

Effects of Three Different Modern Anthelmintics against Gastrointestinal Nematodiasis in Black Bengal Goats Prompting Hematological Parameters and Live Weight Studies

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ABSTRACT

Background and Objectives: This study aimed to evaluate the efficacy of ivermectin, levamisole HCl and albendazole against gastrointestinal nematodes on the basis of body weight of goats and hematological parameters like TEC, Hb, PCV, ESR and TLC in naturally infected goats of Government Goat Development Farm, Sylhet, Bangladesh. **Methodology:** The study included 50 black Bengal breed of which thirty were naturally infected and twenty of 13-15 month old irrespective of sex were randomly selected for this experiment on the basis of their weight and egg count and randomly divided into four equal groups A, B, C and D where each group consisted of 5 goats and goats of group D were kept as control group. One injectable ivermectin ($200 \mu\text{g kg}^{-1}$ b.wt., S/C) preparations and two solid levamisole HCl and albendazole (7.5 mg kg^{-1} b.wt., orally) preparations were used for positive control of group A, B and C. Before trials (day 0), blood samples and initial body weight were recorded. During the study period, the fecal and blood samples were collected and examined on 7th, 14th, 21st and 28th day using McMaster fecal egg counting method. **Results:** The results of the comparative efficacies of anthelmintic of ivermectin were 83.25%, followed by levamisole HCl 94.53% and albendazole 86.12%. After treatment, TEC, Hb and PCV were increased significantly ($p < 0.01$ and $p > 0.05$) in goats but ESR and TLC were decreased significantly ($p < 0.05$ and $p > 0.01$) in all treated goat and body weight was increased significantly ($p < 0.01$) on day 28. **Conclusion:** The findings of the present study reveal that Ivermectin (A-mectin, injectable formulation), Levamisole (Levavet) and Albendazole (Almex-Vet) are effective for the reduction of EPG (eggs per gram) of gastrointestinal nematodes. Additional detailed studies are required to clarify the current status of the efficacy of the anthelmintic widely used in different agro ecologies, animal species and livestock management systems in Bangladesh.

Key words: Ivermectin, levamisole, albendazole

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INTRODUCTION

Bangladesh is an agro based country. The livestock is an important sub-sector which is considered to be the backbone of agriculture in Bangladesh¹ and approximately 80% people depend on it directly or indirectly for their subsistence. Among livestock, the population in Bangladesh is currently estimated to comprise 20.75 million goats². Black Bengal Goat rearing is very popular in Bangladesh and treated locally as “cow

of poor people”. Goat rearing contributes greatly to the poverty stricken rural people, especially to small and marginal farmers and landless laborers holding less than 2 acres of land³. The domestic goat is a sociable, inquisitive and intelligent species, which has been used for its meat, milk, skin and fur since it was first domesticated ca. 10,000 years ago⁴. The climatic condition of Bangladesh is favorable to the ecological conditions suitable for parasites of which the helminth parasite predominates. Parasitism has been considered as one of the major constraints of livestock production⁵. Helminthiasis especially gastrointestinal nematodiasis

