

## Research Article

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# Current status of street foods, over consumption and human health issues in Hyderabad City

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### Abstract

Globally, the use of street foods is accessed at their walking distance. In Hyderabad city all age groups eat different street foods, which have severe impacts on human health. General survey and interviews were conducted to collect data of eating habits, a survey from health institutions and the clinical samples were collected for screening of pathogens and antibiotic sensitivity. Total 24%, 37%, 23%, 16%; 28%, 40%, 17, 13%; 18%, 28%, 32%, 20% population of 5-25; 26-40; 41-60 years of age consume foods one time in a week, two times in a week, periodically and as per need respectively. The hygienic standard of venders revealed, food handlers and cook wash hands before handling and cooking (27%), wash food items before cooking (14%), Using and re-using normal cloth for drying hands and using head covering only (11%), wash utensils with detergent and warm water and using oven for drying crockery (10%), using new tissue papers for drying hands (6%), using gloves, head covering and apron during cooking (5%), infected personal serving for street foods (4%) and infected cooks (2%). Out of 375 samples the numbers and percentage revealed *P. mirabilis* 4% in Rabri, *S. aureus* 36% in Bhutta; *C. jejuni* 20% in Qatlama and Nihari soup, *L. monocytogenes* 20% in Qatlama, *E. coli* 24% in Chicken Mayo roll; *S. enterica* 20% in Rabri; *B. cereus* 12% in Dahi Bhalla and street salad; *S. lactis* 32% Fritter; *Shigella dysenteriae* 8% in Nihari soup and *P. aeruginosa* 5% in Fritters. Over consumption, irregular eating habit, and the contamination of foods may cause different infection and antibiotic resistance.

**Keywords:** Antibiotic sensitivity pattern; Bacterial isolates; Street foods; Survey

### Introduction

The human beings change with the new trends of food consumption outside the home due to less availability of human source and inadequate time for cooking. Currently, street foods are significantly consumed at their door steps like offices, educational

institutions, railway station, transport stands, tourism sites and also at the festivals. More than two billion populations in different countries consume street foods that include Falafel (Egypt), Acaraja (Brazil), Panipuri (India), Chuanr (China), and Thai (Thailand), Paratha roll (Pakistan), Mandazi (Kenya),

Doza (Turkey), Taco (Mexico) and Sunya (Nigeria). Besides, the quality food consumption, the street foods may be the source of several human diseases such as cholera, typhoid, food poisoning, diarrhea etc. due to the unawareness of safe food supply, improper handling, cross contamination, venues of street food preparation and environmental contamination [1].

Food in either form (Solid, liquid) containing sugars (Carbohydrates), amino acids (Proteins), salts (Minerals) and growth factors (Vitamins) are essential for life process to enhance growth and protection from any body's disorder. In Hyderabad Sindh, mostly the people enjoy the Qatlama [2, 3], Chapli Kabab, Chicken Mayo roll [4, 5], Street salad, Nihari, Dhahi Bhalla [6, 7]. Human beings un-cautiously consume varieties of food items without any knowledge of quantity, value, calories and shelf life. This include snacks, roasted foods, fat containing foods, homemade and hotel foods, desserts, juices etc. that may be curse for human life. Environment and some domestic events influence the eating habits of all age groups especially fast foods, which are greatly consumed by children and youths [8, 9]. Food safety is essential part worldwide to prevent the dissemination of infectious diseases. World Health Organization reported more than one billion cases of diarrhea per year in children, which estimated three million deaths in different parts of the world [10, 11]. Other agencies like CDC explored more than seventy complications that could be the lethal for humans that happened due to the substandard foods, low standard hygiene and mishandling [12, 13].

Recently, it has been observed that the consumption of foods take place anywhere during leisure time, even at the time of morning and evening tea. Most of the people of either age or gender prefer street higher influence on health issues that include ill

body growth, less wisdom, blemishes, diabetes, indigestion, ulcers that leads to death [14, 15]. The foods are composed of enough growth factors, which also support the microbial growth. These foods get contaminated with gram positive and negative bacteria [14, 16, 17]. Many workers explored their research work on human sickness that are due to the improper diagnosis and treatment and less infection control. This study was carried out to analyze the comparison of the occurrence of bacterial contaminants in street foods in Latifabad, Hiarabad, Hosri, Zeal Pak areas (Hyderabad), Kotri and Jamshoro, Sindh region.

