Clinical and Hematological studies of Theileriosis in local breed goats in middle of Iraq (Baghdad, Diala and Al-Anbar)

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Abstract

The study include survey for Theileriosis in goat in middle of Iraq, their age ranged between (1-5) years, the study extended from 20 June to 25 December 2011 the study registered and confirmed Theileriosis infection depending upon clinical signs as well as hematological changes that recorded in 150 goats then select 50 goat as healthy group which appeared normal signs (Temperature, Pulse, Respiratory) with the normal rang. But 100 goats recorded infected which appeared increase in body temperature, pulse and respiratory rate, enlargements of lymph node, pale mucous membrane, weakness. Hematological there was significant ($p<0.01$) decrease in red blood cell, hemoglobin concentration, packed cell volume, leukocyte count decreased significant ($p<0.05$). The blood examination showed the high level of parasitemia and presence of Koch blue bodies in lymphocyte in all cases of infected Theileriosis. The epidemiology survey of infection showed that high prevalence in Baghdad at summer season mostly in August with increasing climate temperature and humidity.

دراسة سريرية ودمية للإصابة بمرض الثاليريا في الماعز المحلي في وسط العراق (بغداد، ديالى والأنبار)

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الخلاصة

تضمنت الدراسة مسح لحالات الإصابة بمرض الثايليريا في الماعز المحلي في مناطق وسط العراق (بغداد، ديالى، الأنبار) في الأعمار (1–5) سنة وللفترة 20 حزيران إلى 25 كانون الأول لعام 2011 تم تثبيت وجود الإصابة بواسطة الفحص السريري 100 رأسا من الماعز بالاعتماد على درجة الحرارة، التنفس، النبض، تضخم الغدد اللمفية أمام لوح الكتف إضافة لفحص الأغشية المخاطية. إذا تم مقارنتها مع (50) رأسا من الماعز كانت تتمتع بصحة جيده (درجات حرارة، نبض، تنفس ضمن المدى الطبيعي) حيث سجلت الحالات المصابة ارتفاع في درجة الحرارة, معدلات النبض والتنفس، تضخم في الغدد اللمفية وشحوب في الأغشية المخاطية وضعف كما أظهرت ألصوره الدمية انخفاضا ملحوظا إحصائيا ($p<0.01$) لإعداد الكريات الدم الحمراء، خضاب الدم وحجم الخلايا المرصوصة بالمقارنة مع مجموعة السيطرة، كما انخفضت أعداد الخلايا البيض بصوره معنوية ($p<0.05$). كما تم ظهور الشايزونات في الخلايا اللمفية إضافة لظهور الميروزات في كريات الدم الحمر للمسحة الدموية داخل وخارج الكريات الحمر وهذا يؤكد الإصابة. إن المسح الوبائي للإصابة كان واضح بنسبة عالية في منطقة بغداد تلتها بقية المحافظات إضافة لظهور الإصابة في موسم الصيف في شهر آب خاصة مع ارتفاع درجة حرارة الطقس.

Introduction

Theileriosis are those tick- borne protozoan diseases associated with *Theileria* spp. In cattle, sheep and goats as well as in wild animals (1). The distribution of the causative protozoa is govern by the geographical and seasonal distribution of the insect vectors that transmit them (2). Blood parasite is the most economically important of these diseases because of direct losses of production meat and milk (3) and is caused by several different pathogenic *Theileria species*(4). This species is transmitted by ticks of the genus *Hyalomma* (5). Regarding *Theileria* of small ruminants, the highly pathogenic species *T. lestoquardi* causes a disease called malignant ovine Theileriosis in sheep and goats (6). Generally, the diagnosis of infection by *Theileria*parasites in cattle and small ruminants is usually based on clinical signs, vector distribution and on the morphological examination of the piroplasm and schizont stages of the parasite in Giemsa-stained blood and lymph node smears (7). The acute disease is characterized by fever and very high mortality in (3-6) days. Anemia, jaundice and enlargement of lymph nodes are characteristic and both piroplasms and schizonts can be demonstrated in smears of blood tissues (8). reported that *T. lestoquardi* was determined in blood smears of the 33.6% of small ruminants in Iraq. No work has been registered *Theileria spp*. In middle of Iraq on local breed goats.

