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Prevalence of Methicillin Resistant *Staphylococcus aureus i*n Canine Dermal Infection in Mizoram

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ABSTRACT

Many of the antibiotics have been prescribed for different clinical signs and symptoms of bacterial and viral infections from its discovery. Due to the excessive use of antibiotics, microorganisms increase their resistance power against many of antibiotics. Penicillin was used in an excessive manner after its discovery which resulted in the formation of Methicillin resistant *Staphylococcus aureus* (MRSA). Dogs could be a source of zoonotic MRSA. There are only few studies about the prevalence of MRSA in dogs in India. There are no reported studies about MRSA in dogs of north-east India especially in Mizoram. The study was undertaken with the objective to study the prevalence of MRSA in canine dermal infection in Mizoram Bacteriological screening on 100 samples from canine dermal infection in Mizoram gave 76 positive samples for *Staphylococcus* spp. and 46 samples were found positive for *S. aureus* in Mizoram in canine dermal infection. Prevalence of MRSA was found 22% in canine dermal infection in Mizoram.

HIGHLIGHTS

- The zoonotic MRSA bacteria can be transmitted by dogs.
- There is no comprehensive documented research on MRSA in North-East Indian or Mizoram dogs.

Keywords: Canine dermal infection, Bacteriological screening, Methicillin resistant *Staphylococcus aureus* (MRSA), Prevalence

Staphylococcal infection is of major importance in both human and Veterinary medicine. *S. aureus* is a Gram positive, non-spore forming bacteria and it may be found singly, in pairs, in short chains, or in irregular clusters. *S. aureus* is a major resident or transient colonizer of the skin and the mucosa of human and animals and the colonies were circular, smooth and glistening. *S. aureus* causes variety of infection in animal and human from mild skin infection to life threatening invasive infections (Pantosti, 2012). Studies found that MRSA can cause infections in dogs and dogs can also act as reservoirs of MRSA. Recurrent pyoderma is an important clinical skin problem in dogs (Reddy *et al*., 2016). In subsequent years MRSA has gained global attention as a human pathogen in hospitals and in communities. MRSA infection and colonization in companion animal (dogs and cats) indicate that MRSA has apparently developed as a pathogen of animals. There were so many infections in dog with MRSA having involved with postoperative infections. It lacks specific types of infections, clinical outcomes, and risk factors associated with such MRSA infections in dogs (Faires *et al*., 2010). The household is the site of close interactions between all the family members, so it is the place from where *S. aureus* may be spread among household members. The people who work in veterinary

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hospitals, own pet house, and work on farms may be at greater risk for MRSA colonization or infection perhaps because of transmission of MRSA between humans and animals. Cats and dogs were shown to play a role in household transmission of MRSA, and they may also represent important targets for further transmission of MRSA in the community (Bramble *et al*., 2011). There were only scanty studies about the occurrence of MRSA in dogs in India. There were no reported studies about MRSA in north-east India especially Mizoram.

MATERIALS AND METHODS

Study Location and Data Source

This research was conducted at Teaching Veterinary Clinical Complex, College of Veterinary Sciences and Animal Husbandry, Central Agricultural University, Selesih, Aizawl, Mizoram and veterinary dispensaries of Mizoram state.

A total of 100 dogs of either sex which brought for treatment to the Teaching Veterinary Clinical Complex, College of Veterinary Sciences and Animal Husbandry, Central Agricultural University, Selesih, Aizawl, Mizoram and veterinary dispensaries of Mizoram state were screened on the basis of symptoms like crusts, scaling, papules, pustules, erythema, hair loss and inflammation in the ear or skin infections, infections of the eyes, skin, ears or respiratory system.

Data Collection

The animals were categorized based on the age, sex, and body weight. All the animals were divided in four age groups: pups (below 6 months), young (6 months to 2 years), middle age (2 to 8 years) and old (more than 8 years). Body weight was categorized according to small (between 1 to 10 kg), medium (between 10 to 25 kg) and large (more than 25 kg). Swab samples from skin lesions were collected with a sterile swab on the affected areaas per the standard protocol. After collection, swab was inoculated on 5ml nutrient broth for 24 hours at 37°C. The swab sample from skin lesion incubated in Nutrient broth at 37°C for 24 hours was streaked on selective media plates of Baird Parker Agar (BPA) and kept overnight at 37°C for observing the colony growth (Fig. 1). *Staphylococcus* species was identified by grams staining and catalase test.

