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Bacterial pneumonia in goats: Prevalence and epidemiological patterns

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Abstract

Pneumonia is a major respiratory disorder in goats, contributing significantly to morbidity and mortality. This study was conducted over a nine-month period to determine the incidence and epidemiological patterns of bacterial pneumonia in goats from the Banaskantha region of Gujarat. A total of 178 goats presenting with clinical signs of respiratory illness were screened, and deep nasal swab samples were collected for bacterial isolation and identification. Bacterial pneumonia was confirmed in 82 goats, with an overall incidence of 46.06% (82/178). Age-wise analysis revealed a significantly higher prevalence in goats aged 1-2 years (47.56%) ($P < 0.05$). Sex-wise distribution indicated a significantly higher occurrence in females (71.95%) compared to males (28.04%) ($P \leq 0.01$). Seasonal evaluation demonstrated a significantly higher prevalence during winter (76.82%) ($P \leq 0.01$). These findings highlight the influence of host and environmental factors on the occurrence of bacterial pneumonia in goats.

Keywords: Pneumonia, goats, incidence, age, sex, season, Banaskantha

Introduction

Goats contribute significantly to the Indian economy, with a population of 148.88 million, accounting for 27.8% of the total livestock population in India (20th Livestock Census, 2019; Kumar *et al.*, 2014, Kamboj *et al.*, 2015, Lata *et al.*, 2021) ^[1, 37, 22, 28]. Banaskantha district of Gujarat has a goat population of nearly 3.88 lakh, establishing it as a major goat-rearing region (Halpati and Vahoniya, 2024). Respiratory diseases constitute a significant health constraint in small ruminants in India, resulting in increased morbidity and mortality, reduced body weight gain and considerable economic losses in goat production (Rahal *et al.*, 2014; Doley and Nekibuddin, 2018) ^[37, 11]. Small ruminants exhibit high susceptibility to respiratory diseases, which collectively contribute to about 5.6% of the overall disease burden in these species (Kumar *et al.*, 2014) ^[37].

Pneumonia is the most frequently reported serious respiratory disease in goats and represents a leading cause of economic loss in ruminants worldwide, characterized by inflammation and consolidation of the lung parenchyma (Ferdausi *et al.*, 2008, Yener *et al.*, 2009, El-Deeb and Tharwat, 2015; Attoh-Kotoku *et al.*, 2018) ^[15, 44, 13, 4]. Pneumonia of bacterial origin is usually associated with toxemia, septicemia and hypoxic condition leading to alterations in the physiological, haematological and biochemical characters in affected goats (Mandal *et al.*, 2017) ^[29]. Goats of all age groups are susceptible to respiratory disorders, which can spread rapidly through airborne transmission (Tesfaye and Mekonnen, 2016) ^[43]. A high incidence in goats from the Banaskantha region of Gujarat has been reported, with prevalence rates of 42.85% (90/210) and 42.68% (70/164) (Nair, 2021, Parmar, 2022) ^[32, 35].

Materials and Methods

The study was conducted over a nine-month period on goats presented to the Veterinary Clinical Complex (VCC), Sardarkrushinagar and Deesa. A total of 178 goats exhibiting clinical signs of respiratory illness were screened for bacteriological pneumonia. Suspected cases underwent detailed clinical examination, and deep nasal swab samples were collected

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aseptically by inserting sterile cotton swabs into the nostrils through the ventral meatus for bacterial isolation and identification (Quinn *et al.*, 2011) [36]. Of the screened animals, 82 goats confirmed with bacterial pneumonia were selected for further investigation and evaluated for age, sex, and seasonal distribution. The study was confined to bacterial aetiology. Data were statistically analysed to determine the incidence of bacterial pneumonia in the study area and its association with host and seasonal factors using SPSS software package (version 20). Categorical data on the occurrence/positivity of the disease was analysed by Chi-square test for goodness-of-fit or independence as per the case.

