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# Bovine Brucellosis Sero-Prevalence, Associated Risk Factors, Assessment of Farmers' Knowledge, Attitudes, and Practices in Selected Districts of the Eastern Bale Zone, Oromia Region, Ethiopia

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**Abstract:**

**Objectives:** in order to ascertain the current serological prevalence and the risk factors associated with it.

**Methods:** A structured questionnaire was designed and administered by the consented study participants in the area. A total of 384 cattle, Sera samples were screened for evidence of brucellosis using the Rose Bengal Test (RBT), with positive results confirmed by the Complement Fixation Test (CFT). The Statistical Program for the Social Sciences (SPSS, version 22) was used to analyze the data. We have described the significant association between the seroprevalence of Brucella and explanatory variables.

**Results:** The overall animal level prevalence was 6 (1.6%) animals were seropositive for Brucella in RBPT and 4 (1.0%) in CFT. The result of the sero pre-valence study showed that statistically significant variation was observed in animals with abortion histories, since animals with a history of abortion had a nearly 12-fold higher chance of testing positive for Brucella than animals without a history of abortion (P = 0.019; OR = 11.81; CI = 1.513-92.157). However, the seroprevalence of Brucella with respect to host-specific risk factors sex, age, body condition, and parity in multivariable regression analysis did not show a statistically significant association with the seroprevalence of Brucella ($p > 0.05$).

**Conclusion:** The current study demonstrated that brucellosis was common in the cattle in the study area, resulting in production losses, economic loss, and public health importance. Therefore, in order to develop suitable and successful control and prevention strategies against the disease throughout the study area, sero surveilance and monitoring systems need to control brucellosis.

***Keywords:*** *Brucellosis; Bovine; Eastern Bale; Risk factor; Seroprevalence.*

## 1 Introduction

Bovine brucellosis, an infectious disease caused by gram-negative bacteria of the genus Brucella, is a widespread zoonosis that can cause significant human suffering and enormous economic losses in animals (Carvalho *et al*., 2010; Mufinda *et al*., 2017; & Migisha *et al*., 2018). The human population depends on domestic animals for the production of meat, fat, milk, dairy products, transportation, traction, fertilizers and fiber (Ulvevadet and Hausner, 2011). The World Health Organization (WHO) ranks them among the seven most neglected zoonosis (Bundle & McGiven, 2017).

Bovine brucellosis mainly affects the reproductive system, resulting in late-stage abortions that are often followed by endometritis and fetal membrane retention, which can lead to sterility in subsequent pregnancies (Radostits *et al*., 2007). The variations in serology are associated with the quantity of A and M antigens present in a given strain of Brucella. Numerous strain variations and around nine biotypes are known. Biotype 1 accounts for between 85 and 89 percent of infections (Ocholi *et al*., 2004). *Brucella abortus* affects many animal species on every continent and has zoonotic and economic importance, as well as a public health hazard (OIE, 2018).

Over 80% of Ethiopians are employed in agriculture, with cattle accounting for the majority of production (CSA, 2009). Cattle, the primary livestock component, have been essential to human history since their domestication. Due to last-trimester abortions, mastitis and decreased milk supply in female animals, orchitis, and epididymitis in male animals, the disease results in significant economic losses. Animals, both male and female, can become infertile (Figueiredo *et al*., 2015).

The identification and isolation of Brucella from mammary secretions, post-mortem tissues, aborted materials, or patient blood is required for the diagnosis of the disease. Serological techniques used to detect specific antibodies: by evaluating particular cell-mediated or serological reactions to Brucella antigens, a preliminary diagnosis can be established (PAHO-WHO, 2001). Although the nature of brucellosis makes it very difficult to treat, the longer treatment with antibiotics results, the longer the chance of recovery (Falagas & Bliziotis, 2006; Revue, 2013).

Animals can contract brucellosis from other animals and people through direct contact with infected animals or indirect contact with contaminated objects. Lemos et al. (2018) state that drinking contaminated milk is still the main way that humans become infected. Bovine brucellosis is a zoonotic disease that mostly affects human and animal populations in developing countries that rely largely on cattle production. It has an effect on both the economic and public health. The disease impedes the socioeconomic growth of livestock owners because it causes significant productivity losses from miscarriage, prolonged intervals between calving, kidding, or lambing, low herd fertility, and relatively low milk production in farm animals (Migisha, 2018).