For catalase test a small amount of colony from BPA plate was transferred to a clean, dry glass slide by using a loop and placed few drops of 10% hydrogen peroxide on the culture. Formation of oxygen bubbles was confirmatory for *Staphylococcus* spp.

Presence of *S. aureus* was confirmed by using commercially available kit Hiaureus Coagulase Confirmation Kit from (HIMEDIA) (Fig. 2). Antibiotic Sensitivity Test was conducted as per standard protocol. Mueller Hinton Agar

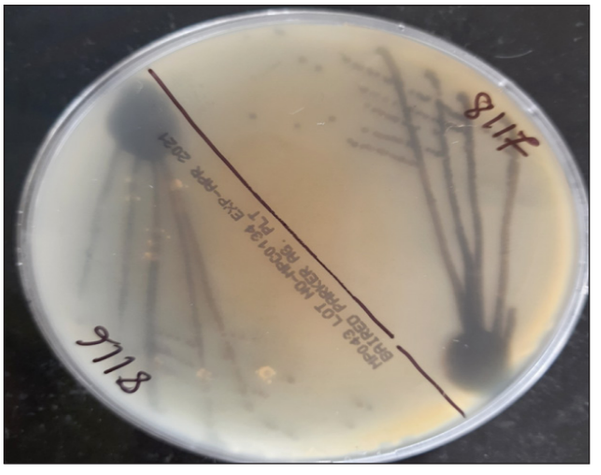

Fig. 1: Typical black colour colony was found on BPA media plate

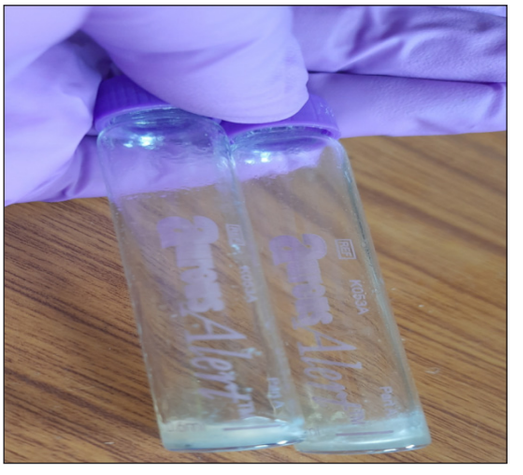

Fig. 2: Clot formation in Hiaureus Coagulase Confirmation Kit for *S. aureus* (K053AD) detection: Positive

was used for antibiotic sensitivity test. A small amount of colony culture from BPA media plate was inoculated in Luria Bertani (LB) broth for 24 hours at 37°C. Inoculated LB broth was spread on MHA plate for antibiotic sensitivity test. Methicillin resistant *S. aureus* was diagnosed by using Methicillin disc in Antibiotic Sensitivity Test.

RESULTS AND DISCUSSION

Out of 100 cases examined, 89 samples were showing positive growth on BPA media where 78 samples were found gram positive bacteria by gram staining. Out of 78 samples 76 numbers were positive for catalase test. 46 samples were showing clot formation in Hiaureus Coagulase Confirmation Kit Test for *S. aureus*. 22 samples were found MRSA by antibiotic sensitivity test.

After Hiaureus coagulase confirmation test it was observed *S. aureus* infected samples were 46 out of 100 samples. Prevalence of *S. aureus* in Mizoram in canine dermal infection was 46%.

Methicillin resistant *Staphylococcus aureus* was found in 22 samples and Methicillin sensitive *Staphylococcus aureus* was found 24 by antibiotic sensitivity test. Prevalence of MRSA in Mizoram in canine dermal infection was found 22%.

Table 1: Laboratory Diagnostic Tests for Methicillin resistant *S. aureus* infected animals

Laboratory Tests	Total No.	Positive No.	Percentage (%)
Culture on BPA media	100	89	89
Grams staining	89	78	87.64
Catalase Test	78	76	97.43
Hiaureus Coagulase Confirmation Kit Test for *S. aureus*	76	46	60.52
MRSA in Antibiotic Sensitivity Test	46	22	47.82

In this study, it was observed that total number of *Staphylococcus* positive samples were 76 out of 100 (76%) samples from Mizoram in canine dermal infection. This result was less than Janos *et al*. (2021) where they reported a total of 43 skin samples were positive for *Staphylococcus* from 78 (55.12%) samples collected from skin of dogs. 67.3% samples were found *S. aureus* positive from muco-cutaneous site of dogs from New South Wales in Australia by Ma *et al*. (2020). 100% of dogs were found positive for *Staphylococcus* species as per the report of González-Domínguez *et al*. (2020). But this work was based on canine superficial pyoderma where 50 dogs were tested for *Staphylococcus* and all were positive. Prevalence of *S. aureus* in Mizoram in canine dermal

