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Incidence of food borne pathogens of chicken sold in and around greater Hyderabad Municipal Corporation

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Abstract
To study the incidence of food borne pathogens of chicken sold in and around Greater Hyderabad Municipal Corporation. A total of 150 chicken samples were collected from each source i.e. Large scale processing centers, Hygienically maintained chicken shops and Road side slaughtering stalls. The incidence of *S. auerus* was 100% in the chicken samples from road side slaughtering stalls, 84% in the samples from large scale processing centers and it was in between two sources (96%) in the samples from hygienically maintained chicken shops were recorded. All the chicken samples from road side slaughtering stalls and hygienically maintained chicken shops were positive for *E. Coli*. where as 96% of the chicken samples from Large scale processing centers were positive for *E. Coli*. The incidence of *Salmonella spp* was 92% in the chicken samples from road side slaughtering stalls, 76% in the samples from large scale processing centers, which was less and it was in between (88%) in the samples from hygienically maintained chicken shops. The incidence of *Clostridium* spp was 84% in the chicken samples from road side slaughtering stalls, 68% in the samples from large scale processing centers and (78%) in the samples from hygienically maintained chicken shops. The incidence of *Listeria* spp. was high (70%) in the chicken samples from road side slaughtering stalls, less (56%) in the samples from large scale processing centers and it was in between (64%) in the samples from hygienically maintained shops. The incidence of *Campylobacter* spp. was 56% in the chicken samples from road side slaughtering stalls, whereas 42% and 50% in the samples from large scale processing centers and hygienically maintained chicken shops respectively.

Keywords: incidence-pathogenic microbes-chicken-different source-public health importance

Introduction
In recent times, Poultry industry is growing rapidly in India due to high rate of urbanization and changed food consumption pattern. In most of the chicken retail shops, the sanitary and hygienic conditions are not up to the expected conditions, even it will be in worsen conditions, especially in Road side vendors. The absence of organized poultry slaughter houses under Indian conditions is the main reason for poor quality of chicken in the markets. To maintain low microbial load of chicken, application of HACCP is practiced in Large processing centers, but in smaller chicken outlets due to negligence and lack of infrastructure, it is not practiced (Darshana *et al*., 2014) [14]. Many pathogens like *E. coli*, *S. aureus*, *Salmonella* spp, *Clostridium* spp, *Listeria* spp, *Campylobacter* spp etc. have been isolated in many of the food borne diseases outbreaks through chicken and its products that affects public health. In view of these facts and as there is no proper study on load of various pathogenic microbes in chicken sold at different markets; the present study was carried out.

Materials and Methods
The study was conducted in the laboratory of Veterinary public Health and Epidemiology, College of Veterinary Science Rajendranagar, Hyderabad. Meat samples from three sources i.e large scale processing centers, hygienically maintained chicken shops and Road side slaughtering stalls of 150 samples each source 100g quantity, packed in self-sealed sterilized polyethylene bags with appropriate labeling. The samples were kept at refrigeration temperature till further analysis.

Results and Discussion
Incidence of *E. coli*
All the chicken samples from Road side slaughtering stalls and hygienically maintained

chicken shops were positive for *E. coli* where as 96% of the chicken samples from large scale processing centers were positive for *E. coli*. The incidence of *E. coli* (98%) reported by Sakia and Joshi (2010) [37] from local chicken markets of North east India was almost similar to the Incidence in the present study from Large scale processing centers. Very low incidence of *E. coli* from Large scale processing centers 2%, 4%, 10%, 14.57%, 20% and 25% were reported by Iroha *et al*. (2011), Ibrahim *et al*. (2015) [17] Commercial retail shops in Benisuef city, Kumar *et al*. (2014) [27], Vaidya *et al*. (2005) [46] Organized poultry slaughter house in Mumbai, Jerry *et al*. (2015) [19] Nigeria and Sharf and Sabra (2012) [39] respectively.

Table 1: Incidence of pathogens in chicken collected from different sources

S. No	Pathogen	Large scale processing centers	Hygienically maintained chicken shops	Road side slaughtering stalls
1	*S. auerus*	42 (84%)	48 (96%)	50 (100%)
2	*E. coli*	48 (96%)	50 (100%)	50 (100%)
3	*Salmonella spp*	38 (76%)	44 (88%)	46 (92%)
4	*Clostridium spp*	34 (68%)	39 (78%)	42 (84%)
5	*Listeria spp*	28 (56%)	32 (64%)	35 (70%)
6	*Campylobacter spp*	21 (42%)	25 (50%)	28 (56%)

