

Detection of Trypanosomiasis in Cattle by Different Blood Smear and Staining Methods

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Abstract

In most nations, including Iraq, the disease known as bovine trypanosomosis, which is spread by tsetse flies and other vectors, seriously impairs the health and production of cattle. Our study's goals were to find out how common bovine trypanosomosis is in the Nineveh Governorate and what risk variables are linked to it. Blood samples from 120 cattle, representing a range of ages, sexes, and breed, were obtained. The blood was stained with Giemsa and Leishman stains and analyzed using standard diagnostic techniques (wet blood smear, thin and thick blood smears). The total infection rate was 18.33%(22/120). Thin blood smear method revealed the greatest infection rate (18.33%). There were significant differences ($P<0.05$) between males, the highest rate (26.15%), and females, the lowest rate (9.09%). Since imported cattle had the greatest infection incidence (28.07%), the study also showed that there were notable disparities in infection rates between native and imported cattle.

Keywords: *Trypanosoma*, Cattle, Thin and Thick blood smears, Nineveh Governorate

Livestock is one of the primary economic foundations in any country in the world, especially agricultural ones, as they produce meat, milk, wool, etc. Since diseases create economic losses, they are one of the biggest barriers to the expansion and prosperity of this riches, which many countries are working to build in order to meet the need for human consumption (Rushton, 2009).

Worldwide, cattle, buffaloes, camels, sheep, goats, horses, and dogs are all susceptible to trypanosomiasis, a protozoan illness caused by trypanosomes (Mirshekar *et al.*, 2019).

Trypanosoma congolense, *T. vivax*, *T. evansi*, and *T. brucei* are the main sources of nagana disease in the cattle (Taylor *et al.*, 2016). While the most common method of *Trypanosoma* transmission is by tsetse flies, there is also a mechanical method that involves tabanids and stomoxys. (Van den Bossche *et al.*, 2010). Trypanosomes are classified into: Salivarian and Stercorarian groups based on the site of development of the parasite in the vector, and all species belonging to the salivary group are considered pathogenic (Magez *et al.*, 2021).

The parasite impairs health by resulting in anemia, weight loss, neurological problems, it also causes significant financial losses because of low productivity and high treatment costs. (Esther, 2021). The study aimed to determine the prevalence of trypanosomiasis in cattle in Nineveh Governorate in relation to age, sex and breed of the cattle.

Materials and Methods

For the current study, 120 cattle of various ages, sexes, and breeds were randomly chosen from various places in the Nineveh province of Iraq, and samples and data were gathered from them between October 2023 and May 2024. Under aseptic circumstances, 5 milliliters of blood were extracted straight from the jugular vein of each animal. For blood smears, the blood was put into tubes containing EDTA anticoagulants. Standard procedures for the microscopic examination of parasites were devised. A drop of blood was placed in the middle of a slide to create wet blood smears, which were then immediately viewed under a light microscope. (Sirigireddy *et al.*, 2014). Thin and Thick blood smears were prepared directly for each sample, labeled with the number of animals and stained using Giemsa and Leishman stains and examined with a light microscope using 1000× power to detect the

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parasite (Bowman, 2014).

Statistical analysis: SPSS was used to table and analyze all of the data. For statistical analysis of the data and to identify significant differences at a level of $P < 0.05$, the Chi-Square test was employed. (Petrie and Watson, 2006).

Results and Discussion

Trypanosomiasis in cattle is a serious threat to animal agriculture and socioeconomic development in many parts of the world. Beyond just affecting animal productivity, bovine trypanosomiasis also has an impact on land use changes, resource exploitation, and access to available, and the ability to vary agricultural production. (Dobson *et al.*, 2009, Shaeel *et al.*, 2020). The overall prevalence of *Trypanosoma* parasite in cattle in Nineveh Governorate was 18.33% (22/120), this result was higher than the previous studies in Iraq, Researchers (Shaeel *et al.*, 2020) indicated to an infection of cattle with *Trypanosoma theileri* and *T. cervi* with an infection rate (3.33%) in Wasit Province., but lower than prevalence of *Trypanosoma* parasite (21%) reported in Mosul City's goat and sheep populations (Mahmood and Alobaidii, 2021).

