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Bratati Deb Sarkar
M.V.Sc scholar, Department of Veterinary Clinical Medicine, Ethics and Jurisprudence C. V. Sc, AAU, Khanapara, Assam, India

Ditul Batman
Assistant Professor, Department of Veterinary Clinical Medicine, Ethics and Jurisprudence C. V. Sc, AAU, Khanapara, Assam, India

Arabinda Phukan
Professor, Department of Veterinary Clinical Medicine, Ethics and Jurisprudence C. V. Sc, AAU, Khanapara, Assam, India

Bhaben Chandra Baishya
Associate Professor, Department of Veterinary Clinical Complex C. V. Sc, AAU, Khanapara, Assam, India

Mrinal Kumar Nath
Assistant Professor, Department of Veterinary Epidemiology and Preventive Medicine C. V. Sc, AAU, Khanapara, Assam, India

Jodumoni Kachari
Assistant Professor, Department of Veterinary Surgery and Radiology, C. V. Sc, AAU, Khanapara, Assam, India

Mousumi Hazorika
Assistant Professor, Department of Veterinary Clinical Complex (Vety. Biochemistry), C. V. Sc, AAU, Khanapara, Assam, India

Panchali Baishya Chetia
M.V.Sc Scholar, Department of Veterinary Clinical Medicine, Ethics and Jurisprudence C. V. Sc, AAU, Khanapara, Assam, India

Tanay Ghosh
Ph.D. Scholar, Department of Animal Nutrition, C. V. Sc, AAU, Khanapara, Assam, India

Corresponding Author:
Bratati Deb Sarkar
M.V.Sc Scholar, Department of Veterinary Clinical Medicine, Ethics and Jurisprudence C. V. Sc, AAU, Khanapara, Assam, India

Prevalence studies of bacteria associated respiratory tract infection in dog

Bratati Deb Sarkar, Ditul Barman, Arabinda Phukan, Bhaben Chandra Baishya, Mrinal Kumar Nath, Jodumoni Kachari, Mousumi Hazorika, Panchali Baishya Chetia and Tanay Ghosh

Abstract
The prevalence of bacteria associated respiratory tract infection in dog was undertaken *w.e.f.* October 2022 to June 2023 at the Veterinary Clinical Complex, College of Veterinary Science, Assam Agricultural University, Khanapara, Guwahati. The prevalence of bacteria associated respiratory tract infection was 0.96% with higher prevalence in German Spitz breed (0.26%) with males (0.51%) being predominantly affected and in age group of above 2-6 years (0.32%) in the month of December 2022 (0.19%).

Keywords: Rottweiler, German spitz, December, infectious

1. Introduction
Dog (*Canis familiaris*) is affectionate and faithful pet animal which can learn easily and is obeyed by the master. They also provide emotional support, reduce stress levels and increase the social activities of the owner. In modern society rearing of dog and its population is increasing day by day. In the year 2012 dog Population was around 10.2 million in India (Bradley and King, 2012) [3]. Dogs are affected by both infectious as well as non-infectious diseases. As there is a close bonding between human and dog, people can easily get infection by direct or indirect contact (CDC, Atlanta, USA, 2022) [5]. Increasing population in India compelled to live in close vicinity which might precipitate poor hygienic status, acquired infection due to inhalation of pathogenic organisms, increasing environmental pollution, nosocomial infections among human. Since dogs are living with human in close contact, they are quite frequently exhibiting respiratory tract infections involving both upper and lower respiratory tract infection. Qekwana *et al.* 2020 [8] found that in respiratory tract infection of dog, various kinds of bacteria are involved *viz. Staphylococcus* spp., *Streptococcus* spp., *Escherichia coli*, *Pasteurella* spp., *Klebsiella* spp., *Pseudomonas* spp., *Bordetella bronchiseptica* etc. Based on a retrospective study of hospital record of few parts of Uttarakhand depicted that the lower respiratory tract infection on canine was more prevalent (9.75%) in Pant agar and least prevalent in Nainital (1.79%) (Dey *et al.*, 2013) [6].
In North Eastern Region of India, epidemiological investigation on bacteria associated respiratory tract infection in canine has not been studied so far. Hence, an attempt is made to study the association of bacteria in respiratory tract infection of dog.