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overwhelming a severe havoc on health and production^{6,7} throughout the world due to impacts on economy also⁸ and market value of the living animals⁹ with a high rate of anthelmintic resistance prevalence^{10,11}. The main gastrointestinal nematodes playing lower productivity of Black Bengal Goats typically take account of *Haemonchus*, *Oesophagostomum*, *Ostertagia*, *Cchabertia*, *Nematodinus*, *Trichuris*, *Moniezia* and *Fasciola*¹². The incidence was reported in goats and sheep in Mymensingh against naturally occurring gastrointestinal nematodiasis infection by Haq and Shaikh¹³. The use of sustainable, integrated parasite control systems, using scientifically proven non-chemical methods and limited use of drugs is being considered to ensure animal health and food safety¹⁴. One can prevent and control the parasitic diseases by using a routine prophylactic anthelmintics measurement. The anthelmintic activities and therapy of ivermectin, levamisole HCl and albendazole have been studied against gastrointestinal nematodiasis in goats¹⁵. Ivermectin produces flaccid paralysis of parasites by acting as an agonist of the neurotransmitter Gamma Amino Butyric Acid (GABA), thereby disrupting GABA-mediated Central Nervous System (CNS) neurosynaptic transmission¹⁶. Albendazole acts by inhibiting tubulin polymerization, whereas oxclozanide lowers the essential ATP through uncoupling oxidative phosphorylation¹⁷. Modern anthelmintic such as Benzimidazoles like albendazole and levamisole HCl are widely used in Bangladesh and very recently ivermectin is being used sporadically. The present investigation was aimed to evaluate the effect of modern anthelmintics A-mectin® (Ivermectin), Levavet® (Levamisole HCl) and Almex-vet® (Albendazole) against gastrointestinal nematodiasis in goats irrespective of the species involved and their effects on the basis of EPG (eggs per gram) count, body weight of goats and hematological parameters like Total Erythrocyte Count (TEC), Hemoglobin % (Hb%), Packed Cell Volume (PCV), Erythrocyte Sedimentation Rate (ESR) and Total Leukocyte Count (TLC) were also included in this investigation.

MATERIALS AND METHODS

Study placement and duration: The research was carried out during the period of July to December, 2013 to compare the efficacy of ivermectin, levamisole HCl and albendazole against gastrointestinal nematodes in naturally infected goats of Government Goat Development Farm, Sylhet, Bangladesh. The research work was performed in the Department of Pharmacology and Toxicology, Sylhet Agricultural University, Sylhet, Bangladesh.

Allotment of trial: The following procedures were adopted for performing the experiment. Twenty goats of 13-15 months old were selected within the randomly sampling of goats which were severely infected with gastrointestinal nematodiasis irrespective of the species of parasites involved. These twenty goats were randomly divided into four groups each comprising of five goats and marked as A, B, C and D. Goats of group A were treated with A-mectin injection (Ivermectin 1%, The ACME Laboratories Ltd, Bangladesh) subcutaneously at the dose rate of $200 \mu\text{g kg}^{-1}$ b.wt., group B were treated with tablet Levavet (Levamisole HCl, The ACME Laboratories Ltd, Bangladesh) orally at the dose rate of 7.5 mg kg^{-1} b.wt., group C were treated with tablet Almex-Vet (Albendazole, Square Pharmaceuticals Ltd, Bangladesh) orally at the dose rate of 7.5 mg kg^{-1} b. wt. and goats of group D served as untreated control.

EPG (eggs per gram) count: Weekly EPG (eggs per gram) count was done on day 7th, 14th, 21st, 28th post treatment by using McMaster egg counting technique method¹⁸.

Hematological studies: With sterile syringe and needle maintaining aseptic condition, 5 mL of blood sample was collected from jugular vein of each goat and kept in vials containing anticoagulant (sodium-EDTA) and this was done on day of 0, 7th, 14th, 21st and 28th during experimental period. Blood samples were collected from each goat and after prescribing a proper identification tag, goats were immediately brought to the Pharmacology and Toxicology Laboratory, Sylhet, Bangladesh for fecal examination. The hematological parameters were examined in the laboratory of the Department of Pharmacology and Toxicology, Sylhet, Bangladesh. Live weight gain of each group was recorded on day 0 and 28 using digital weight balance. All the goats of treated and control groups were closely observed for 28 days after treatment. The fecal samples were collected from the treated and control groups of goats on 7th, 14th, 21st and 28th day of treatment to investigate the fecal egg count. The blood samples were collected from the treated and untreated control groups on the day '28' of treatment and hematological parameters TEC, Hb, PCV, ESR and TLC were determined as per method¹⁹.

