	5	Semi-processed	4	<i>Shigella dysenteriae</i> - 1; <i>E. coli</i> -3
Kuruma	5	Processed	1	<i>S. aureus</i>
Coconut chutney	7	Semi-processed	2	<i>E. coli</i>
Salads	5	Un-processed	2	<i>S. aureus</i> - 1; <i>E. coli</i> - 1
Samosa	4	Processed	3	<i>E. coli</i>
Paanipuri	5	Semi-processed	4	<i>E. coli</i> -3; <i>S. dysenteriae</i> -1; <i>V. cholerae</i> - 1
Bonda	5	Processed	1	<i>S. typhimurium</i>

The antibiotic sensitivity test was done thereby all the bacterial isolates were subjected to various antibiotics. Among the antibiotics, *E. coli* showed maximum resistance to Ampicillin (61.1%) followed by cotirmaxazole (22.2%) and cefoxitin (16.7%). Out of three isolates of *S. aureus*, ampicillin and cotrimaxazole showed resistance (66.7%) followed by clindamycin, linozolid and vancomycin with 33.3% of antibiotic resistance. No drug resistance was noticed among the two isolates of *S. typhimurium*. Ampicillin is not effective against *S. dysenteriae* and *V. cholerae* with 50% resistance each. The detailed description and percentage of antibiotic resistance among bacterial isolates was impregnated in table 6.

Table 6 Antibiotic resistant status of bacterial isolates

Antibiotic	Resistant pattern of bacterial isolates				
	<i>E. coli</i> (n=18)	<i>S. aureus</i> (n=3)	<i>S. typhimurium</i> (n=2)	<i>S. dysenteriae</i> (n=2)	<i>V. cholerae</i> (n=2)
Ampicillin	11 (61.1)	2 (66.7)	0	1 (50)	1 (50)
Cefaperazone + sulbactam	1 (5.6)	NA	0	0	NA
Cefotaxime	2 (11.1)	NA	0	0	NA
Cefoxitin	3 (16.7)	0	0	0	0
Ceftriaxone	2 (11.1)	NA	0	0	NA
Choromphenicol	1 (5.6)	NA	0	0	0
Ciprofloxacin	2 (11.1)	0	0	0	0
Clindamycin	NA	1 (33.3)	NA	NA	NA
Cotrimaxazole	4 (22.2)	2 (66.7)	0	0	0
Doxycycline	NA	0	NA	NA	0
Erythromycin	1 (5.6)	0	NA	NA	NA
Gentamycin	1 (5.6)	NA	0	0	0
Linozolid	NA	1 (33.3)	NA	NA	NA
Norfloxacin	2 (11.1)	0	0	0	1 (50)
Piperacillin + Tazobactam	2 (11.1)	NA	0	0	NA
Vancomycin	NA	1 (33.3)	NA	NA	NA

(NA - Not applicable) [Figure in parenthesis denoted percentages]

The simple questionnaire survey related to the hygienic practices of the food handlers was also done and the detailed response rate was depicted in table 7. Among them, 83.3% of the platform vendors, all cart vendors and hawkers sold food where the surroundings were unclean and 16.7% of platform vendors and 42.10% of the cart vendors were not serving food hot. Foods like ice-creams, juices, buttermilk which cannot be served hot are selling and served to the customers until it completed from the stock. The expiry are not noticed by the sellers and mostly the consumers are noticed the same. Most of

the (88.89%) platform vendors, all the cart vendors and hawkers did not keep the vending facility clean.

Hand washing facility was available in 77.8% of the platform vendors whereas, 89.5% of the cart vendors and none of the hawkers had hand washing facilities. But provision of clean and hygienic water is questionable. It was noticed that 77.8% of the platform vendors, 89.5% of the cart vendors and all the hawkers are not wore clean clothes. Only 16.7% of the platform vendors wore gloves while, none of the vendors wore any headgear while handling food. As a plate hygiene to be concerned, 27.8% of platform vendors, 5.26% of the cart vendors and 33.3% of the hawkers served plates covered with leaf or wax paper. Out of the stalls that sold food in vessels and plates, none of the vendors washed the dishes using hot water whereas, 27.8% of the platform vendors, 21% of the cart vendors and 33.3% of the hawkers washed the dishes in the same water repeatedly. The rest of the vendors washed the dishes under running water. Surprisingly no one had any training on food handling methods nor did they use soap to do wash hands.

