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Microbiological quality of street vended Panipuri in Jagtial district of Telangana, India

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ABSTRACT

Street vended foods have gained a lot of popularity in recent days owing to their appealing taste and flavour. These foods apart from the taste and flavour, have been cost-effective and easily available for all people. That has been the reason for such high demand for these foods in all walks of life and are being relished by the populations from the rural to urban areas. Street foods have been satisfying the hunger of a good percentage of people at an affordable cost. On the other side of the situation, these foods have been posing a good risk of health problems for the people because of the unhygienic methods and process of preparation of these foods by the mostly illiterate community of businessmen who have been preparing them. Hence the need of evaluating these foods for the contamination levels and risk factors for human health have been exponentially felt and the present study was taken up. Therefore, the present study was carried out to check the microbiological quality of street vended panipuri sold in Korutla, Metpally, and Jagtial towns of Jagtial Dist, Telangana state. A total of ninety-six samples viz., water, dall and kachori (thirty two each) were aseptically collected from various vendors and were subjected for standard plate count, total Coliform count, total *Salmonella* count and total *Staphylococcus aureus* count. Results revealed that 74% of samples had high loads of bacterial pathogens such as *Escherichia coli* (41%), *Staphylococcus aureus* (31%), sp. (20%), *Pseudomonas* sp. (5%) and yeast (3%). Hence, it has been enumerated that the quality of street foods must be monitored, and standards of the microbiological load have to be followed for human health safety.

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1. Introduction

The food which is prepared on the roadside and catered for the people in a ready to eat condition is termed a street food. The preparation process is totally done with various ingredients on the site of serving besides the road.

Street food has been a part of the Indian culture from very long which has taken the admiration of the folks for its impeccable taste and versatile flavours with a diversified range of preparations.

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Street food also became an important cheap and essential component of the nutrition of the people which is helping for the maintenance and to improve the nutritional status of people (1). The Street foods provide a source of affordable nutrients to the majority of the people especially the low-income group in the developing countries (2) However, street foods are frequently posing threat to the people with various health problems for the consumers due to their improper preparation, handling, preparation and serving practices (3).

Microbial contamination of foods sold by street vendors and hawkers has become a major health problem for the people who are consuming them. Street food vendors are mostly lacking knowledge about the good hygiene practices (GHP) and causes of diarrhoeal diseases (4), which can increase the risk of street food contamination (5,6). From the initial stage of contamination of raw foods with pathogenic bacteria to subsequent contamination at various stages by vendors during processing, cooking, preparation and storing; there are many factors that should be considered for analysing the hazards due to street foods (7, 8).

The vendors can be carriers of pathogens like *E. coli, Salmonella, Shigella, Mycobacterium, Campylobacter* and *S. aureus* who eventually transfer these communicable diseases to consumers. In most places of sale of these foods, running water is not available at vending sites; hands and utensils washing are usually done in one or more buckets, and sometimes without soap. Waste waters and garbage's are discarded nearby, providing nutrients for insects and rodents, which may carry food borne pathogens (6).The utensils used for preparation, processing and serving of food at the vending site are often contaminated with various pathological organisms hazardous for the human health which may have originated from various sources like the water used for cleaning the ingredients, the contamination by the unhygienic hands of the vendors when they touch the food. when they touch the food preparation areas, dish cloths and the water during dish washing and hand washing which indicates cross contamination between dish water, food preparation surfaces, and the food itself; consequently, perceive a major public health risk (4, 9,10). Street foods are posed major public health risk due to lack of basic infrastructure and services, difficulty in controlling the large numbers of street food vending because of their diversity, mobility and temporary nature (11). A general lack of factual knowledge about the epidemiological significance of many street vended foods, poor knowledge of street vendors in basic food safety measures and inadequate public awareness of hazards posed by certain foods has severely hampered the deployment of a precise scientific approach to this very serious problem (12). Therefore, the conditions of street food preparation and vending raise many concerns for consumer's health. Street vended chats like Panipuri and bhelpuri sold in almost all the cities throughout India and are consumed by huge population and frequently associated with diarrhoeal diseases due to their improper handling and serving practices. The present study aims to establish the hygienic status of street vended food Panipuri water, dall and kachori and their impact on human health.

Street vended food not only appreciated for their unique flavours, convenience and the role which they play in the cultural and social heritage of societies.

2. Materials and Methods

2.1. Study site and samples collection

Microbiological investigations of panipuri samples collected from October to November 2019 in Korutla, Metpally and Jagtial towns were performed. The study was conducted in the major streets and markets of Jagityal dist. There were approximately more than hundred vending sites. Samples were collected during visits to the sites. A total of ninety-six Panipuri water, dall and kachori samples were collected from selected vending sites in sterile containers and stored in refrigerator for further analysis.

2.2. Sample analysis

For analysis 1 mL/g of sample was inoculated on 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 Cysteine Lactose Electrolyte Deficient agar (CLED) and incubated at 37°C for 24 h. After incubations, suspected colonies were identified based on their morphological and biochemical features using microscopic observation, standard biochemical methods and cultural characteristics on CLED such as yellow colored colonies of lactose fermenting *E.coli*, greenish blue, mucoidal yellow to whitish blue colonies of *Klebsiella* spp. and deep opaque colonies of *S. aureus* (13).