Statistical analysis: All the data were statistically analyzed by the computer using statistical package

programmed MSTAT-C developed²⁰ and following the standard methods²¹ to find out the level of significance at 1 and 5% level. The eggs of parasites were identified on the basis of morphological characteristics as described²² and then counted.

RESULTS AND DISCUSSION

The results of the comparative efficacy of ivermectin, levamisole HCl and albendazole based on fecal egg counts reduction on naturally infested goats are presented in Table 1. In the treatment, group A were treated with A-mectin injection (Ivermectin 1%, The ACME Laboratories Ltd, Bangladesh) subcutaneously at the dose rate of 200 $\mu\text{g kg}^{-1}$ b.wt. The mean EPG (eggs per gram) count before treatment 290.25 \pm 5.67 and after treatment mean EPG (eggs per gram) on 7th, 14th, 21st and 28th day were 72.95 \pm 0.76, 85.77 \pm 3.69, 63.35 \pm 1.39 and 41.77 \pm 3.58, respectively. The rate of reduction of mean EPG (eggs per gram) on 7th, 14th, 21st and 28th day after treatment were significantly increased to the extent of 70.65, 72.69, 79.54 and 83.25%, respectively. In conformity to the present findings, Similar results were reported in previous studies²³⁻²⁸. Likewise similar findings were reported in sheep^{29,30,31}. Similar results have also been stated by some researchers in sheep³² and in buffaloes³³. It seems that a few work was carried out previously to determine the efficacy of these anthelmintics in Bangladesh. Its occurred due to the potency of different anthelmintic against gastrointestinal nematodiasis in goats. This study revealed that ivermectin is most effective anthelmintic against gastrointestinal nematodiasis in goats.

In treatment, group B was treated with tablet Levavet (Levamisole HCl), orally at the dose rate of 7.5 mg kg⁻¹ b.wt. The pre-treatment mean EPG (eggs per gram) count was 322.45 \pm 7.15 and the post-treatment mean EPG (eggs per gram) count values at 7th, 14th, 21st and 28th day were 84.32 \pm 2.25, 63.45 \pm 3.45, 43.45 \pm 4.50 and 20.45 \pm 1.23, respectively. The rate of reductions were significantly increased to the extent of mean EPG (eggs per gram) on 7th, 14th, 21st

and 28th day after treatment were 77.73, 10.98, 85.21 and 94.53%, respectively. The result is more or less similar by earlier reported studies³⁴⁻³⁹. Another study reported that Levamisole at the dose rate of 8.5 mg kg⁻¹ b.wt. was 100% effective naturally infected with various gastrointestinal nematodes in goats⁴⁰. The findings of the present study are more or less similar to the earlier researchers.

In treatment, group C was treated with tablet Almex-Vet (Albendazole, Square Pharmaceuticals Ltd, Bangladesh) orally at the dose rate of 7.5 mg kg⁻¹ b.wt. The pre-treatment mean EPG (eggs per gram) count was 320.52 \pm 17.15 and the post-treatment mean EPG (eggs per gram) count values at 7th, 14th, 21st and 28th day were 45.87 \pm 3.15, 55.45 \pm 3.05, 47.23 \pm 1.65 and 40.75 \pm 0.76, respectively. The rate of reductions were significantly increased to the extent of mean EPG (eggs per gram) on 7th, 14th, 21st and 28th day after treatment were 75.78, 85.97, 87.86 and 86.12% respectively. This result is conformity with the earlier workers⁴¹⁻⁴³. Another studied reported the comparative efficacy of albendazole, albendazole plus rafoxanide combination, ivermectin and doramectin in reducing gastrointestinal nematodiasis in goats⁴⁴. This study was conducted in Pashmina goats infested with *Haemonchus* spp and maintained at high altitude (>2350 m above sea level). Mean body weight of untreated control group D (day 0) EPG (eggs per gram) count was 298.05 \pm 5.86 and on the EPG (eggs per gram) count values at 7th, 14th, 21st and 28th day were 302.25 \pm 2.27, 305.05 \pm 2.53, 307.52 \pm 3.45 and 310.52 \pm 1.27, respectively and the rate of EPG (eggs per gram) count was increased. The efficacies of the products were evaluated on the basis of the percentage of reduction in mean egg count compared to the mean egg count per gram of feces. A significant (p<0.01) reduction of EPG (eggs per gram) count was found on 7th, 14th, 21st and 28th day of treated goat of group A, B and C, respectively.

