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Demographic study on etiology and haemato-biochemical alterations in anaemic goats in Puducherry

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Abstract

Anaemia in small ruminants is characterized by reduced productivity and increased mortality, which poses significant nationwide economic loss. The present study was carried out in the Puducherry, India to understand the prevalence, etiology, and haemato-biochemical changes associated with anaemia in goats. A total of 43 goats showing visible signs suggestive of anaemia were selected and screened for estimation of Hemoglobin (Hb) and Packed cell volume (PCV). Six apparently healthy goats were selected as controls. In the study, 36 out of 43 (83.72%) suspected goats were anaemic, and the females were highly affected (66.67%) than males. The highest incidence was recorded from 6 months to 1 year of age (33.33%), followed by more than 2 years of age (30.56%). A highly significant ($p < 0.01$) reduction in Hb, PCV, RBC count, and MCV was observed in anaemic goats. Serum biochemical estimations showed no significant difference in total protein, albumin, and globulin levels between the anaemic and control animals. On fecal examinations, twelve out of the 36 (33.33%) anaemic animals were found to be positive for endoparasitic infections. The incidence of strongylosis was highest (8.33%), followed by a mixed infection of strongylosis and trichuriasis (8.33%), strongylosis and coccidiosis (5.56%) and amphistomiasis (2.78%). Mixed infections involving *Trichuris* spp., *Strongyloides* spp., *Moniezia* spp., and coccidiosis were also observed. Lack of regular deworming in places like Puducherry with high humidity and temperature can lead to severe parasitic infections in goats.

Keywords: Anaemia, endoparasite, goats, hemoglobin, deworming

Introduction

Goat rearing bestows an important farming enterprise in India, capable of generating income, employment, and animal protein. According to the 20th livestock census, Puducherry, a state in India is home to 73,630 goats (Livestock census, 2019) [4] and 63.3% of people were goat farmers (Mallikarjuna *et al.*, 2021) [6]. One of the major life-threatening conditions in goats encountered by most small and marginal-scale farmers is anaemia. Anaemia is defined as a clinical condition, which causes an absolute decrease in the red cell mass as measured by RBC count, hemoglobin concentration, and PCV. It can develop from loss, destruction, or lack of production of RBC (Rao *et al.*, 2022) [9]. Consequently, it arises in many of the infectious and non-infectious diseases in goats. The condition is characterized by pale or white mucous membranes, exercise intolerance, tachypnea, tachycardia, possible systolic murmurs, weakness, loss of body weight, and collapse. Hypoproteinemia, ascites, and weight loss are other signs noticed along with anaemia. Endoparasitism, ectoparasitism, haemoparasitism, and nutritional deficiencies are claimed to be the potential etiologies of anaemia. A common endoparasite associated with anaemia in goats is *Haemonchus contortus* (the barber's pole worm) which sucks about 50µL of blood per day and can cause severe blood loss (Wagener *et al.*, 2022) [12]. Besides, external parasites like ticks, lice, and fleas also favor anaemia. Minerals such as cobalt, copper, and iron are critical to hemoglobin and red blood cells, a lack of which would result in anaemic condition. Other possible causes of anaemia in goats include toxicities like fluorosis, and bracken fern ingestion, and infections like paratuberculosis, and anaplasmosis (Choudhary *et al.*, 2023) [3]. Therefore, the present study was conducted to observe the incidence and various etiological factors in causing

anaemia in different parts of Puducherry during the period of period of January to June month of 2023.

Materials and methods

The present study was conducted in the Veterinary Clinical Complex (Department of Veterinary Medicine unit), RIVER, Puducherry. A total of 49 goats were presented, of which 43 goats screened for anaemia based on anamnesis, clinical signs, haemato-biochemical studies, and faecal examination. Clinical examination of the animals was undertaken as per standard methods. Six apparently healthy goats were selected as controls. Detailed haematological, biochemical, and parasitological studies were conducted in all the anaemic cases and controls.

