Seroprevalence of Brucellosis in Cattle of Rupandehi District, Nepal

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Abstract

Brucellosis is a contagious zoonotic disease affecting both cattle and humans, with notable economic and public health implications in Nepal. Despite previous studies indicating varying prevalence rates in different regions of the country, there is limited recent data on the status of Brucellosis in Rupandehi district. A cross-sectional study was conducted in Rupandehi district, Nepal, from 1st July to 30th September 2023. A total of 141 cattle blood samples from 92 farms were collected and tested using ID Screen® Brucellosis Indirect ELISA kits. Epidemiological survey was also conducted to gather information on risk factors associated with Brucellosis. All 141 blood samples were tested negative for Brucellosis, resulting in a seroprevalence rate of 0%. This study provides valuable data indicating a zero prevalence of Brucellosis in cattle of Rupandehi district, Nepal. This research doesn't show any association for the prevalence of Brucellosis regarding the risk factor.

Keywords: Abortion, Brucellosis, Cattle, iELISA

Introduction

Livestock rearing has played a key part in the development of the economy in Nepal. According to the climatic region, Nepali farmers produce and raise a variety of dairy animals. Nepal's livestock rearing contributes 13% to GDP and about 27% to AGDP(MoALD, 2021). Further to serve as a source of food and nourishment, this industry is important economically.

In various part of Nepal, including hilly areas, terai, and some lower mountain regions, cattle rearing is considered as a growing agricultural industry. Rupandehi district alone shares 98,423 cattle with milking population of 19,291 that contributes 19.60% of total cattle milk production(DLS, 2020).

Although raising dairy cattle seems advantageous, there are associated dangers and challenges. The presence of diseases among the cattle can lead to disruptions and financial setbacks for the dairy industry. Brucellosis is a contagious and infectious livestock disease that has notable economic implications which causes animals to become sterile, leading to reproductive problems, and also results in financial losses due to restrictions on international trade(Franc et al., 2018). It is also categorized by the WHO laboratory biosafety manual as risk group III(Dean et al., 2012). It is considered as one of the most prevalent zoonosis by Food and Agriculture Organization and WHO(Khurana et al., 2021). Office International des Epizooties (OIE) declares brucellosis as multiple species disease, infection and infestation(Ekgatat, 2021). Among the various diseases on livestock, Brucellosis is one of the most important zoonosis spreading globally, caused by gram negative bacteria of the genus *Brucella* that include six species namely *Brucella melitensis, Brucella abortus, Brucella suis, Brucella ovis, Brucella canis and Brucella Neotomae* (Corbel, 1997).*Brucella abortus* is the causative agent for causing Brucellosis in cattle(Pandeya et al., 2013).

Being zoonotic, the disease affects humans and a number of wild and domestic animals, including cattle. It causes significant economic losses due to decreased calving rates, delayed calving, culling for infertility, decrease milk production, abortions, stillbirths, the birth of weak calves (Holt et al., 2021, Khan & Zahoor, 2018). Abortion in the final trimester or after the fifth month of pregnancy is the primary symptom of the condition (Lokamar et al., 2020). It has been suggested that the presence of erythritol in the placentas increases at the last trimester of pregnancy in goats, cows, and pigs accounts for the localization of Brucella to specific areas and the subsequent buildup of significant numbers of bacteria, which ultimately results in abortion (Petersen et al., 2013).

In bulls, it causes orchitis, epididymitis, seminal vesiculitis and hygroma of joint of leg (WOAH, 2022). In human, the disease is clinically manifested by fever, sweats, fatigue, abdominal pain, arthralgia, arthritis, myalgia, back pain, epididymo-orchitis, miscarriage, endocarditis, respiratory and neurological signs, and cutaneous abnormalities (Corbel, 2006).

The pathogenesis depends upon various factors such as the species, size of inoculum, mode of transmission and immune status of host. Extensive replication in placental trophoblasts is

associated with abortion and persistence in macrophages and other cell types leads to chronic infections (Acharya et al., 2016, Corbel, 1997).

