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Antibiotic Susceptibility Profile of Microbes Isolated from Street Food Vended in Chittagong, Bangladesh

[1]Plabon Paul, [2]Abdul Ahad, [1]Mirza Mienur Meher, [3]Md. Ali Asgar, [1*]A.K.M. Mostafa Anower

[1]Department of Microbiology and Public Health, Faculty of Animal Science and Veterinary Medicine, Patuakhali Science and Technology University, Bangladesh.
[2]Department of Microbiology and Veterinary Public Health, Faculty of Veterinary Medicine, Chittagong Veterinary and Animal Sciences University, Bangladesh.
[3]Department of Physiology and Pharmacology, Faculty of Animal Science and Veterinary Medicine, Patuakhali Science and Technology University, Bangladesh.

[*]**Correspondence Author:** *anower@pstu.ac.bd*

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Abstract:

The study was conducted to evaluate the antibacterial susceptibility of isolates from street vended foods in five selective areas of Chittagong district, Bangladesh. A total of 200 samples of ready to eat foods-Fucka, Chicken biriani, Sugarcane juice and Egg toast-were aseptically collected. All bacterial isolates were identified by studying their cultural characteristics and biochemical properties. Susceptibility of the isolates to eight (08) antibiotics namely amoxicillin, cephalexin, ceftriaxone, ciprofloxacin, colistinsulphate, gentamicin, oxytetracycline and streptomycin were tested by disk diffusion method. The results illustrated that the high individual and multiple resistances to antibiotics were in *Escherichia coli* (*E. coli*) isolates. The most resistant phenotype was against to oxytetracycline, ciprofloxacin, amoxicillin, and streptomycin where resistance to oxytetracycline has approached 100% level for E. coli isolates. In case of E. coli, multi-resistance (resistant to at least four antibiotics) was observed in all sources. Resistance to oxytetracycline was common (80%) in Salmonella spp. isolates and also observed that *Staphylococcus aureus* resistance to oxytetracycline (55%) and amoxicillin (10%). Besides this, the three isolates from food products having complete sensitivity (100%) to Cephalexin and Gentamicin. Consumption of street food contamination with antibiotic resistant bacteria could be a major threat to public health.

Keywords: Antibiotic susceptibility, Microbes, Street food, Chittagong.

Introduction:

The term "street food" refers to a wide variety of ready-to-eat foods and beverages sold and sometimes prepared in public places. Street foods are preferable to people of all ages and classes like laborers, students, rickshaw pullers and children in Bangladesh because of its availability and reasonable price (**Rahman *et al.*, 2014**). Besides this, a total of 2.5 billion people all over the world have street foods every day (**FAO, 2007**). In this Consequent, the food poisoning has been well reported in developing country (**Latham, 1997**; **Muleta and Ashenafi, 2001**). Microbiological studies from many developing countries, carried out on street vended food articles have revealed a high bacterial count. In Bangladesh, bacteria belonging to the genus Bacillus, Staphyloccus, Clostridium, Vibrio, Campylobacter, Listeria, Salmonella are reported from street vended food (**Rahman *et al.*, 2014**). These bacteria may have led to increase the use of antibiotics transform the bacteria as an antibiotic resistant to human pathogens (**Van *et al.*, 2000**) that have inevitable hazardous effects on public health. Likewise, evolution of multidrug-resistant (MDR) bacterial strains, known as "superbugs" may create serious threat which results in resistance to several antibiotics (**Alanis, 2005**). Thereafter, the treatment of diseases lead by such pathogen becomes a challenge day by day. However, the specific knowledge of susceptibility

or resistance of bacterial species to various antibiotics may help in the choice of antibiotics to treat effectively. Hence, the present study was designed to formulate an effective control measure against the isolated microbes in the street foods by selecting the best antibiotics.

