

PREVALENCE OF *HAEMONCHUS CONTORTUS* AND HAEMATOLOGICAL CHANGES IN DIFFERENT AGE GROUPS OF NELLORE BROWN SHEEP

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ABSTRACT

The present study was conducted to investigate the prevalence of Haemonchus contortus and hematological changes in different age groups of H. contortus affected Nellore brown sheep. A total of 180 Nellore brown sheep flock maintained in an extensive system of grazing were selected randomly. Even though the sheep were dewormed regularly, an outbreak was noticed during May 2020 in Raptadu mandal of Anantapur district, Andhra Pradesh. Eight sheep were found dead in the flock prior to screening. During screening out of 180 sheep, 128 sheep were found normal and were kept as control group and 52 which exhibited clinical signs of anemia, poor growth, emaciation, diarrhea were selected. Blood samples were analyzed for the parameters like hemoglobin concentration (g/dl), Packed cell volume (%), Total erythrocyte count (TEC) and white blood cells (TBC), MCV (fl), MCH(pg), MCHC (g/dl) and compared with normal animals. The infection was confirmed to be due to H. contortus following the recovery of Haemonchus worms at post-mortem. The prevalence of H. contortus was recorded to be 40.9 percent in males (18 out of 44) and 25 percent in females (34 out of 136) with an overall prevalence of 28.89 percent (52 out of 180) in this present study.

Keywords: *Haemonchus contortus*, Prevalence, Hematology, Postmortem, Sheep

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INTRODUCTION

Anantapur district is one of the lowest rainfall regions of south India and the district holds a population of approximately 50 lakh sheep and goat. Most of the land is cultivable only under rain fed conditions and farmers depend on alternative activities like sheep farming and thus the small ruminant's

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population is high in this district. Because of the close grazing habit of sheep, GI nematode infections are common and among the various GI nematodes *H. contortus* is the predominant parasite.

Haemonchus contortus is also known as barber poll worm or red worm and is a blood sucking nematode that uses sheep as a host and causes haemonchosis characterized by anemia and severe damage to the abomasal mucosa resulting in lower serum protein and higher enzyme activities in the affected animals (Bordoloi *et al.*, 2012). Haemonchosis is a disease of economic importance in sheep resulting in high morbidity moderate mortality, poor growth and affects the productivity in sheep. Parasitic nematodes (GI round worms) of small ruminants and other livestock have major economic impact worldwide (Roeber *et al.*, 2013). The main species that causes the disease in sheep is *H. contortus* (Kuchai *et al.*, 2011 and 2012) is found in the abomasum resulting in significant blood loss. Both larval and adult worms are blood suckers and leave wounds/ hemorrhages on the abomasal wall of the host. Debilitating infection with this parasite is commonly reported in young animals (Soulsby 1982).

The present study was conducted to investigate the prevalence of *H. contortus* and hematological and postmortem findings in different age groups of *H. contortus* affected Nellore brown sheep in Raptadu mandal of Anantapur district, Andhra Pradesh.

MATERIALS AND METHODS

The study was carried out at Raptadu mandal of Anantapur district, Andhra Pradesh

where an outbreak occurred. Eight sheep were reported to have died before screening. In the flock, 52 sheep showed clinical signs of GI nematodal infection and remaining 128 sheep appeared normal without any clinical signs and were treated as control group. The total sheep flock (180 no's) was divided into three groups (below 6 months, 7 months to 1 year and above 1 year) and the faecal and whole blood samples were collected. The qualitative faecal examination was carried out by Sedimentation and Floatation techniques using sodium chloride as floatation solution. The number of eggs per gram per gram of feces (EPG) was evaluated by Mc masters technique. The data collected were analyzed by one way ANOVA in SPSS 20 software and Chi-squared test was used to for determine the association or non-association of variables.