In the absence of abortion in cattle, there is significant bacterial shedding through the placenta, fetal fluids, and vaginal exudates, as well as infection of the local lymph nodes and mammary gland with bacteria in milk excretion (Khan & Zahoor, 2018). Aborted fetuses, fetal membranes, and uterine fluids discharged following abortion or parturition are the main sources of infection. Conjunctiva, respiratory mucosa after inhalation, and skin infections in cattle are significantly less common than those acquired through the GI tract (Rahman et al., 2011, Shamsullo et al., 2019). A potential source of infection with artificial insemination (AI) is tainted semen. In terms of transmission routes, vertical, venereal, and milk transmission predominate (Zakaria, 2018). Human to Human transmission is uncommon, however direct contact with infected animals and consumption of contaminated dairy products may cause infection, also the disease had been reported after blood marrow transplantation, sexual intercourse, and also following blood transfusions (Prasad, 2015). The objective of this study is to determine sero-prevalence of Brucellosis in cattle of various farms in Rupendehi district of Nepal. This paper aims to collect the data of different risk factors such as types of breeds, age, history of abortion, retention of placenta, repeated breeding and use of insemination techniques in cattle associated with Brucellosis. Along with that this paper also provide the information regarding the presence of *Brucella* anti-bodies in the blood of those cattles.

Materials and methods

A cross-sectional study conducted in the Rupandehi district of Nepal from 1st July to 30th September 2023, total samples of 141 animals were collected using Daniel's formula, with a focus on brucellosis prevalence. Blood samples were drawn from restrained animals, processed, and stored at 2°C before being transported to the National Cattle Research Program (NCRP) for serum separation. Epidemiological data were gathered through structured questionnaires, and laboratory analysis was performed using the ID Screen® Brucellosis Indirect ELISA kit. Statistical analysis was carried out using MS Excel 2007 and SPSS version 25.

Results

All 141 samples were tested with iELISA and all samples were found negative for Brucellosis. Hence, the seroprevalence was found 0%.
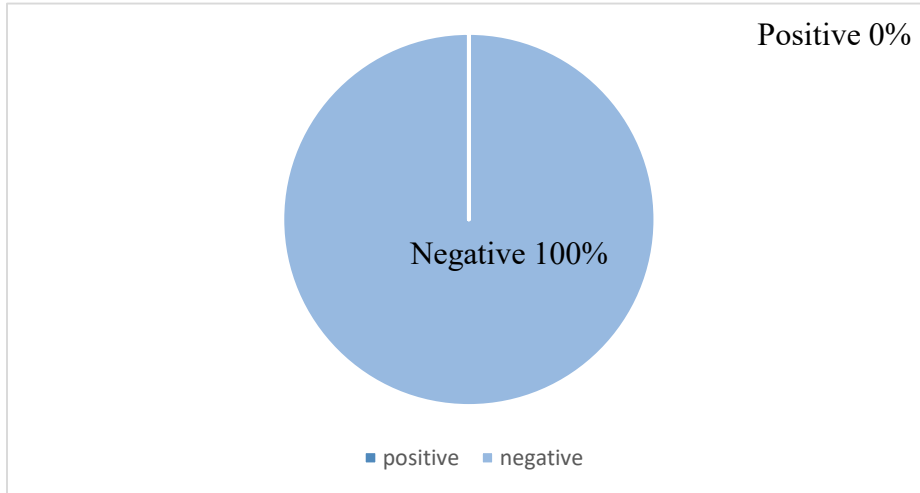