The human beings change with the new trends of food consumption outside the home due to less availability of human source and inadequate time for cooking. Currently, street foods are significantly consumed at their door steps like offices, educational institutions, railway station, transport stands, tourism sites and also at the festivals. More than two billion populations in different countries consume street foods that include Falafel (Egypt), Acaraja (Brazil), Panipuri (India), Chuanr (China), and Thai (Thailand), Paratha roll (Pakistan), Mandazi (Kenya), Doza (Turkey), Taco (Mexico) and Sunya (Nigeria). Besides, the quality food consumption, the street foods may be the source of several human diseases such as cholera, typhoid, food poisoning, diarrhea etc. due to the unawareness of safe food supply, improper handling, cross contamination, venues of street food preparation and environmental contamination [1].

The food contains carbohydrates, protein, minerals and vitamins, which are essentially required to enhance growth and protection from any body's disorder [2]. In Hyderabad Sindh, mostly the people enjoy the Qatlama [3], Chapli Kabab [4], Chicken Mayo roll [5], Street salad, Nihari [6], Dhahi Bhalla [7]. Human beings consume varieties of food

items without any knowledge of quantity, calories and shelf life. This include snacks, roasted foods, fat containing foods, homemade and hotel foods, desserts, juices etc. Environment and some domestic events influence the eating habits of all age groups especially fast foods, which are greatly consumed by children and youths [8, 9]. World Health Organization reported more than one billion cases of diarrhea per year in children, and estimated three million deaths in different parts of the world [10, 11]. Center for Disease Control (CDC) explored more than seventy lethal complications of humans [12, 13].

Recently, it has been observed that the streets foods are frequently consume during leisure time. Most of the people of all either age groups of both gender prefer street foods, which have higher influence like ill body growth, less wisdom, blemishes, diabetes, indigestion, ulcers and death [14, 15]. The foods are composed of enough growth factors, which also support the microbial growth. These foods get contaminated with gram positive and negative bacteria [14, 16, 17]. This study was carried out to analyze the comparison of the occurrence of bacterial contaminants in street foods in Latifabad, Hiarabad, Hosri, Zeal Pak areas (Hyderabad), Kotri and Jamshoro, Sindh region.

#### **Problem statement**

The insufficient documents on the preparation, sell and several irregularities done by unauthenticated, untrained street hawkers and vendors are the source of many human complications. This study indicated more than 50% of the human population consume of street foods with ill-habit that could be hazardous of food related complications [18]. The essence of this work is to determine the eating habits of the male and females of different age groups to determine the standard of hygiene of hotels, fast food shops and the working personals, to determine the percentage of bacterial

contamination in different commercial foods and to determine the health impacts of contaminated foods and the antibiotic resistance of isolates.

#### **Materials and Methods**

##### **Survey of food consumers**

A random data was collected from 600 persons of both genders of 5-60 years was undertaken from June 2019 to June 2021. Food consumers of all age groups of male and females were examined for their eating routine eating habits and eating habits one time in a week, two times in a week, periodically and as per need.

##### **Analysis of food samples**

Random sampling of total 375 samples of Rabri, Qatlama, Fritter, Bhutta, Dhahi Bhala, Nihari soup, Chicken mayo roll and street salad were collected in sterile containers and processed in laboratory for microbial analysis.

##### **Survey of hygienic standards**

Hygienic standards of different food venders were collected. This study also noted the hygienic standards of working personals such as those who wash hands before handling foods and during the distribution to the customers.

##### **Data collected from hospitals**

A data of male and female patients of 5-60 years of hospitalized patients was collected from the hospitals and Outpatient department (OPD).

##### **Microbial analysis**

##### **Isolation and identification of food borne bacteria**

All food samples were analyzed by pour plate technique by mixing small quantity of food samples in 100 mL sterile distilled water, later 10 fold dilution was prepared and 1 mL of sample from each dilution was poured on to the Laboratory media such as nutrient agar, MacConkey's agar (Oxoid) Pylori agar (Sigma) plates and incubated for 24-48 hours at 37°C for microbial growth to examine the

colonial, microscopic and biochemical characterization by standard methods.

