Available online **www.ijpras.com**

International Journal of Pharmaceutical Research & Allied Sciences, 2017, 6(1):161 - 174

Research Article

ISSN : 2277-3657
CODEN(USA) : IJPRPM

Epidemylogical and histopathological Studies of Haemonchuscontortus among goats in Taif, KSA.

Jamila S. Al-Malki

Biology Department, Science Collage, Taif University, KSA
Corresponding authors
Jamila, S. Al-Malki
Biology Department, Science Collage, Taif University, KSA.
E-mail: shamlanj@ yahoo.com

ABSTRACT

Hemonchosis is a very common disease in small ruminants caused by Haemonchuscontortus, a blood sucking parasite causing anaemia that may be fatal particularly to young animals. The present study was conducted to determine the prevalence of Haemonchusspp in slaughtered goats at Taif abattoir located in the KSA. A total of 351abomasum from slaughtered animals were examined from March 2012 to August 2013. The result revealed that the percent of infestation with Haemonchusspp was higher in imported breed (9.18%) than in native breed (5.16%). The percent of infection were 5.34%and 4.17 %in male and female goats respectively. Relationship between age and rate of infestation with haemonchosis were found (4.17), (7.14), (8.69) and (3.75) percent in native breed goats aged, 6-12 month ,1-1.5 years ,1.5-2 years and over 2 years respectively. While, the rate of the infestation was found (9.30), (8.33), (12.96) and (3.70) percent in imported breed goats aged, 6-12 month ,1-1.5 years ,1.5-2 years and over 2 years respectively. Seasonal incidence revealed that the highest percentage was recorded during summer season (12.5), while the lowest was recorded during the Spring season (4.20). The relationship between total incidence and months showed that the highest was recorded in July (17.14) and the lowest percent was in April (1.64). On microscopic examination, infiltration of mononuclear cells and eosinophils in gastric glands, periglandular hyperemia and hemorrhage, mucous gland hyperplasia, connective tissue proliferation and necrosis were observed.

Key words: *Abomasum, Haemonchosis, Haemonchuscontortus, goat, small ruminants, Taif, K S A, epidemylogy and Histopathology.*

INTRODUCTION

Abomasum is one of the most important sites for living bursate nematodes belonging to *Trichostrongylidae* family in small ruminants. It is the site location for 3 pathogen species of GI nematodes e.g., *Haemonchus spp., Teladorsagia spp., Ostertagia spp.and Trichostrongylus spp.*, meanwhile it was shown that gastrointestinal nematodes could be harmful to the health mortalities, reduce weight gain and other production losses [1,2]. Small ruminants play an important role in maintaining family stability by providing meat, milk, skin and wool, earn cash income and play traditional social and religious roles. Health disorders in all classes of small ruminants represent the

major problems and largely on the economics of sheep and goat production [3]. The gastrointestinal nematode, *Haemonchuscontortus* (Barber's pole worm), is a major pathogen of ovine throughout the temperate and tropical regions of the world and is a significant cause of production losses. Debilitating infection with this parasite is most commonly seen in young animals while resistance to infection develops, with exposure, in older ovine [4]. Female worms are 18-30 mm long and are easily recognized by the 'barbers pole' appearance of the white ovaries and uteri twisting for the length of the worm around a red blood-filled intestine and males are 10-20 mm long and uniformly reddish-brown [5]. This parasite is a gastrointestinal nematode of special importance in associated with small ruminant production in warm climates [6] and is a blood feeding nematode which parasitises the abomasum and presents a serious constraint to ovine production in areas with predominantly summer rainfall [7]. The fourth larval (L4) and adult stages of this worm suck blood and in addition, move and leave wounds that hemorrhage from the abomasal wall of the host. A blood sucking *H. contortus* can suck about 0.05 ml blood per day in ovine [8]. *Haemonchuscontortus* is of primary concern since it is a highly pathogenic blood-feeder helminth that causes anaemia, reduces productivity and can lead to death in infected animals [9]. The diagnosis of Haemonchosis is usually based upon clinical signs and fecal examinations. Eggs are found in feces when the damage has already been done. So ELISA enables detection of sub clinical infection [10]. Fayza Ahmed Omer *et al*. [11] showed that histopathological changes of the abomasum were of severe mucosal and submucosalhaemorrhages. Epithelial cells indicated degeneration and other revealed hypertrophy. Gastric glands demonstrated some changes and contained mononuclear cells dominated with eosinophils. Previous infection with *O. ovis* in the nasal cavity also reduces the development and fertility of *H. contortus* in the abomasum. This reduction is associated with eosinophilia and globular leukocytes, as well as an inflammatory response in the abomasal mucosa [12, 13]. Among the diseases that impose the survival and productivity of ovine and goats, gastrointestinal nematode infection ranks highest on a global index, with Barber's pole worm being of overwhelming importance [14].

The objective of this study was: - Studying theepidemiology, histopathological and identification of *Haemonchuscontortus* (gastric worm) among goats in Taif governorate.

MATERIALS AND METHODS

A total of (351) abomasa were collected from slaughtered abattoir at Taif during the period from 2012 to 2013. They were examined for the presence of *Haemonchuscontortus* adult worms.

Abomasal examination:

Collection of parasites from abomasum were done by following standard procedure as (14 and 15).

Identification of adult worms of *Haemonchuscontortus*:

The collected worms were mounted in 3 steps according to [16] and [17].

0ne hundred worm were randomly chosen for identification and morphology of male Haemonchus species.

Histopathological examination

A 10-mm-long sample of the abomasa segment without any injury was removed as a control sample and another samples were taken from the affected abomasa for fixed and prepared for histopathological examination. Tissue fragments were fixed in 10% neutral buffered formalin solution (for 72 hours), after stabilizing embedded in paraffin, sectioned at 5 μm thickness and then, stained with hematoxylin and eosin (H&E).

Statistical analysis

Statistical analysis using SPSS software and Chi-square test was applied for the statistical analysis of the data [18].

