The Haryana Veterinarian (June, 2023) **62(1),** 8-12 ISSN 0033-4359 (P) **Research Article**

PREVALENCE AND HAEMATO-BIOCHEMICAL CHANGES IN DIFFERENT PULMONARY AFFECTIONS IN GOATS OF BAGHELKHAND REGION OF MADHYA PRADESH

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Received: 21.03.2022; Accepted: 19.05.2022

ABSTRACT

The present study was conducted to study the prevalence and haemato-biochemical changes in different pulmonary affections in goats. A total of 518 lungs of goats belonging to the three districts (Rewa, Satna and Sidhi) of Bhaghelkhand regions were analyzed for the presence of any types of gross abnormalities in the lungs. Amongst 518 goat lungs examined at slaughter, 171 (33.01%) cases were found to be affected various pathological conditions in the lungs. Among the various pathological condition of the lungs prevalence of congestion and hemorrhages (11.58%) was found to be highest followed by interstitial pneumonia (5.79%), bronchopneumonia (3.67%), fibrinous pneumonia (3.28 %), haemorrhagic pneumonia (2.32%). suppurative bronchopneumonia (1.35%) and pulmonary hydatidosis (1.16%). The mean values of Hb, PCV and TEC were significantly ($P \leq 0.05$) decreased in the case of suppurative pneumonia and haemorrhagic pneumonia. The mean values of TLC, neutrophil, monocytes and eosinophils were significantly increased in cases of pulmonary hydatidosis, bronchopneumonia, suppurative pneumonia, fibrinous pneumonia and interstitial pneumonia. The mean albumin values were significantly decreased in cases of bronchopneumonia and interstitial pneumonia.

Keywords: Albumin, Goats, Haematology, Prevalence, Pulmonary Affections, Total Proteins

How to cite: Kumar, J., Singh, S., Sheikh, T.J., Singh, S., Singh, A.K., Kumar, D., Baghel, N.S., Dixit, P., Walwadker, K.K. and Shrivastava, N. (2023). Prevalence and haemato-biochemical changes in different pulmonary affections in goats of Baghelkhand region of Madhya Pradesh. *The Haryana Veterinarian* **62(1)**: 8-12.

Livestock plays a pivotal role in the Indian agricultural economy and provides livelihood support to the rural population. India is the second largest goat producing country in the world after China. The goat population in India is estimated to be 148.88 million and 11.6 million in Madhya Pradesh (DAHD, 2019). Goats, called "poor man's cow", play an important role in nutrition and produce a livelihood for the people around the whole world. They act as a source of meat, milk, skin, fiber and manure (Asaye and Alemneh, 2015). Goat rearing is easy, less expensive, less laborious and highly profitable business. Unfortunately, an enormous number of goat population die due to respiratory tract affections at the early stage of their lives resulting in greater economic losses on animal husbandry. Respiratory diseases have been identified as the leading health problem of small ruminants which accounts for up to 54% of the overall mortality of goat (Mukasa-Mugerwa *et al.*, 2000). Irrespective of etiology, infectious respiratory diseases of sheep and goats contribute to 5.6 percent of the total diseases of small ruminants (Mukasa-Mugerwa *et al.*, 2000). Pneumonia is one of the most common respiratory tract affections in small ruminants. Pneumonia constitutes a serious threat to either individuals or flocks, resulting in poor live weight gain, a decrease in milk and wool production, less number of offspring, and a high rate of mortality. Bronchopneumonia, interstitial pneumonia, embolic pneumonia, granulomatous pneumonia and verminous pneumonia are the different types of pneumonia that occurs in the lungs of the domestic animals (Zachary and Mc Gavin, 2013). There is very scarce data about haemato-biochemical changes associated with pulmonary affection of goats. Therefore, present work aims to describe the prevalence and haemato-biochemical changes in caprine lung lesions.

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MATERIALS AND METHODS

The materials for the present study were comprised of lungs and blood samples obtained from goats slaughtered at the different slaughterhouses (Rewa, 222 samples), (Satna, 180 samples), (Sidhi, 108 samples) in the Baghelkhand region of Madhya Pradesh. The goats of different breed, sex and age group were examined for the presence of gross abnormalities in the lungs if any, and samples that showed gross abnormality in the lungs were collected for further studies. At slaughter, the lungs of the animals were thoroughly examined for the presence of gross pathological lesions. The lungs were thoroughly examined for change in color, abnormality in size, shape, presence of any growth and consistency of the tissue.

