ISSN: 1343-4292
Volume 140, Issue 05, August, 2022

Evaluation Of some Immunological parameters in Sheep infected with Abomasal Nematodes in Kirkuk City

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ABSTRACT— This study aimed to diagnose Abomasal Nematodes and investigate some Immunological parameters in Sheep infected with Kirkuk City. The current study involved the examination of 50 sheep infected with abomasal nematodes, which were collected randomly and submitted to the laboratory tests in Kirkuk Teaching veterinary hospital from different regions and from the slaughter of Kirkuk city for microscopic and serological diagnosis of recovered nematodes, for the period from September 2021 to April 2022. Weakness and emaciation were the most clinical signs shown on diseased animals; with fewer rates were pale mucous membranes, diarrhea, and bottle jaw (submandibular edema). Blood samples were collected from the Sheep to determine the effect of these nematodes on some Immunological parameters. The results showed the eggs in feces and worms of nematodes identified in the abomasum, and that made according to morphology and length of worms include the: *Ostertagia circumcincta* 42%, *Marshallagia marshall* 28%, *Haemonchus contortus* 20%, and *Trichostrongylus spp.* 10%, The results showed a significant increase ($P \leq 0.05$) in the rates of IgG (80.27 ± 2.4 µg/dl) and (56.3± 1.7 µg /dl) respectively and a reduction in the rate of IgM (31.8 ± 5.2 µg/dl) in infected sheep comparing with the control group.

KEYWORDS: Nematodes, Immunological parameters, Sheep, Iraq.

1. INTRODUCTION

Nematodes of sheep abomasum include many sanitary and economic parasites worldwide and in Iraq, which causes productivity losses and health problems, parasitic gastroenteritis results from infecting grazing ruminants with one or more nematodes [1]. Helminths, specifically gastrointestinal nematodes GIN, carry out severe threats to livestock in these zones in the form of morbidity, mortality, cost of treatment, and control measures [2]. Many nematodes infect the ovine abomasum, including (Ostertagia sp., Marshallagia sp., Haemonchus contortus, and Trichostrongylus sp.); these parasites are more predominant in hot and humid regions [3]. Parasitic infections in ruminants caused poor weight gain and less feed utilization due to a decreased natural resistance to diseases [4]. Many factors affect the immune responses of the host to resist parasites and limit their spread, involving animal health, sex, age, weight, lactation, and nutritional state of the animal, as well as the stress that the animal goes through, such as weather changes, transportation, and poor ventilation in crowded barns [5]. Small animals are more susceptible to infection than large animals [6].

[7] showed an increase in the levels of immunoglobulins, particularly type IgE, in the blood serum of Sheep infected with Haemonchus contortus worms, playing a vital role in immunity against parasitic infection.

2. Objective

The current study aimed to assess the effect of abomasal nematodes on some immunological indicators in Sheep.

3. MATERIALS AND METHODS

3.1 Sample collection

The research was conducted between September 2021 and April 2022, with the study beginning in the former month. Butchers working in the modern abattoir in Kirkuk, Iraq, collected a total of fifty blood and abomasal samples from sheep that had been slaughtered in a variety of locations within the city of Kirkuk, Iraq. Fecal samples and blood samples were collected randomly from healthy and clinically infected sheep that were characterized by weak, pale mucous membrane and submandibular edema (bottle jaw) before slaughter under sterile conditions; fecal samples were collected by using sterile gloves from the rectum directly and put in plastic containers then transported to the laboratory within 24 hours for the examination (direct and floatation method), the length and width of eggs we measured; blood samples were collected randomly from A unique identifier was written on the label of every sample. Five milliliters of blood samples were drawn from each sheep's jugular vein using disposable syringes. The blood was then transferred slowly into a sterile test tube that did not contain an anticoagulant in order to prevent hemolysis in the serum. The serum was separated using a centrifuge (at 3000 revolutions per minute for ten minutes), and the separated serum was kept at a temperature of -20 degrees Celsius until it was needed.