EXPERIMENTS AND RESULTS

A total of (351) abomasa of goats were collected from slaughtered house at Taif abattoir during the period from March 2012 to August 2013.They were examined for the presence of *Haemonchuscontortus* adult worms, for getting the following relations: -

1-The relationship between total incidence and breed (native or imported) among goats suffering from *Haemonchuscontortus*in Taif governorate

Results are shown in Table (1).

Breed	No. of total examined animals	No. of infested animals	Percentage of infestation
Native	155	8	5.16
Imported	196	18	9.18
Total	351	26	7.41

2-The relationship between total incidence and age and its affect by breed (native or imported) among goats suffering from *Haemonchuscontortus* in Taif governorate

Results are shown in Table (2).

Breed	Native			Imported		
Age	Total ex. animals	Infested animals	% of -- infestation	Total ex. animals	Infested animals	% of infestation
More than 6-12 month	24	1	4.17	43	4	9.30
More than 1-1.5 year	28	2	7.14	72	6	8.33
More than 1.5-2 year	23	2	8.69	54	7	12.96
More than 2 year	80	3	3.75	27	1	3.70
Total	155	8	5.16	196	18	9.18

3-The relationship between total incidence and seasonal changes among goats suffering from *Haemonchuscontortus* in Taif governorate

Results are shown in Table (3).

Season	No. of total ex. animals	No. of non-infested animals	No. of infested animals	% of infestation
Spring	119	114	5	4.20
Summer	88	77	11	12.5
Autumn	88	82	6	6.82
Winter	56	52	4	7.14
Total	351	325	26	7.41

4-The relationship between total incidence of *Haemonchuscontortus* and breed (native or imported) and its affect by seasonal changes among goats in Taif governorate

Result are shown in Table (4).

Breed	Native			Imported		
Season	Total ex. animals	Infested animals	% of infestation	Total ex. animals	Infested animals	% of infestation
Spring	27	2	7.40	42	6	14.29
Summer	81	6	7.41	57	2	3.51

Autumn	36	zero	zero	52	6	11.54
Winter	11	zero	zero	45	4	8.89
Total	155	8	5.16	196	18	9.18

5-The relationship between total incidence and monthly prevalence of goats suffering from *Haemonchuscontortus* in Taif governorate

Results are shown in Table (5)

Month	The number of examined abmasal Samples	The number of positive samples	The percentage of Positively
June	33	3	9.09
July	35	6	17.14
August	19	3	15.79
September	37	2	5.41
October	57	4	7.02
November	31	2	6.45
December	74	6	8.11
January	19	4	21.5
February	71	6	8 .45
March	55	1	1.81
April	61	1	1.64
May	66	7	10.61
Total	558	45	8.o6

P< 0.05 for monthly prevalence and total worm burden; Values in bracket are mean worm burden.

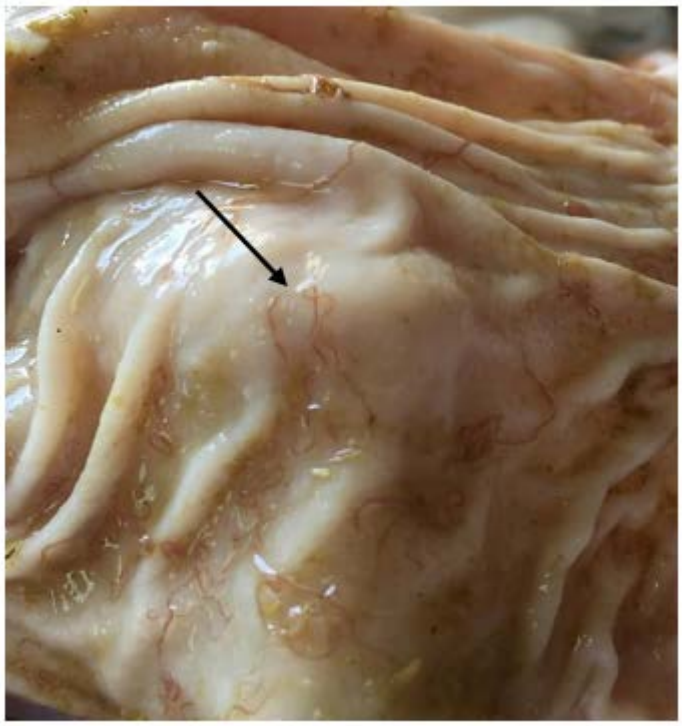

Figure (1): Abomasal contained hundreds of the adult worms *Haemonchuscontortus*were moving freely in the abomasal contents and other were attached to the mucosal surface.

Figure (2): The posterior end (Y shape dorsal ray) of the adult *Haemonchusconturtus* male [X 10].

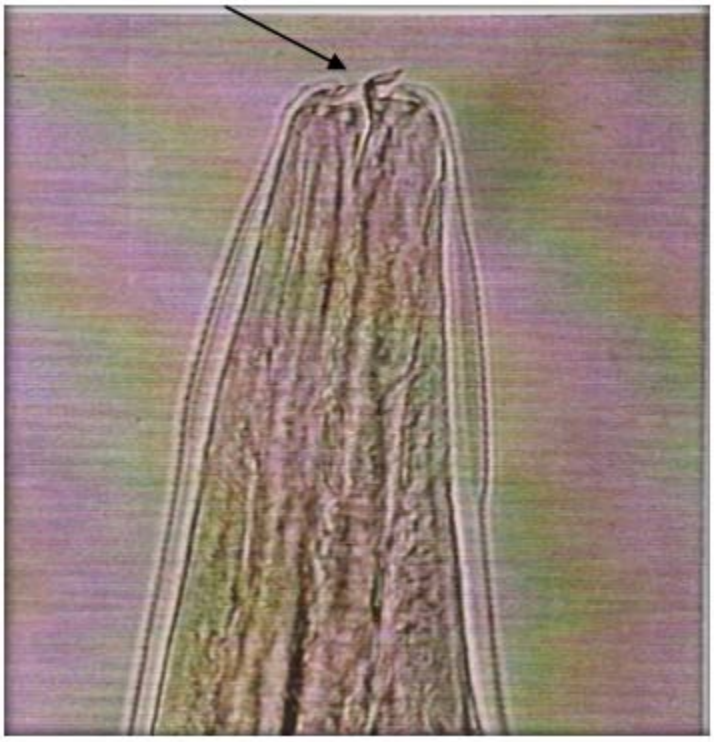

Figure (3): The anterior end of the adult *Haemonchuscontortus* in Taif governorate

Male and female, Dorsal lancet tooth [X40].