Moderate incidence of *E. coli* from Large scale processing centers 38.7%, 40%, 42-88%, 42-88%, 45.4%, 70.22% and 61.1% were reported by Zhao *et al*. (2001) [47], Bohara (2017) [7] Local markets of kanchanpur District Nepal, Badhe *et al*. (2013) [4] wet market in Bangalore, Ruban *et al*. (2010) [36], Darshana *et al*. (2014) [14] and Vaidya *et al*. (2016) [45] respectively. Moderate incidence of *E. coli* from Hygienically maintained chicken shops of 43% and 68% was reported by Cohen *et al*. (2007) [11] and Patyal *et al*. (2012) [34] from retail shops in Jaipur was less than the incidence in the present study (100%) from the same source. The incidence of *E. coli* (98%) reported by Sharma and Chatopadhyay (2015) [40] Open markets of Kolkatta was almost similar to the Incidence in the present study (100%) from Road side vendors. The main source of *E. coli* in chicken meat is through contaminated water and feacal contents, whose conditions are not up to the mark in street vendors that resulted higher *E. coli* in Road side slaughtering stalls samples (Afolabi *et al*., 2017) [1].

Incidence of *S. aureus*

The incidence of *S. auerus* was 100% in the chicken samples from road side vendors, 84% in the samples from large scale processing centers and it was in between (96%) in the samples from hygienically maintained chicken shops. The incidence of *S. auerus* (76.6%) reported by Vaidya *et al*. (2016) [45] from retail outlets, Pune was less than the Incidence in the present study from Large scale processing centers (84%), whereas Very low incidence of *S. auerus* from Large scale processing centers of 6.67%, 10.0%, 17.9%, 20% and 30.30% was reported by Arul kumar and Saravanan (2011) [3], Sharf and sabra (2012) [39], Kozacins *et al*. (2012) [25], Sakia and Joshi (2010) [37] and Kozacinski *et al*. (2006) [26] respectively.

Moderate incidence of *S. auerus* from Large scale processing centers of 52%, 57%, 62.02%, 72% and 73%was reported by Koluman *et al*. (2011) [23], Bohara (2017) [7], Bananna *et al*. (2016) [5], Ahmad *et al*. (2013) [2] and Ibrahim *et al*. (2015) [17] commercial retail shops in Benisuef city respectively. Moderate incidence of *S. auerus* from Hygienically maintained chicken shops 20%, 22.7%, 38%, 57%, 65% and 65.8% was reported by Sharma and chattopadhyay (2015) [40], Patyal *et al*. (2012) [34] from retail shops, Jaipur, Gundogan *et al*. (2005) [16], Javadi and saeid (2011) [18] and Kitai (2005) [22] respectively, which were less than the incidence in the present study.

The incidence of *S. auerus* (100%) reported by Badhe *et al*. (2013) [4] and Joshi and Joshi (2010) [37] was similar to the Incidence in the present study from Road side vendors. The major contamination source for *S. auerus* is handlers hands and surfaces of equipment that gives higher counts in chicken from Road side slaughtering stalls (Datta *et al*., 2012) [15], whereas the counts were less in chicken from large scale processing centers where personnel hygiene is maintained (Ahmad *et al*., 2013) [2].

Incidence of *Salmonella spp*.

The incidence of *Salmonella spp* was 92% in the chicken samples from road side vendors, 76% in the samples from large scale processing centers and it was 88% in the samples from hygienically maintained shops. The incidence of *Salmonella spp* 3%, 3%, 8%, 14.2%, 20.5% and 41.7% was lower than the Incidence in the present study from Large scale processing centers was reported by May (1969) Zhao *et al*. (2001) [47], Kumar *et al*. (2014) [27], Morris and wells (1970) [32], Surkiewcz *et al*. (1969) [43] and Brichta-Haray *et al*. (2008) [8] respectively. The incidence of *Salmonella spp* 100% reported by Brichta-Haray *et al*. (2008) [8] was higher than the Incidence in the present study from hygienically maintained chicken shops.

The incidence of *Salmonella spp* 95% reported by Brichta-Haray *et al*. (2008) [8] was almost similar to the Incidence in the present study from Road side vendors. Very low incidence of *Salmonella spp* from Road side slaughtering stalls of 12%, 25% and 30% was reported by Ibrahim *et al*. (2015) [17] from retail shops in Benisuef city, Jorgenson *et al*. (2002) [20] from retail outlets in England and Vaidya *et al*. (2016) [45] from retail outlets in Pune respectively. Salmonella mainly comes from the poultry birds especially feaces and feathers, the cross contamination with these items results different levels of contamination (Kindu and Addis, 2013) [21].

