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# Prevalence of *Anaplasma* Infection and Some Associated Risk Factors in Lower Shabelle Region, Somalia

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## Abstract

*Anaplasmosis is a tick-borne disease (TBD) which damages the output of livestock in sub-Saharan Africa including Somalia. Yet to date, no studies have been done in the farming areas of the Lower Shebelle region of Somalia to establish the prevalence of the Cattle Anaplasmosis. The objective of this study was to investigate the prevalence and some associated Anaplasmosis risk factors using microscopic technique. A total of 127 Cattle blood samples were collected from three districts of Lower shabelle region of Somalia through January to February 2020. Thin dried Giemsa's stained blood smears were prepared from the samples and tested for Anaplasma spp under microscope. The overall prevalence of Cattle Anaplasmosis in the study area was (72.4%, 95%CI: 63.8-80.0), regarding the species identification using the intra-erythrocytic morphological position of the organism, 8/92 (8.7%, 95%CI: 3.8-16.4%) were single infection of A. marginale and 84/92 (91.3%, 95%CI: 83.6-96.2) were co-existence of A. centrale and A. marginale. The disease was found to be prevalent throughout the region without significance association between the infections and the analyzed risk factors like district, sex, age, body condition, tick infestation and*

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*place. The mean PCV of the infected cattle was insignificantly (P = 0.168) lower than the non-infected ones. The overall tick infestation of cattle was 34/127 (26.8%). Six tick species belonging to the Rhipicephalus and Amblyomma genera were identified in the investigated cattles, including, R. pulchellus, R. (Boophilus) microplus, R. (Boophilus) decoloratus, R. evertsi, A. gemma, and A. lepidum. In conclusion, this study shows that Anaplasmosis is endemic among Cattle in lower Shabelle region of Somalia. Additional studies are necessary to evaluate the clinical and economic impact of Anaplasmosis and other TBDs in the country for building better Animal diseases management and control strategy.*

**Keywords:** *Anaplasma* spp., Anaplasmosis, Cattle, Prevalence, Somalia, Tick.

## INTRODUCTION:

Cattle Anaplasmosis is one of the most important tick-borne diseases in the tropical and subtropical (400 N–320 S) livestock industries, including Somalia **[1, 2].**

**"**The diseases is caused by Gram-negative obligate intracellular bacteria parasitizing erythrocytes *Anaplasma marginale* and to a lesser pathogenicity by *A. centrale* **[3].**

In 2013 Somalia had an estimated cattle population of over 5.1 million heads **[4].** Cattle's economic importance for Somalia lies in food safety and milk production. The average estimated milk production per cow is 2 liters per day with an estimated gate farm price of 1 USD **[4].**

Transmission of Cattle Anaplasmosis typically occurs in two different forms, Mechanical transmission and Biological transmission **[2].** In biological transmission, Tick is considered the primary vector for the disease **[5**]. In mechanical transmission, the organism is transferred by biting flies or equipment contaminated with infected blood [**1**].

Animals with acute Anaplasmosis may present with a variety of symptoms such as fever, oculonasal discharge, tachycardia, tachypn ea, abnormal mucous membrane color, and low PCV values. Although

these symptoms are not pathognomonic, and animals with chronic infections can be asymptomatic carriers **[6].**

In Somalia, previous studies on detection of *Anaplasma* Infections were performed during the 1990s, the reported prevalence was (0.8%) **[7]**. Due to the significant livelihood benefits derived from cattle in Somalia, successful management of Anaplasmosis in cattle depends on adequate knowledge of Anaplasmosis prevalence and the risk factors associated with transmission **[8].** Hence, the purpose of this study was to determine by microscopic technique the prevalence and certain risk factors of anaplasmosis.

## MATERIALS AND METHODS

### Study area

Lower Shabelle region is one of the eighteen regions of the Federal Republic of Somalia. It comprises eight districts, three of them were included this study namely Afgoi (Latitude: 2° 08' 17.16" N and Longitude: 45° 07' 16.32" E), Awdhegle (Latitude: 1.9805° N, Longitude: 44.8330° E) and Wanleweyn (Latitude: 2° 37' 6.60" N and Longitude: 44° 53' 37.68" E).

### Study population and Samples

A total of 127 Cattle (119 females and 8 males), <2 years-old (n = 10), 2-5 years-old (n = 50), and >5 years-old (n = 67) from Awdhegle (n = 65), Wanlaweyn (n = 44) and Afgoye (n = 18) districts were sampled.

Blood samples were collected by jugular venipuncture. Three milliliters were placed into EDTA tubes for packed cell volume (PCV) measurement and microscopic detection of *Anaplasma* spp. Animals with PCV less than 24% were considered to be anaemic **[9].**

### Tick collection:

All visible ticks were manually collected by using forceps in a bottles containing 70% ethanol from each cattle. The ticks were then transported to the Abrar Research and Training Centre (ARTC) in Abrar University, Mogadishu-Somalia for identification.