Tissue pieces from representative portions of the lungs that showed definite gross lesions were collected and fixed in 10% neutral buffered formalin and stained with routine haematoxylin and eosin stain.

Hematology: To determine the haematological changes, 5 ml of blood samples were collected during the slaughter of goat in a sterile vials containing anticoagulant (EDTA @ 2 mg/ml of blood). Five milliliter of blood was collected from 10 healthy goats, which were used as a control group. The estimation of Haemoglobin (Hb) was carried out with the help of haemoglobinometer set (Sahli's method). Haemoglobin was expressed as g/dl. The estimation of TEC was carried out with haemocytometer consisting of an improved bright-line Neubar's chamber and a standard RBC diluting pipette. The count was expressed as millions/cumm. The estimation of TLC was determined by haemocytometer consisting of improved bright-line Neubar's chamber and standard white cell diluting pipette. The count was expressed as thousands/cumm. The differential leukocyte count was done by preparing a thin blood smear on a glass slide, stained with Leishman's stain and was examined under oil immersion lens of a microscope. One hundred cells have been counted by the battlement method and values were expressed in percentage. A long capillary tube with a bore of 1mm was charged with blood up to $3/4^{th}$ of its length. Blood on the outside of the tube was wiped off. The vacant end of the tube was sealed with special clay. This was placed in the slot provided in the micro-hematocrit centrifuge with the sealed end closed and rotated at 12000 rpm for 4-5 min. The column of the packed RBC was read using a special scale. The result was expressed in percentages.

Biochemical Analysis: To determine the biochemical parameters, 5 ml of blood samples without anticoagulant were collected during the slaughter of goats in vacutainer tubes. 5 ml of blood was collected from 10 healthy goats, which were used as a control group. The vacutainer tubes were kept in a slanting position at room temperature for clotting and then centrifuged at 3000 rpm for 5 min. The separated serum samples were collected in screw-capped plastic vials and stored at -20º C till further use. The parameters like albumin, globulin and total proteins were analysed with the help of a semi-automatic biochemical autoanalyzer. Albumin was estimated according to the method described by Young (1997), using Erba diagnostic kit and the result was expressed in gram per deciliter (g/dl). Globulin was estimated according to the method described by Young (1997), using Erba diagnostic kit and the result was expressed in gram per deciliter (g/dl). Total protein was estimated by the modified biuret method as described by Young (1997), using Erba diagnostic kit and the values were expressed in gram per deciliter (g/dl).

Statistical analysis: The mean values of (data) and standard errors were calculated as per procedure described by Snedecor and Cochran (1994). Data analyzed using software SPSS version 16.0.

RESULTS AND DISCUSSION

Amongst 518 goat lungs examined at slaughter, 171 (33.01%) cases were found to be affected by various pathological conditions in the lungs. The higher prevalence of different pulmonary affections was recorded in Rewa district (38.70%, 89/230) and lower prevalence was recorded in Satna district (28.89%, 52/180) and Sidhi district (27.78%, 30/108) of Bhaghelkhand region. Various pulmonary lesions observed included, congestion and hemorrhages (11.58%), pulmonary emphysema (1.74%), atelectasis (2.12%), pulmonary hydatidosis (1.16%) and different types of pneumonia, like bronchopneumonia (3.67), suppurative pneumonia (1.35%), fibrinous pneumonia (3.28%), interstitial pneumonia (5.79%) and haemorrhagic pneumonia (2.32%). A higher prevalence of lung lesions is reported by many workers (Tijjani *et al.*, 2012; Rashid *et al.*, 2013). The difference in the prevalence of lung lesions may be due to variability in the agro-climatic conditions, disease predominance and animal husbandry practices. The variations in the reports of the above workers may be attributed to the fact that some workers examined only clinically infected animals. Pneumonia in slaughtered animals may develop due to transportation stress, overcrowding, unrest in the lairage, odd weather, and inadequate feed and water. These conditions may predispose the animals for the failure of pulmonary defense mechanism leading to pneumonia. Histopathologically, in bronchopneumonia, the alveolar and bronchial lumen filled with neutrophilic exudates and a few mononuclear cells. The blood vessels surrounding the bronchioles and alveolar wall were engorged (Fig. 1). In interstitial pneumonia, interalveolar septa were thickened by infiltration of varying numbers of neutrophils, fibroblasts and mononuclear inflammatory cells (Fig. 2).