The blood samples were analyzed for the common hematological parameters like alteration in the total Red Blood Cells (RBC), White Blood Cells (WBC), Hemoglobin (Hb) levels, Packed Cell Volume (PCV), Mean Corpuscular Volume (MCV), Mean Corpuscular Hemoglobin (MCH) and Mean Corpuscular Hemoglobin Concentration (MCHC). Differences between the parameters were tested for significance at probability levels of 0.05 (Soulsby, 1982).

RESULTS AND DISCUSSION

The present study demonstrated the prevalence of *H. contortus* in different age groups of Nellore brown sheep (Table 1 - 3), bottle jaw condition and pale mucous membrane in *H. contortus* affected sheep (Fig. 1), the presence of live *H. contortus* worms in abomasum and microscopic examination of

eggs (Fig. 2) and hematological findings in different age groups of *H. contortus* affected sheep (Table 4 - 6).

Prevalence according to age

In all the three groups the *H. contortus* was observed to be more in male sheep (42.85%, 40.00% and 33.33%) in group 1, 2 & 3 respectively.

The prevalence was higher in sheep aged below 6 months with lower incidence in sheep aged above 1 year which correlates with the earlier report of Tasawar *et al.* (2010). The prevalence of *H. contortus* infection in the present study revealed significant ($P < 0.05$) relation with the age (Table 3). The reason may be the free roaming in the extensive method of husbandry with no strict confinement of young ones (Table 1). Adhikari *et al.* (2017) also recorded 14.54 % prevalence of *H. contortus* in goats less than 1 year, whereas 13.64 % prevalence in goats more than 1 year age group.

Prevalence by sex

There was significance ($P < 0.05$) difference in the prevalence of *H. contortus* infection between males and females. These observations revealed that the prevalence of gastrointestinal parasites was more in males than females. The results of the present study are supported by Kanyari *et al.* (2009), who found females were more resistant to infection than males. Raza *et al.* (2007) reported the same that ram were more susceptible to gastrointestinal parasites parasite as compared to ewe. In the present

work the prevalence of *H. contortus* recorded was higher in males than females in all age groups which might be due to stimulatory effects of estrogen and inhibitory effect of androgens on immune responses, which is in accordance with the studies of Lashari and Tasawar (2010) (Table 1). The influence of sex on the susceptibility of animals to *H. contortus* infections could also be attributed to genetic predisposition and differential susceptibility owing to hormonal control. Testosterone is known for its immunosuppressive activity (Seli and Arici, 2002).

The observed hematological values are listed in Table 4 which revealed significant ($P < 0.05$) reduction in total erythrocyte count, total leukocyte count and hemoglobin concentration. These findings were similar to that recorded by Ameen *et al.* (2010), pertaining to the significant decrease in total erythrocyte count, total leukocyte count and hemoglobin concentration in below 6 months age *H. contortus* affected goats. The significant ($P < 0.05$) decrease in PCV and MCHC in below 6 months age group is due to severe anemia caused by *H. contortus*. Sharma *et al.* (2000) and Ameen *et al.* (2010) also found similar changes in PCV and MCHC in 6-9 months age group and below 6 months age group goat respectively.

The present work revealed a significant ($P < 0.05$) reduction in total erythrocyte count, total leukocyte count, hemoglobin concentration, PCV, MCV and MCHC in 7 months to 1 year age *H. contortus* affected sheep (Table 5). Similar

Table 1. Prevalence of *Haemonchus contartus* among Nellore brown sheep according to sex and age

Age Group Sex	Total sample		Tested positive		Tested negative		Total prevalence percentage	
	Male	Female	Male	Female	Male	Female	Male	Female
Group 1: Below 6 months	28	32	12	11	19	21	42.85	34.38
Group 2: 7 months to 1 year	10	21	4	8	8	20	40.00	38.09
Group 3: Above 1 year	6	83	2	15	6	57	33.33	18.07
Total	44	136	18	34	30	98	40.90	25.00
Overall prevalence	180		52		128		28.89	

Table 2. Frequency of *Haemonchus contartus* positive cases

Risk factor	Variable	Frequency	Percent
Age	< 6 months	60	33.33
	7 months to 1 Year	31	17.22
	> 1 Year	89	49.44
Sex	Male	44	24.44
	Female	136	75.56