3.2 Investigation of nematodes (adult worm)

The abomasum was collected from examined and studied animals after slaughtering. The abomasum was tied at both ends, labeled, and immediately transported to the Kirkuk Teaching Vet Hospital laboratory for macro-microscopic examination. Abomasa was opened along the greater curvature and thoroughly washed their contents under running water using a mesh sieve. The recovered helminth from the contents was cleaned with normal saline and then cleared in lactophenol for sex determination [8]. Some of the recovered nematodes were identified according to the morphological characteristics by preserving in 70% alcohol containing 5% glycerin and [9].

3.3 Immunoglobulins examination

Serum levels of immunoglobulins G (IgG), immunoglobulins M (IgM), and immunoglobulins E (IgE) were measured by using Elisa kits made in the USA for Sheep according to the methods described by [10].

4. Statistical Analyses

The data were analyzed by using the Minitab program with (a T-test) at the level of probability ($p \leq 0.05$).

5. Result and Discussion

This study diagnosed seven types of nematodes by detecting parasite eggs in fecal samples: *Ostertagia sp.* 42%, *Marshallagia marshall* 28%, *Haemonchus contortus 20%, Trichostrongylus spp.* 10% as single infection (Table 1,3) and *Nematodirus spp. 8%, Chabertia ovina* and *Toxocara sp.* four %، 4% respectively as mixed infection (Table 2), the adult worm diagnosed in the abomasum *(Ostertagia sp., Marshallagia marshall, Haemonchus contortus and Trichostrongylus spp.) which differentiated by morphology and length measurement* (Table 4). The total infection rate in Diseased Sheep with a high percentage of 83.3% of nematodes in Kirkuk city. Ostertagia circumcincta was the most prevalent among the other species. The range of immunological parameters was significantly different between infected and uninfected sheep. The results showed a significant increase ($P \leq 0.05$) in the rates of immunoglobulins IgE

ISSN: 1343-4292
Volume 140, Issue 05, August, 2022

and IgG (80.27 ± 2.4 µg/dl) and (56.3± 1.7 µg /dl) respectively in infected Sheep compared with the control group. (Table 4).

Table 1. Diagnosed Types of Abomasal Nematodes infection in studied Sheep with single infection in Kirkuk city, Iraq.

NO.	Nematodes	infected Sheep	%
1	*Ostertagia circumcincta*	9	37.5
2	*Marshallagia marshall*	7	29.2
3	*Haemonchus contortus*	5	20.8
4	*Trichostrongylus spp.*	3	12.5
Total		24	100

Table 2. Diagnosed Types of Abomasal Nematodes infection in studied Sheep with mixed infection in Kirkuk city, Iraq.

NO.	Nematodes	Number of infected Sheep	%
1	*Marshallagia marshalli* + *Haemonchus contortus* + *Trichostrongylus spp.*	11	42.31
2	*Ostertagia circumcincta* + Chabertia ovina + *Marshallagia marshall*	7	26.92
3	*Haemonchus contortus*+ *Toxocara vitulorum*+ *Trichostrongylus spp.* + *Ostertagia circumcincta*	4	15.38
4	*Trichostrongylus spp.*+ *Haemonchus contortus*+ *Marshallagia marshall*	2	7.69
5	Chabertia ovina+ *Ostertagia circumcincta*+ *Trichostrongylus spp.*	1	3.85
6	Nematodirus spp.+ *Marshallagia marshalli*+ *Ostertagia circumcincta*	1	3.85
Total		26	100

Table 3. Diagnosed Abomasal Nematodes egg measurements in studied Sheep measured by µm

NO.	Nematodes	Egg measurement	
		Length	Width
1	*Nematodirus spp.*	210-262	99-110
2	*Marshallagia marshall*	126-196	73-84
3	*Trichostrongylus spp.*	83-105	44-52
4	*Ostertagia circumcincta*	86-100	47-52

5	*Chabertia ovina*	92-100	52-57
6	*Haemonchus contortus*	70-80	44-50
7	*Toxocara vitulorum*	70-84	66-74

Table 4. The effect of Abomasal Nematodes infection on Immunological parameters.

NO.	Parameters	Infected	Non- infected
1	IgG µg/dl	56.3± 1.7*	10.56 ± 0.41
2	IgM µg/dl	31.8 ± 5.2	32.2 ±9.5
3	IgE µg/dl	80.27 ± 2.4*	27 ± 1. 6

* indicate significant differences ($P \leq 0.05$).