Effect of ivermectin, levamisole HCl and albendazole on hematological parameters

Total Erythrocyte Count (TEC): The effects of three anthelmintics ivermectin, levamisole HCl and

Table 1: Efficacy of ivermectin, levamisole HCl and albendazole on egg count EPG (eggs per gram) in gastrointestinal nematodiasis in goats

Groups	Treatments	Pre-treatment		Post-treatment		Day 7		Day 14		Day 21		Day 28	
		Mean \pm SE	%	Mean \pm SE	%	Mean \pm SE	%	Mean \pm SE	%	Mean \pm SE	%	Mean \pm SE	%
A	Inj. A-mectin [®]	290.25 \pm 5.67		72.95 \pm 0.76**	70.65	85.77 \pm 3.69**	72.69	63.35 \pm 1.39**	79.54	41.77 \pm 3.58**	83.25		
B	Levavet [®]	322.45 \pm 7.15		84.32 \pm 2.25**	77.73	63.45 \pm 3.45**	10.98	43.45 \pm 4.50**	85.21	20.45 \pm 1.23**	94.53		
C	Almex-vet [®]	320.52 \pm 17.15		45.87 \pm 3.15**	75.78	55.45 \pm 3.05**	85.97	47.23 \pm 1.65**	87.86	40.75 \pm 0.76**	86.12		
D	Control group	298.05 \pm 5.86		302.25 \pm 2.27**	0.98	305.05 \pm 2.53**	2.76	307.52 \pm 3.45**	3.43	310.52 \pm 1.27**	5.07		

** : Significant at 1% level (p<0.01 and p>0.05)

Table 2: Effects of ivermectin, levamisole HCl and albendazole on Total Erythrocyte Count (TEC)

Groups	Treatments	Pre-treatment		Post-treatment							
		Day 0		Day 7		Day 14		Day 21		Day 28	
		Mean±SE	%	Mean±SE	%	Mean±SE	%	Mean±SE	%	Mean±SE	%
A	Inj. A-mectin [®]	8.11±0.07	0.65	8.14±0.04**	0.65	8.16±0.02**	0.54	8.17±0.03**	0.86	8.25±0.08**	0.56
B	Levavet [®]	8.05±0.09	1.49	8.09±0.07**	1.49	8.19±0.06**	0.29	8.22±0.09**	2.43	8.45±0.09**	2.98
C	Almex- vet [®]	8.09±0.03	2.89	8.13±0.03**	2.89	8.15±0.01**	1.78	8.16±0.03**	1.68	8.35±0.09**	1.98
D	Control group	8.92±0.07	1.54	8.96±0.05**	1.54	8.98±0.03**	4.87	8.99±0.06**	4.90	8.32±0.12**	8.37

** : Significant at 1% level ($p < 0.01$ and $p > 0.05$)

Table 3: Effects of ivermectin, levamisole HCl and albendazole on Hemoglobin (g%) in goat

Groups	Treatments	Pre-treatment		Post-treatment							
		Day 0		Day 7		Day 14		Day 21		Day 28	
		Mean±SE	%	Mean±SE	%	Mean±SE	%	Mean±SE	%	Mean±SE	%
A	Inj. A-mectin [®]	7.50±0.25	6.47	7.85±0.27**	6.47	8.17±0.25**	8.45	8.47±0.25**	11.53	8.97±0.29**	5.59
B	Levavet [®]	7.52±0.15	6.89	7.98±0.29**	6.89	8.95±0.49**	2.96	9.17±0.21**	14.78	9.53±0.39**	21.95
C	Almex- vet [®]	7.45±0.25	4.67	7.59±0.28**	4.67	8.59±0.34**	5.56	8.94±0.18**	2.97	8.95±0.29**	3.81
D	Control group	7.12±0.13	-4.85	7.52±0.21**	-4.85	8.43±0.28**	4.42	8.59±0.16**	-9.52	7.57±0.29**	-6.69