Material and Methods:

This study was carried out during the period of December 2016 to May 2017. A total of 200 street vended food samples (50 fucka, 50 chicken biriani, 50 sugarcane juices and 50 egg toast) were collected from different places namely Chawkbazar, GEC moor, AK khan, Agrabad and New market in Chittagong District of Bangladesh. All the samples were collected in a sterile plastic tip packet and plastic bottle to restrict the secondary bacterial contamination and immediately brought to the laboratory under the Department of Microbiology and Veterinary Public Health, Chittagong Veterinary and Animal Sciences University (CVASU), Bangladesh. After collection of food samples, the bacterial species were isolated from samples by using different bacteriological media and biochemical test. In all cases of different sources were tested according to the methods described **by Cheesbrough (1985)**, **Khan et al. (2005)** and in OIE Manual (**OIE, 2006**). Morphology of the isolates were characterized by the method narrated by **Merchant and Packer** (1967).

Antibiogram study:

Total 50 isolates (20 from E. coli, 10 from Salmonella spp. and 20 from Staphylococcus aureus) were tested for antimicrobial drug susceptibility against 08 commonly used antibiotics belonging to different groups by disc diffusion method or Kirby-Bauer method (**Bauer et al., 1966**) according to the guidelines of National Committee for Clinical Laboratory Standards (CLSIFDA 2013). Based on zones of inhibition recommended by Clinical Laboratory and Standards Institute-Food and Drug Administration (CLSIFDA, 2013) isolates were classified as either sensitive (S), Intermediate (I) or resistant (R). The isolates resistant to three or more antibiotics were classified as multi-drug resistant (MDR) strains. Antimicrobial discs were purchased commercially (Oxoid, UK). Antimicrobial agents with their disc concentrations and zone diameter interpretive standards for E. coli, Salmonella spp. and Staphylococcus aureus are mentioned in table 1.

Results and Discussion:

The study revealed 135 of 200 food samples had pathogenic bacterial contamination. Three different bacterial species were isolated from the foods sampled. The highest incidence of Staphylococcus aureus 24.3% was seen in fucka and chicken biriani while the highest incidence of *E. coli* 9.7% was observed in chicken biriani and also highest incidence of Salmonella spp. was 3.9% in fucka. Isolates of *E. coli*, Salmonella spp. and Staphulococcus aureus were selected randomly for the antibiotic sensitivity test against 08 commonly used antibiotics (tab 2). In case of *E. coli*, there found 100% sensitive to cephalexin, ceftriaxone and gentamicin; 75% sensitive to ciprofloxacin; 60% sensitive to streptomycin; 35% sensitive to colistin sulphate. E. coli is totally resistant to Oxytetracycline (100%). Else that 25%, 20% and 20% case of resistance found against ciprofloxacin, amoxicillin and streptomycin respectively (Figure 2). Similar results were also observed by **Saifullah *et al.*, 2016**. In case of Salmonella spp., there found 100% sensitive to cephalexin, ciprofloxacin, gentamicin and streptomycin; 70% sensitive to amoxicillin; 60% sensitive to ceftriaxone; 20% sensitive to colistin sulphate (figure 3). Salmonella spp. is 80% resistant to oxytetracycline. Where **Viswanathan and Kaur (2001) and Farzana *et al.* (2009)** reported that most of the isolates of *Salmonella* had higher degree of resistance to ampicillin. On the other hand, Staphylococcus aureus were 100% sensitive to cephalexin, ciprofloxacin and gentamicin; 90% sensitive to streptomycin; 75% sensitive to colistin sulphate and ceftriaxone; 60% sensitive to amoxicillin. Staphylococcus aureus is 55% resistant to oxytetracycline; and 10% resistance found against amoxicillin (figure 4) which is similar to the report of **Thaker *et al.*, 2013, Kumar *et al.*, 2006 and Jahan *et al.*, 2015.**

Table 3. Antimicrobial agents with their disc concentrations and zone diameter interpretive standards for Enterobacteriaceae.

Antibiotic discs (Symbol)	*Disc concentration*	*Resistance*	*Intermediate*	*Sensitive*
Amoxycillin (AML)	10 µg	≤ 13 mm	14-17 mm	≥ 18 mm
Cephalexin (CL)	30 µg	≤ 14 mm	15-17 mm	≥ 18 mm
Ceftriaxone (CRO)	30 µg	≤ 19 mm	20-22 mm	≥ 23 mm
Ciprofloxacin (CIP)	5 µg	≤ 15 mm	16-20 mm	≥ 21 mm
Colistin sulphate (CT)	10 µg	≤8 mm	9-11 mm	≥ 12 mm
Gentamicin (CN)	10 µg	≤ 12 mm	13-14 mm	≥ 15 mm
Oxytetracycline (OT)	30 µg	≤ 15 mm	16-25 mm	≥ 26 mm
Streptomycin (S)	10 µg	≤ 11 mm	12-14 mm	≥ 15 mm

