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Research Article

Consumer Attitude on Vendors Practices and Safety Aspects of Street Foods in Selected Study Area of Kanchipuram (Dt)

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Abstract

Background: Street foods play an important role in people's daily food options and their regular nutritional requirements which dependents on these foods, as their ever-growing busy schedule take away the chance to eat homemade food. Over the years, many food-borne diseases were reported due to contaminated non-homemade food consumption.

Objective: This study was conducted to analyse the microbiological quality of foods which are sold on street side and to compare the microbial load with petty shops and restaurants.

Materials and Methods: Most commonly consumed food items (Samosa, Panipuri) from street stall, petty shops and Restaurants were collected according to the survey taken and these samples were tested for microbial quality.

Results: Pathogenic organisms like *Escherichia coli, Pseudomonas aeruginosa, Salmonella typhi, Staphylococcus aureus* were found in these food items. Antibiotic sensitivity test was carried out with *Escherichia coli, Pseudomonas aeruginosa, Salmonella typhi* and *Staphylococcus aureus are* resistant to Kanamycin, Penicillin and Streptomycin.

Conclusion: The microbial loads found in restaurant foods were lower than street and petty shops food.

Keywords: Street Food; Homemade Food; Antibiotics; Food Borne Disease; Microbial Load

Introduction

Street food (SF) and beverages are ready-to-eat foods cooked and sold by retailers in various public places especially on crowded streets bus stands or train stations in Tamil nadu and in other countries around the world [1,2]. SF is an ancient practice and a source of income for several countries [3]. Worldwide rising unemployment and poverty are the major important factors that make people more inclined to run street food businesses, as they require less knowledge and money to establish it [4,5]. It plays an important socioeconomic role by providing nutritious food to low-income, middle income people and it is respected for their unique taste. Around 2.5 billion people worldwide consume street foods per day [6]. But many questions have been raised about the safety and microbiological quality of street foods. Food borne illness is a widespread problem globally. Most of the studies done on street foods in India and abroad had indicated that, these foods are not meeting the microbiological standards and are contaminated with various pathogens viz. *E. coli, Vibrio, Salmonella, Listeria* etc., [7]. These are some of the critical factors that increase risk of inadequate food safety. The consumption of these street foods poten-

tially increases the risk of food borne diseases caused by a wide variety of pathogens which include *E. Coli, Salmonella typhi, Pseudomonas spp, S. aureus* [8]. Studies on street foods in developing countries have showed that street foods were responsible for serious food poisoning outbreaks as these foods are sometimes found to be contaminated with pathogens [9]. These foods are normally ready to eat, which are very popular among urban dwellers in developing countries because they are perceived to be inexpensive, convenient and attractive [10].

Therefore the present study was undertaken to evaluate the microbial quality and safety on consumption of street foods. This study has the major objective of analysing the safety of street foods vended in Kanchipuram (Dt) and the factors contributing to the safety. In particular, the study was conducted to investigate the food safety knowledge and attitude of vendors and consumers attitude on street foods. In addition, the assessment of microbiological quality of certain selected street foods was performed. The results of the present study would contribute to improve the policies and actions of the government concerning the safety of street foods.

Materials and Methods

Research questions

The aim of this study is to explore street food consumers' attitude towards food handling practices and their views on street foods safety. The demographic profiles of consumer respondents, their opinion in comparison with street foods and other food stalls, reasons for buying and commonly purchased items of street foods, their experience on street food safety aspects, their attitude towards the vending practices of the vendors etc. were conducted in this study. To find the consumer attitude, survey was taken from various departments of Aarupadai Veedu Institute of Technology, Chennai.

Data

A total of one hundred (n = 100) street foods consumers took part in this study. The study was conducted during the period of January 2018 to March 2018. Simple random sampling technique was used and having the experience of street foods consumption is the only condition required in selection of respondents. For the sake of respondents' and consumer convenience, the majority of the questions were designed with a given set of options, with the exception of some demographic questions. Incentive was not given to the study participants. From the above survey we have selected the food items from three different places.