**Laboratory Examination:**

**Thin dried Giemsa stained blood smears**

Thin dried Giemsa stained blood smears were prepared and investigated under microscope for *Anaplasma* spp.

**Packed Cell Volume determination**

Packed Cell Volume determination Blood was collected on capillary tubes and centrifuged at 12,000 rpm for 5 minutes to evaluate the level of anaemia in the examined animals.

**Tick identification:**

Ticks were identified to stages and species level using a stereomicroscope according to their morphological key.

**Data Analysis**

The PCV data were not normally distributed (Shapiro–Wilk normality test, $W = 0.98$, $P = 0.025$). Therefore, a non-parametric Mann–Whitney test was used to compare the PCV concentration between *Anaplasma* infected and non-infected Cattle.

The data obtained from the field were recorded in notebook and later stored in Microsoft Excel 2013 and analyzed using software SPSS® version 25.

Descriptive statistics were presented as tables. The association of Cattle Anaplasmosis with different independent variables (age, sex, body condition, lymphnode enlargement and presence of ticks) was analyzed using logistic regression.

**Result:**

A total of 127 blood samples from Cattle were investigated for Aaplasmosis and the overall prevalence of Cattle Anaplasmosis was (72.4%, 95%CI: 63.8-80.0), regarding the species identified for Anaplasmosis 8/92 (8.7%, 95%CI: 3.8-16.4%) were *A. marginale* and 84/92 (91.3%, 95%CI: 83.6-96.2) were both *A.centrale* and *A.marginale.* The highest prevalence of Cattle Anaplasmosis recorded (54.3%) was Awdhegle, flowed (35.9%) was walaweyn and the lowest was (9.8%) in Afgoye. This difference was not statistically significant ($\chi 2 = 5.34$, P= 0.069).

**Risk factors associated with Cattle Anaplasmosis**

Based on the study districts was found non-significantly (P= 0.069) associated with the occurrence of Cattle Anaplasmosis. However, via univariate analysis study districts proved to be a potential risk factor (OR = 0.9; CI = 0.4-2.2) for the occurrence of Cattle Anaplasmosis. Sex of the animal proved to be a potent risk factor for Cattle Anaplasmosis (OR = 0.4; CI = 0.0-3.0), where male showed a higher prevalence (87.5 %) than female (71.4%) animals, respectively, however, it was statistical insignificant on chi-square test. Similarly, Age of animal proved as a risk factor for the occurrence of Cattle Anaplasmosis based on the univariate analysis (OR = 1.8; CI = 0.4-9.3), though it was non-significantly associated with the disease dynamics based on chi-square test (P=0.582).

The tick infestation status of animals was found statistically insignificance (OR = 0.6; CI = 0.2-1.7; p > 0.05) associated with the occurrence of disease. Body condition of animals showed a positive association (OR = 0.9; CI = 0.3-3.0) as risk factor with the disease occurrence, however, on chi-square test association was found non-significant with Cattle Anaplasmosis (P=0.652). (table 1).

The mean PCV concentration for Cattle was 0.26 l/l. No statistical difference ($U = 1339.5$, $Z = -1.38$, $P = 0.168$) was found in mean PCV between *Anaplasma*- positive (0.27 l/l) and *Anaplasma*-negative Cattle (0.29 l/l).

**Tick identified in study area.**

The Overall infestation of cattle with tick was 34/127 (26.8%). The identified tick species in study area were six species. The overall, six tick species belonging to the Rhipicephalus and Amblyomma genera, *R. pulchellus (*64.7%*), R. (Boophilus) microplus,* (2%) *R. (Boophilus) decoloratus* (2%), *R.evertsi,* (3.9%) *A.gemma* (15.7%), and *A.lepidum* (11.8%).

