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Original Research Article

Isolation, Identification and Antibiotic Resistance Pattern of Bacteria Associated with Street Vended Foods

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Abstract: Street vended foods are widely enjoyed because they are inexpensive, easily accessible and flavorful. However, poor hygiene during their preparation and handling can lead to contamination by harmful and antibiotic-resistant bacteria. In this study, 30 street food samples were collected and tested, including momos (n=10), manchurian (n=10), and noodles (n=10). The results showed that all the samples were contaminated with *S. aureus* while *Pseudomonas* sp. was only found in the momos samples. No *Escherichia coli* and *Salmonella* sp. were detected in any of the samples. Antibiotic susceptibility results showed that most of the isolates were found to be sensitive to chloramphenicol, cefpodoxime, gentamicin, meropenem, doxycycline hydrochloride, amikacin, and tobramycin. On the other hand, a significant level of resistance was observed against ampicillin and ceftazidime in both *S. aureus* and *Pseudomonas* isolates. The presence of antibiotic-resistant bacteria in street-vended foods points to poor hygiene practices and poses a serious risk to public health. To prevent the spread of antimicrobial-resistant foodborne pathogens, regular microbial quality monitoring, improved hygiene practices, and appropriate use of antibiotics are essential.
Keywords: Antibiotic Resistance, Foodborne Pathogens, Momos, Street Food.

INTRODUCTION

Street food is foodstuffs that are easily and quickly available on the roadside for immediate consumption in almost all cities, worldwide. These foods are popular and consumed all over the world not only because of their easy accessibility as well as their unique taste and aroma. For a large portion of the population, these foods are a primary source of daily nutrition, especially in urban and low-income areas (Acharya *et al.*, 2025). However, this widespread reliance often comes at the cost of food quality and safety. These foods are often prepared by vendors may lack formal education. Consequently, their knowledge of hygiene and sanitation practices is limited, posing potential health risks to consumers. Common hygiene shortcomings include inadequate hand and dishwashing methods. Many vendors use plastic containers for washing, and due to the lack of access to running water, soap is frequently omitted from the process. Such conditions can lead to contamination and foodborne illnesses. These challenges can be overcome by implementing targeted awareness programs and providing better resources to vendors. This would enhance the health benefits of this food as well as protect the people from different diseases (Kwiri *et al.*, 2014; Anukampa *et al.*, 2017).

Unhealthy handling practices, including contamination of raw ingredients, food contact surfaces, improper storage or refrigeration, and unsanitary working environments, are a major cause of bacterial contamination of street food. It is reported that worldwide, around 7.69% people suffer from food-borne diseases and these diseases contribute to about 7.5% of deaths, worldwide (Alemu *et al.*, 2018). Many bacterial species including *Staphylococcus*, *Salmonella*, *Pseudomonas*, *Clostridium*, *Campylobacter, Escherichia, Listeria, Vibrio,* and *Proteus* etc. are responsible for around 90% of foods borne diseases. Previous studies have reported that street food is often contaminated with pathogenic bacteria such as *Staphylococcus aureus*, *Salmonella* sp., *Shigella* sp., and *Escherichia coli*, *Pseudomonas* sp., and *Klebsiella* sp. (Rane., 2011).

Antibiotic resistance in foodborne bacteria has been a growing problem worldwide in recent year. The indiscriminate utilization of antibiotics in human therapy and agriculture has accelerated the development of multidrug-resistant bacteria. Street food contaminated by resistant bacteria can be a reservoir for the transfer of resistant genes to humans. Monitoring of the microbiological quality and the antibiotic resistance profile of bacteria isolated from street food is therefore of crucial importance to ensure the safety of public health. The aim of this study was to isolate bacteria from selected street foods and to evaluate the pattern of antibiotic susceptibility to commonly used antibiotics (Anukampa *et al*., 2017).“Monitoring of the microbiological quality and the antibiotic resistance profile of bacteria isolated from street food is therefore of crucial importance to ensure the safety of public health”

MATERIALS AND METHODS

Sample Collection

A total of 30 street food samples, including Momos (n=10), Manchurian (n=10) and Noodles (n=10) were collected from different locations of Amravati region. These samples were collected separately, in sterilized plastic zip-lock bags and were immediately transferred to laboratory for further analysis.