** : Significant at 1% level ($p < 0.01$ and $p > 0.05$)

albendazole on TEC of goats for 28 days at 7 day interval shown in Table 2. The pre-treatment values of TEC (million/mm³ of blood) were 8.11±0.07, 8.05±0.09 and 8.09±0.03 in the goats of group A, B and C respectively. On the 28th day of the post-treatment, the mean values of TEC were increased up to 8.25±0.08, 8.45±0.09 and 8.35±0.09 in the goats of group A, B and C respectively. The mean value of TEC in control group (group D) was 8.92±0.07 but the mean values of TEC started to decrease on 28th day and recorded as 8.32±0.12. The mean value of TEC was significantly increased ($p < 0.01$ and $p > 0.05$) on 28th day of the treatment of three anthelmintics. These results are more or less similar with the earlier researchers in goats^{34,45,46}.

Hemoglobin (Hb) concentration: The pre-treatment values of Hb (g%) were 7.50±0.25, 7.52±0.15 and 7.45±0.25 in the goats of group A, B and C, respectively shown in Table 3. On the 28th day of the post-treatment, the mean values of Hb (g%) were increased up to 8.97±0.29, 9.53±0.39 and 8.95±0.29 in the goats of group A, B and C, respectively. The mean value of Hb (g%) in control group (group D) was 7.12±0.13 but the mean values of Hb (g%) started to increase on 28th day and recorded as 7.57±0.29. The mean value of Hb (g%) was significantly increased ($p < 0.01$ and $p > 0.05$) on 28th day of three anthelmintics treatment. Similar results have also been stated with the earlier researchers in goat^{33,47,48}.

Packed Cell Volume (PCV): The pre-treatment values of PCV were 27.88±0.15, 27.95±0.69 and 27.93±0.29 in the goats of group A, B and C, respectively shown in Table 4. On the 28th day of the post-treatment, the mean values of PCV were increased up to 29.45±0.18, 30.15±0.12 and 29.95±0.38 in the goats of group A, B and C, respectively. The mean value of PCV in control group (group D) was 27.77±0.25 but the mean values of PCV started to increase on 28th day and recorded as 27.58±0.04. The mean value of PCV was significantly increased ($p < 0.01$ and $p > 0.05$) on 28th day of three anthelmintics treatment. These results are more or less similar with the report of sheep in which declined PCV value was observed in control group⁴⁹. Similar results have also been stated by the earlier workers^{33,50}.

Erythrocyte Sedimentation Rate (ESR): The initial control values of ESR (mm h⁻¹) were 0.18±0.07, 0.14±0.02 and 0.19±0.05 in the goats of group A, B and C, respectively shown in Table 5. On the 28th day of the post-treatment, the mean values of ESR (mm h⁻¹) were increased up to 0.00±0.00, 0.00±0.00 and 0.00±0.00 in the goats of group A, B and C, respectively. The mean value of ESR (mm h⁻¹) in control group (group D) was 0.13±0.04 but the mean values of ESR (mm h⁻¹) started to increase on 28th day and recorded as 1.29±0.00. The mean value of ESR (mm h⁻¹) was significantly decreased ($p < 0.05$ and $p > 0.01$) on 28th days of treatment. This results is similar to the reports of^{44,51}.