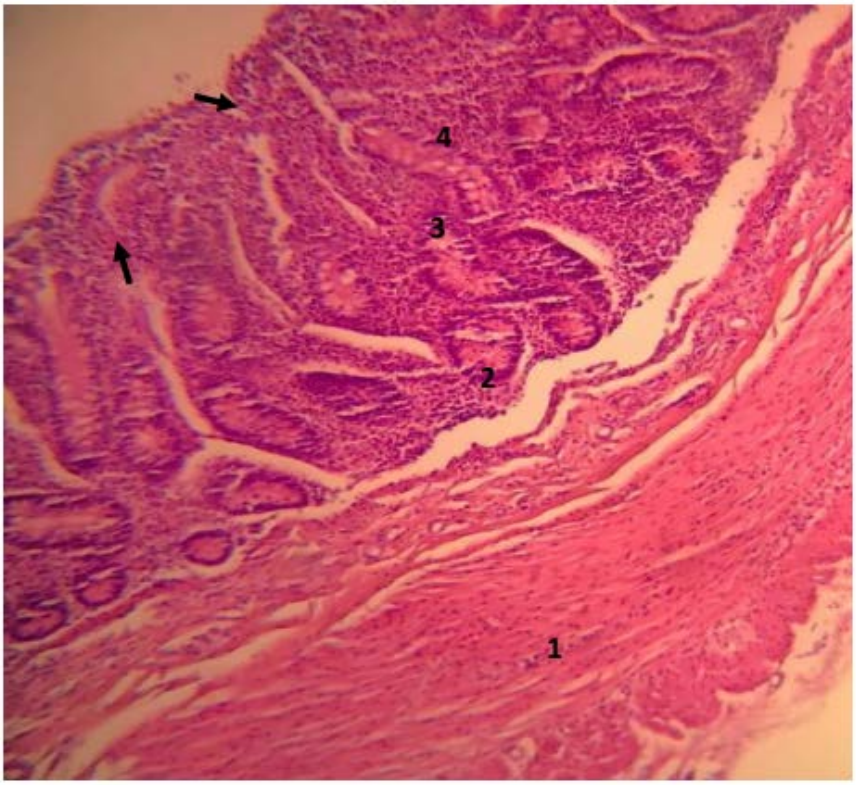

Figure (4): Thickening (1) of abomasum mucosa and muscularis mucosa, broadening of villi with some detachment of tips (arrow), hyperplasia of mucous (2) and gastric glands (3) with heavy cellular infiltration (4) in abomasums mucosa suffering from *Haemonchuscontortus* [H&E,100].

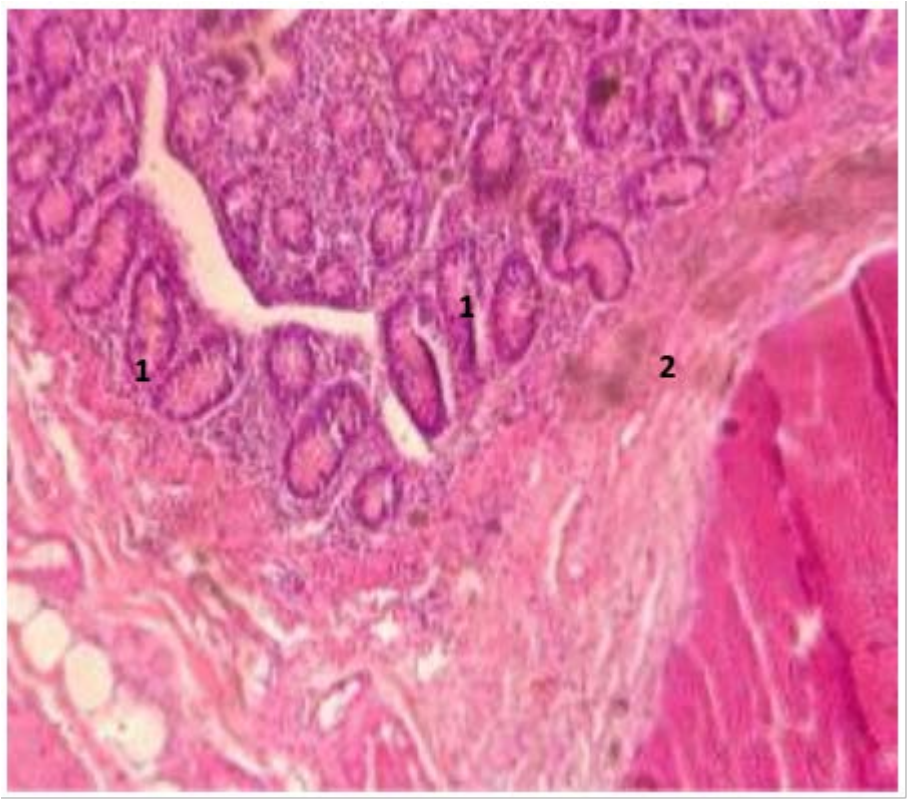

Figure (5): Hyperplasia of mucous glands of abomasal mucosa suffering from *Haemonchuscontortus* (1) with connective tissue proliferation and necrotic patches (2) [H & E, 100].