Materials and Methods

A total of 230 goats, 1-5 years of age and from both sexes were examined randomly in middle of Iraq to registering Theileriosis infection in the (Baghdad, Diala and Al-Anbar) Careful clinical examination temperature, pulse, respiratory rate, lymph node, mucus membrane of all suspected animal were carried out, Blood was collected from jugular vein for hematological examination of total red blood cells (RBC), hemoglobin concentration (Hb), packed cell volume (PCV), then calculated mean corpuscular volume (MCV), mean corpuscular hemoglobin concentration (MCHC), and total and differential leukocytes counting (DLC) (9). Thin blood smears were taken from jugular vein and stained with Giemsa stain were used to identify *Theileria spp* as well as lymph smear to identify Koch blue body (10). Statistical analysis were done by using SPSS (11).

Results and Discussion

Clinically examination for 50 goats as control group subjected to study, it showed the body temperature in healthy goats in different age between the (38.06-39.9 C°) with a mean (39.4 C°), the respiratory rate between (24.99/min-28.60/min) at mean (26.6/min) and The pulse rate a range (73.48-81.07b/min) and a mean of (77.41 b/min) as in Table (1). All these values appeared within the normal range agree with (12). While the Clinical examination for infected goats showed increasing in a body temperature at range between (40.25-41.75 C°) with a mean of 40.80 C°. The increasing of body temperature occurs due to the liberation of endogenous pyrogens because white blood cells Lysis specially neutrophils, macrophage cells duration infection and high level of parasitemia lead to the stimulation of thermoregulatory center in the hypothalamus in cocompatible with that of (13,14). There is also during the acute illness an obvious increase in the respiratory rate between (51.98/min-59.53/min) and the mean is (55.75/min) which agreed with (14). While the pulse rate is increased in the range (99.80b/min-119.57/min) the mean was 117.50 b/min as in Table (2). The increase in pulse rate may be due to dehydration and anemia which is the findings in our group collections this sign resulted due to decrease of RBCs, Hb and PCV levels these explained the hearing of strong heart beats in the infected animals

which may be attributed to anemia which leads to increased heart beats and cardiac output and decreased circulation time (rapid circulation), which can result in cardiac hypertrophy or failure these findings were similar to that of (14, 21, 22) studies. The prescapular lymph node enlargement in our Acutely infected goats among our collection could be explained by lymphoid hyperplasia in early stage of disease that occurs due to increases of proliferation of microschizonts inside the lymphocyte caused inflammatory reaction in the infected lymph node this was agreed with the explanations of (13). The anorexia could be attributed to present fever (14, 17, 18). In our study of acute infection the goats showed pale-yellowish of mucus membranes which a similar findings in the studies of (15, 16) they explained that paleness of mucous membranes exhibited the development of anemia and reduction of hemoglobin concentration and the total erythrocytes count was due to the destruction and the removed of the infected erythrocytes by reticuloendothelial system. In our study most of the goat with acute Theileria and even some of chronic goat also have pallor. These results agreed with the results of studies done by (14). The infected goats showed pale to icterous mucous membrane which is a yellowish discoloration that discovered on examination of eye conjunctiva which is the result of increased levels of total bilirubin. The jaundice (yellow discoloration) of conjunctival mucous membranes, is similarly found by (18, 23). The diseased goats are usually emaciated, In this group of our study weakness and emaciation are predominant physical findings as in the results of (16). These results were in agreement with the results findings of (17).

Table (1) Explain the Body temperature, Respiratory rate and Pulse rate in goats of healthy group in different ages.

Clinical parameters	1-2 Years	2-4 Years	>4 Years
Temperature (C°)	38.06 - 39.6	39.35- 39.85	39.1 - 39.9
Respiratory rate/ min.	24.99 – 27.43	28.00 – 28.6	23.7 – 27.10
Pulse rate b/min.	73.48 – 78.14	75.56 – 79.24	77.00 – 81.07

Table (2) Explain the Body temperature, Respiratory rate and Pulse rate in goats infected with Theileriosis in different ages