- Street stall
- Restaurants
- Petty shops

Sample collection

Samples (samosa, panipuri) were collected from local street shops, restaurants and petty shops. All the samples were aseptically collected in sterile containers, stored at 4°C and analysed within an hour of collection.

Isolation and enumeration of microorganisms

Ten grams of sample was weighted under aseptic condition and properly homogenized by using a sterile pestle and mortar. Ten grams of homogenate sample was added to 90 ml of sterile 0.85% saline water in a flask and diluted serially up to 10-5 dilution. For bacterial isolation 0.1 ml of dilution from each tube was aseptically pipetted out and plated onto different agar media using spread plate technique. The plating was done in the laminar flow to maintain aseptic conditions. All the plates were placed in an incubator at 37°C for 24 to 48 hours. For bacterial enumeration the plates were used to determine the number of colony forming units (CFU) per gram of food. Enumeration of bacteria and isolation of bacterial colonies were done after incubation of plates at 37°C to obtain viable bacterial colonies. Plates containing 30 to 300 colonies were selected and counted at the expiration of the incubation period using the colony counter (Gallenkamp, England). Bacterial counts were expressed as colony - forming units per gram of food sample (cfu/g).

Morphological identification of isolates

Identification of distinct bacterial colonies was based on standard methods [11,12]. The bacteria isolates were gram stained and specific biochemical tests were performed. The morphological characterization of each of the isolated colonies was done by observing their shape, colour, texture and appearance. The following biochemical test were performed on the isolates; sugar fermentation, catalase activity, indole test, methyl red test, citrate utilization test, ureases test, voges-proscaure test and motility test [13].

Antibiotic sensitivity test

A single colony of the purified isolates were inoculated in 5 ml sterile peptone water and incubated at 37°C overnight. Loop full of culture was diluted in 5 ml sterile phosphate buffered saline and seeded into Muller Hinton agar. Antibiotic disc was placed on the surface of agar and incubated overnight at 37°C. Zone of inhibition was recorded. A control sensitive culture was included in the experiment. The test determines the sensitivity of a microbial species against different antibiotic agents [14,15].

Results and Discussion

Microbiological analysis

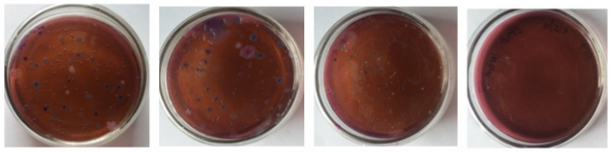

Plate 1: Bacterial growth on EMB agar.

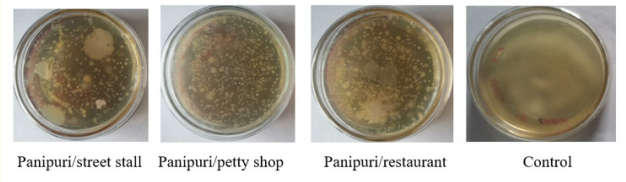

Plate 2: Bacterial growth on nutrient agar.

Media	Sample	Dilution	No. Of colonies	CFU/ML
Samosa	Street food	10^-5	315	0.0315
	Restaurants Shops	10^-5	254	0.0254
	Petty shops	10^-5	348	0.0348
Panipuri	Street food	10^-5	122	0.0122
	Restaurants Shops	10^-5	104	0.0104
	Petty shops	10^-5	202	0.0202

Table 1: Number of colonies present in selected food sample.

Catalase test

Samosa and panipuri from street stall, petty shops and restaurants showed positive results for catalase reaction.

Simmons citrate test

Catalase test has shown negative result in Samosa collected from street stall and samosa from petty shops, restaurants foods showed catalase positive because the organisms present in it has the ability to utilize citrate. The panipuri samples collected from street stall and restaurants has showed positive results while sample from petty shops showed catalase negative.