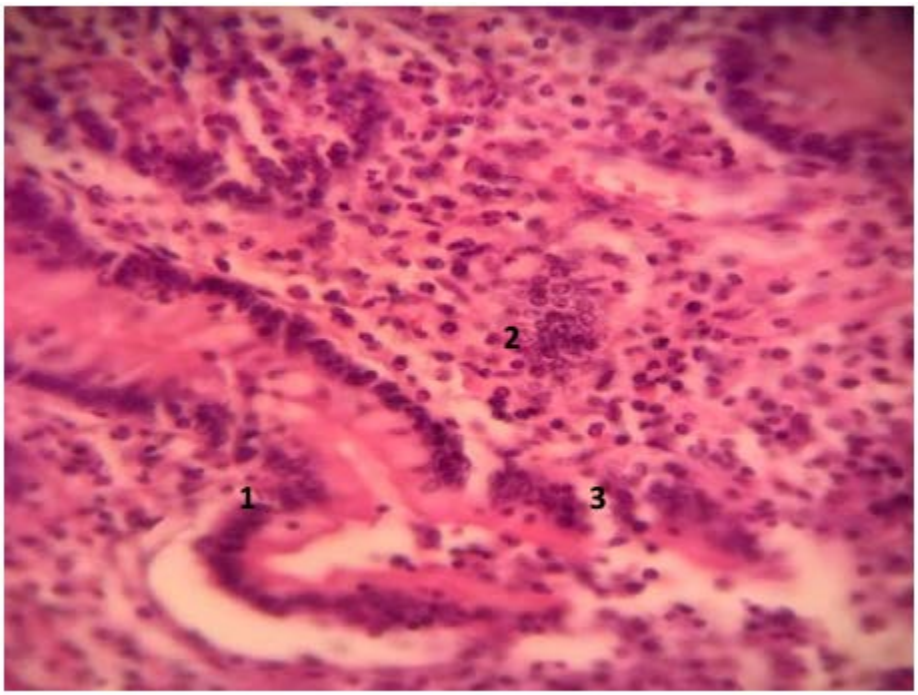

Figure (6): Hypertrophy, oedema and necrosis of abomasal gastric glands (1) with prominent cellular infiltration (2) and haemorrhage (3) [H & E, 200].

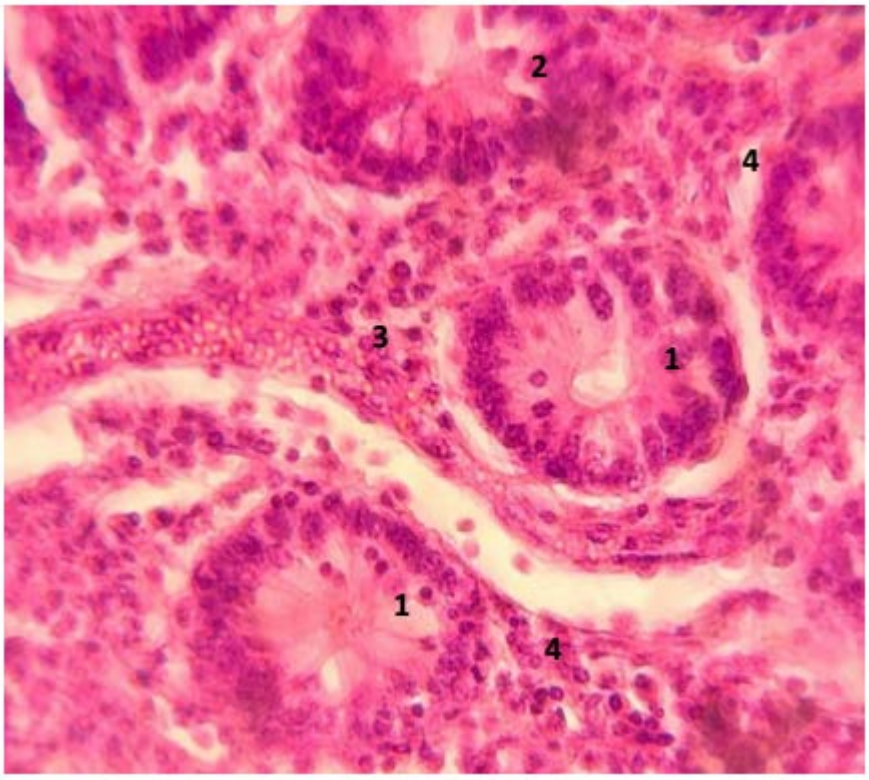

Figure (7): Gastric glands (1) showing hypertrophy, massive oedema and necrosis (2) with haemorrhage (3) and heavy cellular infiltration (4) [H & E,200].

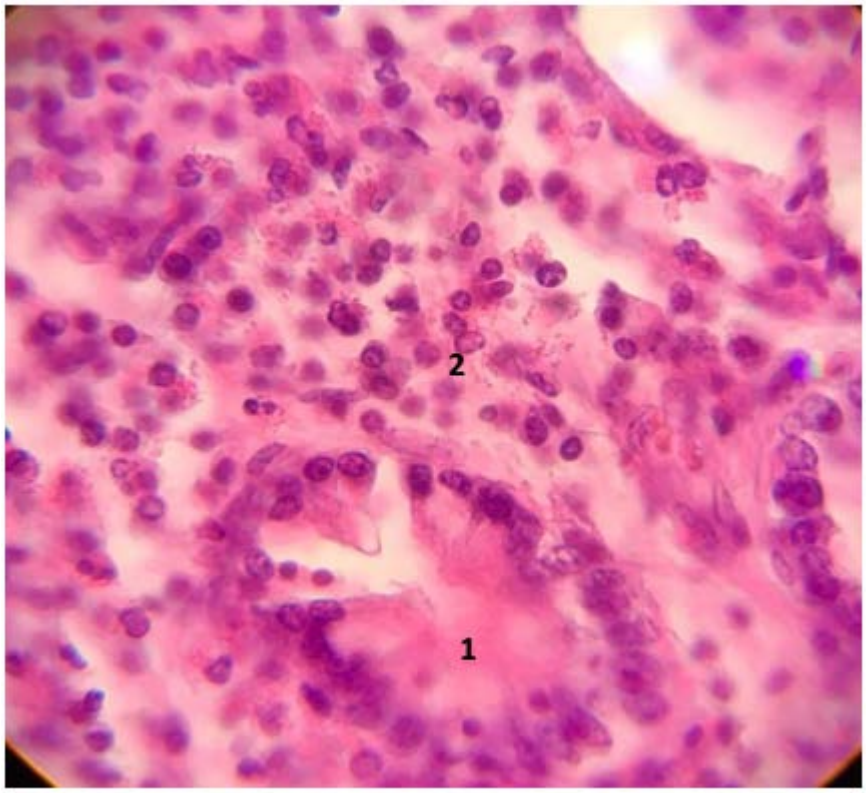

Figure (8): Oedematous mucous secreting gastric gland (1) surrounded with heavy cellular infiltration (2) [H & E, 250].

