



ISSN: 2456-2912

VET 2025; 10(1): 38-41

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Received: 12-11-2024

Accepted: 16-12-2024

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Prevalence studies on *Klebsiella pneumoniae* in sheep and goat infections of Krishna district, Andhra Pradesh

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DOI: <https://doi.org/10.22271/veterinary.2025.v10.i1a.1993>

Abstract

Studies on the prevalence of *Klebsiella pneumoniae* in sheep and goat in Andhra Pradesh was carried out in and around the villages of Gannavaram, Krishna district. In this study, a total number of 104 samples were collected, of which 51 samples were from pneumonic cases and 53 samples were from enteric cases of sheep and goats were subjected for isolation followed by cultural and biochemical tests. Out of 104 samples 42(40.3%) samples were found to be positive for *K. pneumoniae*. The study revealed a prevalence of 38% and 40% for pneumonic cases and 40% and 42.8% for enteritis in sheep and goat population respectively for *Klebsiella pneumoniae*.

Keywords: Prevalence-*Klebsiella pneumoniae*-sheep and goat-Andhra Pradesh

Introduction

Livestock is one of the major industries and plays an important role in the up-life ment of India and a significant role in the national economy. It is a good economic source to the Indian marginal and landless farmers. Sheep and goats constitute an important role in India, mainly on account of their market and to earn money in needs. They are important for their contribution to the development. According to 20th livestock census of India (2019), sheep contributes to around 74.26 million and goat contributes to around 148.88 million of the total livestock population 536.76 million. Statistics show an overall increase 4.8% in the total livestock population as compared to previous census of 2012. The total sheep population in the country was increased by about 14.1% and goat population has increased by 10.1% over the previous census 2012. (20th Livestock Census-2019 All India Report). Livestock census in Andhra Pradesh: Rural population in India depends on these animal populations for their livelihood. The statistics of sheep and goat population in Andhra Pradesh is as follows. Sheep population 17.6 million, increased by 30% than previous census. Goat population 5.4 million, increased by 0.9% than previous census. (20th Livestock Census-2019 All India Report).

Klebsiella species are rod shaped gram-negative, non-motile, lactose-fermenting, facultative anaerobic bacteria belonging to the *Enterobacteriaceae* family. The organisms found widely in the environment, i.e., soil, water, manure, and plants, as well as enteric tract, skin, and mouth micro-biota of animals and humans. (Quinn *et al.*, 2011; Martin and Bachman, 2018; Yang *et al.*, 2019) [18, 14, 28]. *K. pneumoniae* is well-known inhabitant of enteric micro-biota of livestock and companion animals. (Quinn *et al.*, 2011) [18]. *K. pneumoniae* is an opportunistic pathogen, able to cause pneumonia by colonization in the respiratory tract and in the intestinal tract of animals and human beings. (Paczosa and Mecsas, 2016) [17]. The small ruminants' population is in decreasing trend and it is associated with various diseases in goats and sheep because of infection, poor management and environmental conditions. The respiratory system is exposed directly to the environment. It is highly vulnerable to various environmental conditions and pneumonia can have considerable consequences. It is estimated that pneumonia alone causes at least 10% mortality in the sheep population in India (Maru *et al.*, 1990) [16]. Pneumonia is multifactorial in origin. It is usually a combination of infectious, environmental and management factors. *K. pneumoniae* is involved in pneumonia and it is a persistent problem that hampers the well-being of small ruminants, causing long term effects and an overall decline in their quality of life.

Klebsiella spp., particularly *K. pneumoniae* are well known entero-bacteria related to lot of clinical infections in domestic animals with its refractory to conventional therapy. Respiratory diseases are common in sheep and goats. Because of their economic effect on the industries the pneumonia caused by bacteria has been broadly studied in the field (Azizi *et al.*, 2013) [3]. Estimating the prevalence and outbreak of lung lesions and their influence on the growth of lambs and kids showed that severe lung lesions lead to reduced performances of the animals (Daniel *et al.*, 2006) [6].