3.Results

A total of ninety-six samples of Panipuri water, dall and kachori (thirty-two each) were assessed for presence of total viable counts, faecal coli forms, faecal *Streptococci* and pathogenic microorganisms like *Escherichia coli*, *Staphylococcus aureus* and *Klebsiella*. The study revealed 74% pathogenic bacterial contamination, majority of them contamination with *Escherichia coli*, *Staphylococcus aureus*, and *Klebsiella spp*., indicating poor bacteriological quality of the Panipuri. The results of the present study were mentioned in table 1. Total viable count in panipuri water, dall and kachori were 0.3-2.9x10^5, 0.1-1.9x10^5 and 0.6-2.6x10^5 respectively. The faecal coliforms count ranges between 0.06x10^4 to 0.21x10^4, 0.03x10^4 to 0.13x10^4 and 0.01x10^4 to 0.09x10^4 in panipuri water, dall and kachori respectively. The faecal *Streptococci* count varies between 4x10^4 to 10.3x10^4, 0.2x10^4 to 8.8x10^4 and 0.5x10^4 to 7.2x10^4 in panipuri water, dall and kachori respectively. *Escherichia coli* present in panipuri water, dall and kachori are 41.25, 31.3 and 34.37% respectively. *Staphylococcus aureus* present in 12 samples of panipuri water out of 32, 8 samples of dall out of 32 and 10 samples of kachori out of 32. The number of *Klebsiella spp.* (in %) in panipuri water, dall and kachori are 34.8, 12.3 and 21.8 respectively.

Table 1. Total viable counts (cfu/g) of street vended panipuri samples

Type of sample	Total Viable Count		Faecal *Coliform* count	Faecal *Streptococci*
	Range	*No. (%)*	No %	No %
Panipuri water (32)	0.3-2.9x 10^5	28 (87.5)	0.06-0.21	4-10.3
Dall (32)	0.1-1.9 x10^5	19 (59.3)	0.05-0.13	0.2-8.8
Kachori (32)	0.6-2.6x10^5	23 (71.87)	0.02-0.09	0.5-7.2

Table 2. Bacterial pathogens isolated from various street vended Panipuri in Jagtial Dist, Telangana

Type of sample	*E. coli*		*S. aureus*		*Klebsiella spp.*	
	No of samples	%	No	%	No	%
Panipuri water (32)	13	41.25	12	37.5	11	34.8
Dall (32)	10	31.3	8	25	4	12.3
Kachori (32)	11	34.37	10	31.3	7	21.8

4.Discussion

Total viable count in panipuri water, dall and kachori were 0.3-2.9x10^5, 0.1-1.9x10^5 and 0.6-2.6x10^5 respectively. These results are in accordance with Das et al, in 2010 and who reported that, 0.4x10^4 to 3x10^4 cfu/g total viable count in panipuri and bhelpuri (10).

The presence of these bacteria in the panipuri might be due to number of factors like improper handling and processing, use of cross contamination water during washing & dilution, cross contamination from the utensils.

Gawande et al, evaluated the quality of Pani-puri in Allahabad city, (UP) India and reported that the microbiological results indicated the presence of salmonella in Pani-puri to the extent of 75 to 30 per cent yeast, mould were 81 per cent in Pani-puri (14). The faecal Coliforms count ranges between 0.06x10^4 to 0.21x10^4, 0.03x10^4 to 0.13x10^4 and 0.01x10^4 to 0.09x10^4 in panipuri water, dall and kachori respectively. These results are similar to the Das et al, (2010). The faecal *Streptococci* count varies between 4x10^4 to 10.3x10^4, 0.2x10^4 to 8.8x10^4 and 0.5x10^4 to 7.2x10^4 in panipuri water, dall and kachori respectively.

These results are nearer to the Das et al (2010). *E.coli* present in panipuri water, dall and kachori are 41.25, 31.3 and 34.37% respectively. In another study, Tambekar et al, reported similar results (15). *Staphylococcus aureus* present in 12 samples of panipuri water out of 32, 8 samples of dall out of 32 and 10 samples of kachori out of 32. Abdalla et al, (2009) studied and reported almost same results in accordance with the results of the current study (16). The number of *Klebsiella spp* (in %) in panipuri water, dall and kachori are 34.8, 12.3 and 21.8 respectively. In a study, it was presented the results which are in accordance with present study (17).
The total plate count in Pani-puri and noodles was log 4.77 cfu/g and log 7.14 cfu/g, respectively (9). Also, the total viable count of bacteria in all the samples varied between 0.4-3.0×10^4 cfu/g, faecal Coliforms between 0.03-0.14×10^4 cfu/g and faecal *Streptococci* between 0.2- 11×10^4 cfu/g, respectively in the samples of Gupchup, Chaat, Dahi-badaand Panipuri sold in Bhubaneswar city (18).

5. Conclusion

The results of the present study reveals that the samples collected from various street vendors of Korutla, Metpally and Jagtial towns have high total viable count, faecal Coliform count, faecal *Streptococci* count and pathogens organisms like *E. coli* and *Staphylococcus aureus*. The higher counts in these street vendor food samples of might be due to the preparation of these foods in unhygienic or unhealthy conditions such as use of unclean water, dipping of kachori in panipuri water with bare contaminated hands and preparation of the food at road side where heavy air pollution because of vehicular traffic, human movement, dust and environmental pollutants contaminating the food. This might have been contributed to increasing the microbial load. Fresh ingredients and clean water should be used during preparation of fast foods/ street foods by wearing hand gloves, head cap and in a closed glass chamber at roadside. Further studies are required for the detection of various food/waterborne pathogens in panipuri and other street vendor foods from other parts of state.

Conflict of interest

The authors declare that there is no conflict of interest.

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