Microbiological Analysis

For microbial analysis, 1gram of each solid sample was added in to 1ml of distilled water separately and homogenized with the help of mortar and pestle. These samples were further subjected to the serial dilution. From the last dilution, 1ml of each sample were plated on Nutrient agar separately and incubated for 24 hours at 37^0C. Morphological different colonies were identified and subculture on nutrient agar slants. The cultures were further inoculated on selective and differential media such as MacConkey agar, Salmonella shigella agar, Eosine-methylene blue agar, Cetrimide agar and Mannitol salt agar and incubated at 37^0C for 24 hrs. Similarly, these isolates were subjected to Gram staining and different biochemical tests as per Bergey’s Manual of Determinative Bacteriology.

Antibiotic Susceptibility Tests of Isolates

The antibiotic profiling was performed by Kirby-Bauer diffusion method on Muller-Hinton agar according to Clinical and Laboratory Standard Institute guidelines (Kirby *et al.,* 1966). The isolated bacterial culture was suspended in a nutrient broth separately and incubated for 30min to make it comparable with the 0.5% McFarland standard. These suspensions were inoculated on Muller-Hinton agar by sterile cotton swab separately. Antibiotic discs were placed by using disc dispenser and the plates were incubated at 37^0C for 24 hrs. The antibiotics used in this study included Ampicillin (10mcg), Chloramphenicol (30mcg), Cefpodoxime (10mcg), Gentamicin (30mcg), Meropenem (10mcg), Doxycycline hydrochloride (30mcg), Amikacin (30mcg), Ceftazidime (30mcg) and Tobramycin (10mcg) of Hi- Media Laboratories, Bombay, India. The isolates were characterized as susceptible or resistant, based on the diameter of zone of inhibition and results interpreted according to Clinical Laboratory Standards institute.

RESULTS AND DISCUSSION

Table 1. indicates the occurrence of isolated bacteria from street food. A total of 22 isolates were obtained, with six from momos, ten from manchurian and six from noodles. The high isolation frequency of *S. aureus* suggests poor hygienie practices during preparation, handling, and storage of street-vended foods may responsible. Contamination can occur due to food handlers not maintaining proper hand hygiene, using contaminated utensils, or exposure to environmental pollutants. *Pseudomonas* sp. was only found in momos samples, with all samples showing the presence of this species. A total of six isolates of *Pseudomonas* sp. were recovered which suggest contamination from water, raw materials, or unhygienic storage conditions, as these bacteria are known to cause food spoilage. In contrast, *Escherichia coli* and *Salmonella* sp. was not detected in any of the samples. It may indicate low fecal contamination and use of high cooking temperatures, but the presence of *S. aureus* in all samples highlights a public health risk related to poor handling after cooking and unhygienic vending conditions. Similar studies on the isolation of *S. aureus and Pseudomonas sp.* from street food have been reported (Sonune, 2022; Saxena and Agarwal, 2013).

Table 1: Occurrence of isolated bacteria from street food

Street food samples	*S.aureus*	Positive samples (%)	*E. coli*	Positive samples (%)	*Salmonella* sp.	Positive samples (%)	*Pseudomonas* sp.	Positive samples (%)
Momos	06	10 (100)	00	00 (00)	00	00 (00)	06	10 (100)
Manchurian	10	10 (100)	00	00 (00)	00	00 (00)	00	00 (00)
Noodles	06	10 (100)	00	00 (00)	00	00 (00)	0	00 (00)

Table 2: Antimicrobial resistance pattern of isolated bacteria from momos

Antibiotics	*Staphylococcus aureus*		*Pseudomonas* sp.	
	Sensitive (%)	Resistant (%)	Sensitive (%)	Resistant (%)
Ampicillin (10mcg)	33.33	66.67	00	100
Chloramphenicol (30mcg)	100	00	100	00
Cefpodoxime (10mcg)	100	00	100	00
Gentamicin (30mcg)	100	00	100	00
Meropenem (10mcg)	100	00	100	00
Doxycycline hydrochloride (30mcg)	100	00	100	00
Amikacin (30mcg)	100	00	100	00
Ceftazidime (30mcg)	00	100	00	100
Tobramycin (10mcg)	100	00	66.67	33.33