Table 2: Prevalence of *Staphylococcus aureus* based on age, sex and body weight in canine dermal infection in Mizoram

Age Group	Body Weight (Kg)						Total
	Small (1-10 Kg)		Medium (>10-25 Kg)		Large (>25 Kg)		
	Male	Female	Male	Female	Male	Female	
Below 6 months	06	02	00	00	00	00	08
Between 6-24 months	06	02	02	04	00	00	14
Between 2-8 years	02	04	08	06	00	02	22
Above 8 years	00	00	00	00	00	02	2
Total	14	08	10	10	00	04	46

Table 3: Prevalence of Methicillin Resistant *Staphylococcus aureus* based on age, sex and body weight in canine dermal infection in Mizoram

Age Group	Body Weight (Kg)						Total
	Small (1-10 Kg)		Medium (>10-25 Kg)		Large (>25 Kg)		
	Male	Female	Male	Female	Male	Female	
Below 6 months	02	02	00	00	00	00	04
Between 6-24 months	02	02	02	00	00	00	06
Between 2-8 years	02	02	04	00	00	02	10
Above 8 years	00	00	00	00	00	02	02
Total	06	06	06	00	00	04	22

infection was 46%. According to Sekhar *et al*. (2017), 14 isolates (35%) were showing positive for *S. aureus* out of 40 nasal samples collected from apparently healthy dogs in Andhra Pradesh, India. According to Yadav *et al*. (2018), a total 21 swab samples were collected from Veterinary Clinical Complex, College of Veterinary Science and Animal Husbandry, Mathura from dogs with pyogenic infection and 8 isolates (50%) were positive for *S. aureus*. Nine nasal swabs collected from dogs were positive for *S. aureus* out of 36 samples from Bangladesh according to Rahman *et al*. (2018). A study conducted by Hakim *et al*. (2019) at Wayanad district, India was showing 23 samples were positive in 30 nasal swabs from apparently healthy dogs (76.67%). A total of 26 (42.62%) *S. aureus* positive samples were found from 61 samples collected from dog in Dhaka according to Habibullah *et al*. (2017). Prevalence of MRSA in Mizoram in canine dermal infection was found 22%. According to Reddy *et al.* (2016), 50 skin swabs were collected at College Hospital of College of Veterinary Science, Tirupati from 2009 to 2011 from dogs with recurrent pyoderma where, 6 samples were MRSA positive (12%).

According to Sekhar *et al*. (2017), 5 isolates (12.5%) were showing resistance for Oxacillin and Cefoxitin out of 40 nasal samples collected from apparently healthy dogs in Andhra Pradesh, India. According to Yadav *et al*. (2018), a total 21 swab samples were collected in Veterinary Clinical Complex of College of Veterinary Science and Animal Husbandry, Mathura from dogs with pyogenic infection where 4 isolates (19.05%) were positive MRSA. In this study it was observed that, occurrence of MRSA in dogs below 6 months were 4%, between 6- 24 months were 6%, between 2-8 years were 10% and above 8 years were 2%. Here also it was found that positive samples were more in numbers from adult (2-8 years) dogs which was in agreement with Faires *et al*. (2010) where they found more numbers of MRSA cases in adult dog from 3-8 years age group. It might be due to adult dogs were most of the times staying outside of home. Here it was found that, prevalence of MRSA positive samples was more in male dogs (12%) than in female dogs (10%) in Mizoram in canine dermal infection. The reason might be the preference of dog owners for male dog in this locality. Here also observed that, the 12 number isolates were positive from small (1-10 Kg), 6 were positive for medium (>10-25 Kg) and 4 were positive from large (>25 Kg) MRSA positive in Mizoram in canine dermal infection based on body weight. It was showing that small (1-10 kg) dogs were more in number for MRSA. But according to Faires *et al*. (2010) more no. of MRSA in were found from medium breed (>10-25 Kg). It might be due to a greater number of samples was collected from small (1-10 Kg) dogs.

CONCLUSION

The present study showed the occurrence of MRSA is more in adult dogs between ages of 2-8 years and reported more in number from male dogs than female dog in Mizoram in canine dermal infection. However, it is also found that from small size between 1-10 kg, medium size between more than 10-25 kg, large size more than 25 kg based on body weight. Therefore, it is required to understand the occurrence of MRSA in canine regards its sex, age and body weight.

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