Clinical parameters	1-2 Years	2-4 Years	>4 Years
Temperature C°	40.7- 41.10	40.25 - 41.75	40.35 - 40.65
Respiratory rate/ min.	51.98 – 56.66	54.85 – 55.59	55.93 – 59.53
Pulse rate b/min	115.65-121.15	99.8 -110.6	119.57 – 122.23

*** refer to significant increase ($p<0.01$) between groups, in acute higher than Healthy groups.**

Hematologically there was significant ($p<0.01$) between acute infected and healthy group. The total red blood cell count in healthy goats is ranged between ($10.60 \times 10^6{}_{\mu l}$ - $12.62 \times 10^6{}_{\mu l}$) and of a mean ($12.13 \times 10^6{}_{\mu l}$), and the Hb ranged between (8.72g/dl-9.98g/dl) with a mean (9.40g/dl). The PCV in this group shows a range between (29.18%-32.21%) and a mean of (30.90%). The MCV in this group shows a range between (23.47fl-25.91fl) and a mean of (25.27fl), The MCH range in the healthy group is between (7.65 pg-9.50pg) and in the mean of (8.6pg) and the MCHC range is (30.79g/dl-33.39g/dl) of a mean (32.31g/dl). These results were in agreement with the (14,23). The White blood cell in healthy goats shows a range between ($7.45 \times 10^{3\ \mu l}$-$9.35 \times 10^{3\ \mu l}$) and the mean is ($8.92 \times 10^{3\ \mu l}$). The lymphocytes in healthy group were ranged between (42.38%-44.50%) and in the mean of (43.53%), The neutrophil in this group ranged between (54%-57%) of a mean (55.81%), the monocyte is ranged between (0.17%-0.29%) with a mean of (0.24%), eosinophil range was (0.15%-0.44%) and a mean of (0.35%) and basophile range in healthy

goats was (0.00%-0.06%) and with a mean of (0.03%). These results were in agreement with the (15, 22). The present study showed that goats infected with with *acute* and *chronic* Theileriosis showed a decrease in total RBCc, PCV, Hb and MCHC while the MCV is elevated in both acute and chronic groups. In the acute infection the RBCs is ranging between (3.64×10^3 µl-5.31×10^3 µl) and a mean (4.74×10^6µl), and the Hb ranged between (6.20g/dl-6.70g/dl) with a mean (6.45g/dl). The PCV in this group shows a range between (25.61%-27.33%) and a mean of (26.16%) and the MCHC range is (27.11g/dl-29.18g/dl) of a mean (28.22g/dl). The MCV range is (56.65fl-60.02fl) its mean is (57.68fl). While In the chronic infection the RBCs is ranging between (4.36×10^3 µl -5.43×10^3 µl) and a mean of (4.67×10^6µl). The Hb range is between (6.03g/dl-7.26g/dl) with a mean (6.56g/dl). The PCV in this group showed a range between (24.63%-26.64%) and a mean of (25.76%) and the MCHC range is (25.04g/dl-28.33g/dl) of a mean (26.99g/dl). The MCV range is (56.82fl-59.11fl) and a mean of (58.46fl). These hematological results are nearly similar to the results of (13, 14, 21, 22,). This study demonstrate a significant decreases in hemoglobin concentration (Hb) and total RBCs count in the *acute* and *chronic* groups which was not differing from the results of (25, 26). The types of anemias in our study are macrocytic, hypochromic anemia and normocytic normochromic anemia in infected goats which were also found by studies done by (23, 24) and showed that the animals infected by *Theileriosis* had macrocytic hypochromic anemia, due to some of reticulocyte cells apparent in blood cycle. In the acute and chronic groups there was significant increases in MCV ($p<0.01$) with no statistical significance in the MCH changes in both acute and chronic groups (17, 18). All these changes occur as a result of anemia which occurs due to toxic metabolites of Theileria spp. which have harmful effect on bone marrow as they interfere with the process of erythropoiesis and persistent loss of blood caused by permanent blood sucking ticks also agree with (14). The other important cause to make the anemia in ovine theileriosis was destruction of RBCs by reproductive of parasite inside RBCs which caused hemolytic anemia (21). The White blood cell in Acute infected goats shows a range between (5.89×10^3 µl -7.00×10^3 µl) and the mean is (7.02×10^3 µl). The lymphocytes in acutely infected group were ranged between (34%-38%) and the mean is (36.45%), The neutrophil in this group ranged between (55%-62%) of a mean (59.35%), the monocyte is ranged between (1.31%-1.38%) with a mean of (1.34%), eosinophils range was (1.30%-1.62%) and a mean of (1.45%) and basophile range in healthy goats was (1.05%-1.07%) and with a mean of (1.04%) as in Table (10). These results were in agreement with (14). The present study in the acute phase of the disease showed a significant decreases ($p<0.05$) in total WBC and lymphocyte percentage but neutrophil significantly increase in the acutely infected group and this came in agreement with (22). The decreased in white blood cells count might be explained by destruction of WBCs specially lymphocyte cells due to infection, in addition present of some lymphocyte destruction in blood smears which are related to reproduction of parasite inside lymphocyte. The parasite appeared in single or sometimes in pairs as shown in (Fig. 1) and the lymph smear showed the schizonts as in (Fig. 2).