2. Materials and Methods
Prevalence of bacteria associated respiratory tract infection in dog was analysed from the total number of cases screened at Veterinary Clinical Complex (VCC), College of Veterinary Science, Assam Agricultural University, Khanapara. Further, prevalence study was conducted according to age, sex, breed and month during the period of October, 2022 to June, 2023.

3. Results
Prevalence of bacteria associated respiratory tract infection in dog
In the present study a total of 3100 dogs were screened at the Veterinary Clinical Complex (VCC), *w.e.f.* October 2022 to June 2023. Out of 3100 screened dogs 30 positive cases were confirmed for bacteria associated respiratory tract infection based on history, clinical findings, Hematobiochemical alteration, thoracic radio graphical examination and isolation and identification of causative organism.

The prevalence of bacteria associated respiratory tract infection out of total screened dogs was 0.96% and is shown in the Table 1 and Fig 1.

Fig 1: Pie chart showing prevalence of bacteria associated respiratory tract infection in dog out of total screened dogs

Table 1: Prevalence of bacteria associated respiratory tract infection in dogs

Total no. of dogs screened	No. of positive cases	Prevalence (%)
3100	30	0.96

3.1.1 Breed-wise prevalence of bacteria associated respiratory tract infection in dog

The breed-wise prevalence of bacteria associated respiratory tract infection on the basis of breed is given in the Table 2 and Fig 2. The highest prevalence was recorded in German Spitz (0.26%) followed by Pomeranian (0.19%), German Shepherd (0.13%), Labrador (0.10%), Cross-bred (0.10%), Mongrel (0.10%), Pug (0.06%), Golden Retriever (0.03%) respectively and lowest was recorded in Rottweiler (0.00%). Statistically Chi-square value was found to be 166.97, (P value <0.01) which proved significant association between dog breeds and disease, indicating that the breeds had a positive correlation with the bacteria associated respiratory tract infections in dog.

3.1.2 Sex-wise prevalence of bacteria associated respiratory tract infection in dogs

The sex-wise prevalence is shown in Table 3 and Fig 3. The sex wise prevalence was found highest in male (0.51%) than in female (0.45%). The Chi-square value was found to be 0.12, (p value >0.05) indicating that the sex of the animal had no correlation with the disease.

Table 2: Breed-wise prevalence of bacteria associated respiratory tract infection in dogs

Breeds	Total no of dogs screened	No. of positive cases	Prevalence (%)	Chi-square value
Pomeranian	23	6	0.19	166.97**
Labrador	752	3	0.10	
German Shepherd	534	4	0.13	
German Spitz	310	8	0.26	
Cross bred	450	3	0.10	
Pug	102	2	0.06	
Mongrel	652	3	0.10	
Golden Retriever	256	1	0.03	
Rottweiler	21	0	0.00	
Total	3100	30	0.96	

**: $p<0.01$ (highly significant); *: $p<0.05$ (significant), NS: $p>0.05$ (non-significant)

Table 3: Sex-wise prevalence of bacteria associated respiratory tract infection in dogs

Sex	Total no. of dogs screened	Total no. of positive cases	Prevalence (%)	Chi-square value
Male	1752	16	0.51	0.12^{NS}
Female	1348	14	0.45	
Total	3100	30	0.96	

**: $p<0.01$ (highly significant); *: $p<0.05$ (significant), NS: $p>0.05$ (non-significant)

Table 4: Age-wise prevalence of bacteria associated respiratory tract infection in dogs

Age group	Total no. of dogs screened	Total no. of positive cases	Prevalence (%)	Chi-square value
Up to 2 years	1100	6	0.19	10.17*
>2-6 years	920	10	0.32	
>6-10 years	695	5	0.16	
>10 years	385	9	0.29	
Total	3100	30	0.96	