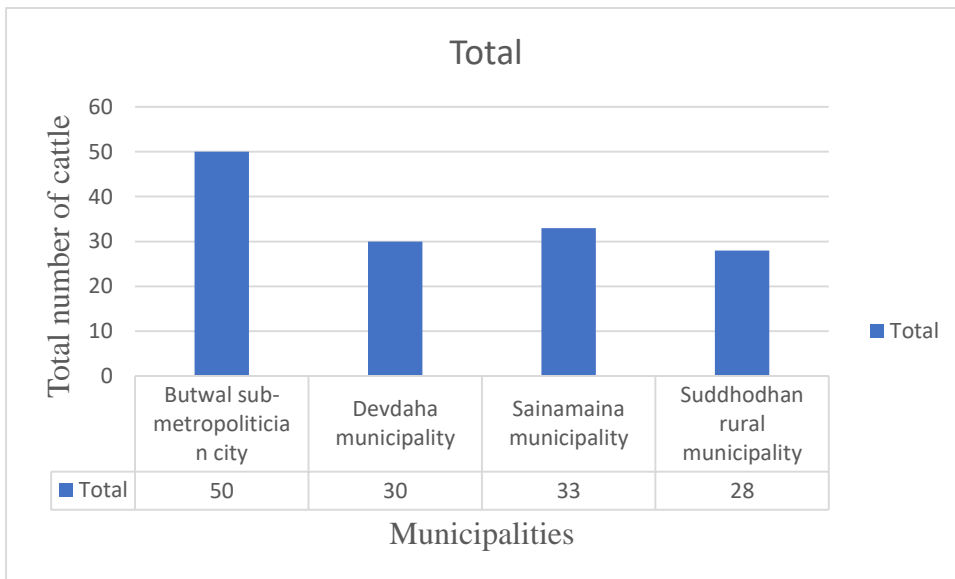Figure 1: Pie-chart showing overall prevalence of brucellosis

Figure 2: Sample of cattle serum from different municipality of Rupandehi district.

Out of 141 sample, 50 samples were collected from Butwal sub-metropolitician city, 30 were collected from Devdaha municipality, 33 were from Sainamaina municipality, and 28 were from Suddhodhan rural municipality.
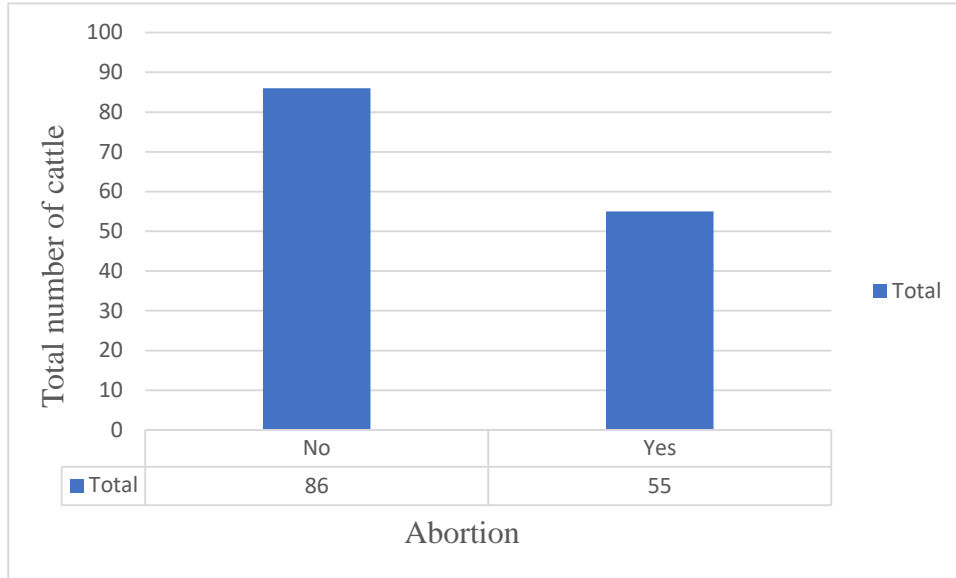

Total	No	Yes
Total	86	55

Figure 3: History of abortion in cattle

Out of 141 sample, 67 were collected from aborted cattle and 74 were from non-aborted cattle.