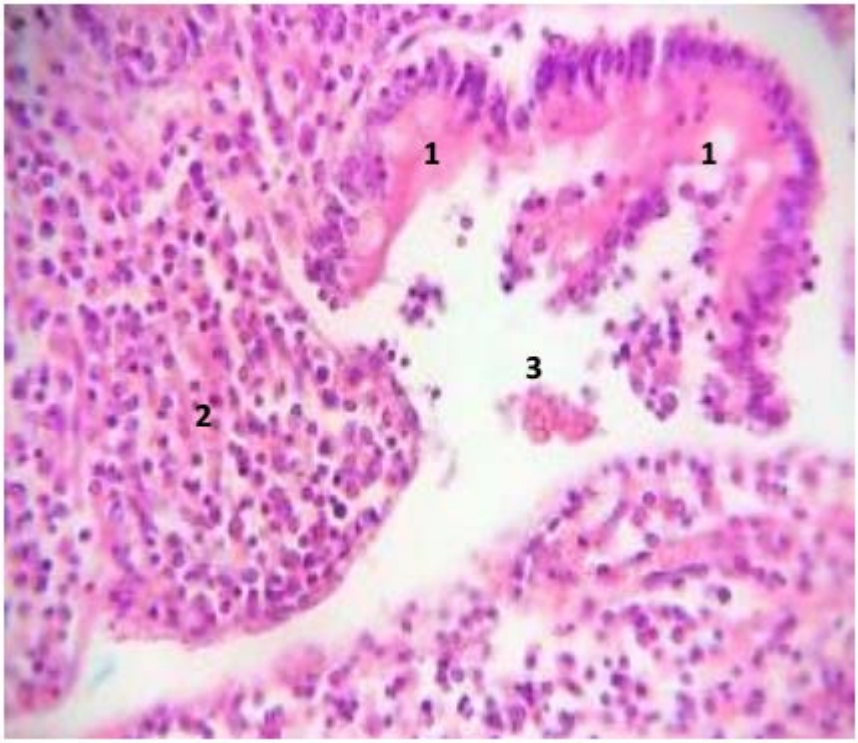

Figure (9): Detachment, desquamation and necrosis of abomasal villi (1) with prominent eosinophilic and lymphocytic cellular infiltration (2) and haemorrhage (3) [H & E,100].

DISCUSSION:

Concerning the relationship between total incidence of Haemonchuscontortus and breed (native or imported) among goats in Taif governorate.

The relationship between total incidence with haemonchosis among goats in native and imported breed. The result observed was the percent of infestation was higher in imported breed (9.18) than in native breed (5.16). The result are shown in Table (1) .

Many parasitic infections were previously recorded in imported animals in Saudi Arabia, often at higher prevalence rates than indigenous breed. It is, thus, likely that the exchange of these parasites, between imported and indigenous livestock, is contributing to wards the spread of animal parasitism as well as the incidence of parasitic zoonosis in the country [19]. Results of this study agreed with the results by [20] who recorded that higher prevalence of heamounchosis infection among imported compared to indigenous food animals in Jaddah. We concluded that all imported livestock should be quarantined, upon arrival for inspection and medication.

Studying the relationship between age and rate of infestation with *Haemonchuscontortus* in goats, the rate of infestation was found (4.17%), (7.14%), (8.69%) and (3.75%) in native breed goats aged, 6-12 month ,1-1.5 years ,1.5-2 years and over 2 years respectively. While, the rate of the infestation was found (9.30), (8.33), (12.96) and (3.70) percent in imported breed goats aged, 6-12 month ,1-1.5 years ,1.5-2 years and over 2 years respectively. The results are shown in table (2).

Our results indicated that lambs up to 1.5 years to 2 years recorded the highest percent of infestation in both local and imported breed (8.69 % and 12.96 % respectively). Our results agreed with [21 and 22] who recorded that in relation to age, the occurrence of helminth parasites in younger (<1 year) and in old (≥2 years) sheep was 100% but in young (≥1-2 years) was76.09%. This high increase in rate of infestation with heamonchousis among this age may be explained as the acquired immunity during the previous period was declined, due to some stress factors under which the animals were existed such as, pregnancy and lactation as well as malnutrition. Our finding was not coincided with the results of [23] reported that the infection rate of haemonchosis was a higher infection rate recorded in animals below 9 months than above 9 month of age, while [24] in Tehran (Iran) reported that no significant relationship was found between prevalence of infection with heamonchousis and different ages. Our finding reported that the curve of infestation in animals over 2 years old show steady decline in rate of infestation, and no significant variation in both local and imported goats (3.75% and 30.70% respectively). This could be attributed to age resistance manifested in developing protective antibodies against the parasites due to their metabolic production.

4-Studing the relationship between total incidence of *Haemonchuscontortus*and seasonal changes among goats in Taif governorate

The result revealed that the highest percentage *Haemonchuscontortus* was recorded during summer season (12.5), while the lowest percentage was recorded during the spring season (4.20). At the autumn and winter the rate of infestation were 6.82 and 7.14 respectively. The result obtained are shown in Table (3). The results indicated highest rate of infection during summer, while there was a sharp drop in the incidence during spring season (4.20%). These results were supported by [23] who reported that the highest (43.69%) seasonal prevalence in goats was during summer. This could be attributed to the climatic conditions including temperature, relative humidity and rainy weather which were favorable to the survival and development of larval stages of heamonchuscount in Taif governorate. These findings were strongly supported also by [25].