When employing standard diagnostic techniques, the thin smear method showed the highest infection incidence (18.33%), differing significantly from wet blood smears. There was no discernible difference between the wet blood smears (8.33%) and thick blood smears (10.8%), this study is agreed with (Mahmood and Alobaidii, 2021, Sivajothi *et al.*, 2014), when they mentioned that wet blood film is less accurate than thin and thick smears of Giemsa-stained blood.

Blood smears were stained with Giemsa and Leishman stains in order to reach an accurate and high diagnostic level. Giemsa-

stained blood smear analysis is a reasonably priced and straightforward test, although the staining procedure causes a delay in the results. Trypanosomes can be destroyed during the staining process, but their general form makes them easily identifiable. This could make identifying the species challenging, (Sivajothi *et al.*, 2014). The smear results were displayed using two distinct stains that were designed specifically for this use. The infection rates varied in percentage, with the Giemsa stain exhibiting the greatest percentage (18.33%), while with Leishman stain was (11.66%), According to the study, there were no appreciable variations in the trypanosome parasite detection efficacy between the two stains. Thus, numerous studies demonstrating these colors' effectiveness in identifying a wide variety of blood parasites, Fig 1.

The prevalence of *Trypanosoma* in cattle of the study according to their sex, show that there were significant differences ($P < 0.05$) between males and females. The highest infection was with Males (26.15%), while in females it was (9.09%). The exact cause of this difference in infection rates cannot be determined, however it may be related to the larger proportion of imported males than native females that were

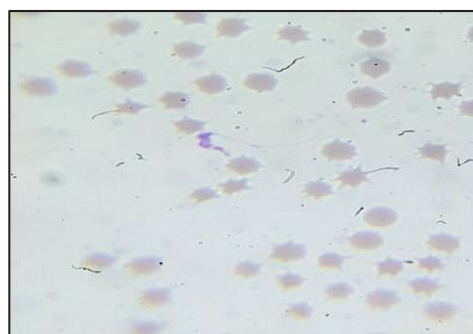


Fig 1. Trypanosomaspp stained with Giemsa (1000x).

Table I. The relationship between positive results and animal risk factors

Risk factor	Group	Total No	Positives (No = 22)
Gender	Male	65	17(26.15%) *
	Female	55	5(9.09%)
Age	< 1 year	47	9(19.14%)
	>1 year	73	13(17.81%)
breed	Native cattle	63	6(9.52%)
	Imported cattle	57	16(28.07%)*

Significant increases* ($P < 0.05$).

included in our study.

Regarding age, the study found that there was no significant difference between the different age groups, (<1 year=19.14%) and (>1year=17.81%) and the reason may be attributed to the providing veterinary guidance services related to disease control and treatment of all age groups of infected animals (Gebisa *et al.*, 2020).

The trypanosome prevalence and breed of infection differed significantly, according to the results, imported animals having a greater prevalence (28.07%) than animals that were primarily native. (9.52%), this agreed with (Mahmood and Alobaidii, 2022., Kizza *et al.*, 2021). Due to the absence of tsetse flies (The most common vector for trypanosome transmission) in Iraq and Nineveh Governorate, the introduction of susceptible and infected males from Georgia, Brazil, Turkey, India, and Iran may have led to the rise in the prevalence of bovine trypanosomiasis. (Al-Badrani, 2012), Table I.

Conclusions

Cattle in the Nineveh Governorate were infected with the trypanosome parasite at varying ages. Giemsa stain has been shown to be effective in detecting the parasite in blood smears. The highest incidence rate was recorded in males and imported cattle.

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