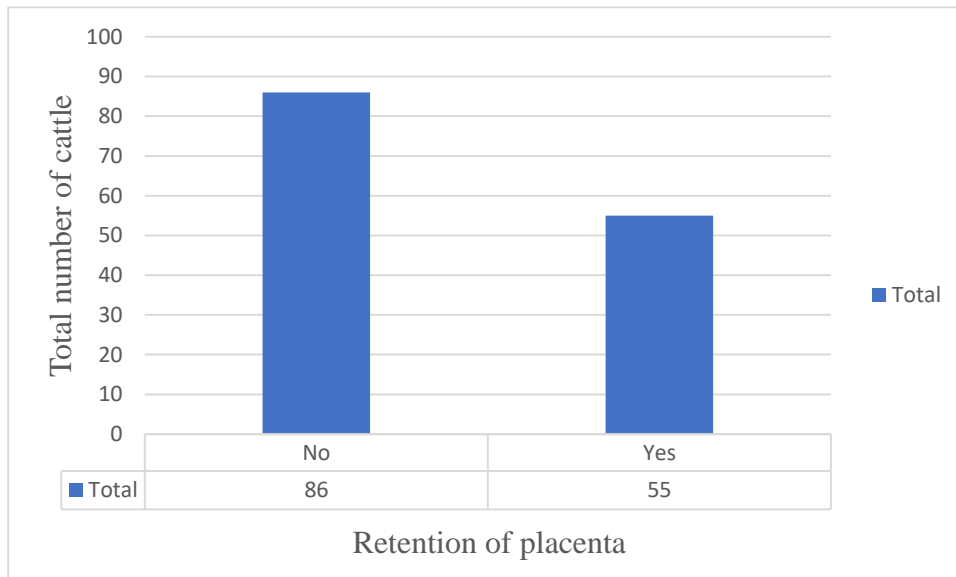| Total	No	Yes
Total	86	55

Figure 4: History of retention of placenta in cattle

Out of 141 sample, 55 were from retention of placenta and 86 were not showing retention of placenta.
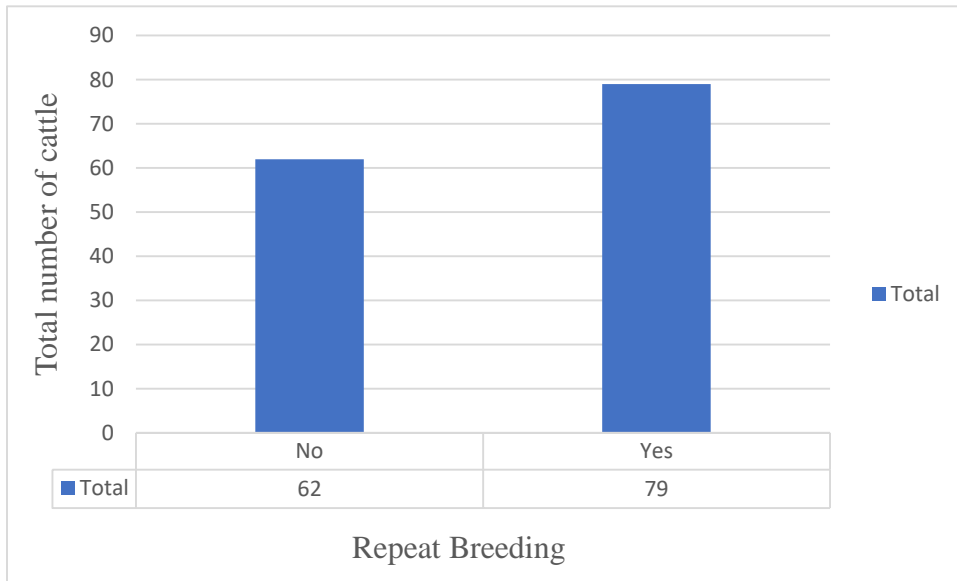