5-The relationship between total incidence of *Haemonchuscontortus* and breed (native or imported) and its affect by seasonal changes among goats in Taif governorate

Seasonal incidence of haemonchosis among native and imported goats in Taif governorate revealed that, in native breeds were (7.40), (7.41), zero, zero during spring, summer, autumn and winter respectively. While in imported breeds were 14.3, 3.51, 11.54 and 8.9 % during spring, summer, autumn and winter respectively. The result obtained

are shown in table (4). Our results agreed with [25], [26], [27] and [28] and disagreed with [30] in Rwanda and [31] in Bangladesh.

5- The relationship between total incidence of *Haemonchuscontortus* and months among goats in Taif governorate showed that the highest percentage of positively was recorded in July (17.14), while the lowest was in April (1.64). It was observed that the total percentage of infection with heamonchusis was 8.06 as shown in Table (5).

Epidemiology of *Haemonchuscontortus* in Taif governorate

During the study year (March 2012 to August 2013) 351abomasa goats were examined at slaughter houses. Overall infection rate was (7.41%). It was evident from (Table 5) that the highest prevalence of haemonchosis was recorded in slaughtered goats during the month of July (17.14%), followed by August (15.79%), and May (10.61%), whereas the lowest prevalence (1.81 and 1.64) was recorded during March and April respectively. It was observed that the highest prevalence of haemonchosis occurred during summer, followed by autumn and winter, while it was the lowest during spring. These findings are consistent with those of [32], [33], [34] and [35]. They attributed several factors i.e., warmer and wetter grazing seasons, the greater time animals spend on pasture, ineffective deworming practices or the development of anthelmintic resistance in this parasite [36]. In goats, counts of Haemonchus egg increased with the rains and peak levels were attained during rainy season. Adult worm burdens were generally low and showed seasonal variation that corresponded with the rainfall pattern in the study area during the period. Haemonchus species attained peak counts together in goats (July, August and June).

From the results, it was indicated that environmental conditions during summer in Taif, were quite favorable for the development and completion of *Haemonchuscontortus* life cycle that corresponded with the rainfall pattern in the study area.

Macroscopic and microscopic findings

Petechial hemorrhage in the abomasal mucosa (Probably due to the attachment of the parasite) (Figure 1), extensive mucosal hemorrhage, inflammation, mucous secretions around lesions and paleness of internal organs were seen. Thickening of abomasum mucosa and muscularis mucosa, broadening of villi with some detachment of tips (arrow), hyperplasia of mucous and gastric glands with heavy cellular in filtration in abomasums mucosa.

Also abomasal contents were fluidal and partially covered with free blood (Figure 2,3,4). Moreover, mononuclear cells infiltration (lymphocytes, monocytes and plasma cells), prominent eosinophilic infiltration in mucous glands and some even penetrated to the sub mucosa, perivascular hyperemia and lymphocytic infiltration, tissue thickening due to an increase in mucous glands and mucous secretion, connective tissue proliferation and necrosis (in chronic abomasal inflammation and wound healing. Hyperplasia of mucous glands of abomasal mucosa with connective tissue proliferation and necrotic patches. Hypertrophy, oedema and necrosis of abomasal gastric glands with prominent cellular infiltration and haemorrhage. Gastric glands showing hypertrophy, massive oedema and necrosis with haemorrhage and heavy cellular infiltration. Oedematous mucous secreting gastric gland surrounded with heavy cellular infiltration. Detachment, desquamation and necrosis of abomasal villi with prominent eosinophilic and lymphocytic cellular infiltration and haemorrhage (Figure 6, 7, 8, 9).

Macroscopic findings, petechial hemorrhage in the mucosa and severe hyperemia in mucosal folds (Figure 1) were seen as described by McKenna PB [37].

Concerning the microscopic findings eosinophilic infiltration has been observed that while corresponding to those of Nayebzadeh*et al*. [38]. Eosinophils are considered to be important elements in the response against Haemonchus infections [39]. In the study, there was an increased number of circulating blood eosinophils in the sheep infected with Haemonchus larvae. This was in agreement with [12] and [40]. There is also some evidence suggesting that eosinophils may contribute to pathogenesis during parasitic infection [13]. Moreover, it has previously been shown that a number of ovine parasitic gastrointestinal nematodes produce a factor(s) that promote eosinophil migration in vitro [41]. Yacob et al. [52] reported the presence of an early and high eosinophilia and migration of the same cellular components into the abomasal and intestinal mucosa in the absence of nematodes in the gut. Meanwhile, sometimes the focal accumulation of lymphocytes and tissue thickening were seen that is similar to that reported by

[43]. Many studies have been done on this parasite. Ahmed Mir *et al.* [44], [45] and [43] have reviewed pathophysiology of Haemonchosis. Also [46] and [47] reported hematologic changes. Nayebzadeh et al. [46] and [48] studied at parasite growth stages and its changes. In Anderson [49] studies, weight loss is reported during the chronic infection with this parasite in sheep. Zacharias et al. [45] reported anemia in merino sheep. Also, [50] and [38] reported it too. Additionally, in microscopic examination by [38] proliferation of macrophages and fibroblasts and infiltration of lymphocytes and eosinophils have seen around the adult worms in pyloric region [38]. Moreover, in another study by [43], fundus region thickening was seen, that caused by mucous cells hyperplasia. Also [15] reported that lymphocytes from both naive lambs and immune sheep responded to a similar spectrum of molecular and also this report therefore supports the findings of [49, 50] who had suggested that lymphocyte proliferative responses in naive sheep were important in innate resistance to this parasite weight fraction in soluble antigen. Immunosuppression is known to take place in some gastrointestinal nematode infection models [53, 54]. These observations suggest that the chronic nature of primary *H. contortus* nematode infections may be due to a change in the type of immune response induced by larval and adult nematodes and that the adult nematodes may actively subvert the initial immune response induced after infection.

REFERENES

1. Sultan K, Desoukey AY, Elsiefy MA, Elbahy NM (2010) An Abattoir Study on the Prevalence of Some Gastrointestinal Helminths of Sheep in Gharbia Governorate, Egypt. Global Veterinaria 5: 84-87.