Carbohydrate utilization test

Samples from street stall and petty shops showed the positive results as it is showed the presence of gas bubbles. Samples from restaurants indicated the negative results because it does not showed gas bubbles in the tubes.

Methyl red and voges-proscaure test

The samosa sample collected from street stall and restaurants showed positive results by changing its red color because bacteria was fermented by the acid and from petty shop has no color change showed the negative results. The panipuri samples collected from restaurants and petty shops showed positive results as it change its color in to red due to the fermentation of bacteria. Street foods showed negative results.

Ureases test

The samosa sample collected from restaurants showed ureases positive due to the formation of ammonia alkalinizes and food from street stall and petty shops showed ureases negative as a result of acid formation. The panipuri samples collected from street stalls and restaurants showed ureases positive by the formation of ammonia alkalinizes and from petty shops showed ureases negative as a result of acid formation.

Indole test

The Samosa samples collected from the street stall indicated indole positive as it converted into tryptophan; restaurants and petty shops indicated the indole negative as the absence of ring formation. The panipuri samples collected from petty shops indicated indole positive as it converted into tryptophan; street stall and restaurant foods showed indole negative result as the absence of ring.

Motility test

Motility of the organism (Table -2) was tested by using a sterile loop to pick culture from the micro titre wells were placed on a microscope slide, covered with a cover slip and observed under the microscope for locomotion (Feglo., *et al.* 2012) [16].

Sample	Shape	Motility Test	Indole	Catalase	Ureases	MR test	VP test	Citrate test	Sugar fermentation
1	Rod	+	+	+	-	+	-	-	+
2	Cocci	-	-	+	+	+	+	+	-
3	Rod	+	-	+	-	-	-	+	+
4	Rod	-	-	+	+	-	+	+	-
5	Cocci	-	-	+	+	+	+	+	-
6	Rod	+	+	+	-	+	-	-	+

Table 2: Biochemical and motility test.

(+)= positive; (-) = negative

Si. no	Sample	Organisms suspected
1	Samosa from street stalls	*Escherichia coli*
2	Samosa from restaurants	*Staphylococcus aureus*
3	Samosa from petty shops	*Pseudomonas aeruginosa*
4	Panipuri from street stalls	*Salmonella typhi*
5	Panipuri from restaurants	*Staphylococcus aureus*
6	Panipuri from petty shops	*Pseudomonas aeruginosa*

Table 3: Suspected organisms from the collected samples.

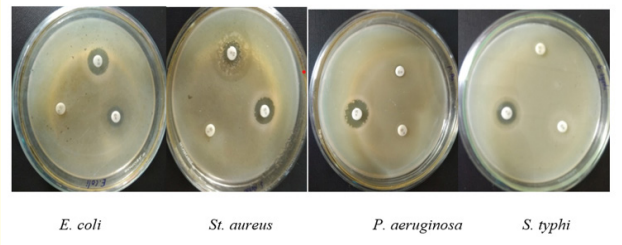

Plate 3: Antibiotic sensitivity of all the isolated organisms.

Gram negative rods and Gram positive coci's were present in significant numbers in petty shop foods, high in street food and comparatively low in restaurants (Table -1). Four organisms were isolated from selected samples; *E. coli, St. aureus and P. aeruginosa* was isolated from Samosa, *Salmonella typhi, St. aureus and P. aeruginosa* was isolated from panipuri (Table -3). The isolates were differentiated on the basis of cultural and cellular morphological studies, after which they were subjected to various biochemical and physiological tests and the isolates were identified (Table-2).

Isolated organisms like *E. coli, St.aureus, P. aeruginosa* and *S. typhi* were found to be resistant to Kanamycin, Penicillin and Streptomycin. The zone of inhibition of Kanamycin was higher than the Streptomycin and Penicillin. (Figure 1).

