



Systematic Review of Human Brucellosis in Kingdom of Saudi Arabia

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Abstract

Background: The objectives of this systematic review were to assess prevalence of human brucellosis, in kingdom of Saudi Arabia over the past three decade.

Methods: Two databases were searched, 1113 articles published between 1990-2022 identified as relating to human brucellosis. After duplicates removed, out of scope, not about Brucellosis in Saudi Arabia, we were left with 17 articles.

Conclusions: The risk for emergence and transmission of brucellosis is evident as a result of the co-existence of animal husbandry activities and social-cultural activities that promote brucellosis transmission. Well-designed countrywide awareness of brucellosis at the human/livestock/wildlife interface are needed. These could help to generate reliable frequency and potential impact estimates, to identify Brucella reservoirs, and to propose control strategies of proven efficacy.

Keywords: Brucellosis; Brucella; Epidemiology; Saudi Arabia; Prevalence

Introduction

Brucellosis is an infectious disease that is transmitted between species from animals to humans caused by the bacterial genus *Brucella*. The transmitted occur by ingestion through infected food products, direct contact with an infected animal, or inhalation of aerosols. *Brucella* organisms, which are small aerobic intracellular coccobacilli Gram-negative, non-spore-forming, non-motil, which excreted in large quantities in an animal's urine, milk, placental fluid, and other fluids.

In addition to its impact on human health, brucellosis causes significant public health problems, including economic losses from miscarriage, reduced milk production, and adult male infertility [1]. Infection occurs mainly in goats, sheep, camels, cattle and

horses, causing the animals to abort, thereby reducing milk production and causing an economic burden to the country. Numerous studies have been conducted on

brucellosis in different regions of Saudi Arabia [2].

Human brucellosis is a multisystem disease with multi-facets clinical symptoms. The disease is either acute or insidious. The typical clinical signs of human brucellosis are fever, splenomegaly, lymphadenopathy and myalgia [3]. Human brucellosis is associated with both humoral and cellular immunity. Although antibody responses play certain role in resistance to brucellosis, cell-mediated immunity (CMI) appears to be the principal mechanism of recovery [4]. Brucellosis is endemic in Saudi Arabia and is regarded as a major public zoonotic infection. It has been reported to occur in most

regions in the Kingdom. Studies on brucellosis have been carried out in different parts of Saudi Arabia, the reported cases of Human brucellosis in the kingdom regions reached 4257 cases by 2019 [5].

The search then limited to the subject areas to microbiology, health care, and public health fields. The search period was from 1990-2022. All articles before 1990 were excluded from search.

The search was focused on Kingdom of Saudi Arabia, thus articles from any other country were excluded. A 397 research articles were excluded at this stage. There were 147 records to be started with at this stage.

The study is built only on original research articles, review papers and health journals. To sustain the quality of the review, all duplications were checked through. Abstracts of the articles were deeply inspected to ensure the quality and relevance of academic literature included in review process. A careful analysis of each research paper was carried out at a later stage. The next exclusion criterion was to extract the papers that of this article scope. There were 82 articles in different scopes and was rejected from the study.

Furthermore, after the exclusion of duplicate records, papers based on case study and book chapters, 36 more articles are excluded from the study. We selected 31 articles after assessing each article on the inclusion and exclusion criteria mentioned before.

Figure 1, shows the inclusion and exclusion at every stage. (PRISMA statements).

In the data extraction phase, 31 articles were selected, and the characteristics extracted were:

- Article must be original paper, review paper and journal paper. Case studies was excluded.
- The article must be in English language and from the field of science, biomedical and microbiology.
- Extracted articles were published between 1990 to 2022.
- The extracted papers were from Saudi Arabia only.

Results and Discussion

In the 90s (1990-2000) total of 6 articles met the inclusion criteria revealed that in average the prevalence of human brucellosis was 51.1% from rural areas and 66.6% from urban areas. Meanwhile, children (0-14Years) had less exposure to brucellosis than who age 45 and more. The common symptoms were fever (73%),

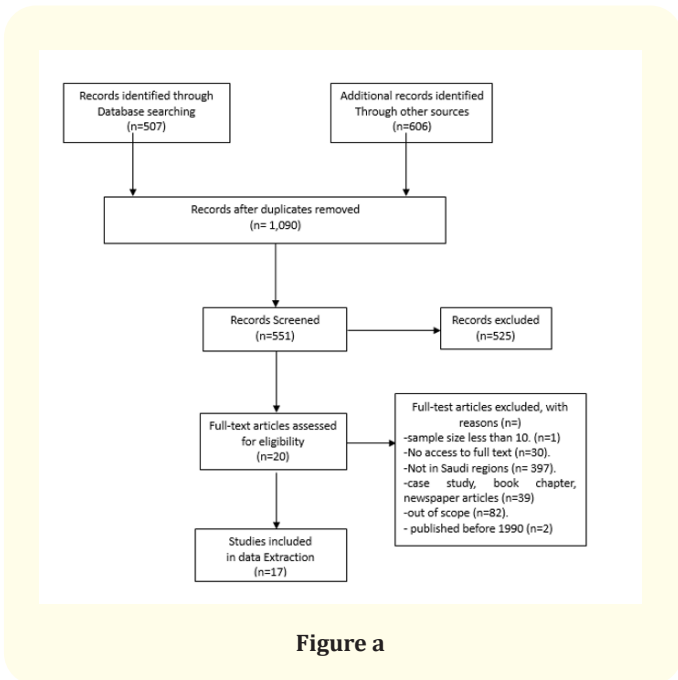


Figure a

This is a systematic review of scientific literature published between 1996-2022 relating to human brucellosis in Saudi Arabia regions. Reviewing brucellosis prevalence in Saudi population was the objective of this study.