The handling of food after preparation and before serving was handled with bare hands and it was noticed among 11.1% of platform vendors, 63.2% of cart vendors and all the hawkers. Both bare hands and ladle were used by 22.2% of platform vendors and 10.5% of the cart vendors to handle food whereas, 10.5% of cart vendors and 22.2% of the platform vendors used ladle and containers and 16.6% of the platform vendors handled food using bare hands, ladle and containers. No one used boiled or treated water to prepare the food they sold. Flies were spotted in the vicinities of 38.9% of platform vendors, 73.68% of cart vendors and 66.7% of hawkers. Both cockroaches and flies were spotted in the stalls put by 44.4% of the platform vendors, 15.78% of cart vendors and 33.3% of hawkers whereas, rodents and cockroaches were spotted in the vicinity of 5.5% of platform vendors. 5.5% of the platform vendors showed the presence of rodent, flies as well as cockroaches in their vending facilities and only 5.5% of the platform vended stalls were free of pests and rodents. Among the study groups, 5.5% adopted electrical methods of pest control and chemical control of pest was also adopted by 5.5%.

Disposable bags were used as waste collection and its was noticed among 55.6% of the platform vendors, 73.7% of the cart vendors and 33.3% of the hawkers whereas, 44.4% of platform vendors, 26.3% of cart vendors and 66.7% of hawkers were dumping waste nearby. The analysis of economic status of the consumers taking food from these food sellers, 61.1% of platform vendors, 79% of cart vendor and 33.3% of the hawkers had low income group customers buying food from them whereas, 38.9% of platform vendors, 21% of cart vendors and 66.7% of hawkers sold food to middle income group customers also. Customers were washing hands before they eat foods are also studied, thereby, 72.2% of platform vended stalls, 15.8% of cart vended stalls and 11.1% of platform vendors were the response rates. In order the analyze the health status of the food handlers and sellers, 16.7% of platform vendors, 10.5% of cart vendors and 33.3% of hawkers were showing signs of ill health.

Table 7 Evaluation of Practice about handling food in hygiene among food handlers

Question/ Statement	Response rate (%)								
	Street Vendors (n=18)			Cart Vendors (n=19)			Hawkers (n=3)		
	Yes	No	NA	Yes	No	NA	Yes	No	NA
Are the surroundings Clean?	16.7	83.3	-	0	100	-	-	-	100
Is the Food served Hot?	27.8	16.7	55.5	10.5	42.1	47.4	-	-	100
Is the vending facility clean?	11.1	88.9	-	0	100	-	0	100	-
Is hand washing facility available?	77.8	22.2	-	10.5	89.5	-	0	100	-
Is the food handler wearing clean clothes?	22.2	77.8	-	10.5	89.5	-	0	100	-
Is the food handler wearing gloves?	16.7	83.3	-	0	100	-	0	100	-
Is the food handler wearing head gear?	0	100	-	0	100	-	0	100	-
Is the food served in plates with leaf or wax paper?	27.8	11.1	61.1	5.3	78.9	15.8	33.3	66.7	-
Are the vessels washed in hot water?	0	88.9	11.1	0	43.4	52.6	0	33.3	66.7
If served in plates or containers does the vendor wash them in running water?	27.8	61.1	11.1	5.3	21	73.7	0	33.3	66.7
Are the plates washed in container water repeatedly?	61.1	27.8	11.1	21	5.3	73.7	33.3	0	66.7
Does the food handler have training on food handling?	0	100	-	0	100	-	0	100	-
Does the vendor use soap to wash hands?	0	100	-	0	100	-	0	100	-
How is the food handled after preparing and before serving?									
Hand	11.1				63.2				100
Ladle	11.1				10.5				0
Containers	27.8				5.3				0
Hand, Ladle	22.2				10.5				0
Ladle, Containers	22.2				10.5				0
Hand, Ladle, Container	16.6				0				0
Is the water boiled or treated before using?	0	100	-	0	100	-	0	100	-
Are there any pests, rodents or flies in the vicinity?									
Flies	38.9				73.7				66.7
Cockroach, Rodents	5.5				0				0
Cockroach, flies	44.4				15.8				33.3
Cockroach, Rodents, flies	5.5				10.5				0
No pests, Rodents	5.5				0				0
Are any methods for pest control used?									
Electrical	5.5				0				0
Chemical	5.5				0				0
How is the waste disposed?									
Disposable bag	55.6				73.7				33.3
Dumping nearby	44.4				26.3				66.7
Types of customers visiting the vendor?									
Low income group	61.1				79				33.3
Middle income group	38.9				21				66.7
Are the customers washing hands	72.2	27.8	-	15.8	84.2	-	0	100	-
Are the nails of the vendor cut?	11.1	88.9	-	0	100	-	0	100	-
Is the vendor healthy?	83.3	16.7	-	89.5	10.5	-	66.7	33.3	-