### Determination of antibiotic susceptibility pattern

All bacterial isolates were examined for antibiotic sensitivity pattern by Kirby-Bauer disc diffusion method on Mueller Hinton agar.

### Results and Discussion

During the on spot interview of 600 people of both genders of poor, lower middle class, upper middle class and rich class of different age groups it was observed that 24%, 37%, 23%, 16%; 28%, 40%, 17, 13%; 18%, 28%, 32%, 20% population of 5-25; 26-40; 41-60 years of age who consume foods one time in a week, two times in a week, periodically and as per need respectively (Table 1). Hygienic status of different food venders and workers revealed (I) sanitization of hands 11 (27%), (II) cleanliness of utensils with quality detergent and warm water 42 (10%), (III) cleanliness of utensils normal water only 22 (5%), (IV) cleanliness of food items for processing 57 (14%), (v) using kitchen tissues for drying hands 25 (6%), (VI) use of dry cloth for drying hands 47 (11%), (VII) using oven for drying of crockery 42 (10%), (VIII) using head covering only 45 (11%), (IX) using gloves, head covering and apron 22 (5%); (X) infected personal serving for street foods 17 (4%) and (XI) infected cooks in street foods 7 (2%) (Fig. 1).

This study showed different numbers of bacterial isolates and their percentage in different test food samples. The findings revealed the number of isolates *E. coli* 38 (27%), *S. aureus* 26 (18%), *S. enterica* 21 (15%), *Shigella dysenteriae* 05 (3.5%), *B. cereus* 09 (6%), *L. monocytogenes* 21 (15%), *P. mirabilis* 03 (6%), *P. aeruginosa* 03 (6%), *S. lactis* 05 (3.5%) and *C. jejuni* 12 (8%) (Table 2a, b & 3).

The most contaminated foods having greater percentage of bacteria were Rabri (*S. enterica* 20%, *P. mirabilis* 4%), Qatlamam, Dhahi

Bhalla, (*C. jejuni* 29%), Street salad, Chicken Mayo roll, (*B. cereus* 12%), Qatlama (*L. monocytogenes* 20%), Fritters (*P. aeruginosa* 8%, *S. lactis* 32%), Bhutta (*S. aureus* 38%), Nihari soup (*E. coli* 24%, *Sh. dysenteriae* 8%) (Table 4). The data showed 255 (55%) males of age group 5-25 (44%); 26-40 76 (30%) and 41-60 (26%) and 222 (46.5%) patients females of age group 5-25 (53%), 26-40 (32%) and 41-60 (15%) of elite, middle class, lower middle class and poor population of both genders who were affected from severe complications such as periodical stomachache, vomiting, diarrhea and watery stools sometimes contained blood, food poisoning, ulcers and finally death (Table 5, Fig. 2).

The isolates revealed different antibiotic resistance zone in millimeter (mm) against Azithromycin 14, Clindamycin 13.8, Ciprofloxacin 14 Erythromycin 13, Methicillin 08 (*S. aureus*); Chloramphenicol 12.5, Ofloxacin 11.5, Oxacillin 12 (*S. lactis*); Ampicillin 10, Chloramphenicol 12.5, Ofloxacin 12, Oxacillin 11, Tetracycline 13.5 (*B. cereus*); Ampicillin 11.5, Chloramphenicol 13, Cephalosporin 15, Oxacillin 10.5 (*L. monocytogenes*); Ampicillin 13, Clindamycin, 12 Erythromycin 11.5, Imipenem 10.5, Oxacillin 12, Tetracycline 11.5 (*C. jejuni*); Chloramphenicol 15, Cephalosporin 12.8, Imipenem, 12, Levofloxacin, 14.5, Ofloxacin 13 (*S. enterica*); Chloramphenicol 12.5, Cephalosporin 15, Imipenem 13.5, Linezolid 12, Oxacillin 12.5 (*E. coli*) and Ampicillin 12.5, Amoxicillin 12.5, Imipenem 12, Levofloxacin 13, Ofloxacin 12.5 mm zone of growth inhibition of *P. aeruginosa*. The observation further revealed numbers and antibiotic resistance percentage of pathogenic strains of *S. aureus* 11 (42%), *B. cereus* 4 (44%), *C. jejuni* 5 (41%), *L. monocytogenes* 5 (24%), *S. enterica* 8 (38%), *Shigella dysenteriae* (20%), *E. coli* 16 (42%), *Pseudomonas aeruginosa* 1 (33%), *S. lactis* 3