Table 2 Antibiogram profiles of *E. coli, Salmonella spp.* and *Staphylococcus aureus*

Antimicrobial agents	*E. coli (n=20)*			*Salmonella (n=10)*			*Staphylococcus (n=20)*		
	R	*I*	*S*	*R*	*I*	*S*	*R*	*I*	*S*
Amoxycillin	*4*	*16*	*0*	*0*	*3*	*7*	*2*	*6*	*12*
Cephalexin	*0*	*0*	*20*	*0*	*0*	*10*	*0*	*0*	*20*
Ceftriaxone	*0*	*0*	*20*	*0*	*4*	*6*	*0*	*5*	*15*
Ciprofloxacin	*5*	*0*	*15*	*0*	*0*	*10*	*0*	*0*	*20*
Colistin sulphate	*0*	*13*	*7*	*0*	*8*	*2*	*0*	*5*	*15*
Gentamicin	*0*	*0*	*20*	*0*	*0*	*10*	*0*	*0*	*20*
Oxytetracycline	*20*	*0*	*0*	*8*	*2*	*0*	*11*	*9*	*0*
Streptomycin	*4*	*4*	*12*	*0*	*0*	*10*	*0*	*2*	*18*

Legend: (R= resistant**, I**= intermediate **and S**= sensitive**)**

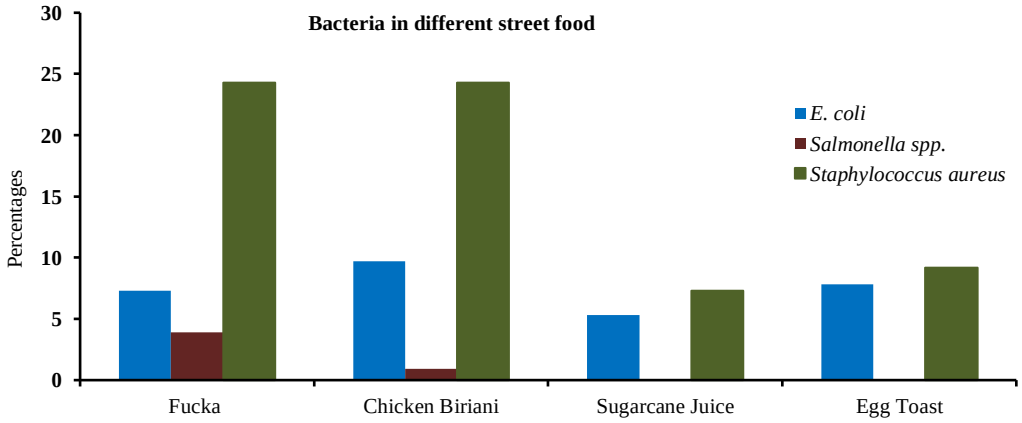

Figure 1 Percentage of bacteria in different street food

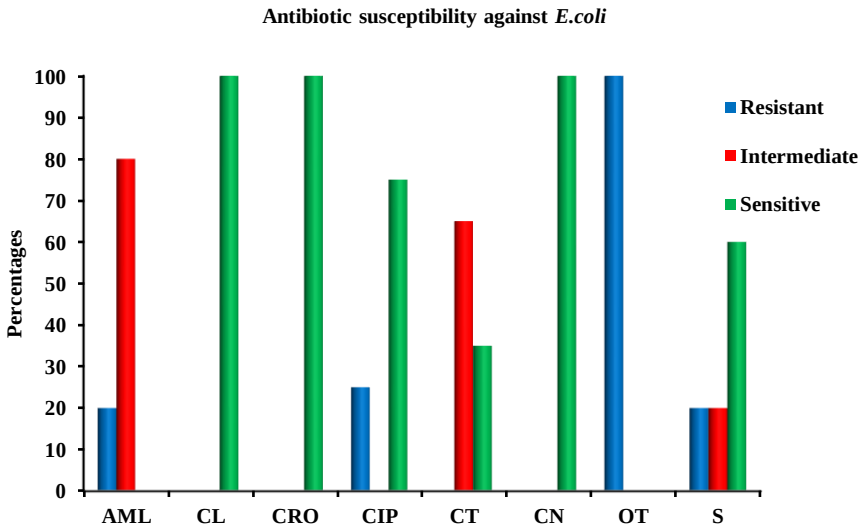

Figure 2 Pattern of different antibiotic susceptibility against *E.coli*

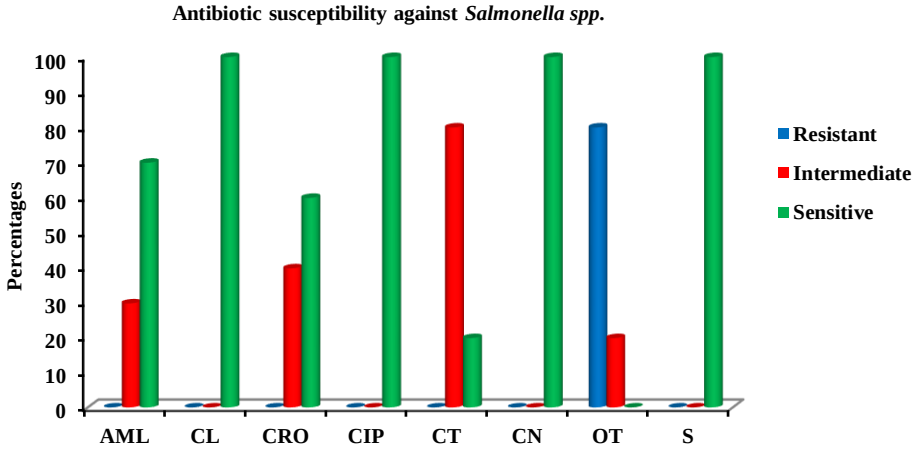

Figure 3 Pattern of different antibiotic susceptibility against *Salmonella spp*

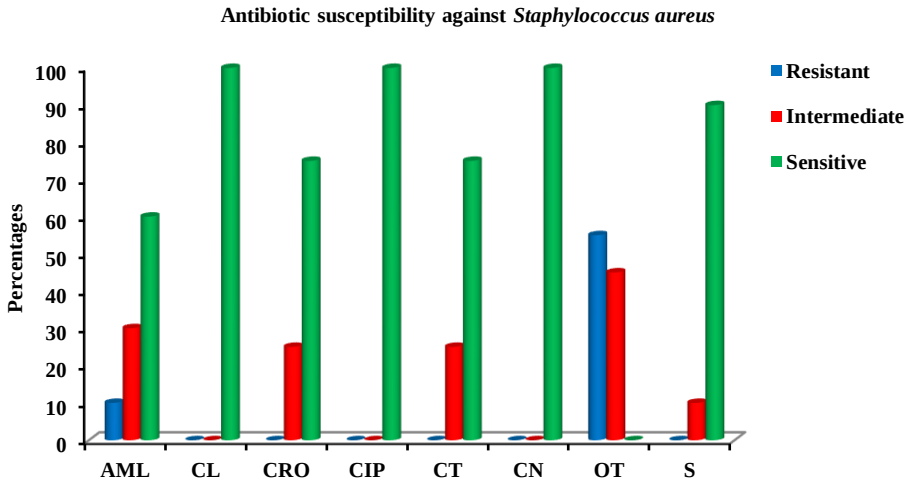

Figure 4 Pattern of different antibiotic susceptibility against *Staphylococcus aureus*

Conclusion:

The report also indicated the development of multi drug resistance against commonly used antibiotics in bacteria isolated from, fucka, chicken biriani, sugarcane juices and egg toast samples. Around the world multi-drug resistant against common

pathogenic bacteria is of great health concerns because it makes the treatment of food borne outbreaks more difficult, particularly in developing countries, which already practices poor health and hygiene conditions. Our study reveal that all three isolates from food products having complete sensitivity to Cephalexin and Gentamicin, as a consiquence it indicate that the choice of Cephalexin and Gentamicin is appropriate for limiting the hazzard related to consumption of bacterial contaminated food. On the other hand, all the three isolates are resistant to oxytetracycline among the commonly used antibiotics with a little bit of variation.

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