**Table 1: Prevalence of Catlle Anaplasmosis within each variable studied**

| Variable | | Anaplasmosis | | | | | |
|---|---|---|---|---|---|---|---|
| | | +/n | Prevalence% | 95% CI: | P-value | $\chi^2$ | OR 95% CI: |
| District | Walweyn | 33/44 | 75 | (59.7-86.8%) | 0.992 | 0.053 | 0.9(0.4-2.2) |
| | Afgoye | 9/9 | 50 | (66.4-100%) | 0.058 | 4.971 | 0.3(0.1-0.9) |
| | Awdhegle | 50/65 | 76.9 | (64.8-86.5%) | Ref | | |
| Sex | Female | 85/119 | 71.4 | (62.4-79.3) | 0.596 | 0.967 | 0.4(0.0-3.0) |
| | Male | 7/8 | 87.5 | (47.4-99.7) | Ref | | |
| Age | <2 | 8/10 | 80 | (44.4-97.5) | 0.747 | 0.535 | 1.8(0.4-9.3) |
| | 2-5 | 38/50 | 76 | (61.8-86.9) | 0.507 | 0.763 | 1.4(0.6-3.3) |
| | >5 | 46/67 | 68.7 | (56.2-79.4) | Ref | | |
| Body condition | Good | 49/66 | 74.2 | (62.0-84.2) | 0.999 | 0.005 | 0.9(0.3-3.0) |
| | Moderate | 28/41 | 68.3 | (51.9-81.9) | 0.822 | 0.291 | 0.7(0.2-2.4) |
| | Poor | 15/20 | 75 | (50.9-91.3) | Ref | | |
| Tick presence | No | 69/98 | 70.4 | (60.3-79.2) | 0.487 | 0.888 | 0.6(0.2-1.7) |
| | Yes | 23/29 | 79.3 | (60.3-92) | Ref | | |
| Lymphnode | Normal | 90/124 | 72.6 | (63.9-80.2) | 0.999 | 0.051 | 1.3(0.1-15.1) |
| | Enlargement | 2/3 | 66.7 | (9.4-99.2) | Ref | | |

Abbreviations: +, number of positive animals; *n*, number of samples; 95% CI, 95% confidence interval; OR, odds ratio

## Prevalence of Cattle Anaplasmosis associated with identified tick species

There is no significant (p= 0.149) association between identified tick species in the study area and presence of Anaplasmosis (table 2).

**Table 2: Prevalence of Cattle Anaplasmosis associated with identified tick species.**

| Tick species | +/n | Prevalence% | 95%CI: |
|---|---|---|---|
| *R.pulchellus* | 14/23 | 60.9 | 38.5-80.1 |
| Mixed *R. pulchellus* with others | 4/23 | 17.4 | 5.0-38.8 |
| *A.lepidium* | 2/23 | 8.7 | 1.1-28.0 |
| *A. gemma* | 2/23 | 8.7 | 1.1-28.0 |
| mixed with other species | 1/23 | 4.3 | 0.1-22.0 |
| P-value | 0.149 | | |

## DISCUSSION:

*Anaplasma* infection in Cattle is common in world-wide. However, determination of its prevalence is important to inform herd health management in both beef and dairy farms. In the current study microscopic technique was used to determine the prevalence of Cattle Anaplasmosis in Lower shabelle region, Somalia. The overall

prevalence was 72.4%, this study was similar those reported [10, 11, 12, 13]. Contrary, this study is higher than study reported by **Heuer *et al.*, (1990a) [7].** These differences may be caused by different sampling times, sampling strategies and locations.

The highest prevalence of Cattle Anaplasmosis recorded in Awdhegle, flowed by walaweyn and the lowest was Afgoye. This difference was not statistically significant (P= 0.069). The explanation behind this may be the famers lack of knowledge of the tick control steps, mixing species rearing may be another possible factor, in addition to this free movement of animals, the use of infected needles and other invasive tools by non-professional workers may disrupt the dynamics of the disease in the study district.

*Anaplasma* spp of higher prevalence was observed among younger cattle compared to older cattle, in accordance with **Swai *et al.*, ( 2005) [8].** However, in contrast, **Atif *et al.*, (2013) [14]** indicated that the seroprevalence of *Anaplasma* spp. increased with age. The explanation is the older animals are required to develop antibody titers over prolonged periods of exposure. Based on sex of the animal, Male animals showed high prevalence 87.5% than female 71.4% in this study similar findings have been reported by **Sajid *et al.*, (2009) [15]** and **Farooqi *et al.*, (2018) [16].**

*Anaplasma* spp ha an insignificantly higher prevalence in cattle infested with tick compared to those not infested it can be due to the fact that ticks are the main vector responsible for the parasite transmission **[17]**.

This study established insignificant association of Anaplasmosis positive with the body condition of the study animals. Similar observation has been reported by other scholars **[18, 19].** This difference may be attributable to the fact that animals with poor body condition have lower immunity which allows various organism such as *Anaplasma* spp to infect.

In conclusion, this study indicates that anaplasmosis is endemic among cattle in the study region. This data gives useful information about the epidemiology of parasite in the country. In making government policies for the prevention and control of the parasite for profitable cattle farming, the information contained in this study is crucial as the country moves towards self-sufficiency in livestock production. Additional studies are necessary to evaluate other

regions of the country to know the pattern of disease distribution precisely and carefully.

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**Conflicts of interest**
Authors declare that they have no conflict of interest. The authors contributed equally to this work.
**Ethics approval**
This study was reviewed and approved by the Ethical Committee of Abrar University, Somalia (reference number AU/ARTC/EC/04/2017).

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