Haemato-biochemical changes: Blood samples collected from 171 affected goats and 10 apparently healthy goats were used for the estimation of haematological parameters. The mean values of haemoglobin (Hb) were significantly ($P<0.05$) decreased in case of congestion & haemorrhages, suppurative pneumonia, fibrinous pneumonia, interstitial pneumonia and haemorrhagic pneumonia as compared to the control group (Table 1). These findings were in accordance with Aziz *et al.* (2019) and Dutta *et al.* (2017) who observed significantly decreased haemoglobin (Hb)

Table 1. Haematological parameters (Mean ± SE) in pulmonary affections of goats in Baghelkhand region of Madhya Pradesh

S.N.	Parameter	Control	C.H.	P.E.	Atle.	P.H.	B.N.	S.P.	F.P.	I.P.	H.P.
1.	Hb	11.27^{a}±0.21	9.70^{b}±0.07	10.84^{a}±0.21	10.66^{a}±0.14	10.42^{a}±0.17	10.97^{a}±0.12	10.07^{b}±0.17	10.28^{b}±0.15	10.47^{b}±0.12	9.85^{b}±0.09
2.	PCV	32.44^{a}±0.34	28.97^{b}±0.15	31.66^{a}±0.26	31.84^{a}±0.32	31.68^{a}±0.48	31.87^{a}±0.34	28.69^{b}±0.17	30.97^{a}±0.42	31.24^{a}±0.34	28.88^{b}±0.17
3.	TEC	14.51^{a}±0.25	11.41^{b}±0.17	14.04^{a}±0.25	14.14^{a}±0.32	13.42^{a}±0.40	11.01^{b}±0.27	11.36^{b}±0.25	11.23^{b}±0.28	11.57^{b}±0.20	10.78^{b}±0.29
4.	TLC	8.87^{a}±0.50	10.21^{a}±0.26	13.58^{b}±0.40	8.96^{a}±0.36	12.58^{b}±0.78	12.96^{b}±0.33	13.36^{b}±0.51	11.97^{b}±0.32	11.99^{b}±0.29	11.85^{b}±0.42

Superscript differ in latter significant difference, should be read row wise (P< 0.05).
C.H- Congestion & haemorrhages, P.E- Pulmonary emphysema, Atle- Atelectasis, P.H-Pulmonary hydatidiosis, B.N- bronchopneumonia, S.P- Suppurative pneumonia, F.P- Fibrinous pneumonia, I.P- Interstitial pneumonia, H.P- Hemorrhagic pneumonia

Table 2. Differential Leukocyte Count (Mean ± SE) in pulmonary affections of goats

S.N.	Parameter	Control	C.H.	P.E.	Atle.	P.H.	B.N.	S.P.	F.P.	I.P.	H.P.
1.	N	37.60^{a}±0.65	46.98^{b}±0.33	49.18^{b}±1.26	43.33^{b}±0.87	44.50^{b}±0.85	48.79^{b}±0.40	49.00^{b}±0.49	49.24^{b}±0.28	48.83^{b}±0.30	49.08^{b}±0.42
2.	L	55.50^{a}±0.78	42.33^{b}±0.43	38.27^{b}±1.27	48.78^{b}±1.10	45.17^{b}±0.90	39.00^{b}±0.15	39.00^{b}±0.21	39.00^{b}±0.17	39.67^{b}±0.32	42.33^{b}±0.64
3.	M	2.40^{a}±0.16	4.88^{b}±0.12	3.09^{a}±0.25	3.89^{b}±0.54	4.67^{b}±0.33	5.05^{b}±0.16	5.14^{b}±0.26	5.18^{b}±0.19	5.00^{b}±0.14	3.83^{b}±0.24
4.	E	4.50^{a}±0.58	5.80^{a}±0.22	9.45^{b}±0.31	4.00^{a}±0.41	5.67^{a}±0.33	7.16^{b}±0.24	6.86^{b}±0.59	6.59^{b}±0.29	7.13^{b}±0.19	4.75^{a}±0.25
5.	B	00^{a}±00	00^{a}±00	00^{a}±00	00^{a}±00	0.50^{a}±0.22	00^{a}±00	00^{a}±00	00^{a}±00	00^{a}±00	00^{a}±00

Superscript differ in latter significant difference, should be read row wise (P< 0.05).

Table 3. Biochemical changes (Mean ± SE) in pulmonary affections of goats.