Even though most reports have either limited geographic coverage or are mostly isolated to a certain agro-ecology, these pointed out facts clearly suggest that bovine brucellosis may be a widespread issue in Ethiopia (Asmare et al., 2015). Serological evidence of Brucella infections in Ethiopian cattle has been reported in a number of articles (Berhe et al., 2007; Jergefa et al., 2009). Unfortunately, because of the large number of animals in the nation, the seroprevalence of brucellosis in the study region has not been thoroughly investigated to the extent that the hazards of the disease are anticipated.Thus, the goals of this study were to ascertain the prevalence of brucellosis in cattle through the use of serological tests (RBT and CFT), to identify potential risk factors that may have contributed to the disease's onset, and to evaluate the knowledge, attitudes, and practices of herders and animal attendants in order to determine the significance of the findings for public health.

## 2 Materials and Methods

### 2.1 Description of Study Area

The study was conducted in three districts of the East Bale zone in Ethiopia, specifically Ginnir, Rayitu, and Dawe Kachen. The zonal town is located 555 kilometers south east of Addis Ababa, the capital of Ethiopia, situated between latitudes 7.45°N, and 39.47°E longitudes. The range rains 1500 ml to 3500 ml annually. This region experiences two separate rainy seasons: the larger one, which spans from September to November, and the primary one, which extends from March to May. The annual average temperature ranges from 27 to 33 °C. The animal population in the zone is estimated to be 276,318 cattle, 5246 sheep, 55742 goats, 12582 donkeys, 2452 horses, 9465 mules, 34957 camels, and 36946 poultry (CSA, 2019).

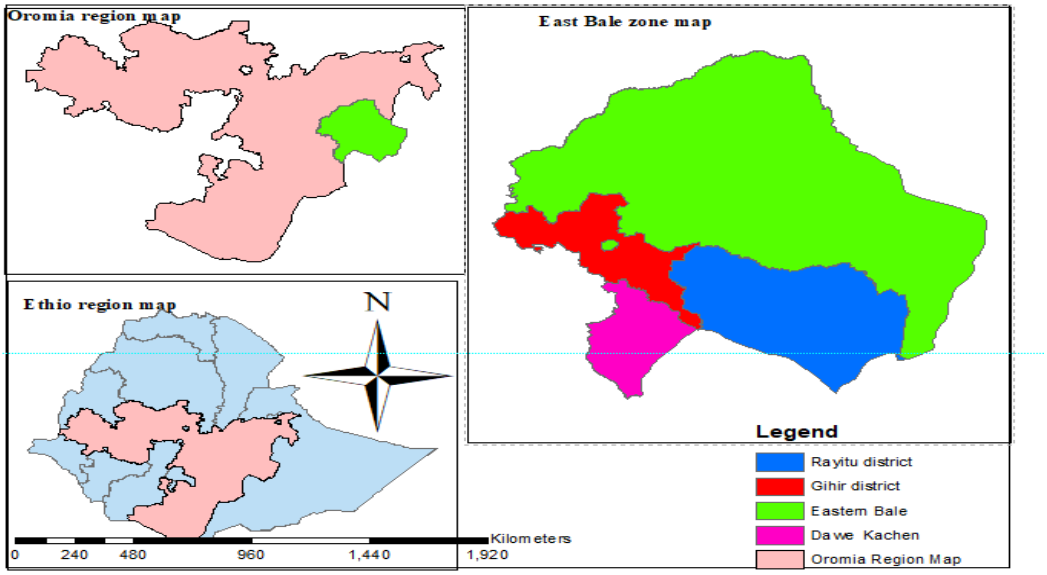


**Figure 1:** Map of the study area.

### 2.2 Study Population

The study population was all cattle kept under a traditional extensive farming system in selected districts of the Eastern Bale Zone. Cattle with no history of vaccination and above 6 months of age were used as sources of sera samples for this study. The age of animals was categorized as young (<3 years) and adult (>3 years). Moreover, the parity of the study population was categorized as low, medium, and large size. The study population was also owners of bovines in selected districts of eastern Bale Zone, and the study was conducted at the household level.

### 2.3 Study Design

A cross-sectional study was conducted from November 2023 to June 2024 to determine the sero prevalence of bovine brucellosis and its associated risk factors in the study area. A structured questionnaire was prepared and administered to the respondents to collect relevant information.

