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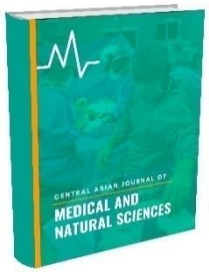

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KNOWLEDGE OF COMMUNITY ON BABESIOSIS IN KIRKUK PROVINCE-IRAQ

1. **Mohammed Abdul-Aziz Kadir**
2. **Sabah Haseeb Hasan**
3. **Urdak Ibrahim Kareem**

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[1] MSc, PhD, Imam Jaafar Sadiq University, Kirkuk branch
mohammdsalam@yahoo.com
[2] PhD, College of Nursing, University of Kirkuk
sabahsaqi@uokirkuk.edu.iq
[3] MSc, Imam Jaafar Sadiq University, Kirkuk branch
urdakibrahim@sadiq.edu.iq

Abstract: Background: Babesia is an intra-erythrocytic protozoan parasite found inside the red blood cells, transmitted by Ixodid ticks, in which sexual cycle occurs. It causes babesiosis in animals and human.

Objective: The object of present study was to determine the knowledge, regarding babesiosis mong different groups of population at Kirkuk province- Iraq.

Methods: A cross-sectional survey was conducted during period from July –November 2022, in Kirkuk-Iraq. A questionnaire was formulated which included demographic data of the respondents and their knowledge toward babesiosis

Results: Regarding the knowledge of studied groups on the causative agent, the vast majority of participants knew the cause of the disease was parasite (63.5%), mode of transmission is by ticks (40.2%) and seasonal distribution in summer (53.3%). Concerning the prevention and control, the highest rate of participant (58.9%) did not comment on prevention and control of babesiosis and (15.0%) of participants knew that vector control is a correct way of prevention and control.

Key words: Babesiosis, Knowledge, Kirkuk, Iraq.

INTRODUCTION

The babesias are non-pigmented ameboid protozoan parasites of the eerythrocytes of vertebrates. The Babesia is primarily of animal parasite and secondarily of human beings, it is reported from different parts of the world. The parasite is economically important specially, the domestic animals. It is transmitted biologically by hard ticks belong to family Ixodidae) which transmit the parasite transovarially, that is to say from egg of mother to the next stage (Demessie & Derso, 2015). Three species of each genus Rhipicephalus and Hyaloma are recorded in Erbil Governorate, North Iraq (Aziz, 2022). Babesi species are the causative agent of babesiosis in a number of domestic animals (Fakhar et al., 2012). It has a serious challenges for many domestic animals and economy of the different parts of the tropical and sub-tropical regions including Iraq, by causing anemia, jaundice, hemoglobinuria and death (Wagner et al, 2002,, El Moghazy et al, 2014)). It is one of the life threaten of animals, leading to loss of sheep, goats and cattle in the world (Al-Wandawi, 2014, El-Menshawy et al, 2020). In the world, Babesia is the second most common blood-borne parasite of mammals, after trypanosomes, which is the causative agent of sleeping sickness in human beings.

More than 100 species have been identified which are traditionally divided on the basis of their morphology into small and large groups. Information about age, breed and sex was recorded (Ameen et al, 2012).

In the mammal host, Babesia develops within erythrocytes and reproduce by binary or quaternary fission given rise to four parasites, sometimes arranged in a "maltese cross" formation. The development and division of the parasites eventually causes the erythrocytes to burst thus releasing the parasites which promptly invade fresh red blood cells are parasitized (Elmenshawy, et al., 2020).

The clinical signs and pathogenesis vary with the age of the animal, the species and strains of the parasite. The clinical signs of animals include are fever, loss of appetite, labored breathing, emaciation, hemolytic anemia, jaundice, increase heart and respiratory rates and drop in milk production and may cause abortion of pregnant cattle; hemoglobin urea is the characteristic clinical feature of babesiosis (Abdel Aziz et al, 2014).