Incidence of *Clostridium spp*

The incidence of *Clostridium spp* was 84%, 68% and 78% in the chicken samples from road side vendors, large scale processing centers and hygienically maintained chicken shops respectively. The incidence of *Clostridium spp* (66%) reported by Nowell *et al*. (2010) [33] was almost similar to the Incidence in the present study from Large scale processing centers (68%). Very low incidence of *Clostridium spp* from Large scale processing centers of 3.81%, 4%, 7.2% and 13.88% was reported by Thangamani and Subramanian (2012) [44], Craven *et al*. (2003) [13], Cohen *et al*. (2007) [11] and Vaidya *et al*. (2005) [46] from Organized poultry slaughter houses in Mumbai respectively. Moderate incidence of *Clostridium spp* from large scale processing centers (58%) was reported by Hall and Angoletti (1965).

Moderate incidence of *Clostridium spp* from hygienically maintained chicken shops of 70% and 70.4% was reported by Cakmak *et al*. (2016) and Singh *et al*. (2005) [41] respectively. The incidence of *Clostridium spp* of 83%, 84% and 84% was almost similar to the incidence in the present study from Road side slaughtering stalls (84%) was reported by Javadi and Saeid (2011) [18], Miwa *et al*. (1998) [30] and Shalt out (2017)

[38] respectively. The major source of *Clostridium spp* are soil, floors and feaces whose contact gives infection and the level of contact decides the incidence and counts of Clostridum that results varied levels in chicken processed under different conditions.

Incidence of *Listeria spp*

The incidence of *Listeria spp* was 70% in the chicken samples from road side vendors, 56% in the samples from large scale processing centers and it was in between (64%) in the samples from hygienically maintained shops. Very low incidence of *Listeria spp* from Large scale processing centers 0.5%, 1.9%, 3%, 3.03%, 4.5%, 6% and 15% were reported by Cohen *et al*. (2007) [11], Molla *et al*. (2004) [31], Colmenga *et al*. (2009) [12], Kozacinski *et al*. (2006) [26], Kozacins *et al*. (2012) [25], Ibrahim *et al*. (2015) [17] and Sakia and Joshi (2010) [37]. *Listeria spp* can contaminate poultry either environmentally or from healthy carrier birds (Skovgard and Morgan, 1998) and improper cleaning and disinfecting of environment and equipments in poultry processing plants and Mishandling of products leads to listeria contamination of poultry meat (Loura *et al*., 2005) [28].

Incidence of *Campylobacter* spp

The incidence of *Campylobacter* spp was 56% in the chicken samples from road side vendors, 42% in the samples from large scale processing centers and it was in between (50%) in the samples from hygienically maintained shops. The incidence of *Campylobacter spp* of 47%, 71% and 70.7% was higher than the Incidence in the present study from Large scale processing centers was reported by Rahimi and Tajbakish (2008) [35], Meldrum *et al*. (2004) [29] and Zhao *et al*. (2001) [47] respectively.

The incidence of *Campylobacter spp* (83%) reported by Jorgenson *et al* (2002) [20] was higher than the Incidence in the present study from hygienically maintained chicken shops. The incidence of *Campylobacter spp* (56.1%) reported by Rahimi and Tajbakish (2008) [35] was almost similar to the Incidence in the present study from Road side vendors. High incidence of *Campylobacter spp* from Road side slaughtering stalls of 66.6% and 95% was reported by Kornelija *et al*. (2009) [24] and Bandekar *et al*. (2005) [6] respectively. The incidence of *Campylobacter spp* in chicken might be due to cross contamination through handlers and environment (Burgess *et al*., 2005) [9].

Conclusion

The incidence of *S. auerus* was 100% in the chicken samples from Road side slaughtering stalls, 84% in the samples from large scale processing centers and 96% in the samples from hygienically maintained chicken shops. The incidence of *Escherichia coli* was 100% in the chicken samples from Road side slaughtering stalls, 96% in the samples from large scale processing centers 100% in the samples from hygienically maintained chicken shops. The incidence of *Salmonella spp* was 92% in the chicken samples from Road side slaughtering stalls, 76% in the samples from large scale processing centers 88% in the samples from hygienically maintained chicken shops.

The incidence of *Clostridium spp* was 84% in the chicken samples from Road side slaughtering stalls, 68% in the samples from large scale processing centers 78% in the samples from hygienically maintained chicken shops. The incidence of *Listeria spp* was 70% in the chicken samples from Road side slaughtering stalls, 56% in the samples from large scale processing centers 64% in the samples from hygienically maintained chicken shops. The incidence of *Campylobacter spp* was 56% in the chicken samples from Road side slaughtering stalls, 42% in the samples from large scale processing centers 50% in the samples from hygienically maintained chicken shops.

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