S.N.	Parameter	control	C.H.	P.E.	Atle.	P.H.	B.N.	S.P.	F.P.	I.P.	H.P.
1.	ALB	3.24^{a}±0.09	2.79^{a}±0.07	2.70^{a}±0.16	3.18^{a}±0.03	3.17^{a}±0.05	2.37^{b}±0.14	2.40^{a}±0.32	2.61^{a}±0.09	2.49^{b}±0.10	2.50^{a}±0.16
2.	GLB	3.32^{a}±0.12	3.30^{a}±0.04	3.40^{a}±0.09	3.24^{a}±0.06	3.32^{a}±0.11	3.47^{a}±0.09	3.50^{a}±0.15	3.43^{a}±0.07	3.51^{a}±0.07	3.45^{a}±0.14
3.	TP	6.56^{a}±0.12	6.09^{a}±0.07	6.11^{a}±0.14	6.42^{a}±0.07	6.48^{a}±0.14	5.84^{b}±0.17	5.90^{a}±0.24	6.04^{a}±0.09	5.99^{a}±0.09	5.96^{a}±0.24

Superscript differ in latter significant difference, should be read row wise (P< 0.05).

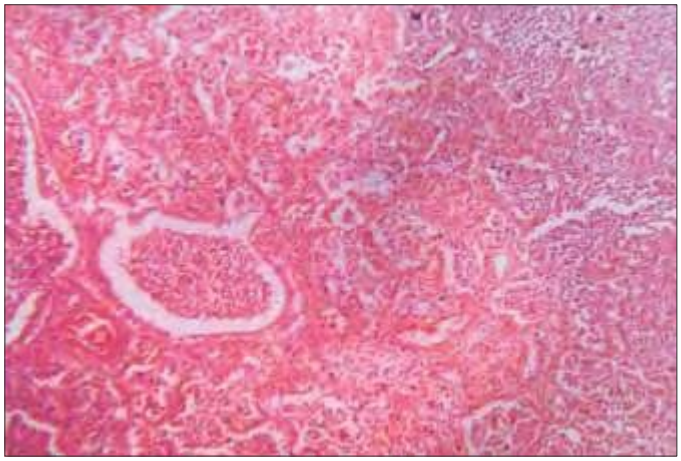

Fig. 1. Microphotograph of lung showing, alveolar and bronchial lumen filled with neutrophilic exudates and mononuclear cells. The severely engorged blood vessels surrounding the bronchioles and alveolar wall (H&E, 10X).

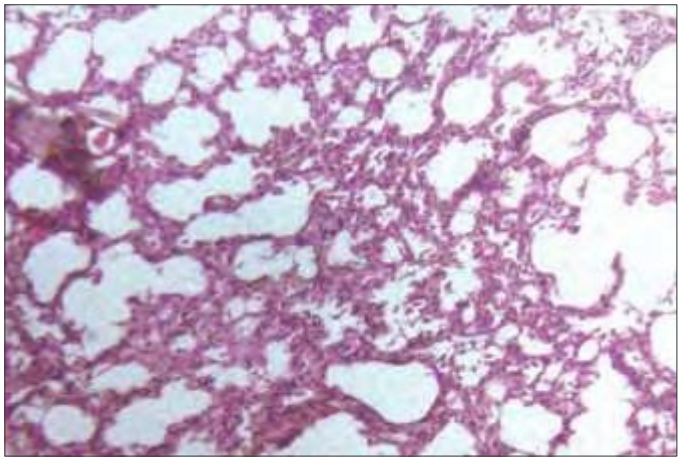

Fig. 2. Microphotograph of lung showing infiltration of inflammatory cells in the interalveolar septa and alveolar lumen (H&E, 10X).

values in case of pulmonary affections of goats. The mean packed cell volume (PCV) values were significantly (P<0.05) decreased in case of congestion and haemorrhages, suppurative pneumonia, haemorrhagic pneumonia as compared to control. Same findings were reported by (Das *et al.*, 2015), who found decreased PCV values in pulmonary affections of goats. The mean values of total erythrocyte count (TEC) were significantly lower in congestion & haemorrhages, bronchopneumonia, suppurative pneumonia, fibrinous pneumonia, interstitial pneumonia and haemorrhagic pneumonia as compared to healthy goats (Table 1). These findings were in agreement with others (Ghanem *et al.*, 2015; Dutta *et al.*, 2017), who reported lower TEC in the pneumonic goats. The decreased value of Hb, PCV and TEC showed anemia in pneumonic goats that might be allocated to micro-haemorrhages and sequestration of red blood cells during disseminated micro-thrombosis (Gutierrez *et al.*, 1999). It may be due to the destruction of red blood cells by micro-organism secretions or due to the deficiency of nutrients and anorexia. The mean value of TLC significantly increased in pulmonary emphysema, pulmonary hydatidosis,