Table 3: Antimicrobial resistance pattern of isolated bacteria from manchurian

Antibiotics	*Staphylococcus aureus*	
	Sensitive (%)	Resistant (%)
Ampicillin (10mcg)	40	60
Chloramphenicol (30mcg)	100	00
Cefpodoxime (10mcg)	100	00
Gentamicin (30mcg)	100	00
Meropenem (10mcg)	100	00
Doxycycline hydrochloride (30mcg)	80	20
Amikacin (30mcg)	100	00
Ceftazidime (30mcg)	00	100
Tobramycin (10mcg)	60	40

Table 4: Antimicrobial resistance pattern of isolated bacteria from noodles

Antibiotics	*Staphylococcus aureus*	
	Sensitive (%)	Resistant (%)
Ampicillin (10mcg)	00	100
Chloramphenicol (30mcg)	100	00
Cefpodoxime (10mcg)	100	00
Gentamicin (30mcg)	100	00
Meropenem (10mcg)	100	00
Doxycycline hydrochloride (30mcg)	100	00
Amikacin (30mcg)	100	00
Ceftazidime (30mcg)	00	100
Tobramycin (10mcg)	100	00

All the *S. aureus* isolates from the momos samples were found sensitive to chloramphenicol, cefpodoxime, gentamicin, meropenem, doxycycline hydrochloride, amikacin, and tobramycin (Table 2). However, 66.67% resistant to ampicillin, and 100% resistant to ceftazidime were found. Similarly, all *Pseudomonas* isolates were resistant to ampicillin, and ceftazidime, and 33.33% to tobramycin, whereas for other antibiotics these isolates were susceptible.

The *S. aureus* isolated from Manchurian showed variation in sensitive to the antibiotics. These isolates were found to be sensitive to chloramphenicol, cefpodoxime, gentamicin, meropenem, and amikacin (Table 3). However, resistance was found against ampicillin (60%), doxycycline hydrochloride (20%) and tobramycin (40%). likewise, *S. aureus* isolates from the noodles samples were susceptible to the meropenem, gentamicin, amikacin, tobramycin, chloramphenicol, doxycycline hydrochloride, and cefpodoxime. In contrast, these isolates showed resistance to ampicillin and ceftazidime (Table 4).

Production of β-lactamase enzymes that hydrolyse β-lactam antibiotics and render them ineffective may be responsible for the resistance to the ampicillin by *S. aureus* isolates (Tong *et al*., 2015). The overuse of penicillin derivatives may be responsible for the evolution of resistant strains. Resistance to ceftazidime further supports the increasing prevalence of β-lactam resistance among food-associated *S. aureus* isolates. The ampicillin resistance seen with *Pseudomonas* sp. is consistent with the intrinsic resistance to many β-lactam antibiotics of this organism through reduced outer membrane permeability, efflux pumps, and chromosomally encoded β-lactamases, while the ceftazidime resistance observed in this study may represent the presence of ESBL or AmpC β-lactamase-producing strains (Pang *et al*., 2019). *Pseudomonas* isolates were also less susceptible to tobramycin compared with *S. aureus* indicating the emergence of aminoglycoside-resistant *Pseudomonas* isolates. Ampicillin resistant *S. aureus* was also reported by Hasan *et al*., (2021) from street food.

CONCLUSION

In the present study, a total of 30 street food samples were tested. The finding indicated that all the samples were contaminated with *S. aureus* while *Pseudomonas* sp. was found exclusively in momos samples. These isolates were susceptible to majority of antibiotics used. However, a notable level of resistance to ampicillin and ceftazidime was identified among *S. aureus* and *Pseudomonas* isolates. This highlights the need for continuous surveillance of antimicrobial resistance in food on the street. Improved hygienic practices during food preparation, regular microbiological monitoring, rational use of antibiotics and public health awareness programmes are necessary to minimize the spread of antimicrobial resistant foodborne pathogens.

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