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INCIDENCE OF HOSPITAL ACQUIRED INFECTIONS TO ANIMALS FROM VETERINARY HOSPITALS

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Abstract– The present study was undertaken to get an idea regarding incidence of hospital acquired infections from inanimate objects in veterinary hospitals to animals. In this study, a total of180 samples were collected twice daily immediately after opening and closing of hospital thrice in a week for a period of two and half months from different areas in the hospitals such as chairs in the waiting area, general examination of 180 Tables in outpatient ward and injection ward. Samples were collected using wet swabs in 4 cm^2 area from selected places and analyzed for total viable count and presence of pathogens *i.e., Escherichia coli*, *Staphylococcus* spp and *Salmonella* spp. The total viable count in different places of hospital environment ranges from 52.96 $x10^3$cfu/cm^2/ml to 113.60$x10^3$cfu/cm^2/ml. Out of 180 samples collected from three different places of veterinary hospital, 89, 103 and 94 samples shown positive for *Escherichia* spp, *Salmonella* spp and *staphylococcus* spp respectively. The incidence was 40% and 58.8% for *Escherichia coli*, 44.4% and 70% for *Salmonella* spp,38.8% and 65.5% for Staphylococcus spp in the morning and evening samples respectively. The Regular microbiological surveillance of veterinary hospitals is required to detect and control of infectious agents, educating animal care workers, animal attendants on best hygienic practices could help in reducing risk of getting nosocomial infections**.**

INTRODUCTION

Hospital acquired infections (HAI'S) are also known as nosocomial infections, are infections acquired during the process of hospitalization are inherent risks in fields of human and veterinary practice (Stull *et al.,* 2015). Among the pathogens, bacteria are common pathogens followed by fungi and viruses (Sikora *et al.,* 2022). Pet animals can be infected with pathogens during the process of hospitalization, which creates threat to animal as well as public health. Severe threats may be caused when multidrug-resistant bacteria involved (Keck *et al.,* 2020)

Public health issues involve spreading of pathogens to hospital staff, other animals in contact and animal attendants. Animals suffering from hospital acquired infection increases stay in hospital which leads to economic loss to pet owners, some of the pets will suffer from permanent health consequences leading to death (Keck *et al.,* 2020). Regular practice of general infection prevention measures can reduce HAI's dramatically. Direct (by physical contact), indirect (through infected objects from hospitals), and airborne infections via droplet or inhalation are the most common methods of transmission. Transmissions via blood and food are quite rare (Milton *et al.,* 2015)

Various scientists reported certain HAI bacterial infections like Methicillin-Resistant *Staphylococcus aureus*, *Clostridium difficile*, Multi drug resistant *Escherichia coli*, *Salmonella* spp (Milton *et al.,* 2015) fungal infections like Candida spp., *Aspergillus* spp., Mucorales, *Fusarium* spp (Perlroth *et al.,*2007)

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parasitic infections like *Toxoplasma gondii*, plasmodium spp, Babesia spp, Demodex folliculorum/Demodex brevis, Giardia spp, Cryptosporidium spp (Fürnkranz and Walochnik, 2021), viral infections like Hepatitis B, C. influenza, and rotavirus (Ahmed Khan *et al.,* 2017). Numerous documented nosocomial outbreaks with various aetiologies in veterinary hospitals for both large and small animals have led us to think that nosocomial infections are significant issues in veterinary medicine (Dallap Schaer *et al.,* 2010). Sufficient information not available about common HAI from veterinary dispensaries in India, so present was undertaken

MATERIALS AND METHODS

Sample collection: A total of 180 samples were collected aseptically using wet swabs from 4 cm^2 area of three places such as chairs in the waiting area (CWA), general examination tables (GET) in outpatient ward, and injection ward (IWT) of Veterinary Clinical Complex, College of Veterinary Science, P V Narsimha Rao Telangana Veterinary University, Hyderabad, Telangana. The collected samples were carried to laboratory for further analysis in ice box.

Frequency of sample collection: The samples were collected thrice in a week i.e., on Monday and Friday, Saturday. The samples were collected immediately after opening and closing of the hospital (twice) from three selected places for a period of two and half months.

