

## Prevalence and Antimicrobial Resistance Pattern of Food Borne Pathogens Isolated from Food Handlers

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Food handlers with poor hygiene working in food service establishments act as potential sources of infection due to pathogenic microorganisms. The study was undertaken to determine the prevalence of gram negative enteropathogens among the food handlers working in food establishments in Vizianagaram, Andhrapradesh, India. Randomly 10 food establishments were selected and samples were taken from finger nails and palms of food handlers and also from utensils used for serving food by swabbing method. Most Prevalent organisms identified were *Klebsiellaspp.*, (31.5%) followed by *Vibriospp.*, (15.7%), and other members of enterobacteriaceae family. Antimicrobial susceptibility was evaluated for all the identified isolates. Imepenem was found to be most effective antibiotic while other antibiotics showed high to moderate activity. The study showed the poor hygiene condition and lack of awareness on hygienic practices in food handlers. An effective means for preventing the transmission of pathogens from handlers to consumer is strict adherence to good personnel hygiene and practice hygiene food handling procedures

**Key words:** Food borne infection, Food handlers, Food hygiene, Antibiotics.

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In India food borne diseases occur frequently causing morbidity and mortality. Out breaks of food borne diseases are due to microorganisms and environmental contaminants. The common form of food borne disease are found to be due to bacterial contamination of foods<sup>1</sup>. A broad spectrum of microbial pathogens can contaminate human food products and cause illness after microbial pathogens or their toxins are consumed by humans<sup>2</sup>.

According to the center for disease control, nearly 76 million Americans get sick, more than . 300,000 people were hospitalized and nearly 5000 people die from food borne illness each year<sup>3</sup>. Diarrhoeal diseases, mostly caused by food borne or waterborne microbial pathogens, are leading cause of illness and death. In developing countries killing is estimated to be 1.9 million people annually at the global level<sup>4</sup>. However many cases of food borne illness remain unreported as only the most serious cases are usually investigated. On the other hand many food borne illness share common symptoms and can not be distinguished by the symptoms alone. Diagnosis of food borne illness can be made only after considering the recent food consumption history of patient<sup>5</sup>.

Transmission of intestinal parasites and enteropathogenic bacteria is affected directly or indirectly through objects contaminated with feces. These include food, water, nails and fingers

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indicating the importance of fecal oral human to human transmission<sup>6</sup>. Food handlers with poor hygiene and who harbour enteropathogenic bacteria may contaminate food from their feces through their fingers, then to food processing and finally to healthy individuals<sup>7</sup>. Compared to other parts of hand, the area beneath fingernails harbours most microorganisms and is more difficult to clean<sup>8</sup>.

Present study was aimed to isolate, identify and study the antibiogram of the Gram negative enteropathogens, particularly which are responsible for Diarrhoeal diseases from food handlers and utensils that are used for screening the food in food establishments.

### MATERIAL AND METHODS

Study was conducted among 10 food establishments present in phoolbaugh region located in Vizianagaram, Andhra Pradesh, India. The area selected for the study was a developing area in Vizianagaram. This area has more educational institutions, where students mostly eat in these food establishments. These food establishments were selected because mass provisions of food service cause a potential source of transmitting infections.

#### Bacterial isolates

100 samples were collected from all the workers working in food establishments. The study was conducted during December 2008 to March 2009. Samples from the fingernails, hands and also from the surface of utensils that are used

for serving are collected using sterile cotton swab by swabbing method.

Samples that are collected by swabbing method are inoculated onto Macconkey agar (Hi-Media, Mumbai, India) and incubated at 37°C for 24hrs. The plates were examined and bacterial species were identified using standard Biochemical tests. Identified organisms were tested for their Susceptibility pattern.

#### Antibiotic susceptibility testing

Antimicrobial susceptibility testing was performed by Kirby-Bauer disc diffusion method recommended by the CLSI guide lines [9] against various antibiotics namely: Ampicillin(10mcg), Cefepime(30mcg), Cefuroxime(30mcg), Cephalexin(30mcg), Ciprofloxacin(10mcg), Gentamicin(10mcg), Imipenem(10mcg), Netilmicin(10mcg), Trimethoprin(5mcg), Ceftazidime/Clavulanic acid (30/10 mcg), Cefotaxime(30mcg), Piperacillin/tazobactam(100/10mcg)(Himedia, Mumbai, India)

### RESULTS

100 samples were collected from food handlers and utensils used for serving the food. Of the hundred samples 152 enteropathogens were identified. Of them 87 Isolates were isolated from handlers (57.23%) and 65 isolates were from utensils (42.76%). Major isolate was *Klebsiella pneumonia*, followed by *Vibrio* spp., *Enterobacter* spp., *Salmonella* spp., *Shigella* spp., *Citrobacter* spp., *E.coli*, *Serratia* spp. (Table 1) (Fig. 1).