Pneumonia can cause heavy economic losses to farmers including mortality, emaciation, poor weight gain, poor meat quality and condemnation of the affected lungs during meat inspection. In many countries, respiratory disease is a most serious sheep problem and can be an important cause of death and reduced productivity (Martin, 1996) [15]. *Klebsiella pneumoniae* is an opportunistic pathogen, able to cause pneumonia by colonization in the respiratory tract and in the intestinal tract of animals and human beings (Paczosa and Meccas). Kohler *et al.* (2007) [11] reported *K. pneumoniae* as an opportunistic pathogen, able to colonize in the respiratory tract to cause pneumonia, or the intestinal tract of humans and animals. This study was designed to know the prevalence rates of sheep and goat population due to *K. pneumoniae* infection in around Gannavaram domicile, because of its economic values to the farming community.

Results and Discussion

Table 1: Details of the bacterial isolates, isolated from respiratory and enteritis samples of sheep and goat

Animal species	Nasal samples	Positive isolates	Positive isolates (%)	Enteric samples	Positive isolates	Positive isolates (%)	Total (%)
Sheep	26	10	38	25	10	40	39.2
Goat	25	10	40	28	12	42.8	41.5
Total%	51	20	39.2	53	22	41.5	40.3

Sheep and goat are important livestock species of India. Goats often referred to as the cattle of the poor and sheep are reared as sources of meat for family consumption and as a source of income that could strengthen the rural economy. Respiratory diseases in sheep and goat results in reduced live weight gain and mortality, thus causing considerable financial losses. In fact, respiratory diseases pose a major problem in sheep rearing throughout the world (Martin *et al.*, 1996) [15]. Its occurrence attributed to many interplay of factors such as host physiology, immunology, and the other agents such as bacteria, viruses, parasites, environmental factors and poor management practices (Goodwin, 2006) [10]. Hence ensuring the health of these livestock poses a significant challenge (Berihulay *et al.*, 2019) [4].

The present study was undertaken to study the prevalence of *K. pneumoniae* isolates from sheep and goats by identifying the *Klebsiella pneumoniae* in sheep and goat suffering with pneumonia and enteritis by applying morphological, cultural, biochemical tests and molecular confirmation by PCR

In this study, totally 51 nasal samples with pneumonic signs were screened. In sheep, out of 26 nasal samples screened, 10 samples were found positive (38%). In goat out of 25 nasal samples screened 10 samples were found positive (40%). The overall positives for pneumonic cases were 39.2% in both sheep and goats. In this study 53 enteric samples were screened both in sheep and goats. Out of 25 enteric samples screened 10 samples were found positives (40%) in sheep and out of 28 enteric samples 12 enteric samples were found positives in goats (42.8%). The overall positives for enteritis was 41.5% in both in sheep and goats. Out of 104 samples

Materials and Methods

Study design: Study was conducted by the Microbiology department, NTR College of Veterinary Science, Gannavaram, this project was being taken to study the status of *Klebsiella*-induced infections in sheep and goats.

Animal selection criteria for case studies: All the selected animals were from semi intensive system of rearing in and around Gannavaram domicile. Animals with respiratory problems and enteritis were included in this study as per their clinical manifestations. All the *Klebsiella* isolates recovered were from the non-repetitive samples.

Epidemiological and Clinical data: Animals were grouped into two categories Group 1: Animals with clinical signs i.e. nasal discharge, rise of temperature, dyspnea, and anorectic conditions. Group 2: Animals with clinical signs i.e. enteritis, diarrhea, rise of temperature, weight loss, anorexia. Clinical specimens were obtained mainly from nasal cavities and from rectum directly. Materials were collected from April 2024 to November 2024. All the 104 samples i.e. 51 nasal samples and 53 enteric samples were collected from sheep and goat population with the clinical signs of pneumonia and enteritis. Isolation and identification of *K. pneumoniae* was carried out by culture, biochemical tests and by Gram's staining (Aher *et al.*, 2012) [1].

tested for *K. pneumoniae*, 42 samples were found positives (40.3%) both in sheep and goats.