In addition to animals, babesiosis is human infection have been reported from different parts of the world. The first human case was reported among splenectomized part-time Yugoslavian (Croatia) farmer, after a traffic accident in 1956 (Dakhil. 2021). The second case reported in 1967 in a splenectomised man in the west of Ireland. Then several cases were reported in human beings among splenectomised patients in Italy and Austin, Germany, Austria and Sweden. In 2003 in Italy and Austria a zoonotic reported due to *Babesia venatorum* cases were reported. Furthermore several babesiosis were recorded in human among spleen intact patients. In Germany, *Babesia microti* is the first case caused moderate illness in a spleen-intact (Gorenflot et al, 1998, Ord & Lobo, 2015). In human, *B. microti, B. divergens, B. duncani* and *B. venatorum* are reported in different countries. Report of cases babesiosis reported within in North west of the U.S. through eastern Europe, and into China are on the rise. Most cases were infected by *B. microti* (Gorenflot et al., 1998). Human babesiosis are transmitted by tick bite, blood transfusion or congenitally during pregnancy (Ord and Lobo, 2015). The clinical signs of human babesiosis are fever, fatigue, chills, sweats, headache, myalgia, anorexia, cough, arthralgia and nausea (Ord, and Lobo , 2015)). Although babesiosis is endemic in Iraq, but according to knowledge of authors no human cases recorded in any part of the country. In Iran a study done on sheep, goat and human; no human cases also recorded in human beings (Naderi et al., 2017)

Regarding the distribution of babesiosis in Iraq, Ameen et al., 2012 found the overall prevalence of *Babesia bigemina* infection was 12(27.27%), 4(6.77%), 5(7.14%) and 1 (9.09%) in cattle, sheep, goats and wild goats. The seasonal prevalence of B. bigemina peaked in both spring and summer using both blood smear and ELISA tests. Dakhill, 2021, reported that ten species of Babesia registered in Iraq such as (Babesia; equi, caballi, ovis, gibsoni, taylori, foliate, motasi, bigemina, canis, and microti) in many governorates. The highest rate was in foals in Nineveh 81.11%, while the lowest was in sheep 0.01% and cattle 0.17% in Nineveh. In Sulaimania, it was found the rate of babesiosis in sheep was 76/135(56.3%), while in goats 16/25(64%). The species of Babesia were B. ovis, B. motasi, B. foliata and B. taylori (Abdullah and Mohammed, 2014). In Baghdad, Arwa and Kawan (2022) reported the overall rate of Babesia infection in sheep 15.55%; the rate of infection in males 19.67% was significantly higher than females 6.89%, with highest rate of infection recorded in April.

In Algeria, Foughali, et al 2021, carried on a study on knowledge, attitude and perception of bovine piroplasmosis by cattle owners in Constantine, North-East of Algeria, using proportional piling technique to determine most common cattle diseases, and to evaluate economic impact diseases according to the interviewed farmers. Theileriosis and babesiosis were considered the most important bovine diseases. They reported that the majority of cattle owners, believed that theileriosis and babesiosis are deadly diseases (87.3 and 78.1%, respectively.

The aim of this study was to study the knowledge, attitude and perception of Kirkuk community on babesiosis

Materials and Methods:

A cross sectional study was carried on in Kirkuk province North of Iraq, on general population during period from beginning of July 2022 to end of November 2022.

Kirkuk is a city in Iraq, serving as the capital of the Kirkuk Governorate, located 238 kilometers (148 miles) north of Baghdad. Kirkuk sits on the ruins of the original Citadel which sits near the Khasa River. Elevation 350 m (1150 ft). It has a hot semi-arid climate, with extremely hot and dry summer and mild winters with moderate rainfall.

The distribution of location in Kirkuk is shown in Figure 1.. A questionnaire form was arranged to obtain information from each individual. The governorate is divided into four districts, which include Kirkuk, Dibis, Daquq and Hawija.

Fig. 1: The districts of the study in Kirkuk Governorate.

A special sheet was arranged to estimate the knowledge of population, the information in the questionnaire sheet involved sociodemographic characteristics including gender, residency, occupation, infestation with ticks is indicated in the form below. Knowledge of Babesia, which include modes of transmission, prevention and control.

Statistical analysis: Statistical analysis was carried out using statistically available SOFT WARE (SPSS version 18). Chi-square test was used to show significant difference between groups and student t-test was used to show the difference between any two groups (Daniel, 2014).

A Questionnaire Form
No……Date……..
A-Personal information
Name……..Sex…….Residency: Urban……Rural……..
Occupation:
Official……Students……..Employee……..Animal breeders……
B-Causative agent of Babesia:
Bacteria……..Virus……..Fungus……Parasite……
Season: Winter……., Spring……., Summer……, Autumn……
C-Mode of transmission: Direct contact……., Flies……., Ticks……., Blood transfusion……
D-Prevention and control: Isolation of animals, Vector control, Treatment, Vaccination, No comment

Results:

The distribution of participants according to demographic characteristics is shown in table 1. The number of participants was 107, males 37(34.6%); females 70(65.4%). The residency of participants in urban areas were 90(84.1%) were greater than rural areas 17(15.9%).