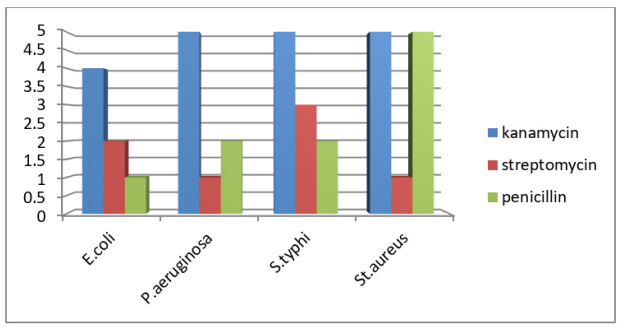

Figure 1: Zone of Inhibition against microorganisms.

Discussion

Different resourceful and obligate bacterial pathogens were isolated from samosa and panipuri sold by street vendors. This kind of contamination may be due to low pH and high temperature (above 28°C) preferred the growth of microorganism, thus reducing the shelf life of street foods. In our study also we observed that, the samples collected from street side and petti shop showed occurrence of high bacterial loads consisting of faecal *coliforms*, *Staphylococcus aureus, Pseudomonas aeruginosa* and *Salmonella typhi*. The presence of these microbes in food can be connected to a number of factors such as improper handling and processing, cooking, use of contaminated water during washing and dilution, cross contamination from rotten vegetables, or the use of dirty utensils like knife and trays [16-18].

The results of the present study are in agreement with those reported by Sheth and co-workers [9]. They reported that, presence of high *Staphylococcus aureus* counts along with the presence of Escherichia coli in Bhelpuri samples from urban Vadodara. The presence of coagulase positive *Staphylococcus aureus* in the chaats with a count of 0.01-0.8 x 10^4 cfu g^{-1} might be explained by the fact that it forms the normal microflora present on/in several parts of the human body this can be familiarized into the street foods during handling, processing or vending [19].

In most places, street foods are sold by untrained vendors in poor hygienic condition, who are unlicensed with poor educational level [20,21]. Cross- contamination of street foods is also increased by unsanitary processing and preservation. The use of dirty utensils, as well as the open display of street foods encourages the visits of flies, cockroaches, rodents and dust [22]. Preservation of prepared foods that requires no further processing before consumption, at ambient temperatures during retail, maintenance of the food at optimum temperatures, allows the invasion of pathogenic mesophiles [23].

Conclusion

The present study has been carried out to investigate and compare the microbial quality of foods collected from street side stalls, petty shops and restaurants. The food samples were collected and microbial tests were performed and it was observed that gram negative rods and gram positive cocci's in street foods. Four organisms were isolated from selected samples; *E. coli, St. aureus and P. aeruginosa* was isolated from Samosa, *Salmonella typhi, St. aureus and P. aeruginosa* was isolated from panipuri. The isolates were differentiated on the basis of cultural and cellular morphological studies, after which they were subjected to various biochemical and physiological test, then isolates were identified. Antibiotic sensitivity test was done followed by biochemical test. The results of antibiotic sensitivity test showed that *E. coli, St. aureus, P. aeru- ginosa* and *S. typhi* all four organisms were resistant to Penicillin and Streptomycin compare to Kanamycin.

Hence this study has demonstrated that some of the most popular type of foods that were vended on the streets do not meet the required acceptable quality and safety levels.

From the study it was concluded that, based on the consumer survey and results of microbial quality of foods which showed that the vendors had poor safety knowledge, attitude levels and from the observation study which showed that the majority of the vendors had poor food handling practices and mostly operated under unhygienic conditions. Therefore, apart from formal food safety training for the vendors, local government should pay more attention to build standardized infrastructures for street food sectors such as potable water, toilets and waste disposal facilities at the vending sites so that the risks of cross contamination can be minimized.

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