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Haematological assessment of brucellosis in aborted sheep and goats in Proddatur, YSR Kadapa district of Andhra Pradesh

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Abstract

Brucellosis, a zoonotic disease caused by *Brucella* spp., significantly affects the health and productivity of sheep and goats, resulting in substantial economic losses and public health concerns. The present study evaluated the haematological alterations associated with brucellosis in sheep and goats from the Proddatur, YSR Kadapa district of Andhra Pradesh, India. A total of 120 blood samples were collected from animals with a history of abortion and screened for brucellosis using the Rose Bengal Plate Test (RBPT), Standard Tube Agglutination Test (STAT), and Indirect Enzyme-Linked Immunosorbent Assay (I-ELISA). The seroprevalence rates recorded were 36.67%, 40.83%, and 48.33% by RBPT, STAT, and I-ELISA, respectively. Haematological analyses were performed on seropositive animals and compared with seronegative controls. A statistically significant difference ($p < 0.05$) in monocyte count was observed between *Brucella* seropositive and seronegative sheep. In goats, neutrophil and lymphocyte counts showed significant differences ($p < 0.05$) between the two groups. These findings indicate that brucellosis is associated with marked haematological disturbances, which may aid in the clinical assessment and diagnosis of the disease in small ruminants.

Keywords: Brucella, hemoglobin, I-ELISA, neutrophils, lymphocytes, RBPT

Introduction

Brucellosis is an important neglected zoonotic disease worldwide, causing considerable economic losses and serious public health risks. It is transmitted through direct contact with infected animals, consumption of contaminated animal products, or exposure to aborted materials, leading to abortions and infertility in animals and infecting humans, especially farmers and veterinarians (Mahboub *et al.*, 2013) ^[6]. Haematological assessment helps in detection of anaemia, prognosis evaluation and enhancement of outcomes in infectious abortion scenarios. The level of haemoglobin was found to be decreased in affected group than control group (Hashem *et al.*, 2020, Darwish *et al.*, 2022 and Shareef and Albayati, 2023) ^[4,3&8]. Hashem *et al.* (2020) ^[4] reported increase in neutrophil and monocyte count in diseased group than control group, whereas lymphocytes, eosinophils and basophils were identical in both the groups. Darwish *et al.* (2022) ^[3] found increase in neutrophil, lymphocyte, monocyte and eosinophil count in the diseased group than control group whereas basophil counts were identical in both groups and both species. Shareef and Albayati (2023) ^[8] recorded increase in neutrophil and monocyte count in diseased group than control group, whereas lymphocyte was increased in control group and eosinophil, basophil count were identical in both groups. Naik *et al.* (2025) ^[7] noted increase in neutrophil, monocyte, eosinophil and basophil count in the diseased group than control group whereas lymphocyte count increased in control group.

Materials and Methods

The present study was carried out in various villages of Proddatur, YSR Kadapa district, Andhra Pradesh, India. Sample analysis was conducted at the Department of Veterinary

Gynaecology and Obstetrics after obtaining prior approval from the Institutional Animal Ethics Committee (IAEC) under proposal No. 7R-CVSc, PDTR/IAEC/2025.

A total of 120 blood samples were aseptically collected from aborted sheep and goats through jugular venipuncture across fifteen villages. About 2 mL of blood from each animal was transferred into Accutube EDTA K2-coated vacutainers, stored in an insulated ice box, and transported to the laboratory within three hours of collection. Haemoglobin and Differential Leukocyte Count (DLC) analyses were performed within 12 hours of collection. Haemoglobin was estimated using Sahli's method, while DLC was determined using Giemsa stained blood smear (Bernard *et al.*, 2003) [2]. Statistical significance of haematological parameters was assessed using the t-test

Results

Haematological analysis (Table 1 & 2, Fig. 1 & 2) showed significant reductions ($P < 0.01$) in haemoglobin (Hb) in both sheep and goat. A statistically significant difference ($p < 0.05$) in monocyte count was observed between *Brucella* seropositive and seronegative sheep. In goats, neutrophil and lymphocyte counts showed significant differences ($p < 0.05$) between the two groups.

Discussion

In the present study, *Brucella*-seropositive sheep and goats exhibited significantly lower haemoglobin concentrations than seronegative animals, indicating the occurrence of

anaemia associated with brucellosis. Similar reductions in haemoglobin levels have been reported by Hashem *et al.* (2020) [4], Darwish *et al.* (2022) [3] and Naik *et al.* (2025) [7], although Amin *et al.* (2009) [1] observed no significant differences. The decrease in haemoglobin may result from erythrocyte destruction mediated by immune responses against bacterial lipopolysaccharides (Tizard, 1992) [9].