Results and Discussion

During the nine-month study period, 178 goats were examined, of which 82 were confirmed with bacterial pneumonia based on bacteriological examination of nasal swab samples, with an incidence of 46.06% (82/178). The present findings are consistent with reports from the Banaskantha region of Gujarat, where high prevalence rates of 42.85% (90/210) and 42.68% (70/164) have been documented (Nair, 2021; Parmar, 2022) [32, 35], highlighting the widespread occurrence of pneumonia in goats in this region. Pneumonia is recognized as one of the major health problems in goats in the study region. The incidence of caprine pneumonia reported from different regions varies widely from 9.5% to 27.4% (Karim *et al.*, 2014; Parvez *et al.*, 2014; Khan *et al.*, 2017; Kattimani *et al.*, 2020; Rahman *et al.*, 2020) [23, 34, 21, 19, 38]. Kashyap *et al.* (2020) [18] reported a prevalence of 28.11% (253/900) over a one-year period, while Kumar *et al.* (2023) [20], in a nine-year retrospective study at the Veterinary Clinical Complex, GADVASU, Ludhiana, reported respiratory disorders in 15.9% (97/608) of goats, with pneumonia being the most frequently diagnosed condition.

The age-wise occurrence of bacterial pneumonia is presented in Table 2. A significantly higher prevalence was recorded in

goats aged 1-2 years (47.56%; 39/82), followed by goats below one year of age (34.16%; 28/82) and goats older than two years (18.29%; 15/82), with the differences being statistically significant ($P < 0.05$). Similar age-related trends have been reported by Rahman *et al.* (2020) [38], Kabir *et al.* (2010) [26], Nath *et al.* (2014) [33], and Chowdhury *et al.* (2002), who observed higher susceptibility in young and growing animals. Increased vulnerability in this age group has been attributed to immature immune and cardiorespiratory systems, nutritional stress, and waning maternal immunity (Sarkar and Islam, 2011; Maru *et al.*, 2013; Abera *et al.*, 2014) [42, 30, 3].

The sex-wise occurrence of bacterial pneumonia is presented in Table 3. Female goats showed a significantly higher prevalence (71.95%; 59/82) than males (28.04%; 23/82) ($P < 0.01$). This observation is consistent with earlier reports (Asaduzzaman *et al.*, 2013; Momin *et al.*, 2014; Alemneh and Tewodros, 2016; Kashyap *et al.*, 2020) [5, 14, 2, 18]. The higher prevalence in females may be related to management practices favoring retention of females for milk production, exposing them to physiological stress during pregnancy, kidding, and lactation, which may predispose them to respiratory infections (Biondi and Zannino, 1997) [6].

The season-wise occurrence of bacterial pneumonia is shown in Table 4. A significantly higher prevalence was observed during winter (76.82%; 63/82) compared with summer (23.17%; 19/82) ($P < 0.01$). Similar seasonal trends have been reported earlier, with higher prevalence during winter months (Kumar *et al.*, 2004; Dohare *et al.*, 2013; Momin *et al.*, 2014; Alemneh and Tewodros, 2016) [24, 12, 31, 2]. Cold-induced stress during winter is known to impair respiratory defense mechanisms, thereby facilitating colonization and multiplication of bacterial pathogens.

The findings of the present study indicate that bacterial pneumonia is a prevalent respiratory disorder in goats of the study area, with significant associations observed with age, sex, and season, highlighting the importance of timely diagnosis and targeted management strategies.

Table 1: Age-wise distribution of bacterial pneumonia in goats (n=82)

Age	No. of goats screened/examined (n= 178)	No. of goats affected (n=82)	Disease Incidence (%)	Overall Incidence (%)	χ^2	p
0-1 yrs (Young)	62	28	34.16	15.73	6.418	0.040*
1-2 yrs (Yearling)	95	39	47.56	21.19		
>2 yrs (Adults)	21	15	18.29	8.42		

(* $P < 0.05$ indicates statistically significant difference)

Table 2: Gender-wise distribution of bacterial pneumonia in goats (n=82)

Gender	No. of goats screened/examined	No. of goats affected	Disease Incidence (%)	Overall Incidence (%)	χ^2	p
Male	76	23	28.04	12.92	13.33	0.000**
Female	102	59	71.95	33.14		

(** $P \leq 0.01$ indicates statistically highly significant difference)

Table 3: Season-wise distribution of bacterial pneumonia in goats (n=82)

Season	No. of goats screened/examined	No. of goats affected	Disease Incidence (%)	Overall Incidence (%)	χ^2	p
Winter (November- February)	110	63	76.82	35.39	14.551	0.000**
Summer (March - June)	68	19	23.17	10.67		

(** $P \leq 0.01$ indicates statistically highly significant difference)

Conflict of Interest

Not available

Financial Support

Not available

Reference

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