(0%), *P. mirabilis* 3 (33%) antibiotic resistance (Fig. 3).

The seasonal changes in Hyderabad such as elevated temperature, mud, overcrowding, and vehicle's smoke promote the microbial contamination. The type and pH of the edibles, food processing practices, management, storage skills and unhygienic measures significantly affect the human life [19]. The consumption of all kinds of edibles outside home or inside home is insecure for all ages and genders if, consumed at irregular intervals, eating rationally, using sweet dishes, more proteinaceous and fatty foods substances in access. The observation revealed the consumption of foods outside home one time in a week (24%), two times in a week (40%) and periodically (32%) with bad eating habits that include unscheduled eating between two meals or any time when desire [18], advertisement, packing, easy approach and low expense [20, 21].

The population survey revealed 5-25, 26-40 and 41-60 years' consumers eat 37% and 24%; 40% two times in seven days and 23% periodically whereas 32% consume foods periodically and 28% two times in seven days. The findings of patients revealed 21% patients of 5-25 years were suffering from heavy buildup of the body, 13% were suffering from diarrhea and dysentery and 6% Campylobacteriosis, 3% ulcers and 10% hepatitis C. This alarming condition may be because of high level of child's strong need, parental love, consuming food at irregular intervals attraction towards food vendors, different types of advertisements as discussed by Health and Food [18]. Besides, the consumers of 41-60 years showed bit greater concentration of disorders and resulted high fat concentration, hyperglycemia and increased salt concentrations that caused hypertension, paralysis and shocks, kidney and heart diseases, restlessness, insomnia and Hepatitis C etc. The reasons for such complications are the low energetic foods,

lack of quality cooking practices, use of low standard oils and less concentration of proper timings that lead to less oxygen supply, flavonoids of vegetables used, which are useful to prevent body from various complications as discussed previously [22, 23].

According to the analysis the persons that belong to lower middle class, upper middle class, average class showed more infection rate (38%) compared to poor and rich class (19%). These findings may be because of heavily consumed street foods irrespective of the quality and quantity of market foods. The rich class are able to get hygienic foods at the particular time from quality restaurants and the vendors having good hygiene and availing proper medication whereas the poor people particularly the 5-25 years and 41-60 years cannot afford such expensive food that's why showed more prevalence of diseases. The fact behind the different complications would be nature of food, improper storage, contaminated food vendor, utensils and personal hygiene that matches the findings with CDC report [24].

In this study, the main contaminants are *S. aureus*, *S. lactis*, *E. coli*, *L. monocytogenes*, *S. enterica*, *C. jejuni* followed by *B. cereus* and others. The antibiotic resistance revealed greater in *B. cereus*, *E. coli*, *S. aureus*, *C. jejuni* and *S. enterica* followed by others. The reasons of antibiotic resistance may be the irregular eating at variable times, consuming morning food that had been stored till evening at stove or charcoal, which support the microbial invasion, exposure of food to dust and house flies [25-29].