Blood samples (5 ml) were collected from jugular and ear veins using a vacutainer containing EDTA and clot activator. Haematological parameters such as hemoglobin (Hb), Packed Cell Volume (PCV), Mean Corpuscular Volume (MCV), Mean Corpuscular Hemoglobin (MCH), Mean Corpuscular Hemoglobin Concentration (MCHC), Total leucocyte count, and Differential leukocyte count were evaluated. Serum samples were taken for biochemical analysis to evaluate total protein, albumin, and globulin. Fecal samples were taken for the detection of oocysts and endoparasites. Those goats with PCV less than 22 percent and Hb levels lower than 8 g/dl were considered anaemic (Weiss and Wardrop, 2011) [13]. The data generated in the present study was analysed using statistical analysis (Unpaired t test-SPSS version 20)

Results

Overall, 49 goats were presented to the clinics, out of which 43 goats were suspected for anaemia based on clinical signs like a pale mucous membrane, rough hair coat, lethargy, and distended abdomen. A total of 36 goats (83.72%) were supposedly anaemic, of which females (66.67%) were more frequently affected than males. Goats between 6 months and 1 year of age showed the highest incidence (33.33%), followed by goats over 2 years of age (30.56%). Haematological analysis of blood samples was performed, and the mean ($\pm$ SE) values of the parameters are shown in Table 1. The Hemoglobin concentration (Hb) of control and anaemic goats were 8.87 ± 0.73 and 5.74 ± 1.49 g/dL, Packed cell volume (PCV) were 26.3 ± 2.88 and $16.2 \pm 4.57\%$, Total erythrocyte count (TEC) were 4.39 ± 0.48 and 2.7 ± 0.76 10⁶/UL, Mean corpuscular volume (MCV) were 11.7 ± 2.59 and 4.7 ± 2.22 fl, Mean corpuscular haemoglobin (MCH) were 20.3 ± 0.69 and 21.8 ± 2.98 pg, Mean corpuscular haemoglobin concentration (MCHC) were 33.8 ± 1.15 and 36.3 ± 4.97 g/dL, Total leukocyte count (TLC) were 16620 ± 26 and 19180 ± 21 10³/ μ L, neutrophil was 7618 ± 12 and $9298 \pm 18\%$, lymphocyte 8893 ± 14 and $8551 \pm 10\%$, monocyte (%) 127 ± 97.99 and $79.31 \pm 40.52\%$. On biochemical analysis, the values obtained by control and anaemic groups for are total protein 6.462 ± 0.24 and 6.472 ± 1.12 g/dL, albumin 3.055 ± 0.49 and 3.37 ± 1.1 g/dL and globulin 3.407 ± 0.68 and 3.101 ± 1.09 g/dL. The results revealed a highly significant reduction ($p < 0.0001$) in Hb, MCV, TEC, and PCV in anaemic goats compared with healthy goats. The results of fecal sample examination are shown in table 2. On fecal sample

examination twelve goats out of thirty-six (33.33%) were found positive for parasitic infections. Parasites such as Strongyle (8.33%), mixed infection of stronglye and Trichuris (8.33%) were obtained in higher percentage followed by *Amphistome* (2.7%), and mixed infection of *Strongyle*, *Coccidia*, *Strongyloid* and *Moneizia*.

Discussion

The incidence of anaemia in goats was found to have increased from 35% to 65.13% (Velusamy *et al.*, 2015; Bhatane *et al.*, 2018) [11, 2]. The unpaired t-test revealed no significant gender-based differences in anaemia prevalence. However, a closer examination of the data showed that females exhibited a higher anaemia prevalence rate (66.6%) compared to males (33.33%). The present study's finding of a higher anaemia incidence in female goats is in accordance with earlier reports (Bhatane *et al.*, 2018; Rajendra *et al.*, 2021) [2, 8]. Furthermore, the highest incidence of anaemia was recorded in 6 months to 1 year of age (33%), followed by more than 2 years (31%), less than 6 months (22%), and lowest in 1-2 years (14%) of age grouped animals (Fig. 1). Several literatures recorded the highest incidence of anaemia in the age group 6 months to 1 year (Singh *et al.*, 2017; Nayak *et al.*, 2021) [10, 7].

Haematobiochemical analysis

The observations obtained the present study are comparable with the results of Rao *et al.* (2022) [9], who observed significantly ($p < 0.05$) lower TEC, Hb, PCV, MCV, MCH, and MCHC levels, with a significant increase in TLC and neutrophil count in anaemic goats compared to healthy goats. There was no significant difference in differential leucocyte count and neutrophil count. Serum biochemical estimations indicated no significant reduction in total protein, albumin and globulin values.