### 2.4 Sampling Methods and Sample Size

Both purposive and simple random samplings were used. The purposeful sampling technique was applied for selecting the study districts and villages, Depending on the availability of infrastructure, the number of cattle's population, and the agro ecology of the area, a total of 3 districts (Ginir, Rayitu, and Dawe Kachen) were selected for this study. A simple random sampling technique was used to select study animals for blood sample collection. The required sample size for the study was determined based on the formula given by Thrusfield (2018).

$$n = \frac{1.96^2 P_{exp}(1-P_{exp})}{d^2}$$

Where:
n= Required Sample Size
Pexp = Expected Prevalence
d = Desired Level of Precision at 95% confidence interval

There was no documentation on the prevalence study of Brucellosis yet in the selected districts of Bale Zone; therefore, 50% expected prevalence, 5% absolute precision, and a 95% confidence interval were used, and 384 animals were sampled randomly for blood collection. Households in three districts of the eastern Bale zone were simply randomly selected for KAP purposes, and interviews were conducted using the Arsham (2002) questionnaire survey.

$$N = 0.25/SE^2 = 0.25/(0.05)^2 = 100$$

Where:
N = Sample size
SE = Standard error
Hence, assuming a 5% standard error at a precision level of 0.05 and a 95% confidence interval, a total of 100 respondents were taken into account for questionnaire survey

### 2.5 Study Techniques

#### *2.5.1 Serum samples Collection*

Prior to taking a sample, each animal must be properly restrained and have their jugular vein cleaned. Then, in order to conduct a serological investigation on brucellosis, 384 blood samples were drawn from each animal's jugular vein using plain vacutainer tubes. Each animal yielded about 5–7 milliliters of blood, which were then put into a sterile, non-heparinized vacuum sealer. To obtain

clear serum, collected blood samples were centrifuged at 2500 rpm for 5 minutes after being stored at room temperature in a slant posture for 4-6 hours. Every sample has a label. Transporting the sera samples to the Animal Health Institute (AHI), Sebeta, involves packing them into an ice box with pre-cut blocks of ice. Up until processing, all samples were stored at -20°C in a deep freezer.

### *2.5.2 Rose Bengal plate test (RBPT)*

ID.vet, RSA-RB-016, 0112 GB, 310, rue Louis Pasteur, Grables, France, was used in accordance with the manufacturer's instructions and the guidelines supplied by OIE, 2004. Brucella antigen strain 99 was used in the RBPT screening of blood serum. Reagent and sera samples were taken out of the refrigerator and left to come to room temperature for half an hour before the test. On a Rose Bengal plate, the mixture was combined with antigen solution and stirred for four minutes. Agglutination was seen as a positive result, whereas no agglutination was regarded as a negative result. The results were recorded as 0, +, ++, and +++.

### *2.5.3. Complement fixation test (CFT)*

All samples with RBPT positivity were further subjected to a confirmatory complement fixation test (CFT) done at the Animal Health Institute (AHI) in Sebeta, Ethiopia. Standard *Brucella* antigen for CFT was obtained from the Veterinary Laboratories Agency, Addle stone, United Kingdom). The standardization of the antigen was made at a 1:10 working dilution. Before running the test, all positive sera samples were de-complemented at 56 °C for 30 minutes. After the test sera were serially diluted (1:2, 1:4, 1:8, and 1:16, up to 1:128) in microtiter plates, the Brucella CFT antigen and complement were added and incubated at 37 °C for 30 minutes. The hemolytic system, (3% sensitized sheep red blood cells plus 1/700 hemolytic serum in equal volume) were added and incubated for 30 minutes. The microplates were centrifuged at 2500 rpm for 5 minutes using a Sigma centrifuge and read for the result for sedimentation or lysis of sheep RBC. The test was considered positive when there was a complete fixation complement (sedimentation of SRBC) with clear water supernatant at a 1:2 dilution. A complete hemolysis of the SRBC was recorded as negative. The validity of the test was considered when there was complete hemolysis in the negative, antigen, and complement control wells. In hemolytic system, and the positive control wells showed inhibition of hemolysis. Subsequently, it was interpreted as a serum with a strong reaction of more than 100% fixation of complement at a dilution of 1:2, and at least 50% fixation of complement at a dilution of 1:4 is classified as positive.