**: $p<0.01$ (highly significant); *: $p<0.05$ (significant), NS: $p>0.05$ (non-significant)

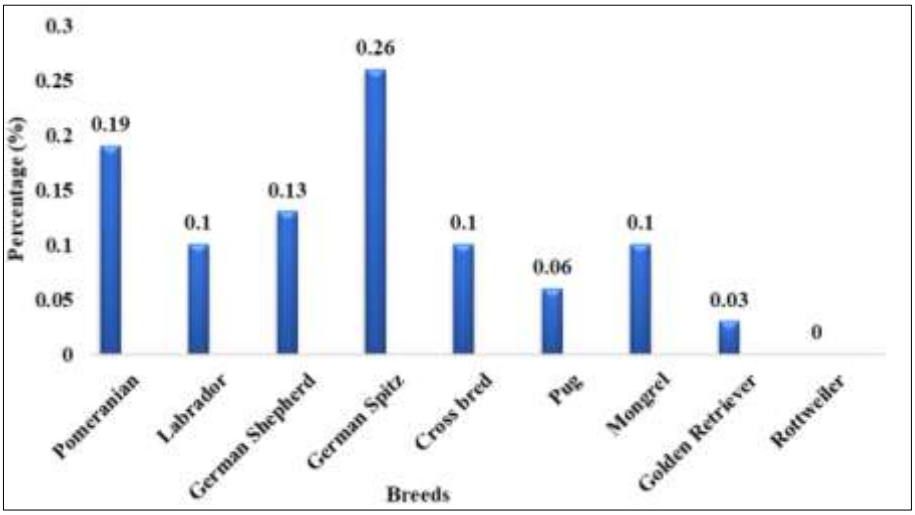

Fig 2: Bar diagram showing breed-wise prevalence of bacteria associated respiratory tract infection in dogs

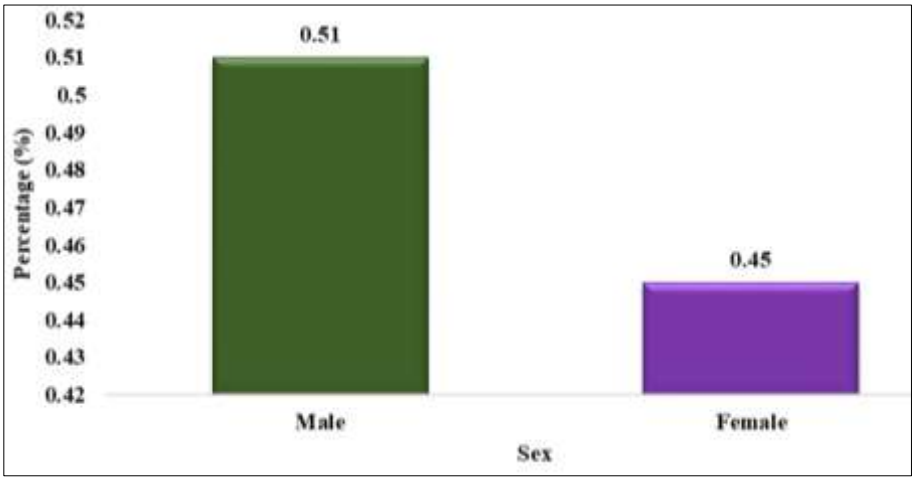

Fig 3: Bar diagram showing sex-wise prevalence of bacteria associated respiratory tract infection in dogs

3.1.3 Age-wise prevalence of bacteria associated respiratory tract infection in dogs

The age-wise prevalence is shown in Table 4 and Fig 4. In the present study out of 30 cases, 6 cases (up to 2 years), 10 cases (above 2-6 years), 5 cases (above 6-10 years) and 9 cases (above 10 years) were found to be positive irrespective of sex and breed. In the result highest prevalence was recorded in age group of above 2-6 years (0.32%) and lowest was recorded in the age group of above 6-10 years (0.16 %). The Chi-square value was found to be 10.17 (p value <0.05) and showed significant association between age groups and prevalence of disease.