Table 4: Effects of ivermectin, levamisole HCl and albendazole on Packed Cell Volume (PCV) in goat

Group	Treatment	Pre-treatment		Post-treatment							
		Day 0		Day 7		Day 14		Day 21		Day 28	
		Mean±SE	%	Mean±SE	%	Mean±SE	%	Mean±SE	%	Mean±SE	%
A	Inj. A-mectin [®]	27.88±0.15		28.89±0.12**	3.48	28.98±0.19**	3.58	29.48±0.16**	3.68	29.45±0.18**	5.65
B	Levavet [®]	27.95±0.69		28.98±0.17**	2.49	29.19±0.14**	2.89	29.68±0.19**	2.73	30.15±0.12**	4.75
C	Almex- vet [®]	27.93±0.29		28.85±0.14**	3.48	28.95±0.17**	3.77	29.48±0.19**	3.98	29.95±0.38**	7.07
D	Control group	27.77±0.25		27.58±0.15**	1.02	27.49±0.10**	1.69	27.38±0.11**	1.86	27.58±0.04**	2.37

** : Significant at 1% level (p<0.01 and p>0.05)

Table 5: Effects of ivermectin, levamisole HCl and albendazole on Erythrocyte Sedimentation Rate (ESR mm h⁻¹) in goat

Groups	Treatments	Pre-treatment		Post-treatment							
		Day 0		Day 7		Day 14		Day 21		Day 28	
		Mean±SE	%	Mean±SE	%	Mean±SE	%	Mean±SE	%	Mean±SE	%
A	Inj. A-mectin [®]	0.18±0.07		0.16±0.04*	57.87	0.00±0.00*	100	0.00±0.00*	100	0.00±0.00*	100
B	Levavet [®]	0.14±0.02		0.14±0.05*	57.36	0.00±0.00*	100	0.00±0.00*	100	0.00±0.00*	100
C	Almex- vet [®]	0.19±0.05		0.13±0.07*	64.57	0.00±0.00*	100	0.00±0.00*	100	0.00±0.00*	100
D	Control group	0.13±0.04		0.31±0.09*	46.66	0.34±0.02*	67.09	0.89±0.12*	82.97	1.29±0.00*	90.78

* : Significant at 5% level (p<0.05 and p>0.01)

Table 6: Effects of ivermectin, levamisole HCl and albendazole Total Leukocyte Count (TLC) in goat

Groups	Treatments	Pre-treatment		Post-treatment							
		Day 0		Day 7		Day 14		Day 21		Day 28	
		Mean±SE	%	Mean±SE	%	Mean±SE	%	Mean±SE	%	Mean±SE	%
A	Inj. A-mectin [®]	7.84±0.04		7.54±0.04*	0.47	7.57±0.07*	0.68	7.97±0.09*	0.67	7.79±0.03*	0.88
B	Levavet [®]	8.45±0.09		8.40±0.09*	4.37	8.37±0.05*	2.89	8.09±0.05*	3.12	8.10±0.09*	3.43
C	Almex- vet [®]	7.86±0.05		7.44±0.01*	1.69	7.92±0.03*	0.45	7.93±0.04*	0.35	7.95±0.08*	0.18
D	Control group	8.07±0.08		8.14±0.02*	0.57	8.16±0.01*	0.78	8.19±0.08*	0.79	8.25±0.10*	1.27

* : Significant at 5% level (p<0.05 and p>0.01)

Table 7: Effects of ivermectin, levamisole HCl and albendazole on body weight (kg) gain/loss in goat

Groups	Treatments	Pre-treatment		Post-treatment	
		Day 0		Day 28	
		Mean±SE	%	Mean±SE	%
A	Inj. A-mectin [®]	14.86±0.12		15.87±0.19**	7.02
B	Levavet [®]	14.95±0.08		16.91±0.48**	14.93
C	Almex- vet [®]	14.59±0.18		15.69±0.17**	9.44
D	Control group	14.35±0.12		14.15±0.01**	-0.90