Rajashekar *et al.*, (2023) [19] reported a prevalence rate of 37.51% in sheep and goat population from Telengana state. Similar reports were made by Srinivasan *et al.*, (2003) [25] and Mahrous *et al.*, (2023) [12] with a prevalence rate of 39% and 36% in sheep and goat, respectively. Singh *et al.*, (2023) reported that 63% prevalence of *K. pneumoniae* in sheep and goat, which is higher than the present study. Fouad *et al.*, (2022) [9], Mansour *et al.*, (2014) [13] in their studies on sheep and goat stated the prevalence rate of 27.5% and 22.3% respectively. Reported a prevalence rate of 4.8% and 4% in sheep and goat.

Zaghawa *et al.* (2010) [30] reported a prevalence of 7.96%, while Yimer *et al.* (2007) [29] reported a lower rate of 1.3% from sheep nasal discharges. Azizi *et al.* (2013) [3] screened 1000 sheep lungs affected by pneumonia characterized broncho pneumonia, interstitial pneumonia and broncho interstitial pneumonia and isolated several bacterial sp. from lungs, in that *Klebsiella pneumoniae* were 15.09% (2016). Ahmed and Abdullah (2022) [2] reported a prevalence rate of 4.8 & 4% in sheep and goat population respectively in Iraq, out of 253 affected lungs tested.

Ribeiro *et al.* (2022) [22] reported 117 isolates from enteric cases and 67 cases from respiratory cases. Out of 697 clinical samples examined for *Klebsiella*, 40% pulmonary infections were by *K. pneumoniae* isolates, represented mainly by pneumonia, bronchitis, and sinusitis in sheep population in Brazil. Rania *et al.* (2021) [21] reported a prevalence rate of 10.9% in sheep population in Egypt for *K. pneumoniae*.

Emikpe *et al.* (2009)^[7] and Bordeanu *et al.* (2012)^[5] reported at the rate of 9.5% and 12.1%, respectively from goat nasal discharges

Klebsiella pneumoniae is a common opportunistic pathogen of community acquired and nosocomial infections in goats. Fang *et al.* (2004)^[8] reported an isolation rate from goat lung as 9.82%. Sharma *et al.* (1991)^[23] reported 12.4% prevalence rate, while Tijjani *et al.* (2012)^[27] reported a very high rate of 52% isolation.

Singh *et al.* (2024)^[23] detected *K. pneumoniae* at the level of 35% and 28% in sheep and goats respectively. Mahrous *et al.* (2023)^[12] recovered 53 isolates (73.6%) from nasal swabs and 19 (26.4%) from lung samples. Among the samples 52(36.9%) were from sheep and 20(33.9%) were from goats. The overall proportion of *K. pneumoniae* infections was 36%. Sharma *et al.* (1991)^[23] investigated 105 pneumonic lesions showing lung samples of sheep and goat, reported *E. coli* as predominant organisms with 14.45% *Pasteurella multocida*, 12.14% *Mannheimia haemolytica*, 8.67% and *Klebsiella pneumoniae* at 6.94% level. Ramaswamy *et al.* (1992)^[20] reported mixed infection of *E. coli* and *Klebsiella* spp. in goat population with enteritis.

The sheep and goat population in this study were raised in different localities under semi-intensive management and nomadic systems. Although no significant differences were observed in the *Klebsiella pneumoniae* infection rate between the localities and management systems, animals raised under the semi intensive system showed a higher infection rate i.e. 35%. This higher rate can be attributed to sudden climatic changes, poor nutrition, unhygienic management practices and the unrestricted movements and contacts between animals. Tewodros A *et al.* (2015)^[26] opined that situations raised their susceptibilities to respiratory and enteric infections. Goodwin Ray (2006)^[10] opined that its occurrence were attributed to many interplay of factors such as host physiology, immunology, and the other agents such as bacteria, viruses, parasites, environmental factors and poor management practices. Azizi *et al.* (2013)^[3] reported that the variation in incidence occurs due to the percentage of causative agents of pneumonia in small ruminants in different geographical area and several other factors included were different isolation processes, misidentification, stress, changes in management, transportation, immune state of infected animals and seasonal variation. The animals in this study were from semi intensive system and the high level of prevalence rates for *K. pneumoniae* both in sheep and goat were attributed to the observations of the above mentioned authors and this study concur with the above observations.