Table 3. Univariate analysis of risk factors

Variable	Risk factor	Chi square value	Odds Ratio	95% CI	P value
Age	< 6 months		1		
	7 months to 1 Year	0.258	0.823	0.328 - 2.060	0.611
	> 1 Year	4.258	0.438	0.210 - 0.915	0.039
Sex	Male		1		
	Female	8.675	0.340	0.166 - 0.697	0.003

Table 4. Haematological findings of *Haemonchus contortus* affected Nellore brown sheep (below 6 months age)

Parameter	Control (Healthy) Sheep	<i>Haemonchus contortus</i> affected sheep
Total RBCs (x10 ⁶ /μl)	8.1±0.12 ^a	5.87±0.32 ^b
Total WBCs (x10 ³ /μl)	11.2±0.37 ^a	8.7±0.18 ^b
Hb (g/dl)	12.4±0.24 ^a	6.8±0.34 ^b
PCV (%)	45.4±0.17 ^a	30.8±0.21 ^b
MCV (fl)	52.5±0.41 ^a	48.78±0.12 ^a
MCH (pg)	10.9±0.18 ^a	10.75±0.2 ^a
MCHC (g/dl)	28.6±0.46 ^a	24±0.23 ^b

Different superscripts of the same row indicate a significant difference at P < 0.05

Table 5. Haematological findings of *Haemonchus contortus* affected Nellore brown sheep (7 months to 1 year age)

Parameter	Control (Healthy) Sheep	<i>Haemonchus contortus</i> affected sheep
Total RBCs (X10 ⁶ /μl)	8.7±0.23 ^a	6.75±0.12 ^b
Total WBCs (X10 ³ /μl)	9.8±0.87 ^a	8.9±0.46 ^b
Hb (g/dl)	13.1±0.26 ^a	8.7±0.18 ^b
PCV (%)	43.4±0.37 ^a	34.3±0.16 ^b
MCV (fl)	51.6±0.42 ^a	43.1±0.32 ^b
MCH (pg)	10.2±0.12 ^a	10.1±0.12 ^a
MCHC (g/dl)	29.6±0.76 ^a	25.0±0.53 ^b

Different superscripts of the same row indicate a significant difference at P < 0.05

Table 6. Haematological findings of *Haemonchus contortus* affected Nellore brown sheep (above 1 year age)

Parameter	Control (Healthy) Sheep	<i>Haemonchus contortus</i> affected sheep
Total RBCs (X10 ⁶ /μl)	9.4±0.22 ^a	7.1±0.34 ^b
Total WBCs (X10 ³ /μl)	10.2±0.87 ^a	8.6±0.48 ^b
Hb (g/dl)	12.4±0.21 ^a	9.6±0.14 ^b
PCV (%)	49.4±0.33 ^a	38.8±0.15 ^b
MCV (fl)	50.5±0.12 ^a	49.3±0.6 ^a
MCH (pg)	10.3±0.17 ^a	10.13±0.2 ^a
MCHC (g/dl)	27.6±0.36 ^a	25±0.21 ^a

Different superscripts of the same row indicate a significant difference at P < 0.05