Table 1. Distribution of participant according to demographic characteristics.

Parameters	Number	Percentage
Gender		
Male	37	34.6
Female	70	65.4
Total	107	100
Residency		
Urban	90	84.1
Rural	17	15.9
Total	107	100

The occupation of participants were students 89(83.2%), Official 16(14.9%), Employee 2(1.9%) as indicated in table (2). Among 107 participant 42 of them were animal breeders (39.2 %).

Table 2. Distribution of participants according to occupation.

Occupation	Number	Percentage
Students	89	83.2
Official	16	14.9
Employee	2	1.9
Total	107	

$x^2 = 4.023$ $d.f = 3$ $P = 0.134$

The knowledge of studied participants on causative agents, it is shown in table (3). The greatest percentage of participants believe that the etiological agent is due to parasite 68(63.5%), followed by virus 17(15.9%), bacteria 13(14.2%) and fungus 9(8.41%) respectively. The difference between groups is not significant statistically. Among 42 animal bleeders 19 of them knew the mode of transmission is by parasite (45.2%).

Table 3. Knowledge of participant on Babesia according to causative agent.

Causative agents	Male No.	%	Female No.	%	Total No.	%
Bacteria	6	5.6	7	6.5	13	12.1
Virus	9	8.4	8	7.5	17	15.9

Fungus	1	0.9	8	7.5	9	8.4
Parasite	21	19.6	47	**43.9**	68	63.5
Total	37	34.6	70	65.4	107	

$x^2 = 5.906$ d.f.= 3 P=0.208

Regarding the knowledge of participant according to mode of transmission, it is clear in table (4), that the majority of participants believe that Babesia is transmitted by ticks 43(40.2%), followed by flies 31 (29.0%), direct contact 28(26.2%), and blood transfusion 5(4.7%). The difference in the knowledge among different groups was not significant (P=0.208).

Table 4. Knowledge of participants on babesiosis according to mode of transmission.

Mode of transmission	Number	Percentage
Direct contact	28	26.2
Flies	31	29.0
Ticks	43	40.2
Blood transfusion	5	4.7
Total	107	100.0

According to seasonal distribution of infection, it is clear in table (5), that the vast majority of participants, believe that the parasite is common during summer season 57(53.3%), followed by winter 32(29.9%), spring 10(9.3%), and autumn 8(7.5%). Statistically no significant difference was found between knowledge of participant according to seasons (P=0.208).

Table (5). Knowledge of participant on babesiosis according to seasonal distribution.

Seasons	Number	Percentage
Winter	32	29.9
Spring	10	9.3
Summer	57	53.3
Autumn	08	7.5
Total	107	

$x^2 = 4.023$ $d.f = 3$ $P = 0.134$

Table 6, shows the knowledge of studied participant on prevention and control of infection. It is shown that the highest percentage of participant had no comment 63 (58.9%), followed by vector control 16(15.0%), treatment 12(11.2%), isolation of animals 10(9.3%) and the lowest percentage believe to by vaccination 6(5.6%). The difference between groups was not significant (P=0.875).

Table 6. Knowledge of participants on prevention and control.

Parameters	Number	Percentage %
Isolation of animal	10	9.3
Vector control	16	15.0
Treatments	12	11.2
Vaccination	6	5.6
No comment	63	58.9
Total	107	100.0

$x^2 = 1.218$ d.f.=4 P=0.875

DISCUSSION:

The tick borne diseases including babesiosis are very common in our country, but to estimate its actual number is not easy due to improper surveillance, lack of sensitive diagnostic procedures, and discrepancies in actual data by researchers.

This is the first community based assessment on knowledge, attitude and practices (KAP) carried on babesiosis in both rural and urban areas of Kirkuk-Iraq .

The study applied a broad concept in terms of knowledge and attitude level of community in Kirkuk related to babesiosis.

Kirkuk is still endemic region in term of babesiosis according to Veterinary authority, but unfortunately they do not have a published data to report a real data on distribution of infection in Kirkuk.