### *2.5.4. Questionnaire survey*

A structured questionnaire was created to gather information on potential risk factors related to bovine brucellosis prevalence in a study area. The questionnaire focused on dairy cattle origin, knowledge of brucellosis transmission, management techniques, disposal of dead aborted calf, handling retained placentas, and raw milk consumption.

### 2.6 Data Management and Analysis

The study utilized Microsoft Excel 2007 for data entry and SPSS version 22 for descriptive statistics. Logistic regression analysis was used to evaluate correlations between independent and dependent variables, with significance level $P<0.05$.

## 3 Results and Discussion

Six samples were found to be seropositive against *Brucella*, with an overall sero prevalence of 6 (1.6%). Out of 6 positive sera samples by RBPT, a proportion of 2 (1.4%), 4 (3.4%), and 0 (0.0%) were recorded in Ginir, Rayitu, and Dawe Kachen districts, respectively. However, further confirmatory tests done by using the CFT test indicated an overall prevalence of (1.0%), in which 2 (1.4%) in Ginir and 2 (1.7%) in Rayitu districts were recorded. The result indicated that there was no statistically significant difference among districts observed (Table 1).

**Table 1:** Sero Prevalence of bovine brucellosis by RBPT and CFT in the study area.

| District | Number Examined | Number positive (RBPT) | Number positive (CFT) | Chi- Square | P value |
|---|---|---|---|---|---|
| Ginnir | 138 | 2(1.4%) | 2(1.4%) | 3.629 | 0.163 |
| Rayitu | 119 | 4(3.4%) | 2(1.7%) | | |
| Dawe Kachen | 127 | 0(0.0%) | 0(0.0%) | | |
| **Total** | **384** | **6(1.6%)** | **4(1.0%)** | | |

### 3.1 Prevalence of Brucella on the Basis of the Predisposed Risk Factors

#### *3.1.1 Effect of predisposed risk factors*

A study of 384 cattle examined in Ginir, Rayitu, and Dawe Kachen districts of East Bale zone found varying prevalence of bovine brucellosis, with no significant difference observed between the three districts. The study found that bovine brucellosis prevalence varies among age groups, with the highest prevalence (1.4%) in adult, followed by young (0.6%) Female animals had a higher prevalence (1.9%) than males. Both age and sex categories have no statistically significant variation ($p>0.05$).

The study found that brucellosis prevalence was highest in animals with medium body conditions (3.8%), while good body conditions had a low prevalence (0.6%). Additionally, larger parity animals (2.7%) and those with abortion history had the highest prevalence (6.3%). There was statistically significant variation observed among body condition, abortion history, and the parity of animals ($p<0.05$). (Table 2).

**Table 2:** Sero prevalence of bovine brucellosis among different risk factors.

| Variables | Categories | No. Examined | No. Positive | Prevalence | X2 | P-value |
|---|---|---|---|---|---|---|
| Districts | Ginnir | 138 | 2 | 1.4% | 2.031 | 0.362 |
| | Rayitu | 119 | 2 | 1.7% | | |
| | Dawe kachen | 127 | 0 | 0.0% | | |
| Age | Adult | 214 | 3 | 1.4% | 0.608 | 0.435 |
| | Young | 170 | 1 | 0.6% | | |
| Sex | Female | 206 | 4 | 1.9% | 3.493 | 0.062 |
| | Male | 178 | 0 | 0.0% | | |
| BCS | Good | 331 | 2 | 0.6% | 4.452 | 0.035 |
| | Medium | 53 | 2 | 3.8% | | |
| Parity | Small | 271 | 1 | 0.4 | 4.042 | 0.044 |
| | Larger | 113 | 3 | 2.7 | | |
| Abortion history | No | 360 | 2 | 0.6 | 13.204 | 0.00 |
| | Yes | 24 | 2 | 6.3 | | |

#### *3.1.2 Multivariable logistic regression analysis*

Following univariable logistic regression analysis, all variables (abortion history and parity) with significance or P-values less than 0.05 were subjected to multivariable logistic regression analysis and model fitting. Thus, among the risk factors taken into account in the analysis, the abortion history of the cattle was associated with Brucella seropositivity in the study area, as shown by the fitting of a multivariable regression model. According to the findings, animals with a history of abortion had a nearly 12-fold higher chance of testing positive for Brucella than animals without a history of abortion (P = 0.019; OR = 11.81; CI = 1.513-92.157) (Table 3).