Fig.1. Sheep showing bottle jaw condition and pale mucous membrane

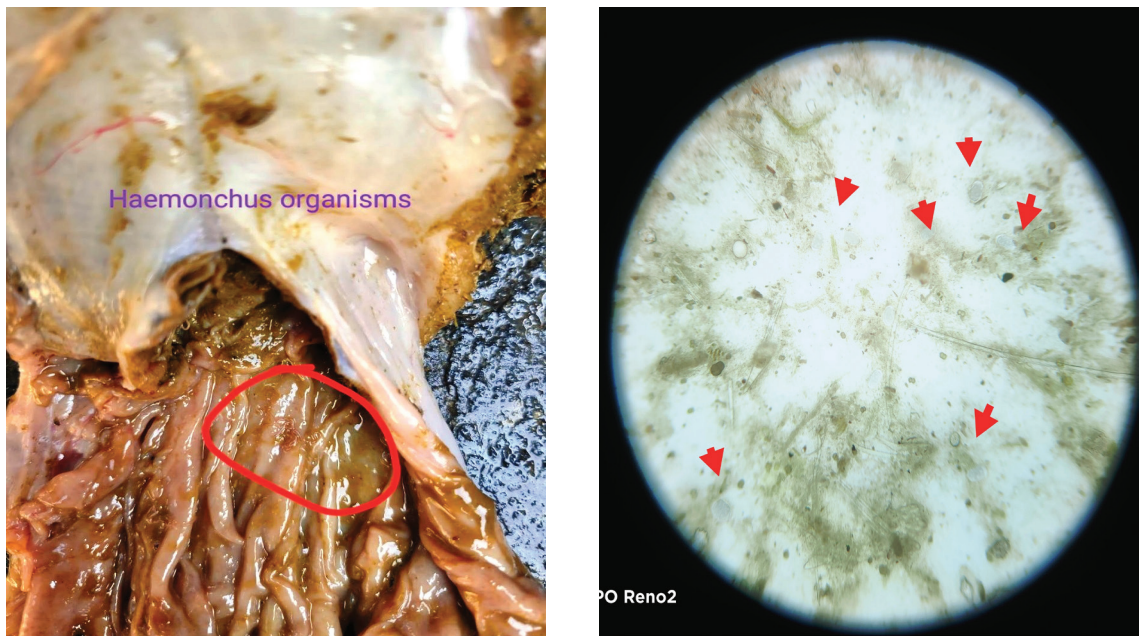


Fig. 2. Live *H. contortus* worms in abomasum and microscopic examination of eggs.

results have been reported in other field studies in 6-9 months age group *H. contortus* affected goats (Sharma *et al.* (2000). However, according to Rasha *et al.* (2020) sheep and goat naturally infected with *H. contortus* showed a significant decrease in RBC count, Hb concentration, PCV, MCV and MCHC which revealed anemia compared to healthy control animals.

The hematological values indicate significant ($P < 0.05$) reduction in total erythrocyte count, total leukocyte count, hemoglobin concentration and PCV in above 1 year aged *H. contortus* affected sheep are shown in Table 6. This study is also in agreement with the findings of Mannan *et al.* (2017) who recorded reduction in PCV, TEC and Hb concentration in *H. contortus* affected sheep and goat. Ameen *et al.* (2010) and Sharma *et al.* (2000) also found similar hematologic changes in haemonchosis in goat. However, Ceriac *et al.* (2017) recorded an increase of reticulocytes and decrease of PCV, RBC and hemoglobin in goats experimentally infected with *H. contortus*.

The findings in the present study revealed that there was decrease in Hb, PCV, TEC, MCV, MCH and MCHC with resultant anemia in the *H. contortus* infected Nellore brown sheep compared to control group. An adult *H. contortus* worm can suck about 0.03ml of blood from the site of attachment in each host (Urquhart *et al.*, 1996) and this blood sucking activity *H. contortus* resulting in reducing Hb levels which in turn reducing the PCV, TEC, MCV, MCH and MCHC values which may result in haemolytic anemia in sheep (Siham *et al.*, 1997; Sharma *et al.*,

2000). This study also support that the *H. contortus* parasites has effect on blood profile (Ameen *et al.*, 2010; Mannan *et al.*, 2017). The results obtained have been confirmed with the findings obtained by Radostitis *et al.* (1994).

CONCLUSION

It was concluded that the overall prevalence of *H. contortus* was recorded as 28.89 (52/180) in the present study. *Haemonchus contortus* is one of the important blood sucking parasite which produce severe anemia in sheep, which may be fatal in young animals. The results of the study indicates that periodical faecal examination must be done in sheep allowed for extensive grazing even though they are dewormed regularly as well as to assess, correct the deworming dose and also to prevent development of anthelmintic resistance in the field conditions.

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