Only animal breeders had good knowledge about causative agent of babesiosis being parasite and zoonotic disease as 19 animal breeders out of 42 (45.2%), of them had knowledge about babesiosis being a zoonotic disease, but statistically no significant difference between participants, probably because of the impact of mandatory campaign targeting tick borne diseases by veterinary authorities in Kirkuk. However, these ratios varies with that reported in different countries. These differences between cities or Countries can be explained by the difference in the prevalence rate of disease in different part of the worlds. In adequate personal hygiene and farming sanitation during close contact with animals, irregular treatment of their animals

The high percentage of participant believe, the distribution of infection in winter 32(29.9%), this indicates that the participant had no knowledge on the activity of vector Babesia (ticks), as it is known that peak of tick activity in Iraq is in spring and summer and decline in Autumn and winter (Kadir et al, 2012, Arwa and Kawan, 2022).

The animal products contamination during production, wrong feeding habits and lack of knowledge can be effective in the transmission of zoonotic diseases (Tebug et al, 2015, Rajkumar et al 2016).

In relation to the occurrence of the disease, it is known that sociocultural habit and socioeconomic conditions have a strong influence (Dincer et al, 2003). If factors such as socioeconomic status of farmers, their education levels, and the enterprise sizes are considered, it is important to put forward

the risk s of enterprise related to zoonotic diseases, prevent these diseases and develop control strategies. In this study no significant differences were found between participants and their knowledge, attitude, and practices about babesiosis ($P>0.05$).

When the knowledge and practice of particapts were compared with their educational status in Iraq, there was no significant difference between official group of different educational level. In Turkey, It was confirmed that especially the ones who had high school and university education had higher knowledge, attitude and practice than uneducated ones (Ozlu et al, 2020). Similarly studies carried on in Tajikistan, Senegal, Nepal and India reported that animal breeders with low education level had a low knowledge, attitude and practice about prevention of zoonotic diseases (Lindahl et al, 2015, Tebug et al 2015, Kelly et al 2018, Prasad et al 2019).

In Tajikstan, it was confirmed that those with high school and university education had knowledge level distinctly higher and their attitude and practices, than illiterates. They also reported that ticks infestation lead to reduce the value of hide and loss in production of milk and meat and illness and death (Gralen, 2009).

In a study done in Illinois-USA, to assess the knowledge, attitudes and practices of Illinois clinicians toward tick and tick borne diseases (TBDs) to identify knowledge gaps and evaluate attitudes and practices related to TBDs. They reported that Illinois clinicians were informed about Lyme disease, but lacked knowledge of

other TBDs endemic to the state (Garson et al, 2022)..

For prevention and control of babesiosis in the community. It is essential for participants to have good knowledge about the disease, unfortunately many participants had lack knowledge on mode of transmission, in spite of great effort was performed by veterinarian especially in rural area, to inform animal breeders about management, isolation and prevention and control methods. The highest of participants did not comment on prevention and control of Babesia this could be due to absence of information about the disease and tick vector in Kirkuk (Foughali et al , 2021, and no study performed on babesiosis in Kirkuk governorate (Dakhil, 2021).

Although in our country the usual method used to control ticks is by using acaricide, but this way of control the disease is not sufficient, but the efficient way of control of the disease depends on education of farmers on applying effective and scientific methods of tick borne diseases as babesiosis. The success of tick control programs largely relies on developing a good understanding of farmers knowledge about ticks and TBDs their perception of the effectiveness of the proposed control methods and the socio-cultural context in which such programs are to be implemented (Adehan , et al, 2018, Sungirai et al, 2016). Providing veterinary facilities near animal breeders and increasing their knowledge in modern scientific management , not only increase the animal production but also increase the awareness of society on prevention and control of the disease (Ramzan et al., 2018).

CONCLUSIONS:

In general there are deficient knowledge of participants on causative agent, mode of transmission of Babesia infections in Kirkuk province. The animal breeders had good information about the disease being zoonosis and its control. Epidemiological studies are essential to provide recent information's on parasitic infestations especially about tick-borne diseases.

Further studies are needed to identify the reasons for the low level of positive practice among farmers. Besides, to prevent and decrease the risks of babesiosis throughout the country. Animal breeders should be given training to livestock farmers, the opportunity to intervene in a number of zoonotic disease transmission cycles can be improved. It could also be applied to the one health approach that is public veterinary, environmental and human health function as part of integrative system. It was observed that a large proportion of the respondents had never heard of any particular names of Babesia in domesticated animals and human beings. This could have been due to lack of awareness programs on ticks and tick borne diseases, which is most likely due to absence of fund from authority.

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