Conclusion

The current study was designed to isolate, and identify *K. pneumoniae* bacteria from sheep and goat pneumonic and enteric samples. The results of this study concluded that *Klebsiella pneumoniae* was found to be one of the most predominant organism recovered from respiratory and enteric tract infections of sheep and goat population in and around Gannavaram, Krishna district in Andhra Pradesh State.

Conflict of Interest: Not available

Financial Support: Not available

Reference

1. Aher T, Roy A, Kumar P. Molecular detection of virulence genes associated with pathogenicity of

Klebsiella spp. isolated from the respiratory tract of apparently healthy as well as sick goats. *Isr J Vet Med.* 2012; 67(4):249-252.

2. Ahmed BA, Abdullah MA. Isolation and molecular diagnosis of the main bacterial species causing pneumonia in small ruminants in the Duhok Abattoir-Kurdistan region of Iraq. *Microbial Biosyst.* 2022;7(2):66-73.
3. Azizi S, Korani FS, Oryan A. Pneumonia in slaughtered sheep in south-western Iran: pathological characteristics and aerobic bacterial aetiology. *Vet Ital.* 2013;49(1):109-18.
4. Berihulay H, Abied A, He X, Jiang L, Ma Y. Adaptation mechanisms of small ruminants to environmental heat stress. *Animals.* 2019;9(3):75.
5. Bordeanu AD, Krupaci FA, Kiss T, Spînu M. Study of seasonal dynamics in respiratory microbial flora in extensively raised goats. *Vet Med.* 2012 8(4):38-45.
6. Daniel JA, Held JE, Brake DG, Wulf DM, Epperson WB. Evaluation of the prevalence and onset of lung lesions and their impact on growth of lambs. *Am J Vet Res.* 2006;67(5):890-4.
7. Emikpe BO, Oyero OG, Akpavie SO. Isolation and antibiogram of aerobic nasal bacterial flora of apparently healthy West African dwarf goats. *Rev Elev Med Vet Pays Trop.* 2009;62(1):17-21.
8. Fang CT, Chuang YP, Shun CT, Chang SC, Wang JT. A novel virulence gene in *Klebsiella pneumoniae* strains causing primary liver abscess and septic metastatic complications. *J Exp Med.* 2004;199(5):697-705.
9. Fouad EA, Khalaf DD, Farahat E, Hakim AS. Identification of predominant pathogenic bacteria isolated from respiratory manifested small ruminants in western north Egypt with regard to their susceptibility to antibiotics. *Int J Health Sci.* 2022;6(S2):10818-28.
10. Goodwin-Ray KA. Pneumonia and pleurisy in sheep: Studies of prevalence, risk factors, vaccine efficacy and economic impact. PhD Thesis, Massey University, Palmerston North, New Zealand, 2006, p. 1-225.
11. Kohler JE, Hutchens MP, Sadow PM, Modi BP, Tavakkolizadeh A, Gates JD. *Klebsiella pneumoniae* necrotizing fasciitis and septic arthritis: an appearance in the Western hemisphere. *Surg Infect.* 2007;8(2):227-32.
12. Mahrous SH, El-Balkemy FA, Zeid ANZ, El-Mekkawy MF, El Damaty HM, Elsohaby I. Antibacterial and anti-biofilm activities of cinnamon oil against multidrug-resistant *Klebsiella pneumoniae* isolated from pneumonic sheep and goats. *Pathogens.* 2023;12(9):1138.
13. Mansour AM, Zaki HM, Hassan NA, Al-Humiany AA. Molecular characterization and immunoprotective activity of capsular polysaccharide of *Klebsiella pneumoniae* isolated from farm animals at Taif Governorate. *Am J Infect Dis.* 2014;10(1):1-14.
14. Martin RM, Bachman MA. Colonization, infection, and the accessory genome of *Klebsiella pneumoniae*. *Front Cell Infect Microbiol.* 2018; 8(4):1-15.
15. Martin WB. Respiratory infections of sheep. *Comp Immunol Microbiol Infect Dis.* 1996; 19(3):171-9.
16. Maru A, Srivastava CP, Dubey SC, Lonkar PS. Epidemiology of pneumonia in sheep flocks. *Ann Rep CSWRI.* 1990; Avikanagar, India: p. 53.
17. Paczosa MK, Mecsas J. *Klebsiella pneumoniae*: Going on the offense with a strong defense. *Microbiol Mol Biol Rev.* 2016;80(3):629-61.
18. Quinn PJ, Markey BK, Leonard FC, Hartigan P, Fanning