2. Vlassoff A, Mckenna P (2010) Nematode parasites of economic importance in sheep in New Zealand. N Z J Zool 21: 1-8.

3. Lateef M, Iqbal Z, Jabba A, Khan MN, Akhtar MS (2005) Epidemiology of trichostrongylid nematode infections in sheep under raditional husbandry system in Pakistan. Int J AgricBiol 7: 596-600.

4. Onyenwe IW, Onwe C, Onyeabor A, Onunkwo JI (2005) Abattoir-Based Study of the Susceptibility of Two Natural Infected Breeds of Goat to *Haemonchuscontortus* in Nsukka Area of Enugu State, Nigeria. Animal Research International 2: 342-345.

5. Love SC, Hutchinson GW (2003) Pathology and diagnosis of internal parasites in Ruminants. University of Sydney, Australia.

6. Sissay MM, Uggla A, Waller PJ (2007) Epidemiology and seasonal dynamics of gastrointestinal nematode infections of sheep in a semi-arid region of eastern Ethiopia. Vet Parasitol 143: 311-321.

7. Santín-Durán M, Alunda JM, Hoberg EP, de la Fuente C (2008) Age distribution and seasonal dynamics of abomasalhelminths in wild red deerfrom Central Spain, J Parasitol 95: 1031-1037.

9. Burke JM, Kaplan RM, Miller JE, Terrill TH, Getz WR (2007) Accuracy of the famach system for on-farm use by sheep and goat producers in the south eastern U.S. Vet Parasitol 147: 89-95.

10. Almazán C, Avila G, Quiroz H, Ibarra F, Ochoa P (2001) Effect of parasite burden on the detection of Fasciola hepatica antigens in sera and feces of experimentally infected sheep. Vet Parasitol 97: 101-112.

11. Ahmed OF, Mustafa SA, Omer BH (2007) Pathogenesis of *Haemonchuscontortus* in naturally and Experimentally Infected Sudanese Desert Sheep. Global Veterinaria 5: 84-87.

12. Terefe G, Yacob HT, Grisez C, Prevot F, Dumas E, et al. (2005) *Haemonchuscontortus*egg excretion and female length reduction in sheep previously infected with Oestrusovis (Diptera:Oestridae) larvae. Vet Parasitol 128: 271- 283.

13. Nickdel MB, Roberts F, Brombacher F, Alexander J, Roberts CW (2001) Counter-protective role for interleukin-5 during acuteToxoplasma gondii infection. Infect Immun 69: 1044-1052.

14. Perry BD, Randolph RF, Mc Dermott JJ, Sones KR, Thornton PK (2002) Investing in animal health research to alleviate verty. International Livestock Research Institute (ILRI). Nairobi, Kenya.

15. Mir RA, Chishti MA, Zargar H, Ganie SA (2007) Clinocopathological changes in sheep experimentally infected with *Haemonchuscontortus*. World J AgricSci 3: 562-566.

16- Gharamah, A.A.; Rahman, W. A. and M.N.SitiAzizah.(2011): Morphological characterization of *Haemonchuscontortus* in sheep(Ovisaries) and goats(Capra hircus) from two governorates in Yemen. World Journal of Zoology, 6:263-267.

17- Akkari, H.; Gharbi, M.; Awadi, S.; Mohamed, A.D. and Kumsa, B. (2013): A new sublinguiform vulvar flap of Haemonchus species in naturally infected domestic ruminants inBéja a battoir, North Tunisia Vet.arhiv.83(3):281-291.

18. Petrie A, Watson P (1999) Statistics for Veterinary and Animal Sciences. Blackwell Science Ltd., London, UK.

19- Taylor, M.; Coop, R and Wall. R. (2007): Veterinary Parasitology 3rd ed. Blackwell publishing, Oxford.

20- Ghandour, A.M.; Tahir, M. O. and Shalaby, I. M. (1989). A comparative study of the prevalence of some parasites in animals slaughtered in Jeddah abattoir. Faculty of Science, King Abdul Aziz university, Jeddah. Saudi Arabia.

21- Sajid, M.S.; Iqbal, Z.; Khan, M.N. and Qudoos,A. (1999): Some epidemiological aspects of gastrointestinal nematodes of sheep. Int. J. Agric. Biol.,4: 306-308.

22- Hassan, D.I.; Mbap.andNaibi, S.A. (2013): Prevalence of Worm Infection in Yankasa sheep and West African dwarf goats in Lafia Town and Environs, Nigeria. IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS) e-ISSN: 2319-2380, p-ISSN: 2319-2372. Volume 4, Issue 4 PP 84-90.

23- Qamar, M.F.; Maqbool, A.; Khan, M.S.; Ahmad, N. and Muneer,M.A. (2009): Epidemiology of haemonchosis in sheep and goats under different managemental conditions.Vet.Parasitol.,2(11):413-417.

24- Nabavi, R.; Eslami, A.; Shokrani, H.R.; Bokaie, S.; Shayan, Pand Saadati, D. (2011): Study on the prevalence, intensity, seasonal dynamics of abomasalhelminths in sheep from different climatic zone of Iran. Faculty of Veterinary Medicine, Tehran Univ., 12(4):441-445.

25-Muhammad, L.; Zafar, I.; Abdul, J.; Khan, M.N.; Akhtar, M.S. (2005): Epidemiology of trichostrongylid nematode infections in sheep under traditional husbandry system in Pakistan.Int.J. of Agriculture and Biol.,7:596-600.

26- Keyyu, J.D., Kyvsgaard, N.C., Monrad, J., Kassuku, A.A., (2005): Epidemiology of gastrointestinal nematodes in cattle on traditional, small-scale dairy and large-scale dairy farms in Iringa district, Tanzania.Vet. Parasitol. 127, 285–294.

27- Lateef, M.; IQbal, Z.; Jabbar, A.; Khan, M.N. and Akhtar, M.S. (2005): Epidemiology of trihostrongylid nematodes in sheep. Int. J. Agri. Biol.7 (4):596-600.

28- Nwosu C.O., Madu, P. P and Richards, W. S (2007): Prevalence and seasonal changes in the population of gastrointestinal nematodes of small ruminants in the semi-arid zone of north-eastern Nigeria. Vet. Parasitol., 144:118–124.