Table 4. The Total length of diagnosed Abomasal Nematodes measured by mm

NO.	Nematodes	Sex	Total length	Average
1	*Haemonchus contortus*	male	10-20	15
		Female	14-30	22
2	*Ostertagia circumcincta*	male	7-9.5	8.25
		Female	9-10	9.5
3	*Trichostrongylus spp.*	male	3-6	4.5
		Female	4-8	6
4	*Marshallagia marshall*	male	10-13	11.5
		Female	15-20	17.5

The current study agreed with [11], who reported that Sheep infected with these different numbers of nematodes might be due to lack of recurrent treatment with anthelmintic and bad management as well as grazing of infected Sheep in different areas. These parasites supply a potent challenge to the host's immune system, leading to repeated exposure to infective stages, resulting in high endemicity of the parasitic infection [12]. The immune system's reaction when infected with worms, that is, the host body's immunity has been produced at infection to protect the body, get rid of them, and throw them out of the body, the attraction of phagocytes to the parasite is one of the immune system's methods for eliminating worm infection. The humoral and cellular immune response is involved in worm resistance and in general, includes. Lymphocytes, somatic cells, eosinophils, Globule cells, and various types of immunoglobulins, all of these types of immune responses vary according to the hostility and types of worms may be revealed the significant increase in immunoglobulins level IgE in circulating blood [13]. Regarding the humoral immune response in the body, H. contortus infection significantly reduced the serum immunoglobulin (IgG& IgM) in heavily infected Sheep and goats. This reduction in serum immunoglobulin may be attributed to the presence of histamine and leukotriene in the abomasal mucus that is associated with parasitic infection to facilitate the translocation of plasma proteins, including humoral antibodies, into the lumen of the abomasum [As a consequence of this, the concentrations of IgG and IgM are reduced in the circulation and

discharged into the abomasum. This serves to protect the abomasum from H. contortus and reduce the larvae's ability to move around. These findings are consistent with those seen in [15], [16]. In addition, there was a significant increase in the level of serum IgE in infected sheep and goats. This may be because natural infection with haemonchosis causes an increase in the production of specific antibodies IgE that are associated with worm fertility control. This is a feature of helminthic infection, it resulted from the response of a Th2-type, and it has been linked to resistance to gastrointestinal nematodes in sheep and goats [17], [18]. Both humans and animals are susceptible to the effects of parasites, which can have a significant impact on the development and maturation of their immune systems. These proteinases, which are responsible for the hydrolysis of collagen, fibrinogen, and hemoglobin, are produced either by the larvae or the adult forms. It has been discovered that G.I. nematodes have metalloproteinases in addition to serine, aspartic, and cysteine proteases. Both humans and animals are susceptible to the effects of parasites, which can have a significant impact on the development and maturation of their immune systems. Eosinophils are considered to be important components in the response against parasite infections, and the increase in the number of eosinophils is a common feature observed during sheep infection with Gastrointestinal Nematodes, which was in agreement with [19]. In the current study, there was an increased level of immunoglobulins IgE and IgG in the circulating blood of animals that were infected with abomasal nematodes.

6. Conclusion

The present study showed the high percentage of abomasal nematodes infection in Sheep in Kirkuk city, mostly Ostertagia spp. Infection also showed changes in some immunological parameters of Sheep infected with abomasal nematodes.

7. Reference

[1] Hamer, K., McIntyre, J., Morrison, A. A., Jennings, A., Kelly, R. F., Leeson, S., ... & Sargison, N. (2019). The dynamics of ovine gastrointestinal nematode infections within ewe and lamb cohorts on three Scottish sheep farms. Preventive veterinary medicine, 171, 104752.

[2] Lashari MH and Tasawar Z, 2011. Prevalence of some gastrointestinal parasites in Sheep in southern Punjab, Pakistan. Pakistan Veterinary Journal, 31: 295- 298.

[3] Roberts LS, Janovy J. 2005. Phylum Nematoda: Form, Function, and Classification. In: Gerald D. Schmidt, Larry S. Roberts, editor. Foundations of Parasitology. 7th ed. New York: McGraw-Hill; p. 367–396.