Fecal sample analysis

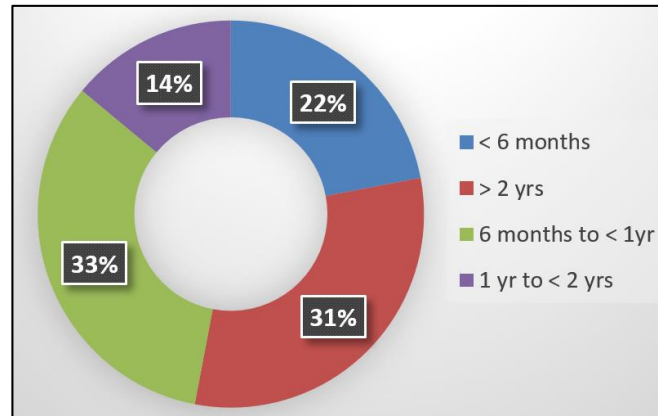
Parasitism was one of the pivotal etiologies in causing anaemia in goats. In the present study, mixed infection was found to be higher (22.22%), followed by infection of *Strongyles* spp. (8.33%) and *Amphistome* spp. (2.78%). Within mixed infections, 2.78% of goats (2 case) were found positive for *Strongyles* spp. along with *Trichuris* spp, *Strongyloid* spp, *Moneizia* spp. and *Eimeria* spp whereas, in 3 case (3.33%) mixed infections of *Strongyles* spp along with *Tricuris* spp. infection was found. In 2 cases (5.56%) *Strongyles* spp. and *Eimeria* spp. mixed infection and 1 case (2.78%) with *Amphistome* spp. and *Trichuris* spp. was detected. No hemoparasites were detected on blood smear examination. This was in accordance with the findings of Anumol *et al.* (2011) [1]; Rajendra *et al.* (2021) [8]; Jayalakshmi *et al.* (2021) [5] and Rao *et al.* (2022) [9]. Also, no external parasites were observed in the present study. The exact cause could not be ascertained in 24 out of the 36 (66.67%) anaemic animals. Anaemia in these cases could be due to nutritional deficiencies, metabolic disorders, bone marrow disorders or other such conditions. Since parasitism is one of the leading causes of anaemia in goats, implementing appropriate treatment and control measures is crucial to reduce the impact of anaemia and improve the health and well-being of affected goats.

Table 1: Haemato-biochemical parameters of healthy and anaemic goats

Parameters	Control (n = 6)	Anaemic (n = 36)	P-value (students T test)
Hb (g/dL)	8.87 ± 0.73	5.74 ± 1.49	$p < 0.0001^{***}$
PCV (%)	26.3 ± 2.88	16.2 ± 4.57	$p < 0.0001^{***}$
TEC (10 ⁶ /UL)	4.39 ± 0.48	2.7 ± 0.76	$p < 0.0001^{***}$
MCV (fl)	11.7 ± 2.59	4.7 ± 2.22	$p < 0.0001^{***}$
MCH (pg)	20.3 ± 0.69	21.8 ± 2.98	0.23
MCHC (g/dL)	33.8 ± 1.15	36.3 ± 4.97	0.23
TLC (10 ³ /μL)	16620 ± 26	19180 ± 21	0.64
Neutrophil (%)	7618 ± 12	9298 ± 18	0.72
Lymphocyte (%)	8893 ± 14	8551 ± 10	0.9
Eosinophils (%)	0	0	-
Monocyte (%)	127 ± 97.99	79.31 ± 40.52	0.68
Total Protein (g/dL)	6.462 ± 0.24	6.472 ± 1.12	0.98
Albumin (g/dL)	3.055 ± 0.49	3.37 ± 1.1	0.5
Globulin (g/dL)	3.407 ± 0.68	3.101 ± 1.09	0.51

Table 2: Distribution of cases of anaemia in goats as per the etiology

S. No	Etiology	Positive cases	Percentage
1.	<i>Amphistomes</i>	1	2.78
2.	<i>Amphistome</i> and <i>Trichuris</i>	1	2.78
3.	<i>Strongyle</i>	3	8.33
4.	<i>Strongyle</i> and <i>Trichuris</i>	3	8.33
5.	<i>Strongyle</i> and <i>Coccidia</i>	2	5.56
6.	<i>Strongyle</i> , <i>Strongyloid</i> , <i>Moneizia</i> , oocyst of <i>Coccidia</i>	1	2.78
7.	<i>Strongyles</i> , <i>Strongyloids</i> , <i>Trichuris</i> , <i>Coccidia</i>	1	2.78

**Fig 1:** Age Wise Occurrence of Anaemia

Conclusion

The incidence of anaemia recorded in this study was higher than those reported from other parts of the country. The difference in prevalence by noted in other studies might be due to different geographical locations, vector populations, climatic variation, and genetic variation of the animals (Jayalakshmi *et al.*, 2021) [5]. The major etiology identified in the present study was endoparasites (33.33% cases). The warm and humid climate of Puducherry is conducive to the development and survival of the pre-parasitic stages, which lead to increased incidence of anaemia. Veterinary intervention is crucial for diagnosing the specific causes of anaemia in individual animals. Moreover, educating goat farmers about the signs of anaemia, risk factors and

preventive measures including regular deworming plays a significant role in reducing the incidence of this condition.