**Table 3:** Multivariable logistic regression analysis results.

| Variables | Categories | No. Examined | No. Positive (%) | OR(95%CI) | P-value |
|---|---|---|---|---|---|
| Abortion history | No | 360 | 2(0.6%) | | - |
| | Yes | 24 | 2(8.3%) | 11.81 (1.513-92.157) | 0.019 |

### 3.2 Questionnaire Survey Results

#### *3.2.1. Socio-demographic characteristics of the study participants*

The study involved 100 owners, 70% males, 30.0% females, 45.0% aged 45-64, 30.0% educated, and 60.0% engaged in farming activities. **(**Table 4).

**Table 4:** Socio-demographic characteristics of the respondents

| Socio-Demographic | Categories | Frequency | Percent (%) |
|---|---|---|---|
| Sex | Male | 70 | 70.0 |
| | Female | 30 | 30.0 |
| Age | 18-44 | 35 | 35.0 |
| | 45-64 | 45 | 45.0 |
| | Above 65 | 20 | 20.0 |
| Marital Status | Married | 65 | 65.0 |
| | Unmarried | 35 | 35.0 |
| Educational Status | Not read and write | 25 | 25.0 |
| | Read and Write | 30 | 30.0 |
| | Grade (5-8) | 20 | 20.0 |
| | Grade (9-12) | 20 | 20.0 |
| | Certificate and above | 5 | 5.0 |
| Occupation | Government | 20.0 | 20.0 |
| | Private | 10.0 | 10.0 |
| | Farmers | 60.0 | 60.0 |
| | Student | 10.0 | 10.0 |
| **Total** | | **100** | **100.0** |

### *3.2.2 Livestock and husbandry practices*

The study found that 50.0% of 100 respondents owned local cattle and Cross breeds, while 25% owned cattle and sheep, 20% cattle and goats (Table 4). Majority of respondents holds local breeds of cattle's and free grazing were more practiced in the study area. The main purposes of keeping livestock were milk, meat and draft production (Table 5).

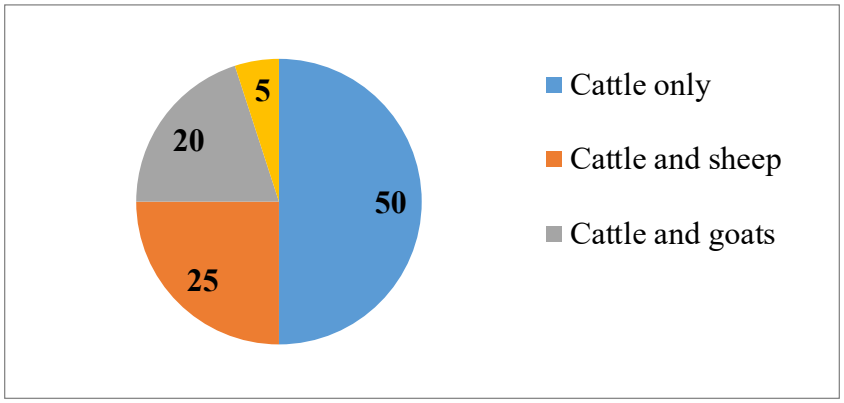


**Figure 2:** Owned animals species of household's in the study area.

**Table 5:** Species of animals owned and purpose of rearing cattle by the respondents.

| Variables | Categories | Frequency | Percent (%) |
|---|---|---|---|
| breed of cattle | Local | 80 | 80.0 |
| | Cross | 5 | 5.0 |
| | Both | 15 | 15.0 |
| Purpose of cattle holding | Milk | 25 | 25.0 |
| | Meat | 10 | 10.0 |
| | Milk, meat and draft | 65 | 65.0 |
| No.of cattle owned | Less than 10 | 65 | 65.0 |
| | 10-20 | 25 | 25.0 |
| | Greater than 20 | 10 | 10.0 |
| cattle management | Free grazing | 95 | 95.0 |
| | Semi-intensive | 5 | 5.0 |
| **Total** | | **100** | **100.0** |

### *3.2.3 Knowledge of participants about brucellosis*

From the total number of study participants, only 25.0% had heard about Brucellosis. However, about 40.0 % had a misconception of etiology of the disease, and attributed it to bad weather and 15% of the respondents did not know the causative agent. About 30.0% of the participants mentioned that Brucellosis could have been transmitted from animals to humans (Table 6).

