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# A systematic review on brucellosis in Asia from 2000 to 2020

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**ABSTRACT**

The review aimed at finding predisposing factors regarding Brucellosis in Asia from the published articles of 2000 to 2020.This study was conducted as a part of the course assignment of Field Epidemiology Training Program for Veterinarian (FETPV) lead by DLS under the academic supervision of Chattogram Veterinary and Animal Sciences University (CVASU) with the fund and technical support of Global Health Development (GHD). A total of 36 articles regarding the factors responsible for Brucellosis were skimmed and found 12 in numbers to fit out there for this review. We found a lot of factors within the epidemiological triad of Brucellosis and avoiding the repetition a series of important factors were separated. Brucellosis has been prevalent throughout the Asia due to its wide range of species variety and virulence considered as agent factors. Hosts factors like age, sex, breed, pregnancy, abortion history, repeat breeding and retention of placenta were found in different researches. Again management issue was given importance on herd size, single/ mixed herd, farming system, introduction of new animals, distance from one farm to another farm etc. by the researchers. Again farmer's age, qualification, training and experience were associated with commencing Brucellosis. Environmental factors likely natural insemination and improper sanitation may also lead to spreading disease. This review concluded that as there is no existing vaccine against *Brucella*, proper control and management are the key ways to prevent.

## Introduction

Brucellosis is an ill reported disease in the world of huge economic importance caused by *Brucella spp*. (Deka et al., 2019). It is caused by almost 10 or more species with a varied host range. This is an endemic disease for the third world countries and domestic animals are the main reservoirs and often used as bio and agro-terrorism weapon (Mehmet et al., 2003; Godfroid et al., 2011). The professional likely veterinarians, health workers, dairy farmers, laboratory workers and slaughterhouse workers are the most susceptible hosts to attain Brucellosis from the domestic animals (Drik et al., 2012) Human infections occur by ingestion of infected uncooked milk and meat, inhalation of aerosol and skin abrasions during disposal of carcasses, working under infected farms without gloves and masks etc. (Mantur et al 2006; Akhtar et al., 2020)

Human infection is acquired through contact, ingestion, or inhalation of organisms from infected animals, principally cattle, goats, and sheep. Seroprevalence studies conducted throughout the developing world demonstrate that when one looks, Brucella infection is frequently found among sampled livestock populations (Hegazy et al., 2011; Kashiwazaki et al. 2012).

Purpose of the overview is to describe predisposing factors regarding *Brucella* the causal agent, host (Human and Vertebrates) and environment for Brucellosis.

## Materials and Methods

We used different sources to accumulate data for this systemic review in Asia from 2000 to 2020. First of all, we've screened articles related to Brucellosis in both human and animals in Google, Google Scholars and PubMed by the title and abstract followed by papers and the following keywords 'Brucellosis' OR (Cattle) AND (Human) OR (Asia) OR (South Asia) OR (Bangladesh) OR (India) AND 2000 TO 2020. To select the necessary articles for this report, we read the articles thoroughly. Additionally we explored the website of Department of Livestock Services (DLS) (www.dls.gov.bd) which is working as the mother organization for ensuring safe milk, meat and eggs for the citizen of Bangladesh. Brucellosis has zoonotic importance and has influence on milk and meat. The Epidemiology Unit under DLS is

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responsible for searching and documentation of all kind of endemic, emerging and re-emerging diseases including Brucellosis. Though this disease is almost unreported over here in Bangladesh in animals, hence we did not find any organized or published data on animal brucellosis. Again Institute of Epidemiology, Disease Control and Research (IEDCR) (www.iedcr.gov.bd) was then targeted to search for the grey data regarding Brucellosis Surveillance in Human. Thereafter we found a published article regarding Sero-prevalence of Human Brucellosis in Sylhet, Bangladesh (Akhtar et al., 2020) from Google Scholar.

For searching on agent, host and environment factors, we skimmed on factors for Epidemiological Triad of a disease (Figure 1) (Johnson-Walker & Kaneene, 2018).

Data at each stage of review were entered into MS excel spread sheet. Articles were then fully reviewed to extract the data for the work. 'Vancouver style' has been followed for referencing the text.