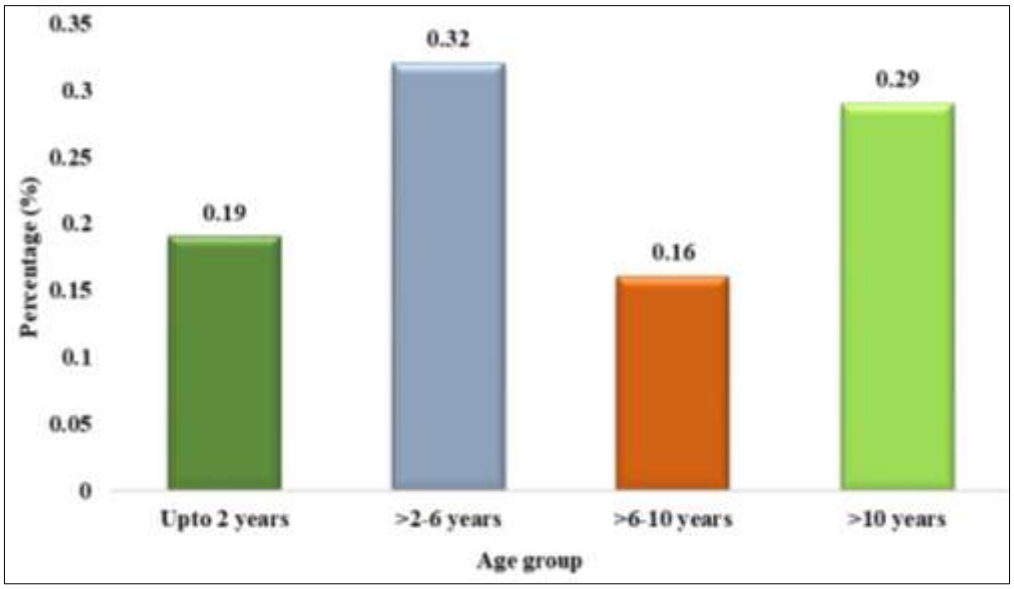

Fig 4: Bar diagram showing age-wise prevalence of bacteria associated respiratory tract infection in dogs

3.1.4 Month-wise prevalence of bacteria associated respiratory tract infection in dogs

The month-wise prevalence of bacteria associated respiratory tract infection in dog is shown in Table 5 and Fig 5. The highest prevalence was found in December, 2022 (0.19%) followed by November, 2022 (0.16%); January, 2023 (0.16%); February, 2023 (0.13%); March, 2023 (0.10%); April, 2023 (0.10%); May, 2023 (0.06%) and lowest in October, 2022 (0.03%) and June, 2023 (0.03%). In the chart Chi-square was found to be 143.63, (p value <0.01) which proved significant association between season and prevalence of disease which indicated that months had a positive correlation with the prevalence of bacteria associated respiratory tract infections in dogs.

Table 5: Month-wise prevalence of bacteria associated respiratory tract infection in dogs

Month	Total no. of dogs screened	Total no. of positive cases	Prevalence (%)	Chi-square value
October, 2022	275	1	0.03	143.64**
November, 2022	387	5	0.16	
December, 2022	393	6	0.19	
January, 2023	350	5	0.16	
February, 2023	232	4	0.13	
March, 2023	388	3	0.10	
April, 2023	268	3	0.10	
May, 2023	410	2	0.06	
June, 2023	397	1	0.03	
Total	3100	30	0.96	

**: $p<0.01$ (highly significant); *: $p<0.05$ (significant), NS: $p>0.05$ (non-significant)

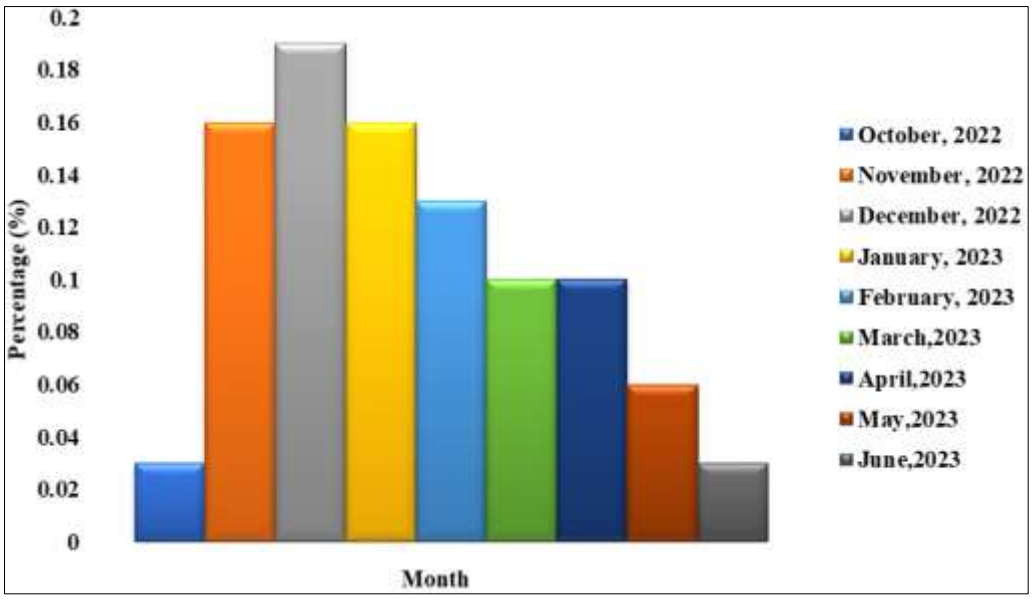

Fig 5: Bar diagram showing month-wise prevalence of bacteria associated respiratory tract infection in dogs