Figure 5: History of repeat breeding in cattle

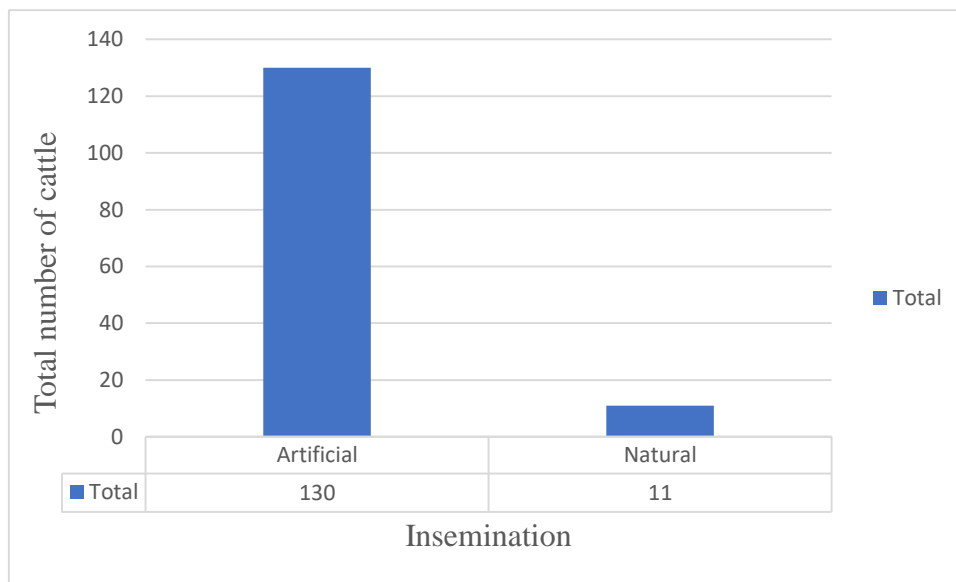Out of 141 sample, 79 were from repeat breeder and 62 were non-repeat breeder.

Fig 6: History of Insemination in Cattle

Out of 141 serum sample, 130 were collected from the artificially inseminated cow/heifer and 11 were collected form naturally breed with bull.

Discussion

In this study, no seropositive brucellosis case was detected among 141 samples taken from 92 farms of Rupandehi district which is consistence with the finding of Acharya et al., 2020 on his finding fifty serum sample from Rupandehi district were tested for brucellosis but none were positive. The similarity might be due to similarity in diagnosis procedure and practice of artificial insemination.

Aryal & Paudel (2014) reported seroprevalence of brucellosis among yaks in Mustang and Myagdi districts was found zero. Also, the finding of our study coincides with the finding of Ayard and Guillemet (2017) conducted in Kathmandu and Kavre district of Nepal among 93 cattle where all samples showed negative on iELISA test.

Various previous research showed a varying rate of prevalence. On a study by Pradhan 1996, a total of 3.37% of Brucella positive cases were found. In the study by Subedi et al, 2016, showed prevalence of 10.86 % positive.

A study conducted by (Pandeya et al., 2013) in brucellosis among cattle, buffalo and goat in Kailali district revealed overall seroprevalence of Brucellosis to be 12% where cattle alone showed 32% prevalence of disease.

The practice of Artificial Insemination rather than natural insemination methods also might be the reason for less occurrence of disease transmission by affected bulls among cattle. Variation in sampling techniques, risk factors from one area to another and different diagnostic tests employed were also seen as factors associated with difference in prevalence rate of this study. Variability of sensitivity and specificity of kit might be the reason for occurrence of diseases in other research, which is 100% in our study.

Conclusion

Brucellosis is unlikely to be a major cause of reproductive issues in female cattle in Rupandehi district, leaving room for investigation into other potential factors like temperature stress, nutrition,

or other bacterial diseases. Animal and public health awareness for the community and farmers using one health approach are necessary to improve prevention and control of disease.

Acknowledgements

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