This investigation of food hygiene on street vended foods, showed bacterial isolates including *Salmonella typhimurium*, *Shigella dysenteriae*, *Vibrio cholerae*, *Escherichia coli* and *Staphylococcus aureus*. We also assessed the relation between hygiene habits of the street vendors with bacterial isolation. Salmonella was isolated from one of the food items. Our observation of Salmonella from eggshell tallies with previous publication since egg is a common source of this bacterium.

Similarly, raw meat from street vendors was infected may be due to poor cooking methods adopted^{16,17,18}.

Our study showed Salmonella in boiled egg since *Salmonella* grows even in higher temperatures (50°C) and rodents, pests and flies were spotted in the vicinity might have played a role in transmission^{6,7}. Previous studies have shown that *Salmonella* and *Shigella* were mostly isolated from street vended food which have poor food handling methods and also due to the fact that food is left open without taking any preservation or storage methods which leads to growth due to ambient temperatures^{11,16}.

Shigella in our study was isolated from sugarcane juice and panipuri. A study published in East African Medical Journal showed growth of *Shigella* in Macaroni (a processed food item) contradicting our study which showed isolation of *Shigella* from semi-processed food samples probably because of presence of flies and pests at the vendor site^{3,16}. Also, the vendor selling panipuri was a hawker who was sick.

In our study, *Staphylococcus aureus* was isolated from fruit salads and kurma. Similar observations have been noted in a study in India and also in Africa, who have reported the prevalence of *S. aureus* from salads^{19,20}. Other studies showed isolation of *S. aureus* is common in raw milk, salads, dairy products and cooked food. Dustbins, sewage and poor sanitary conditions in and around the vicinity where the food is sold might have contributed to the bacterial contamination^{16,19}.

A study conducted in Tamil Nadu stated that prevalence of *Salmonella* and *E. coli* are mainly because of poor sanitary conditions and hence are the major cause for food borne diarrhoeal diseases¹¹. Studies have showed that *E. coli* is found in food, water, unwashed fruits and vegetables, juices and unpasteurized milk and food contaminated by food handlers through fecal-oral route^{11,19}; In our study *E. coli* was isolated from water used for grape juice and also from jiggardhandha. This maybe because the street vendor failed to follow proper hand washing techniques and other hygienic measures while preparation and handling of food^{6,7,19}.

From our study, we found that *Vibrio cholerae* was isolated from buttermilk and chat prepared by the street vendors. Earlier studies have revealed isolation of *V. cholerae* from fresh juices, bhelpuri, coconut chutney and also any food prepared under poor sanitary conditions^{11,15}.

The self survey questionnaire study revealed that the vended foods were the sources for transmitting food borne diseases. Moreover the practice of food handling also was not up to the mark. In developing countries like India, vendors earn very little out the food they sell and hence will face many socio-economic problems which is why, periodical health educational programmes must be conducted frequently on preparation, storage, serving of food and personal hygiene wearing clean clothes, gloves and headgears in order to prevent outbreaks of food borne diseases^{6,7}. Hence, although certain bacteria prefers to grow in selected food items, overall the sanitary conditions that prevails in and around the street vendors play a major role in the introduction and transmission of bacteria. The limitations of this investigation are health status of the people who consumed food sold by the respective food vendor and the consequences of the food consumed were not studied.

CONCLUSION

This type of study brings out the importance of food preparation, storage and handling methods which when not followed are likely to cause food borne diseases. Of the five areas considered for the study, area 1 showed the highest number of isolates which points to the fact that, area 1 is more prone for the outbreaks of food borne diseases. Also this study has brought out that, bacterial isolates were maximum from platform vendors and semi-processed food which might be due to poor sanitary conditions, unhygienic vicinities, poor pest and rodent control methods followed or due to poor food preparatory, handling and storage methods. Organisms resistant to drugs were tabulated and multidrug resistance was shown by *Vibrio cholerae*, *Staphylococcus aureus* and *Escherichia coli*, inferring the increasing resistance of micro-organisms towards antibiotics and therefore the danger of spreading of such strains among the community. The questionnaire revealed that the hygienic practices of the food handlers were far from satisfactory.

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