Among differential leucocyte counts, a significant increase in neutrophils and a corresponding decrease in lymphocytes were observed only in seropositive goats, while no significant changes were detected in sheep. Comparable findings were reported by Darwish *et al.* (2022) [3], whereas Hashem *et al.* (2020) [4] documented neutrophilia in infected ewes. These alterations may reflect inflammatory responses and oxidative stress associated with *Brucella* infection (Hussain *et al.*, 2022) [5]. Monocyte counts were significantly reduced in seropositive sheep, suggesting suppression of cellular immune responses. This finding contrasts with reports of monocytosis in infected sheep and goats by Hashem *et al.* (2020) [4] and Darwish *et al.* (2022) [3], who attributed increased monocyte levels to their scavenging role during uterine inflammation and retained placenta. Eosinophil and basophil counts did not differ significantly between seropositive and seronegative animals, which is consistent with previous observations by Hashem *et al.* (2020) [4] and Darwish *et al.* (2022) [3]. Overall, the haematological changes observed in the present study indicate that brucellosis can induce anaemia and alterations in leucocyte profiles, particularly in goats.

Table 1: Mean $\pm$ SE of haemoglobin concentration and differential leukocyte counts in *Brucella* seronegative and seropositive sheep

Parameter	Seronegative Sheep (n=44)	Seropositive Sheep (n=52)	p value
	Mean $\pm$ SE	Mean $\pm$ SE	
Haemoglobin (g/dL)	10.6 $\pm$ 0.29 ^a	7.5 $\pm$ 0.18 ^b	$P < 0.01^{**}$
Differential leukocyte counts			
Neutrophils (%)	38.61 $\pm$ 0.90	37.57 $\pm$ 1.02	0.45
Lymphocytes (%)	56.2 $\pm$ 0.83	57.84 $\pm$ 0.95	0.19
Monocytes (%)	2.90 $\pm$ 0.70 ^a	2.32 $\pm$ 0.06 ^b	$P < 0.01^{**}$
Eosinophils (%)	2.15 $\pm$ 0.11	2.15 $\pm$ 0.10	0.97
Basophils (%)	0.11 $\pm$ 0.04	0.09 $\pm$ 0.04	0.78

(**= Significance at $p < 0.01$, * = Significance at $p < 0.05$)

Values sharing different superscripts in the same row differ significantly)

Table 2: Mean $\pm$ SE of haemoglobin concentration and differential leukocyte counts in *Brucella* seronegative and seropositive goat

Parameter	Seronegative Goat(n=17)	Seropositive Goat(n=7)	p value
	Mean $\pm$ SEM	Mean $\pm$ SEM	
Haemoglobin (g/dL)	10.47 $\pm$ 0.45 ^a	6.58 $\pm$ 0.58 ^b	0.0001 ^{**}
Differential leukocyte counts			
Neutrophils (%)	33.58 $\pm$ 2.10 ^a	39.28 $\pm$ 0.91 ^b	0.02 [*]
Lymphocytes (%)	61.17 $\pm$ 2.05 ^a	55.28 $\pm$ 1.14 ^b	0.02 [*]
Monocytes (%)	2.76 $\pm$ 0.16	2.85 $\pm$ 0.14	0.67
Eosinophils (%)	2.11 $\pm$ 0.08	2.28 $\pm$ 0.18	0.42
Basophils (%)	0.35 $\pm$ 0.11	0.28 $\pm$ 0.18	0.76

(**= Significance at $p < 0.01$, * = Significance at $p < 0.05$)

Values sharing different superscripts in the same row differ significantly)

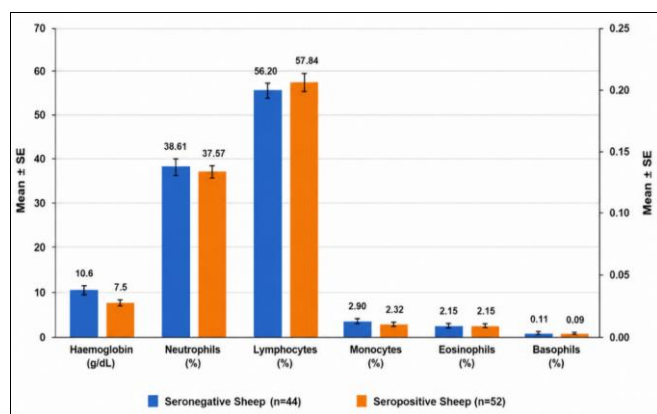


Fig 1: Mean $\pm$ SE of haemoglobin and differential leukocytes in *Brucella* seronegative and seropositive sheep

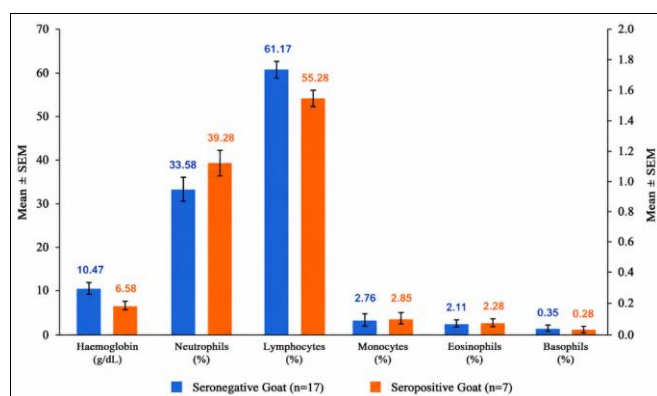


Fig 2: Mean $\pm$ SE of haemoglobin and differential leukocytes in *Brucella* seronegative and seropositive goat

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Conflict of Interest

Not available

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