Table (4) Explain Red blood cell, Hb and PCV counting as well as MCV, MCH and MCHC in goats of healthy group in different ages

Blood element	1-2Years	2-4Years	>4Years
RBCx10$^{6\mu l}$	11.95 - 13.29	10.60-12.50	11.84 -12.62
HB (g/dI.)	8.76-11.20	8.72-9.9.02	9.04 - 9.66
PCV(%)	29.18-31.62	31.77-32.65	29.52 - 30.68
MCV (fl)	24.91-26.91	23.47-25.27	24.68 - 26.42
MCH (pg)	8.06-9.16	7.65-8.25	9.37 -9.63
MCHC(g/dl)	31.90-32.80	33.18-33.60	30.79 - 31.61

Table (5) Explain Red blood cell, Hb and PCV counting as well as MCV, MCH and MCHC in goats infected with Theileriosis in different ages

Blood elements	1-2 Years	2-4 Years	>4 Years
RBC x10$^{6\mu l}$	3.75-5.33*	4.86-5.76	3.64-5.10
HB (g/dI)	6.34-6.64*	6.30-6.70	6.20-6.54
PCV (%)	26.16-26.98*	26.98-27.68	25.61-25.89
MCV (fl)	57.42-60.02**	56.65-57.64	56.82-57.08
MCH (pg)	9.37 -9.63*	7.50-8.80	7.55-8.25
MCHC(g/dl)	28.19-28.43*	27.28-29.18	27.11-29.15

*** refer to significant decrease ($p<0.01$) between groups, in infected groups higher than Healthy groups**

Table (7) Explain White blood cell and differential WBC types in goats of Healthy groups in different ages

Blood elements	1-2 Years	2-4 Years	>4 Years
WBC x10$^{3\mu l}$	8.56-8.94	7.45-9.93	7.40-11.30
Lymphocyte%	42-45	39-42	41-43
Neutrophile%	54-56	58-62	55-60
Monocyte%	0.17-0.23	0.27-0.31	0.24-0.25
Esinophile%	0.34-0.54	0.15-0.45	0.2-0.6
Basophile%	0.00-0.06	0.03-0.05	0.00-0.04

Table (8) Explain White blood cell and differential WBC types in goats infected with Theileriosis in different ages

Blood elements	1-2 Years	2-4 Years	> 4 Years
WBC x10$^{3\mu l}$	7.00-8.90	5.89-8.29	6.57-7.87
Lymphocyte%	35-37	34-36	36-38
Neutrophile%	56-58	58-62	55-60
Monocyte%	1.33-1.37	1.31-1.35	1.36-1.38
Esinophile%	1.56-1.62	1.30-1.50	1.52-1.54
Basophile%	1.05-1.07	1.05-1.09	1.05-1.07

*** refer to significant($p<0.01$) differences between groups, in infected higher than Healthy groups. ** refer to significant($p<0.05$) differences between groups, in infected groups higher than Healthy groups**