[4] Pedreira J et al., 2006. Prevalence of gastrointestinal parasites in sheep and parasite control practices in NW Spain. Preventive Veterinary Medicine 75: 56-62.

[5] Al-Bayati, O. A. S. and Arsalan, S. H. 2009. Clinical and hematological study in Sheep infected with gastrointestinal parasites, Iraqi Journal of Veterinary Sciences, 23 (1), 93-100.

[6] Onyenwe IW, Onwe C, Onyeabor A, Onunkwo JI. 2005. Abattoir-Based study of the Susceptibility of Two natural infected Breeds of goat to Haemonchus contortus in Nsukka Area of Enugu state, Nigeria. Animal Res Int. 2(2):342–345. Qamar M.F., Maqbool A. 2012. Biochemical studies and serodiagnosis of haemonchosis in Sheep and goats. J Animal Plant Sci. .38–32:)1(22

[7] Schallig, H. D. F. H. (2000). Immunological responses of Sheep to Haemonchus contortus. Parasitology,

120(7), 63-72.

[8] E.S. Siham, A.E. Karrar, S.M.M. El Amin (1997). Clinical picture and chemotherapy of experimental Haemonchus contortus and coccidial infection in goats. Sudan J Vet Sci Anim Husbandry 36(1– 2):158–166.

[9] Ghasemikhah, R., Mirhendi, H., Kia, E. B., Mowlavi, G., Sarmadian, H., Meshgi, B., ... & Mobedi, I. (2011). Morphological and morphometrical description of Trichostrongylus species isolated from domestic ruminants in Khuzestan province, southwest Iran. Iranian journal of parasitology, 6(3), 82.

[10] N.W. Tietz (1999). Text book of Clinical Chemistry. 3rd Ed., C.A.Burtis, E.R. Ashwood,W.B. Saunders, pp 477-530.

[11] GÖNENÇ, B., Hasan, E. M. İ. R., & Iacob, O. (2018). Digestive tract helminths of Turkish ibex (Capra aegagrus aegagrus Erxleben, 1877). Ankara Üniversitesi Veteriner Fakültesi Dergisi, 65(3), 247-251.

[12] Sorobetea D et al., 2018. Immunity to gastrointestinal nematode infections. Mucosal Immunology 11: 304-315.

[13] Shakya, K. P. (2007). Evaluation of selected immune response to Haemonchus contortus in Gulf Coast native compared to Suffolk lambs.

[14] Miller, H. R. P. (1996). Prospects for the immunological control of ruminant gastrointestinal nematodes: natural immunity, can it be harnessed?. International journal for parasitology, 26(8-9), 801-811.

[15] Martínez-Valladares M, Vara-Del Río MP, Cruz-Rojo MA, Rojo-Vázquez FA. 2005. Genetic resistance to Teladorsagia circumcincta: IgA and parameters at slaughter in Churra sheep. Parasite Immunol. 27(6):213–218. Crossref. PubMed. ISI.

[16] Muñoz-Guzmán MA, Cuéllar-Ordaz JA, Valdivia-Anda AG, Buendía-Jiménez JA, Alba-Hurtado F. 2006. Correlation of parasitological and immunological parameters in sheep with high and low resistance to haemonchosis. Can J Anim Sci. 86(3):363–371. Crossref. ISI.

[17] De la Chevrotière C, Bambou JC, Arquet R, Jacquiet P, Mandonnet N. 2012. Genetic analysis of the potential role of IgA and IgE responses against Haemonchus contortus in parasite resistance of Creole goats. Vet Parasitol. 186(3-4):337–343. Crossref. PubMed. ISI.

[18] Pernthaner A, Shaw RJ, McNeill MM, Morrison L, Hein WR. 2005. Total and nematode-specific IgE responses in intestinal lymph of genetically resistant and susceptible Sheep during infection with Trichostrongylus colubriformis. Vet Immunol Immunopathol. 104(1-2):69–80. Crossref. PubMed. ISI.

[19] Moosa, D. A., Hussien, A. M., Hameed, H. M., & Hasan, S. A. (2022). Diagnostic and Hematological Study in Sheep Infected With Gastrointestinal Nematode in Mosul City. Al-Anbar Journal of Veterinary Sciences, 15(1).