bronchopneumonia, suppurative pneumonia, fibrinous pneumonia, interstitial pneumonia and haemorrhagic pneumonia (Table 1). These findings were in accordance with several other workers (Dutta *et al.*, 2017; Tharwat, 2021). The changes in leucocytes may be considered as a defense mechanism against the inflammatory processes in the body, the inflammation stimulates the bone marrow to produce a large number of leucocytes. The increase leucocytes may be due to acute inflammation by bacterial infections, which stimulate various types of cells to produce cytokines, and other mediators of inflammation that increase total leucocytes (Sayed *et al.*, 2002). The mean value of neutrophils was significantly higher ($P<0.05$) in congestion and haemorrhages, pulmonary emphysema, atelectasis, pulmonary hydatidosis, bronchopneumonia, suppurative pneumonia, fibrinous pneumonia, interstitial pneumonia and haemorrhagic pneumonia (Table 2). Similar findings were reported by many workers (Dutta *et al.*, 2017). Higher neutrophils may be attributed due to acute inflammatory changes in lower respiratory tract particularly due to bacterial infection in pneumonic goats (Kattimani *et al.*, 2020). The mean value of lymphocytes was significantly ($P< 0.05$) decreased in congestion and haemorrhages, pulmonary emphysema, atelectasis, pulmonary hydatidosis, bronchopneumonia, suppurative pneumonia, fibrinous pneumonia, interstitial pneumonia and haemorrhagic pneumonia (Table 2). Same findings were reported by several workers (Wassel and Awad, 2016; Ugochukwu *et al.*, 2018). The significantly decreased lymphocytes count might be due to stress and the release of endogenous corticosteroids that may play a secondary role in redistribution of recirculating lymphocytes leading to their sequestration in the lymphoid tissues. The decrease in lymphocyte might be due to viral infection, because virus causes necrosis of lymphocytes in lymphoid organs (Aytekin *et al.*, 2011). The mean value of monocytes was significantly ($P<0.05$) increased in congestion and haemorrhages, atelectasis, pulmonary hydatidosis, bronchopneumonia, suppurative pneumonia, fibrinous pneumonia, interstitial pneumonia and haemorrhagic pneumonia (Table 2). These findings were in accordance with (Dutta *et al.*, 2017). Contrary to the present study, Wassel and Awad (2016) reported no significant change in monocyte counts in pneumonic goats. The eosinophil values were significantly ($P<0.05$) increased in case of pulmonary emphysema, bronchopneumonia, suppurative pneumonia, fibrinous pneumonia and interstitial pneumonia (Table 2). The findings of the present study were in agreement with Dutta *et al.* (2017). Contrary to the present study Wassel and Awad (2016) reported no significant change in eosinophils count in pneumonic goats. The increase of the eosinophils count could be attributed to the long period of the disease.

The mean albumin values were significantly ($P<0.05$) decreased in case of bronchopneumonia and interstitial pneumonia as compared to the control group (Table 3). These results were similar to those of other worker's (Aziz *et al.*, 2019; Tharwat, 2021). The decreased albumin may be due to anorexia associated with pneumonia and the inability of the liver to synthesize protein (El-Seidy *et al.*, 2003). The variation in affected and healthy goats might be due to nutritional variation and changes in the immunological status of the animals. The total protein values were significantly ($P< 0.05$) decreased in cases of bronchopneumonia. Decreased total protein in bronchopneumonia in the present study was in agreement with the finding of others (Aziz *et al.*, 2019). The drop in total protein and albumin might be due to anorexia, nutritional difference, environment and hormonal factors.

CONCLUSION

Among the various pathological conditions of the lungs prevalence of congestion and hemorrhages was found to be highest as compared to other pulmonary affections. The mean values of Hb, PCV and TEC were significantly decreased in case of congestion& hemorrhages, suppurative pneumonia and haemorrhagic pneumonia. The mean values of TLC, neutrophil, monocytes and eosinophils were significantly increased in conditions of emphysema, pulmonary hydatidosis, bronchopneumonia, suppurative pneumonia, fibrinous pneumonia, interstitial pneumonia, and haemorrhagic pneumonia. From the present study, it is evident that It is evident that prevalence of pneumonia can bevarying in different geographical conditions. The haematobiochemical parameters may be helpful for the clinician to the diagnosis of different types of pulmonary affections in goats.

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