Preparation of media: Different culture media like plate count agar (Total viable count), Eosin Methylene Blue Agar (*Escherichia coli*), Mannitol Salt Agar (*Staphylococcus* spp), Brilliant Green Agar (*Salmonella* spp) were prepared as per the manufacturer's instructions. Nine ml phosphate buffer blanks were prepared. Then the culture medias and phosphate buffer blanks were sterilized at 116 ^{0}C (15 lbs for 15 mins)

Processing of samples: one ml of phosphate buffer saline (pbs) in which sample was mixed transferred to nine ml of pbs test tube which makes 1:10 dilution and so on up to 10^5dilutions. One ml of 10^3 dilution was used for enumeration of total viable count (TVC) and pathogens. One ml of aliquot spread on the petridish and sufficient quantity of respective media was poured and allowed to spread uniformly. The plates were incubated at 37 ^{0}C ± 0.5 for 24-48 hours. Colonies on each plate having 30-300 colonies were counted by using a digital colony counter. Based on colony characteristics, colonies were picked and subcultured on different selective media for presence of specific pathogens *i.e., Escherichia coli*, *Staphylococcus* spp and *Salmonella* spp. Gram staining and common biochemical tests such as the coagulase test, IMViC tests (indole, methyl red, Voges-Proskauer, citrate utilization), urease test, oxidase test, catalase test, nitrate reduction test, and triple sugar iron agar test were used to identify and confirm the pathogen.

Statistical analysis: The results obtained in the present study were subjected to analysis through software (Version ,16; SPSS) by applying one way ANOVA. The treatment means were ranked using Duncan's multiple range test with significance at 5% level (Duncan, 1955). All the statistical procedures were done as per Snedecor and Cochran (1994).

RESULTS AND DISCUSSION

The total viable counts of samples collected from the three places of veterinary hospital during morning and afternoon time are depicted in the Table 1.

The total viable count in samples collected before opening the veterinary hospital at morning time from general examination tables were significantly ($P<0.05$) lower when compared with chairs in waiting area and injection ward table and significantly ($P<0.05$) higher total viable counts observed in samples collected from the IWT.

TVC in samples collected before closing the

Table 1. Cfu/cm^2/ml

Time of collection	General examination table (GET)	Chairs in waiting area (CWA)	Injection ward table (IWT)	SEM	P	N
After opening of Veterinary Hospital (Mean ± SE)	52.96^{c} ±3.26	64.16^{b} ±3.14	75.13^{a}±3.89	2.18	0.001	30
Before closing of Veterinary Hospital (Mean ± SE)	91.66^{b} ± 4.49	109.26^{a}±5.52	113.60^{a}±4.94	3.02	0.006	30

*The values obtained are from the 3rd serial ten-fold dilution of sample

Table 2.

Sample type	Before opening of hospital			Before closing of hospital		
	E. coli	*Salmonella*	*Staphylococcus*	*E Coli*	*Salmonella*	*Staphylococcus*
General Examination Table(GET)	10 (33.3%)	13 (43.3%)	11 (36.6%)	15 (50%)	19 (63.3%)	21 (70%)
Chair in Waiting Area (CWA)	14 (46.6%)	18 (60%)	9 (30%)	17 (56.6%)	20 (66.6%)	18 (60%)
Injection Ward Table (IWT)	12 (40%)	9 (30%)	15 (50%)	21 (70%)	24(80%)	20 (66.6%)

veterinary hospital at afternoon time from GET were significantly lower when compared with CWA and IWT. The TVC were comparable between CWA and IWT.

The number of Pathogenic bacteria present in the samples collected from the three locations of veterinary hospital before opening and closing of hospital are presented in the Table 2.

Out of 180 samples collected from three different places of veterinary hospital, 89, 103 and 94 samples shown positive for *Escherichia*Spp, *Salmonella* spp and *staphylococcu*s sps respectively. 36 and 53 samples for *Escherichia* spp, 40 and 63 samples for *Salmonella* sps and 35 and 59 samples for *staphylococcus* spp were positive among all collected samples immediately after opening and closing of hospital respectively.

The incidence of *E.coli, Salmonella* and *Staphylococcus* has been increased at the time of closing of hospital compared with opening of hospital. The incidence of *E.coli* on GET as morning time was 33.3% which has been increased to 50% at the time of closing similarly the incidence of *Salmonella* and *Staphylococcu*s was 43.3% and 36.6% respectively on GET has been increased to 63.3% and 70% respectively.

The incidence of *E.coli*on CWA was 46.6% immediately after opening of hospital which has been increased to 56.6% at the time of closing. Similarly, the incidence of *Salmonella* and *Staphylococcus* was 60% and 30% respectively on CWA has been increased to 66.6% and 60% respectively.

The incidence of *E. coli*, S*almonella* spp, *Staphylococcus* spp on IWT was 40%,30% and 50% respectively has been increased to 70%,80% and 66.6% respectively.