29- Juvénal, N.; Carine, N.; Jeanne d'Arc, S. and Edward, S. (2011): An analysis of the dynamics of gastro-intestinal nematode infection in small ruminants in the northern region of Rwanda. Int. J. Anim. Vet. Adv., 3(3): 128-134.

30- Mazid, M.A.; Bhattacharjee, J.; Begum, N. and Rahman, M.H. (2006): Helminth parasites of the digestive system of sheep in Mymensingh, Bangladesh.Bangal.J.Vet.Med.,4(2):117-122.

31- Gauly, M., Schackert, M., Hoffmann, B., Erhardt, G., (2006): Influence of sex on the resistance of sheep lambs to an experimental *Haemonchuscontortus* infection. Dtsch. Tierarztl.Wochenschr. 113: 178–181.

32- Khajuria, J.K., Kapoor, P.R., (2003): Prevalence of parasites in sheep and goats at Kathua-Jammu. J. Vet. Parasitol. 17: 121–126

33- Keyyu, J.D., Kyvsgaard, N. C., Monrad, J., Kassuku, A. A., (2005): Epidemiology of gastrointestinal nematodes in cattle on traditional, small-scale dairy and large-scale dairy farms in Iringa district, Tanzania.Vet. Parasitol. 127, 285–294.

34- Maryah, U.M., (2005): Foarge availability and livestock management systems in the semi-arid zone of northern Nigeria. Ph.D. Thesis. Bayero University, Nigeria.

35- Nuruzzaman, M.; Haque, M.H.; Sarker, S. and Begum, N. (2012): Abomasal Nematodes in Goats Slaughtered at Different Abattoir of Thakurga on District, Bangladesh. J. Sci. Res. 4(2):491- 497.

36-Shalaby HA (2013) Anthelmintics Resistance; How to Overcome it? Iran J. Parasitol 8: 18-32.

37-21. McKenna PB (1998) The effect of previous cold storage on the subsequent recovery of infective third stage nematode larvae from sheep.Vet Parasitol 80: 167-172.

38- Nayebzadeh H, Seyfiabadshapouri M, Hoghooghi N (2005) Immunization of Arabian sheep against haemonchosis with *Haemonchuscontortus* intestinal homogenate. 15th European Congress of Clinical Microbiology and Infectious Diseases (ECCMID). Copenhagen / Denmark.

39- Balic A, Bowles VM, Meeusen EN (2000) The immunology of gastrointestinal nematodes in ruminants. AdvParasitol 45: 181-241.

40-Aliasghar Tehrani1, JavadJavanbakht, Meysam Jani3, FarhangSasani, Amirali Solati4, MojtabaRajabian, Farshid Khadivar3, Hamid Akbari5 and MohammadrezaMohammadian (2012) Histopathological Study of *Haemonchuscontortus* in Herrik Sheep Abomasum J BacteriolParasitol Volume 3 • Issue 5 • 1000144.

41- Wildblood LA, Kerr K, Clark DA, Cameron A, Turner DG, et al. (2005) Production of eosinophil chemo attractant activity by ovine gastrointestinal nematodes. Vet ImmunolImmunopathol 107: 57-65.

42. - Yacob HT, Basazinew BK, Basu AK (2008) Experimental concurrent infection of Afar breed goats with Oestrusovis (L1) and *Haemonchuscontortus* (L3): interaction between parasite populations, changes in parasitological and basic haematological parameters. ExpParasitol 120: 180-184.

43. - Scott I, Dick A, Irvine J, Stear MJ, McKellar QA (1999) The distribution of pepsinogen within the abomasa of cattle and sheep infected with Ostertagia spp. and sheep infected with Haemonchuscontortus. Vet Parasitol 82: 145- 159.

44-Ahmed Mir M, Zahoor CM, Afzal ZM, Tak H, Ahmed SG (2007) Clinicopathological Changes in Sheep Experimentaly Infected with *Haemonchuscontortus*. World Journal of Agricultural Science 3: 562-566.

45-Zacharias F, Guimarães JE, Araújo RR, Almeida MA, Ayres MC, et al. (2008) Effect of homeopathic medicine on helminth parasitism and resistance of *Haemancuscontortus* infected sheep. Homeopathy 97: 145-151.

46- Ameen SA, Joshua RA, Adedeji OS, Ojedapo LO (2006) Experimental studies on Gastro-Intestinal Nematode Infection; Clinical Observations and Haematological Changes Following *Haemonchuscontortus* Infection in West African Dwarf (WAD) kids. Journal of Animal and Veterinary Advance 5: 511- 514.

47- Wilson AG, Thake DC, Heydens WE, Brewster DW, Hotz KJ (1996) Mode of action of thyroid tumor formation in the male Long–Evans rat administered high doses of alachlor. FundamApplToxicol 3: 16-23.

48- Troell K, Waller P, Höglund J (2005) The development and over winter in survival of free-living larvae of *Haemonchuscontortus* in Sweden. J Helminthol 79: 373-379.

49- Anderson GS (2000) Minimum and maximum development rates of some forensically important Callophoridae (Diptera). J Forensic Sci 45: 824-832.

50- Courtney CH, Parker CF, McClure KE, Herd RP (1984) A comparison of the periparturient rise in fecal egg counts of exotic and domestic ewes. Int J Parasitol 14: 377-381.

51- Rowe A, McMaster K, Emery D, Sangster N (2008) *Haemonchuscontortus*infecK.tion in sheep: Parasite fecundity correlates with worm size and host lymphocyte counts. Vet Parasitol 153: 285-293.

52- Anthony RM, Rutitzky LI, Urban JF Jr, Stadecker MJ, Gause WC (2007) Protective immune mechanisms in helminth infection. Nat Rev Immunol 7: 975-987.

53- Gibbs HC (1967) Some factors involved in the “spring rise” phenomenon in sheep. N.G. Elwert Universitatus und Verlagsbuch hand lung, Marburg/Lund.

54-. O’Sullivan BM, Donald AD (1970) A field study of nematode parasite populations in the lactating ewe. Parasitology 61: 301-315.