**Table 6:** Knowledge about Brucellosis and source of information for study participants.

| Indicative Questions | Responses | Frequency | Percent (%) |
|---|---|---|---|
| Heard of bovine brucellosis | Yes | 25 | 25.0 |
| | No | 75 | 75.0 |
| Source of knowing Information of Brucellosis | Mass Media | 10 | 10.0 |
| | Health extension | 15 | 15 |
| | No information | 75 | 75 |
| Causative agent of Brucellosis | yes | 5 | 5.0 |
| | no | 95 | |
| modes of Transmission in Cattles | Abortion secretion | 25 | 25.0 |
| | Share grazing | 10 | 10.0 |
| | Don't know | 65 | 65.0 |
| symptoms of Brucellosis in cattle | Abortions | 10 | 10.0 |
| | Weak calves | 10 | 10.0 |
| | Bull infertility | 5 | 5.0 |
| | Don't know | 75 | 75.0 |
| **Total** | | **100** | **100.0** |

### *3.2.4. The attitude and practices of communities towards the disease*

The study reveals that brucellosis can be transmitted from animals to humans, making cattle dangerous. Most respondents take action by contacting veterinarians when cows should abort. 75% of participants did not consider raw milk and contaminated meat as sources of brucellosis. (Table 7).

**Table 7:** Attitude and Practices of respondents towards brucellosis in the study area.

| Indicative Question | Characteristics | Frequency | Percent |
|---|---|---|---|
| **A. Practices of respondents on Brucellosis** | | | |
| Action taken if a cow abort | Visiting Vet. doctor or clinic | 15 | 15.0 |
| | self-medicate | 15 | 15.0 |
| | the traditional healer | 5 | 5.0 |
| | nothing | 65 | 65.0 |
| **B. Attitude of the respondents on brucellosis** | | | |
| raw milk and meat as a source of bovine brucellosis | Yes | 25 | 25.0 |
| | No | 75 | 75.0 |
| Sharing the drinking raw animal product | Yes | 75 | 75.0 |
| | No | 25 | 25.0 |

The table shows farmers' husbandry practices in consuming raw animal products, with 10.0% consuming boiled or pasteurized milk and 70.0% consuming raw milk, while 20.0% both. Over half consume raw meat, with 45.0% getting milk from their own cows and 25.0% from commercial stores. (Table 8).

**Table 8:** Animal product consumption practices of respondents.

| Indicative Question | Characteristics | Frequency | Percent (%) |
|---|---|---|---|
| habit of milk drinking | Boiled/pasteurized | 10 | 10.0 |
| | Raw milk | 70 | 70.0 |
| | Both | 20 | 20.0 |
| meat consumption | Raw meat | 65 | 65.0 |
| | Cooked meat | 15 | 15.0 |
| | Both | 20 | 20.0 |
| Milk sources | Own cow's | 80 | 80.0 |
| | From informal store | 20 | 20.0 |
| Care taker for cattle | Owner | 70 | 70.0 |
| | Shepherd and/or laborer | 20 | 20.0 |
| | Other family member | 10 | 10.0 |

The questionnaire survey revealed that 40.0% of households donate aborted fetuses to dogs, while 15.0% engage in actions like burying, throwing, or dumping and burning in the study area. (Figure below).