Gizaw *et al.* (2016) reported that lowest bacterial contamination (480 cfu/m^3) in the air of hospital wards at 8:00am (at the time of opening) which has increased to 1468cfu/m^3 (at 2pm) indicating three times increase due to flow of patients as well as accompanying people, Similar increase was noticed in TVC from morning to evening on all the three places in present study. Fekadu and Getachewu (2013) also observed in a surgical ward that a count of 3.3xcfu/m^3 at the opening time, which has been increased almost three times (9.7x10^3cfu/m^3) at 4:00pm. In the present study also TVC counts from all the three places has been doubled the counts at

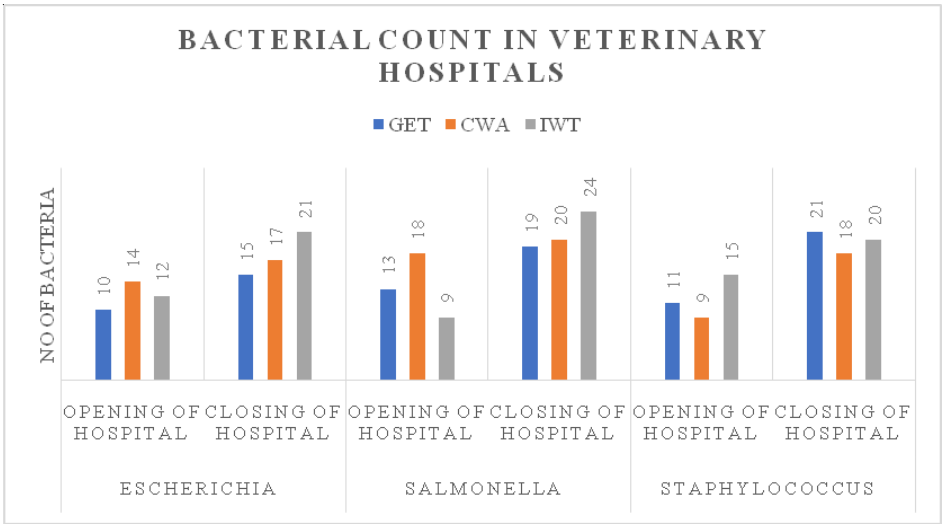

Fig 1. Representing number of samples positive for three bacteria (*Escherichia* spp, *Salmonella* Spp, *Staphylococcus* spp)

closing time of veterinary hospitals. Lower TVC counts of $4.8x10^2$ to $1.4x10^3$cfu/m^3 was reported by Gizaw *et al.* (2016), whereas Feakadu and Getachewu (2015) reported higher counts of $9.7x10^3$cfu/m^3 from Jima university specialized hospital than the counts observed in the present study. The counts on all the three surfaces both at morning and evening are higher than the recommendation (1000cfu/m^3) of WHO expert group. The higher TVC in the present study might be due to contaminated pets and owners and activities like grooming, roaming and etc. in the hospital (Gizaw *et al*., 2016).

The incidence of *E.coli, Salmonella, Staphylococcus* spp on three places (GET, CWA, IWT) were high compared to the incidence reported by Suchitra *et al.* (2008 . The incidence of *E.coli* and *Salmonella* was high in CWA both at morning and evening whereas Staphylococcus sps was high on IWT in the morning and evening which might be due to contamination from the animals . The counts of the pathogens were low on GET Table where in pets were examined for short time, but their incidence has been increased evening due to many numbers of patients handling during working time (Wenzel et *al*., 1981).

Low incidence of 14% and 9% Staphylococcus aureus on hospital furniture was reported by Middleton *et al.* (2005) and Loeffler *et al.* (2005). Boag *et al.* (2004) and O'Mahony *et al*. (2005) observed increase on Staphylococcus counts on various surfaces of veterinary hospitals due to handling of companion animals. An increase in Salmonella incidence in veterinary hospital furniture and tables was observed by Cummings *et al*. (2014). An incidence of 2.2% and 11.9% of Salmonella spp in veterinary hospital environment was reported by Alinovi *et al*. (2003) and Burgess *et al*. (2004) respectively which was very less than incidence observed in the present study both morning and evening.

Aksoy *et al.* (2010) reported 55.8% incidence of *Staphylococcus* which was slightly higher than the incidence (60-70%) observed on the three tables -at the time of closing hospital, in the present study.

CONCLUSION

Regular microbiological surveillance of veterinary hospitals is required to detect and control of infectious agents. Educating animal care workers, animal attendants on best hygienic practices could help in reducing risk of getting nosocomial infections**.**

Further scope of research: There is scope for molecular examination of pathogens to identify the strains and study of antibiotic resistance of the isolates.

Conflict of interest: The authors declare that they have no conflict of interest.

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