Conflict of interests

The authors declare that they have no conflict of interest.

Data Availability Statement

Data set generated during research need to be available from the corresponding author upon reasonable request.

Ethical Approval

All experimental procedures were conducted in accordance with institutional animal ethics guidelines and approved by the institutional animal ethics committee, veterinary clinical complex (RIVER, Puducherry, India)

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References

- Anumol J, Tresamol PV, Saranya MG, Vijayakumar K, Saseendranath MR. A study on aetiology of anaemia in goats. *J Vet Anim Sci.* 2011;42:61-63. doi:10.51966/jvas.2011.42.61-63.
- Bhatane SC, Moregaonkar SD, Gangane GR, Narladkar BW. Studies on overall prevalence of anaemia in goats with special reference to parasitic infections associated with it. *J Entomol Zool Stud.* 2018;6:477-480.
- Choudhary S, Davis KJ, Kumar GKC, Sharma P. Clinical findings of diseases of goats. In: Rana T, editor. *Principles of goat disease and prevention.* Hoboken (NJ): Wiley; 2023. p. 33-48. doi:10.1002/9781119896142.ch4.
- Department of Animal Husbandry and Dairying. Provisional key results of the 20th Livestock Census. New Delhi: Government of India; 2019.
- Jayalakshmi K, Selvaraj P, Veeraselvam M, Venkatesan M, Premalatha N, Kannan K. Prevalence of etiological agents in anaemic goats in Cauvery delta region of Tamil Nadu. *Indian J Small Rumin.* 2021;27(2):217-222.
- Mallikarjuna R, Rajaganapathy V, Ganesan R, Ponnuvel P, Sreekumar D. Socio-economic profile of goat farmers in Puducherry. *Int J Adv Res Biol Sci.* 2021;8(5).
- Nayak S, Rath PK, Panda SK, Mishra BP, Mishra R, Biswal SS. Etiopathological and haematobiochemical profiles in goats with gastrointestinal disorders. *Vet World.* 2021;14(7):1760-1767. doi:10.14202/vetworld.2021.1760-1767.
- Rajendra BP, Sivaraman S, Senthilkumar G, Balachandran P. Demographic study of incidence and etiologies of anaemia in sheep and goats in and around Namakkal, Tamil Nadu. *Int J Curr Microbiol Appl Sci.* 2021;10(3):1177-1183. doi:10.20546/ijcmas.2021.1003.144.
- Rao N, Parmar JJ, Sadhu DB, Shah AI, Patel DM. Studies on etiologies and haemato-biochemical alterations associated with anaemia in goats. *IJVSBT [Internet].* 2022 Sep 19 [cited 2026 Jul 13];18(2):40-43.

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<https://www.acspublisher.com/journals/index.php/ijvsbt/article/view/2154>.

10. Singh E, Kaur P, Singla LD, Bal MS. Prevalence of gastrointestinal parasitism in small ruminants in western zone of Punjab, India. *Vet World*. 2017;10(1):61-66. doi:10.14202/vetworld.2017.61-66.
11. Velusamy R, Rani N, Ponnudurai P, Anbarasi P. Prevalence of internal and haemoprotozoan parasites of small ruminants in Tamil Nadu, India. *Vet World*. 2015;8:1204-1208. doi:10.14202/vetworld.2015.1204-1208.
12. Wagener MG, Beythien G, Sterneberg M, Polifka A, Großmann T, Baumgärtner W, *et al*. Case report: severe anaemia associated with an abomasal fibrosarcoma in a goat. *Front Vet Sci*. 2022;9:869017. doi:10.3389/fvets.2022.869017.
13. Weiss DJ, Wardrop KJ, editors. *Schalm's veterinary haematology*. 6th ed. Ames (IA): Wiley-Blackwell; 2011.