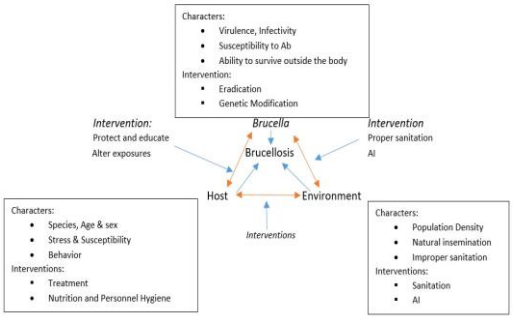


**Figure 1:** Epidemiological Triad of infectious disease (Johnson-Walker1, 2018)

## Results

Literature searched for the latest research on brucellosis in Bangladesh provided two published articles (Rahman et al., 2016; Sarker et al., 2016) by the researchers of Bangladesh Agricultural University and Mymensingh Medical College. These articles briefly described about the history of Animal Brucellosis and a seroprevalence study on Humans who had prolonged fever history.

### Agent

*Brucella* is a gram negative intracellular agent causes Brucellosis in wide range of hosts including human and vertebrates. More than 10 species of *Brucella* have been noticed around the world. Among them *Brucella melitensis* has been identified in 700 years old skeleton at Italy (Hull et al., 2018). It can survive both in live cells and outside the body of a host, replicates and infects the hosts even phagocytes (Godfroid et al., 2011). But the agent is susceptible to antibiotics as well (Mehmet et al., 2003; Hasanjani et al., 2015)

Currently, countries in central and southwest Asia are seeing the greatest increase in cases. The incidence of Brucellosis is very high in China and India.

### Host

In case of vertebrate animal, host factors are age, breeds, sex, pregnancy status, abortion history, retained placenta could be influential for getting affected by *Brucella* (Deka et al., 2019). In a study at Bangladesh, the researchers found aged group (41-80 years) people have a highest 6.2%, male had highest 5.6%, considering type of animals handled goat handlers had 8.5%, milkers had 18.2%, and raw milk drinkers had 11.4% seroprevalence of Brucellosis at 95% Confidence Interval (Dirk et al., 2012).


**Figure 2:** Host risk factors against Brucellosis

### Environment

A study showed that domestic animal's contact with wild animal i.e. geographical location of the farm, unhygienic farming condition, improper disposal of carcasses, and climate can be the predisposing factors for Brucellosis. A professional milker involved in unhygienic farming system, large stock size, mixed herding system, introducing new animal to a regular stock could be potential sources to contaminate the healthy system by contact (Deka et al., 2019).

## Discussion

The review of the studies indicated a higher brucellosis prevalence in the areas with high human population, intensive animal farming, high animal-human interaction (e.g., livestock markets, slaughterhouses, livestock breeding and dairy farms, semen production units, and veterinary hospitals), and livestock trade routes (Figure 1). In addition, consuming unpasteurized dairy milk and neglecting protective measures during handling animals and animal products at parturition/abortion, milking, and/or medication time appeared to be contributing factors. As the disease can stay asymptomatic in animals and remain undiagnosed, such practices pose a high public-health safety risk to the workers and associated people (Figure 2).

*Brucella* infects almost all kind of vertebrates including human due to its virulent properties. Number of species is large, so that preparation of vaccine is difficult. It can infect the host's immune modulator phagocytes; for this property, the cases of zoonosis have been increasing day by day. The agent is getting mutated and infecting large number of vertebrates as well.

In a study, the researchers showed an increasing pattern of Brucellosis at Italy from 1970 to 1900 up to 13000 cases per year, though it is underreported (Doganay & Aygen (2003). In the contrary, approximately 100 cases found per year in USA from 1975 to 2001 (Sauret & Vilissova 2002) According to the results, the personnel hygiene of professional milkers can influence a healthy stock by getting infections. Aged farmers get affected due to weak immune status, but the young do not. Illiterate group has low sense of humor against self-hygiene management, so they are easily affected, where literate farmers are in reverse condition.Males are more involved in livestock rearing than female in Asian Subcontinent. So males are more prone to infections.

The goat handlers get affected higher than the other vertebrates due to large number of population. There are some parts of the world, people intake raw milk and meat have higher tendency to be affected by Brucellosis.

## Conclusion

From this review, some agent factors like antigenic types and virulence; host related to age, sex, personnel hygiene, immunity and environment possess natural insemination of ruminants, population density, improper sanitation etc. may affect the condition of diseases. Though still there is no vaccine against Brucellosis, control and management are the best tools to fight. Building up awareness among the general people, veterinarians, health workers and susceptible professionals are recommended. Managing hygiene in livestock farm and in farm personnel can be good practices recommended for preventing Brucellosis.

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