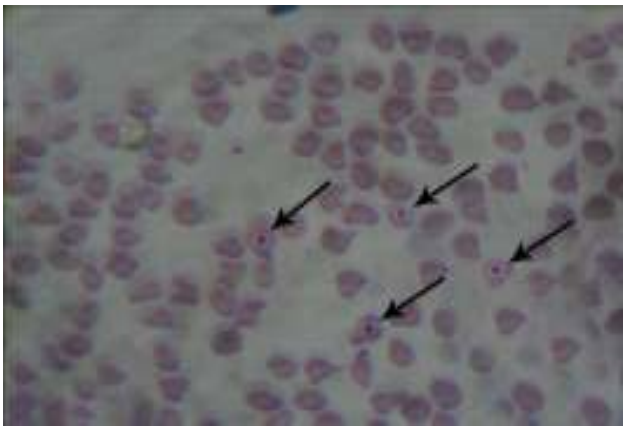

Fig. (1) RBCs infected with *acute Theileria* (erythrocyte stage) 100×.

And the result of epidemiological survey showed a high prevalence rate in the Baghdad provinces 25% followed by Al-Anbar provinces 15% and then with Diala provinces 10%.

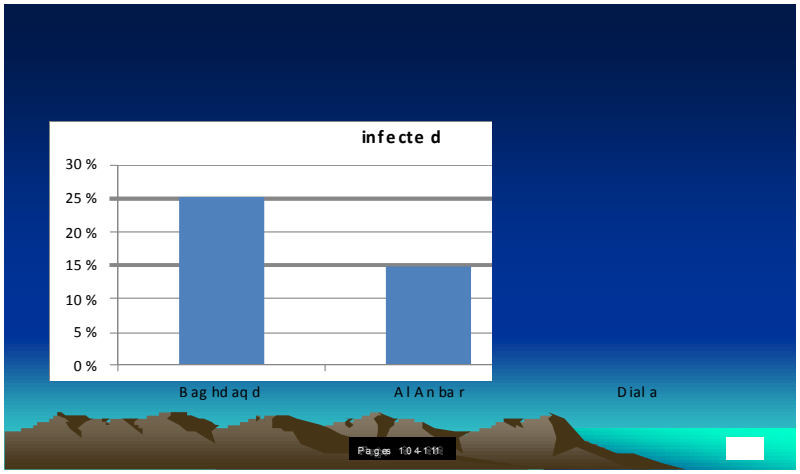

Fig. (2) Relation between the percentage of infection according to the area of the study

These results agreed with (28) who recorded high incidence of Theileriosis in sheep specially in the middle and south of Iraq. This study also showed the prevalence rate increases when the weather temperature increase, and observed the high prevalence rate (26%) of the acute infection when the mean of weather temperature was 47.4 C° while low prevalence rat in the acute infection (2%) when the mean of weather temperature was 12.7C° the prevalence rate of infection theileriosis increased when the mean of the weather temperature was increased. While low prevalence rat in the chronic infection (2%) when the mean of weather temperature was 47.4C° while high prevalence rat in the chronic infection (28%) when the mean of weather temperature was 12.7C° as in Table (10). These findings are in agreement with the result of (14) who reported that the prevalence of *Theileria* infection in sheep reached the highest level in the same months.

Table (10) Relation between the percentage of infection and some climate factor

Months of year	Mean Temperature	Infected %
June (C)	44.5	20%*
July (C)	46.2	24%*
August (C)	47.3	26%*
September (C)	39.8	10%
October (C)	35.4	12%
November (C)	22. 00	6%
December (C)	12.7	2%