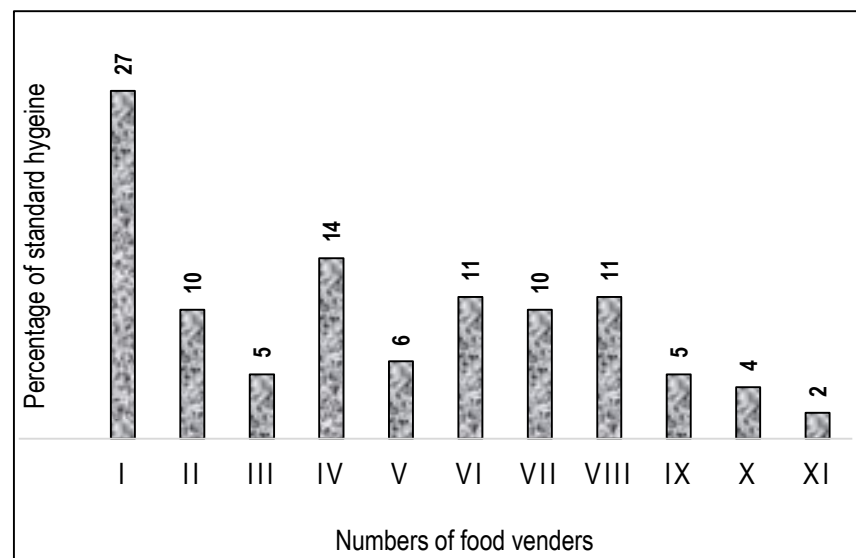
The drug resistance in bacteria is diversified that include the modification in enzyme production that hurdle the protein synthesis by three ways such as acetylation, phosphorylation and adenylation. Mutation in cell permits reduced takeover of the antibiotics, execution of foreign DNA through horizontal gene

transfer help bacteria harbor environmental resistome. Some strains revealed the emergence of resistance may be due to the bacterial conjugation that transfer the plasmids and transposones. The distribution and dissemination of enzymes play an important role in the specific antibiotic they affect such as AAC (6') APH (2'') enzyme, which is located on a Tn4001-like transposon in G+ve bacteria has dual role in greater resistance to all aminoglycosides. Several *cat* genes in gram-positives and gram-negative bacteria show resistance to the particular antibiotic e.g. chloramphenicol. AAC (6')-I in *Pseudomonas* species and other members of *Enterobacteriaceae* affects gentamicin and other aminoglycosides. The

resistance to  $\beta$ -lactam antibiotics may be due to the fact that the genes that encode  $\beta$ -lactamases such as *bla<sub>KPC</sub>*, destroy the amide bond of the  $\beta$ -lactam ring. *S. aureus* showed resistance due to the penicillinase enzyme. Many of the antibiotics in gram negative cells affect intracellularly in the cell membrane but fails to reach the target site by bacterial cell thus declining the uptake of the antibiotics like tetracyclines and some fluoroquinolones. *E. coli* resist tetracycline by means of the efflux pump mechanism via *tet* determinants for instance Tet(K) and Tet(L), which drive out tetracycline and doxycycline and the same could be propelled by multi drug resistant strains via AcrAB-TolC and MexAB-OprM [30].

**Table 1. Determination of food consumption in different age groups**

Age factor	Total numbers of persons interviewed	Eating Habits							
		One time in a week		Two times in a week		Periodically		As per need	
		No of persons	%	No of persons	%	No of persons	%	No of persons	%
5-25	231	56	24	85	37	53	23	37	16
26-40	152	35	23	61	40	26	17	30	13
41-60	126	23	18	35	28	40	32	25	20



**Figure 1. Data collected from 414 food vender for standard hygiene**

**Table 2(a). Determination of the percentage of bacterial isolates from Rabri, Qatlama, Fritter and Bhutta**

No. of isolates	Bacterial isolates	Food samples (25 each)	Total percentage of isolates
3	<i>S. lactis</i>	Rabri	12
3	<i>S. aureus</i>		12
5	<i>S. enterica</i>		20
3	<i>L. monocytogenes</i>		12
4	<i>E. coli</i>		16
1	<i>P. mirabilis</i>		04
5	<i>C. jejuni</i>	Qatlama	20
3	<i>S. enterica</i>		12
5	<i>L. monocytogenes</i>		20
6	<i>E. coli</i>		24
1	<i>P. aeruginosa</i>		04
2	<i>S. lactis</i>	Fritter	32
4	<i>E. coli</i>		16
2	<i>P. mirabilis</i>		04
2	<i>P. aeruginosa</i>		08
2	<i>C. jejuni</i>	Bhutta	08
8	<i>S. aureus</i>		32
2	<i>S. enterica</i>		08
3	<i>L. monocytogenes</i>		12
2	<i>E. coli</i>		08