**Table 1.** Number of isolates from handlers and utensils

No. of Samples	Handler		Utensils		Total	percentage
	50		50			
	n	%	n	%		
<i>E. coli</i>	7	8	5	7.69	12	7.8
<i>Enterobacter</i> spp.	12	13.79	8	12.30	20	13.1
<i>Klebsiella pneumoniae</i>	28	32.18	20	30.76	48	31.5
<i>Salmonella</i> spp.	4	4.59	12	18.46	16	10.5
<i>Shigella</i> spp.	4	4.59	12	18.46	16	10.5
<i>Serratia</i> spp.	4	4.59	0	00	04	2.6
<i>Citrobacter</i> spp	12	13.79	0	00	12	7.8
<i>Vibrio</i> spp.	16	18.39	8	12.30	24	15.7
Total (n=152)	87	57.23	65	42.76		
Percentage	57.23	42.76				

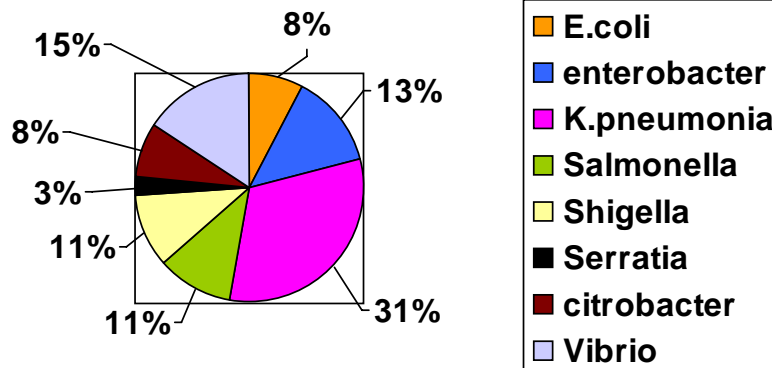


Fig. 1. Percentage of different isolates

Isolates were tested for their susceptibility pattern by Kirby bauer disc diffusion method. Imepenem was found to be most effective antibiotic, as all the organisms isolated were sensitive to the antibiotic. Trimethoprin (97.3%), Ciprofloxacin (92%), Gentamicin (92%),

Neticillin(84.2%), Cefepime(76.31%), piperacillin/tazobactum(89.47%), cefetoxime(65.78%), cefazidime (60.5%), showed moderate activity were as cephalixin(19.5%), cefuroxime(13.1%) and ampicillin(2.6%) has poor activity against isolates (Table 2).

Table 2. Antimicrobial susceptibility pattern of different isolates

	AMP	FEP	LEX	CXM	CIP	GEN	IPM	NET	TIM	CAZ	CTX	PTZ
<i>E. Coli</i> (n=12)	0	8	0	0	12	8	12	12	12	8	8	4
<i>Enterobacter</i> spp. (n=20)	0	20	0	0	20	20	20	20	20	0	12	20
<i>Klebsiella pneumoniae</i> (n=48)	0	44	0	0	44	40	48	40	48	40	24	48
<i>Salmonella</i> spp. (n=16)	0	16	0	0	16	16	16	16	16	16	16	12
<i>Shigella</i> spp. (n=16)	0	0	12	12	16	16	16	12	16	12	12	16
<i>Serratia</i> spp. (n=4)	0	4	4	4	4	4	4	4	4	4	4	4
<i>Citrobacter</i> spp.(n=12)	0	4	0	0	4	12	12	8	8	0	4	12
<i>Alkaligenes</i> spp.(n=4)	0	4	0	0	4	4	4	4	4	0	0	4
<i>Vibrio</i> spp.(n=24)	4	16	4	4	20	20	20	12	20	16	16	16
total	04	116	20	20	140	140	152	128	148	92	100	136
Percentage	2.6	76.31	13.15	13.15	92.1	92.1	100	84.2	97.36	60.52	65.78	89.47

DISCUSSION

Of the total isolates 57.23% of isolates were from handlers and 42.76% from utensils (Table 1).

The majority of isolates are from fingernails of the handlers and in case of utensils

majority were isolated from plates and glasses. This indicates the health status and very poor hygiene practices of the food handlers working in food establishments. Several authors from all over the world have stressed the importance of food handlers as threat in transmission of parasitic and bacterial diseases<sup>10</sup>.

Swab cultures from handlers were positive for *Klebsiella pneumonia*, *Vibrio*, *Salmonella*. This may indicate their poor hygienic conditions and lack of awareness which may lead to outbreaks of bacillary dysentery or diarrhea among the student population. The organisms were isolated from utensils which were washed and kept ready for use, therefore those utensils may act as a potential source for contamination. The hygiene situation of food handlers were further challenged by isolation of several species, of bacteria such as *Shigella*, *Serratia*, *Citrobacter* supporting the notion of contamination by fecal bacteria due to inadequate hand wash of food handlers. The poor hygiene practice might have been confused by the fact that most food handlers were individuals from the lower socioeconomic class with low level of education. In addition, none of the food handlers are trained in food – handling practices.

The presence of most organisms responsible for diarrhoeal diseases were high in this study. An effective means of preventing the transmission of pathogens from food handling persons via food to consumers is strict adherence to good personnel hygiene and practice hygiene food handling procedures. It is necessary to educate and train the food handlers in good – hygiene practices.

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