References

1. Coetzer, J. & Tustin, R. C. 2004. infectious diseases of livestock, 2nd edn. cope Twon: Oxford University press, 1: 448- 501.
2. Yeruham, I.; Handi, A. & Galk, F. 1998. Someepizootiological and clinical aspects of Oview. Vet. Parasitol., 74: 153- 163.
3. Radostits, O. M.; Gay, C. C.; Hinchcliff, K. W. & Constable, P. D. 2000. Veterinary Medicine, 10thEd. A textbook of the disease of cattle, sheep, goats, pigs and hours. Saunders Company Ltd., London, New York. PP. 1328-1329.
4. Mehlhorn, H. & Schein, E. 1994. The piroplasms: life cycle and sexual changes. Adv. Parasitol., 23: 37-103.
5. Uilenberg, G. 1981. Theileria species of domestic livestock. In: Advances in the control of theileriosis. Irvin, A. D., Cunningham, M. P. and Young, A. S. (Eds). Martinus Nijhoff Publishers. The Hague, PP. 4-37.
6. Brown, C. G. D.; Ilhan, T.; Kirvar, E.; Thomas, M.; Wilkie, G.; Lemans, I. & Hooshmand-Rad, P. 1998. Theileria Lestoquarid in vetro and in vivo studies, Ann. N. Y. Acad. Sci., 849: uu-51.
7. Guo, S.; Yuan, Z.; Wu, W.; Ma, D. & Du, H. 2002. Epidiemiology of ovine theileriosis in Ganan region, Gansu province, china. Parasitol. Res., 88: 36-37.
8. Shiono, H.; Yahi, Y.; Chikayama, Y.; Miyazaki, S. & Nakamura, I. 2003. Oxidative damage and phosphatidyseine expression of red blood cell in the cattle experimentally infected with Theileriasergenti. Parastiol. Res., 89: 228-234.
9. Meyer, D. J. & Harvy, J. W. 1998. Veterinary laboratory medicine. 2th ed. W. B. Saunders Co, PP. 157-199.
10. Jain, N. C. 1986. Schalm Veterinary hematology. 4th ed. Lea and Fibiger, Philadelphia, PP. 610-612.
11. SPSS. 2008. Statistical Package for the social science, version 17 (Win/Mac/linux), users guide SPSS Inc., Chicago III, USA. Website, http:/www.spss. com.
12. Radostits, O. M.; Gay, C. C.; Hinchcliff, K. W. & Constable, P. D. 2007. Veterinary Medicine, 10thed. A textbook of the disease of cattle, sheep, goats, pigs and hours. Saunders Company Ltd., London, New York. PP. 1328-1329.
13. Al-Robaiy, H. M. A. 1994. A study of hematological and biochemical change in sheep experimentally infected with (Theileriahirci). M.Sc. Thesis., College of Veterinary Medicine, University of Baghdad. PP. 4-67.
14. Mennat, T. R. 2011. Epidemiological survey of ovine Theileriosis in Basrah province. M.Sc. Thesis., College of Veterinary Medicine, University of Basrah.
15. Jabbar, S. A.; Elizabeth, J. G.; Diaeldin, A. S. & Ulrike, S. 2008. Innate immunity to tropical theileriosis. http;//ini.sageput.com

16. Opasine, B. A. 1984. Blood parasites of village goats in south west Nigeria. Animal Genetic RES.
17. Kozat, S.; Yuksek, N.; Altug, N.; Agaoglu, Z. T. & Ercin, F. 2003. Studies on the effect Iron (Fe) preparation in addition to blood protozoa treatment on the hematological and some mineral levels in sheep naturally infected with Babesiaovis, YYU Vet. Fak Derg., 14 (2):18-21.
18. Soulsby, E. J. L. 1986. Helminthe, Arthopods and Protozoa of domesticated animals. 7th ed. Philadelphia, London, Toronto. PP. 718-719.
19. Opara, M. N.; Udevi, N. & Okoli, I. C. 2010. Hematological parameters and Blood Chemistry of Apparently Healthy west African Dwarf (Wad) Goats in Owerri South Eastern Nigeria. New York Sci. J., 8: 68-72.
20. Orag, G. K. 2002. Vet Lab. Med. (Clinical Biochemistry and Hematology). 2nd ed Blackwell Sci. PP. 74-130.
21. Alfonso, J.; Medine, R.; Fazzino, F. & Caballero, H. 1996. Clinical and hematological changes in calves infected with Anaplasmamarginale. Acta. Cient. Venez., 47: 50-57.
22. Alsaad, K. M.; Al-Obaidi, Q. T. & Esmaeel, S. A. 2009. Hematological and biochemical study on the effect some common blood parasites in native goats in Mosul area. Iraqi J. Vet. Sci., 23(1): 101-106.
23. Al-Saad, K. M.; Al-Obaidi, Q. T. & W. A. 2006. Clinical, hematological and biochemical study of theileriosis in Arabian one-humped camels. Iraq J. Vet. Sci., 20(2): 211-218.
24. Dumanli, N.; Kelestimur, H. & Nizamliglu, M. 1987. Haematological studies in calves experimentally infected with Theileriaannulatacabst. Vet. Bull., 3308.