- S, Fitzpatrick E. Veterinary microbiology and microbial disease. 2nd Ed. Oxford: Wiley-Blackwell, 2011, p. 928.
19. Rajashekar B, Shivajyothi J, Reddy YN, Putty K. Characterization of bacterial pathogens involved in pneumonia of sheep and goats. *Indian J Small Ruminants*. 2023;29(1):89-93.
 20. Ramaswamy V, Ganesan PI, Roy P, Andrew MJ, Saravandava K, Venugopalan AT. Enterobacteria associated with enteritis in goats and their antibiotic spectra. *Indian J Anim Health*. 1992;31(1):67-70.
 21. Rania HA, Mowafy RE, Amira EL, Noha MAA, Heba AME. Mixed infection of *Mycoplasma* and bacteria in the respiratory tract of sheep with reference to the histopathological picture in Sharkia Governorate. *Egyptian J Anim Health*. 2021;1:7-22.
 22. Ribeiro MG, Morais DABC, Alves AC, Bolaños CAD, Paula DCL, Portilho FVR, *et al.* *Klebsiella*-induced infections in domestic species: A case-series study in 697 animals (1997–2019). *Braz J Microbiol*. 2022;53(1):455-464.
 23. Sharma RK, Boro BR, Borah P. Incidence of caprine pneumonia and associated bacterial species. *Indian J Anim Sci*. 1991;61(1):54-55.
 24. Singh S, Chandratre G, Narang G. Detection of bacterial pathogens from the pneumonic lungs of sheep and goats and their antimicrobial sensitivity pattern. *Proc Natl Acad Sci India Sect B Biol Sci*. 2024;94(1):69-74.
 25. Srinivasan P, Iyue M, Kumar RA. Bacteriological studies of ovine pneumonia in an organized farm. *Indian Vet J*. 2003;80:311-313.
 26. Tewodros A, Dawit A. Seroprevalence of small ruminant brucellosis in and around Kombolcha, Amhara Regional State, North-Eastern Ethiopia. *J Vet Sci Med Diagn*, 2015, p. 4.
 27. Tijjani AN, Ameh JA, Gambo HI, Hassan SU, Sadiq MA, Gulani I. Studies on the bacterial flora and pathologic lesions of caprine pneumonic lungs in Maiduguri North-Eastern Nigeria. *Afr J Microbiol Res*. 2012;6(48):7417-722.
 28. Yang YQ, Higgins CH, Rehman I, Galvao KN, Brito IL, Bicalho ML, Bicalho RC. Genomic diversity, virulence, and antimicrobial resistance of *Klebsiella pneumoniae* strains from cows and humans. *Appl Environ Microbiol*. 2019;85:e02654-e2718.
 29. Yimer N, Asseged B. Aerobic bacterial flora of the respiratory tract of healthy sheep slaughtered in Dessie municipal abattoir, northeastern Ethiopia. *Rev Med Vet*. 2007;158(10):473.
 30. Zaghawa A, Hassan H, El-Sify A. Clinical and etiological study on respiratory affections of sheep. *Minufiya Vet J*. 2010;7(1):93-103.

How to Cite This Article

Sravani G, Kumari DG, Kiranmayi Ch B, Kumar AP. Prevalence studies on *Klebsiella pneumoniae* in sheep and goat infections of Krishna district, Andhra Pradesh. *International Journal of Veterinary Sciences and Animal Husbandry*. 2025;10(1):38-41.

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