**Table 2(b). Determination of the percentage of bacterial isolates from Dahi Bhala, Nihari soup, Chicken Mayo roll and Street salad**

No. of isolates	Bacterial isolates	Food samples (25 each)	Total percentage of isolates
5	<i>C. jejuni</i>	Dahi Bhala	20
9	<i>S. aureus</i>		36
3	<i>S. enterica</i>		12
2	<i>Sh. dysenteriae</i>		08
5	<i>E. coli</i>		20
1	<i>B. cereus</i>		04
2	<i>B. cereus</i>	Nihari soup	08
1	<i>Shigella dysenteriae</i>		04
2	<i>Salmonella enterica</i>		08
3	<i>Listeria monocytogenes</i>		12
4	<i>E.coli</i>		16
3	<i>B. cereus</i>	Chicken Mayo roll	12
2	<i>Sh. dysenteriae</i>		08
3	<i>S. enterica</i>		16
3	<i>L. monocytogenes</i>		12
6	<i>E. coli</i>		24

6	<i>S. aureus</i>	Street salad	24
3	<i>S. enterica</i>		12
4	<i>L. monocytogenes</i>		16
5	<i>E. coli</i>		20
3	<i>B. cereus</i>		12

**Table 3. Quantitative analysis of the percentage of G+ve and G-ve bacteria**

Bacterial pathogens	Gram reaction	Percentage (%) of isolates
<i>S. aureus</i>	Gram positive	18
<i>S. lactis</i>		3.5
<i>B. cereus</i>		06
<i>L. monocytogenes</i>		15
<i>Campylobacter jejuni</i>	Gram negative	08
<i>Salmonella enterica</i>		15
<i>S. dysenteriae</i>		3.5
<i>E. coli</i>		27
<i>Pseudomonas aeruginosa</i>		06
<i>P. mirabilis</i>		06

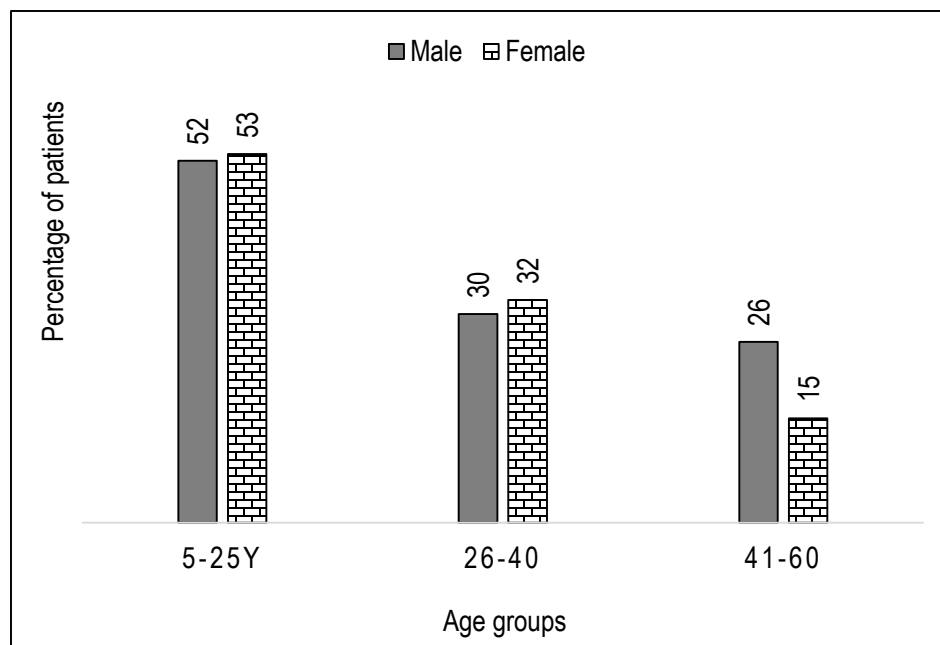
**Table 4. Determination of different contaminants in food samples**