** : Significant at 1% level (p<0.01 and p>0.05)

Total Leukocyte Count (TLC): The pre-treatment values of TLC were 7.84±0.04, 8.45±0.09 and 7.86±0.05 in the goats of group A, B and C, respectively shown in Table 6. On the 28th day of the post-treatment, the mean values of TLC were increased up to 7.79±0.03, 8.10±0.09 and 7.95±0.08 in the goats of group A, B and C, respectively. The mean value of TLC in control group (group D) was 8.07±0.08 but the mean values of TLC started to increase on 28th day and recorded as 8.25±0.10. The mean value of TLC was significantly decreased (p<0.05 and p>0.01) on

28th days of treatment. These present findings are in agreement of the previous works^{45,46,52} and in goat and sheep^{46,48,53}.

Effect of ivermectin, levamisole HCl and albendazole on body weight:

The mean initial body weight on day '0' of goats in group A, B and C were 14.86±0.12, 14.95±0.08 and 14.59±0.18 kg, respectively shown in Table 7. On the 28th day of the post-treatment, the mean values of body weight were increased up to 15.87±0.19, 16.91±0.48 and 15.69±0.17 in the goats of group A, B and C, respectively. The body weight increased significantly (p<0.01) after treatments in group A, B and C. The body weight was increased and this may be due to removal of parasitic load, proper absorption and metabolism of nutrient in the parasite free gastrointestinal tract. The body weight gain in the ivermectin, levamisole and albendazole treated goat is supported by previous study in heifers⁵⁴. On the other hand, the body weight significantly decreased in untreated control group due to overload of parasites within the body of goat. The improvement percentage in

goats of group A, B and C after 28th day was 7.02, 14.93 and 9.44%, respectively. The body weight almost similar to their pre-treatment values. In the control group (group D) body weight reduces to the extent of -0.90% after 28th day (Table 3). Some earlier workers found improvement in body weight after treatment⁵⁵⁻⁵⁹.

During the study of hematological parameters, it was found that after treatment with A-mectin (injectable formulation), Levavet (Levamisole HCl) and Almex-Vet (Albendazole), the TEC, Hb and PCV were significantly ($p < 0.01$ and $p > 0.05$) increased and on the other hand, ESR and TLC was significantly ($p < 0.05$ and $p > 0.01$) decreased in treated groups. The mean value of Hb, PCV and TEC were decreased and ESR and TLC values were increased in untreated naturally parasitized control group. This study indicated that Levavet (Levamisole HCl) is a more effective drug against gastrointestinal nematodiasis in goats than that of A-mectin (injectable Ivermectin) and Almex-Vet (Albendazole).

CONCLUSION

The findings of the present study reveal that *Haemonchus* spp, *Trichostrongylus* spp, *Cooperia* spp., *Oesophagostomum* spp., *Trichuris* spp., *Strongyloides* spp. and mixed infections are prevalent in Bangladesh. Ivermectin (A-mectin, injectable formulation), Levamisole (Levavet) and Albendazole (Almex-Vet) are effective for the reduction of EPG (eggs per gram) of gastrointestinal nematodes. This study indicated that Levavet (Levamisole HCl) is highly effective on egg count EPG (eggs per gram) and hematological parameters (TEC, Hb, PCV, ESR and TLC) in gastrointestinal nematodiasis in goats than that of A-mectin (injectable Ivermectin) and Almex-Vet (Albendazole) during the experiment. These three anthelmintics have wide therapeutic index and are capable of killing or inhibiting egg production of gastrointestinal nematodes. The findings of the present study may help the future researchers to explore the details pharmacokinetic and toxic effects for wide therapeutic uses in Bangladesh for the treatment and control of parasitic infection in goat. Further studies are required to clarify the efficacy of the anthelmintics widely used in different agro ecologies, animal species and livestock management systems in Bangladesh. From these research findings the veterinarian may use the specific anthelmintics for

gastrointestinal nematodiasis in goats. Further studies on anthelmintics pharmacokinetic and toxicity would be helpful.

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