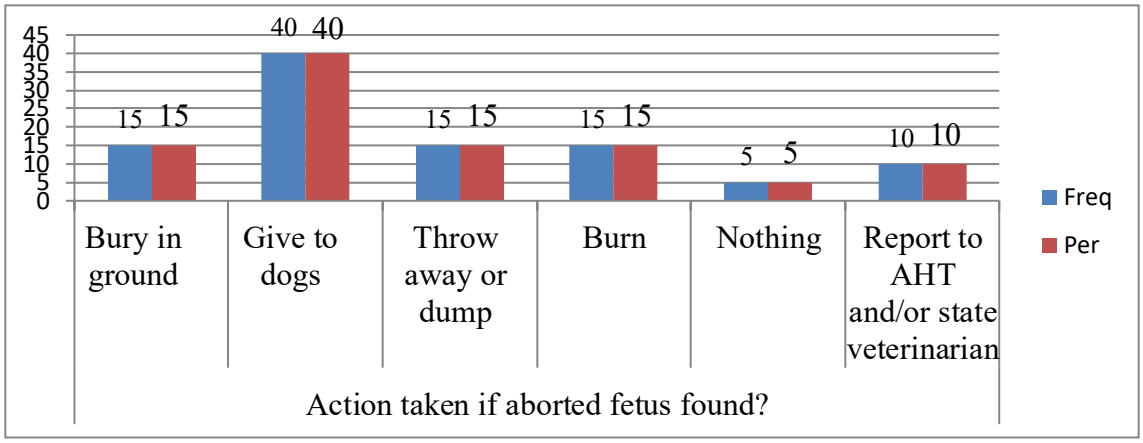


**Figure 3:** Actions taken to susceptible case of the diseases.

## 4 Discussion

The current serological study revealed that the overall prevalence of bovine brucellosis in the study area was 1.0%. This finding was in agreement with findings of Hailu *et al*. (2011) in Jig-Jiga zone of Somali Regional State, Gebreyohans (2004) in Addis Ababa, and Dinknesh *et al*. (2019) in Becho District, who reported 1.38%, 1.5%, and 1.04%, respectively. High seroprevalence was recorded as compared to previous study Garoma, 2018 with 0.73% in Jimma zone, Western Ethiopia; Sarba *et al*., 2016 with 0.49% in Western Shewa; Asmare *et al*., 2007 with 0.4% in urban dairy farms of Northern Ethiopia and Sebeta;(Bashitu *et al*., 2015) with 0.2% in Debrebirhan and Ambo Towns; (Degefa *et al*., 2011) with 0.05% in Arsi zone.

In contrast to our study higher sero-prevalence rate of bovine brucellosis was reported by (Dinka and Chala, 2009) with 11.2% in pastoral and agro-pastoral areas of East Shewa Zone, (Kebede *et al*., 2008) with 11.0% in Wuchale-Jida district, central Ethiopia, (Megersa *et al*., 2011 with 10.6% in Borana, (Eticha *et al*., 2018) with 9.87% in Asella organized dairy farm, South East Ethiopia, (Megersa *et al*., 2012) with 8.0% in pastoral region of the country, (Hailesilassie *et al*., 2011) with 4.9% in Western Tigray, (Tibesso *et al*., 2014) with 4.3% in Adami Tulu, central Ethiopia, (Berhe *et al*., 2007) with 3.19% in the Tigray region, (Ibrahim *et al*., 2010) with 3.1% in Jimma Zone of Oromia region. Similarly higher sero-prevalence were reported in African countries: Mensah et al. (2011) reported 21.9% in Ghana; Matope et al. (2011) reported 5.6% in Zimbabwe; Swai and Schoolman (2010) reported 5.3% in Tanzania; and Angara et al. (2004) reported 24.5% in Sudan; Mai et al. (2012) reported 24.0% in Nigeria. These variations in seroprevalence may be due to factors like agro-geographical factors, sample size, serological test method, management, and availability of maternity pens (Radostits, 2000).

In this study, there was no statistically significant difference in seroprevalence between males and females. This findings was in line with Tadele (2004) (0.00% and 0.97%), Bashitu et al. (2015) (0.00% and 0.2%), Dinknesh et al. (2019) (0.00% and 3.13%), Gebawo et al. (2014) (0.00% and 3.1%), and Bashahun et al. (2015) (0.00% and 1.8%), The absence of positive male animals in the current study may be because males are kept in smaller flocks than females and are therefore less common, or it may be because of the explanation provided by Kebede et al. (2008), who claimed that low erythritol levels in male animals make them less susceptible to Brucella infection This result variation may be due to the small sample size of male animals

The study found no significant association between age categories and bovine brucellosis seroprevalence, contradicting previous research findings of Tadele (2004), Bulcha *et al*. (2020), and Nuraddis *et al*. (2010), who reported significant variation between age groups in cattle. The comparative high occurrence of bovine brucellosis in adult animals could be due to sexual maturity, which is a very important condition for the rapid multiplication of *Brucella* organisms (Mohammed, 2009; Tolosa *et al*., 2008).Cattle that are sexually mature and pregnant are more vulnerable to contracting Brucella infection than cows who are not sexually mature. Furthermore, it has been observed by Radostits et al. (2000) that younger animals are often more resilient to infection and that latent infections may be cleared out. As noted by Garoma (2018) and Berhe et al. (2007), animals that are sexually matured are more likely to contract Brucella infection. This increased susceptibility during sexual maturity and the gestation period may be attributed to the influence of sex hormones as well as the elevation of fetal fluid and erythritol sugar in the placenta.