Food items	Main contaminant	Percentage (%) of contaminant
Rabri	<i>S. aureus</i>	20
	<i>P. mirabilis</i>	4
Qatlama and Dhahi Bhalla	<i>C. jejuni</i>	20
Street salad and Chicken Mayo roll	<i>B. cereus</i>	12
Qatlama	<i>L. monocytogenes</i>	20
Fritter	<i>P. aeruginosa</i>	8
	<i>S. lactis</i>	32
Bhutta	<i>S. aureus</i>	38
Street salad	<i>E. coli</i>	24
	<i>Shigella dysenteriae</i>	8%

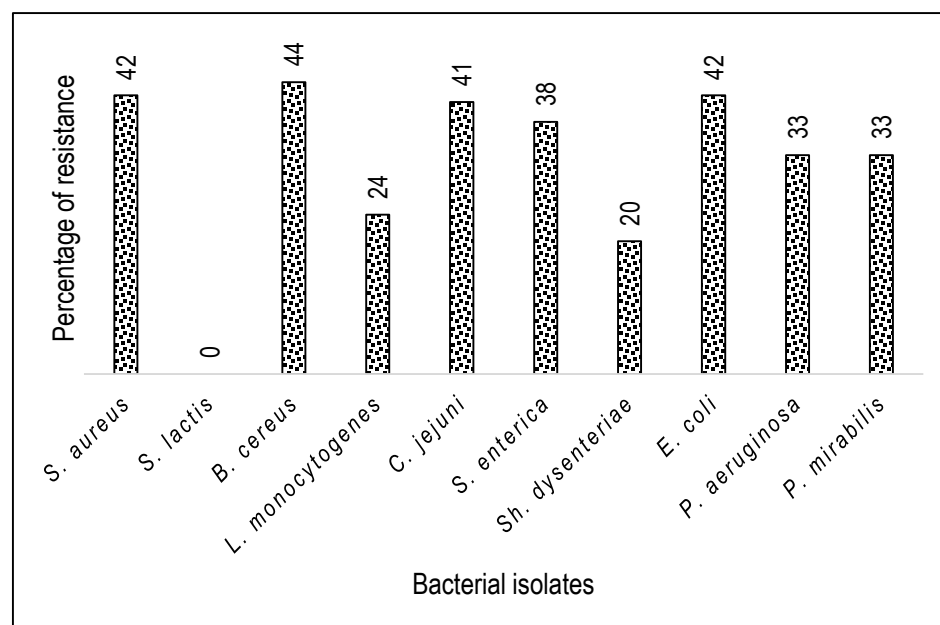
**Table 5. Determination of the numbers of OPD and hospitalized patients**

Gender	Total no. of patients	Age group		
		5-25	26-40	41-60
Male	255	113	76	66
		117	72	33
Females	222			





**Figure 2. Total percentage of OPD and hospitalized patients**



**Figure 3. Determination of the percentage of antibiotic resistance of food-borne pathogens**

**Conclusion**

The findings concluded that careful eating habits, healthy foods, food management and hygienic standards should be of prime importance. It is concluded that the kids and

the elderly age children eat junk foods as scavengers whereas the 36-60 years' persons of both genders are less affected compared to 4-35 years of age. The cleanliness and the general hygiene concluded that few street

food vendors wash utensils with tap water, use normal cloth for drying hands before cooking and reuse them for cleaning the crockery for serving foods and use head covering only during cooking. It is concluded that greater extent of both Gram positive and Gram negative food borne pathogens are actively found in all test food items. The sensitivity to various antibiotics showed that *S. aureus*, *S. enterica*, *E. coli* and *L. monocytogenes* have greater resistance to the test antibiotics. This study elaborates the rational use of street foods, hygienic standards of food vendors, impact on health to notify the human population for public health issues. This work may be notified to concerned government health agencies for health care especially of the children and also the awareness program may be arranged for street vendors, hawkers and continuously monitored for its follow-up

#### Authors' contributions

Collection of data: NA Brohi & RA Soomro, Collected the clinical samples, performed and analyzed laboratory work: AA Noor, Aamna Balouch & NA Brohi, Contributed materials/ analysis/ tools: AA Noor, NA Brohi, RA Soomro, MA Sial, S Dahraj & BA Mahar, Wrote the paper: AA Noor & NA Brohi.

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