4. Discussion

Prevalence of bacteria associated respiratory tract infection in dog

In the present study, 30 dogs were found positive for bacteria associated respiratory tract infections and the prevalence was found to be 0.96% out of hospital population. However, different worker found different prevalence percentage in different geographical areas. Uddin *et al.* (2021) [10] recorded 5.50% and whereas Dey *et al.* (2013) [6] recorded highest prevalence 9.75% and lowest prevalence 1.79% in two different places.

Higher prevalence percentage by different researchers as compared to the present study might be due to the variation in geographical area, climatic condition and managemental practice.

4.1.1 Breed-wise prevalence

In the present study, the prevalence of bacteria associated respiratory tract infection in dog was found highest in German Spitz (0.26%) and lowest in Rottweiler breed. The present finding was in contradiction with the observations of other workers. Kouamo *et al.* (2020) [7], Ayodhya *et al.* (2013) [2] and Uddin *et al.* (2021) [10] found highest prevalence in Rottweiler (0.10%), Pug (20.74%) and Doberman (1.70%) respectively. Ayodhya *et al.* (2013) [2] and Uddin *et al.* (2021) [10] found lowest in Pomeranian (4.33%) and Golden Retriever (0.50%) respectively.

There was a variation in breed wise prevalence percentage from the present study might be due to random number of recorded cases and heterologous breed by different researchers.

4.1.2 Sex-wise prevalence

In the present study, there was no significant difference reported between male and female dog. The highest prevalence was found in male dog (0.51%) and lowest was in female dog (0.45%). Similar observations were also made by Uddin *et al.* (2021) [10], Kouamo *et al.* (2020) [7], Schulz *et al.* (2006) and Dey *et al.* (2013) [6]. Contradictory observations were reported by Ayodhya *et al.* (2013) [2] and Qekwana *et al.*

(2020) [8] where they found that females were suffered more than that of male dogs.

The prevalence rate was higher in male dogs might be due to the higher number of male dogs presented to the clinics as compared to females or selective preference of male dogs as companion animals by the owner.

4.1.3 Age-wise prevalence

In the present study, highest prevalence of bacteria associated respiratory tract infections was recorded in the age group of above 2-6 years (0.32%) and lowest in the age group of above 6-10 years (0.16%). These findings were in accordance with Dey *et al.* (2013) [6] who found adult animals were more prone to canine lower respiratory tract infections than young animals. On contrary, Ayodhya *et al.* (2013) [2] and Kouamo *et al.* (2020) [7] found highest prevalence in the younger dogs.

The prevalence rate was highest in more than 2-6 years aged dogs due to this age groups were suffered from cardiovascular diseases.

4.1.4 Season as well as month-wise prevalence

In the current study, highest prevalence of bacteria associated respiratory tract infection was recorded in December (1.39%) and lowest in October and June (0.03%). Similar results were found by Arsevska *et al.* (2018), Ayodhya *et al.* (2013) [2] and Uddin *et al.* (2021) [10].

Low ambient temperature along with cold air within the nasal passage slows down the mucus clearance in animals and etiological agents get an opportunity to colonize in the nasal passage and simultaneous entry into the lower respiratory tract and hence the percentage of prevalence was more in winter in present finding.

5. Conclusion

From the present study it could be concluded that the prevalence of bacteria associated respiratory tract infection out of total screened dogs was 0.96%. Breed-wise highest prevalence was recorded in German Spitz (0.26%) and lowest was recorded in Rottweiler. The sex-wise prevalence of bacteria associated respiratory tract infection was found highest in male (0.51%) than in female (0.45%). The age-wise highest prevalence was recorded in age group of above 2-6 years (0.32%) and lowest was recorded in the age group of above 6-10 years (0.16 %). Month-wise the highest prevalence was found in December, 2022 (0.19%) and lowest was in October, 2022 (0.03%) as well as in June, 2023 (0.03%).

6. Acknowledgement

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