According to Asgedom et al. (2016), Hileselassie et al. (2008), and Radostitis et al. (2007), this promotes the bacteria's growth and multiplication in the reproductive organs.

Cows with a history of abortion were shown to be significantly more infected than cows without a history of abortion. Similar to this study, cows with a history of abortion had considerably higher rates of bovine brucellosis Hika *et al*. (2018) (14.63% and 2.82%), Dinknesh et al. (2019) (17.4% and 0.00%), and Bulcha et al. (2020) (19.05% and 0.00%). Brucellosis may be a factor in abortion and stillbirth, as evidenced by the association between the sero-prevalence of the disease in cows and the history of abortion. Furthermore, the abortion rate in infected animals is determined by a variety of factors, including the duration of infection, management practices, the sensitivity of pregnant females, and other environmental factors (Bishop *et al*., 2004).

The observed difference in sero-prevalence on parity was statistically significant. This strong correlation between parity and seropositivity for brucellosis suggests that bigger parity groups (2.7%) had higher sero-prevalence than small parity-sized cattle (0.4%).In contrast to this findings Geresu et al. (2016) and Berhe et al. (2007), reported there was no discernible difference between multiple and single parturition.

The questioner results showed that 75% of the participants had not heard of the disease brucellosis, and 25% of the respondents knew that humans can be infected by animals. This high discrepancy of the disease in the community could be due to their level of knowledge, and the prevalence of the disease is less pronounced in the community. In contrast to our findings reported in Uganda by Kansime *et al. (*2014) among pastoral communities living along Lake Mburo; in Egypt among cattle and buffalo farmers in a village in the Nile Delta region (Holt *et al*., 2011); and among small ruminant farmers in the peri-urban areas of Dushanbe Tajikistan (Lindahl *et al*., 2015), in which 99.3%, 83.2%, and 57% of the respondents' had heard of Brucellosis and its zoonotic importance. Less information sources from animal health professionals, however, highlights the limited roles veterinarians play in providing the area's herders—who typically lack equitable access to basic healthcare and education with critical animal health messages.

Regarding the clinical manifestations of brucellosis in animals, 10.0% of participants recognized abortion, 5.0% bull infertility, and 75% did not. This result is consistent with that of the current study Lindahl et al. (2015) found that just 11% of respondents from Tajikistan recognized abortion as a clinical sign of animal Brucellosis. As opposed to studies conducted in the Egyptian state of Holt et al. (2011) and the Nigerian state of Kaduna (Buhari et al., 2015), where 94.4% and 59.5% of respondents, respectively, named abortion as the most significant clinical symptom Most of the owners ate raw meat and unpasteurized dairy products, which are recognized risk factors for infections in humans (Lindahl et al., 2015).According to Lindahl et al. (2015), who documented such practices because of owners' ignorance of the zoonotic role of brucellosis, they did not wear protective gloves when helping with delivery, handling cows having an abortion or with aborted materials, nor did they properly wash their hands.

## 5 Conclusion

In smallholders in the eastern Bale zone, the study indicated a low prevalence of bovine brucellosis and a high correlation between parity seropositivity and abortion. Increased animal-to-animal and zoonotic disease transmission was caused by a lack of knowledge and unsafe behaviors among communities. The attitudes and knowledge of livestock keepers were lacking. As a result, the following recommendations were made based on the conclusion above:

- Community awareness creation about the impact of the diseases, modes of transmission, risk factors, and methods of prevention of the diseases should be important.
- Collaboration as in one health approach to control such an important disease in the country.
- A coordinated surveillance and monitoring system for bovine brucellosis should be carried out to design appropriate and effective control and prevention strategies.
- Animal intensification should be followed by efficient and effective disease control programs.
- Further detail and fully fledged research is very important to have full and all-round information regarding the epidemiology of the brucellosis.

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