Methods and Results

For this systematic search, we have developed a strategy to identify applicable literature. This search strategy was tailored to three databases: google scholar, ScienceDirect, PubMed, and the search terms used were the following: "Human brucellosis" OR "brucellosis" OR "Saudi Arabia" OR "Brucella".

All searches spanned from databases inception until 2022, and included journal articles, papers, research reports, published in English only.

The selection criteria were grounded on the PRISMA statement (Moher, *et al.* 2009). The quest mainly concentrated on the mapping of literature on Brucella in the field of science, biomedical sci-

arthralgia (21.7%), lethargy (21.6%), 28%, 27%, 25%, and 20% respectively suffered from sweating, headache, chills, backache. The prevalence rate of brucellosis in Madinah region found to be 2.6%. The most common presenting symptoms [6-11].

In the 20s (2001-2009) total of 3 articles met the inclusion criteria reported that In Tabuk province. in total 137 cases of brucellosis, male presented 64.2% versus female 35.8% (1.8:1 ratio), 86.1% of the cases occurred in Saudi nationals. 63.5% in rural area and 78.8% were from the Tabuk area. The clinical manifestations were symptoms of fever, joint/back pain, lethargy, sweating and headache. Another retrospective review that 64.3% were male of 115 cases. wA fever in 87.8%, followed by arthritis in 73% of the cases. Another article targeted 178 family members of 25 acute brucellosis patients, 23% manifested various symptoms, (77%) were asymptomatic, the most common symptoms experienced were arthralgia (73%), fever (30%), malaise (18%), backache (15%), headache (12.5%) and arthritis (5%) [12-14].

In the periods of (2010-2019) total of 5 articles met the inclusion criteria conducted in a variety of geographical areas in Saudi Arabia. In Najran, to total of 340 patients (76.5%) were male and (23.5%) were female (3.3:1). The notable symptoms were fever, joint pain, lower backache, headache, and vomiting, (205 patients) and direct contact with domestic animals. To increase the awareness of pediatricians and other childcare providers a paper was published in 2014 shows that 20-30% of affected patients in endemic area were pediatric and the seroprevalence in children aged 0-14 years was 10%. A trends of reported human cases of brucellosis in Kingdom of Saudi Arabia between 2004 to 2012 showed the incidence rate (IRs) among Saudi citizens were consistently higher than those among non-Saudis, over the study period: the IR among non-Saudis remained stable comparing with the decrease the IR among Saudis gradually. Saudi citizens had an IR of 27.1 and non-Saudis had an IR of 11.5 in 2004, while in 2012, Saudi citizens had an IR of 13.2 and non-Saudis had an IR of 11.2. By age group, those aged 15-44 years old had the highest prevalence, and those aged <1 year had the lowest prevalence. Most brucellosis cases were reported from March to August each year. Overall, April was the month with the highest number of reported cases. Another study conducted in Najran targeted 57 Child through 2013-2017, 15.8% of the cases were aged between 2-4 years, 28.1 between 4-8 years old, 21.1% aged between 8-10 years and 26.3% more than 10 years

old. 36.8% of cases presented with fever and arthralgia, 21.1% fever and myalgia, 19.3% fever and bone pain, 14.1% fever, vomiting and diarrhea, 5.4% fever, sweating and skin rash and only 3.5% with fever and respiratory symptoms. A study conducted for period of (2015-2018) at Wadi Al Dawaser, and out of 6721 samples tested, 576 (8.6%) were seropositive for brucellosis. 77.3% were male with a ratio of 3.3:1 (male to female). about, 82% were Saudi Nationals. No seasonal disparity was seen [15-19].

In the past 3 years, total of 6 articles met the inclusion criteria, to assess the knowledge, attitudes, and practices of parents regarding brucellosis a study conducted in Aseer region included 311 parents representing different genders, ages, levels of education, occupations, and family sizes. 29.6% were male parents and 37.9% had families of 1-5 persons. University-level education was recorded among 79.7% of the parents. Overall, most parents (73.6%) had good awareness of brucellosis. Awareness varied by age group ($p = 0.101$), male parents had better awareness than female parents ($p = 0.101$), and awareness was affected by the level of education ($p = 0.001$) but not by family size. Another study showed that Fever, arthralgia, and back pain were the most common presenting symptoms, occurring in (62%), (38%), and (34%) cases, respectively in a 118 patients. the median age at presentation was 50 years, much older than that reported in other studies, included 69% male to 31% female. A cross-sectional sero-epidemiological study performed in Aseer, South Saudi Arabia, between 2014 and 2018 included 7567 patients, the prevalence of brucellosis among the admitted suspected 7567 cases was 12.8%, The highest widespread rate was noticed in age group 21-40 year old (40.5%) followed by 41-60 years (27.7%). The lowest widespread rate was noticed in old and young children (15 and 3%, respectively). The prime symptoms were fatigue, hyperhidrosis, fever and joint pain. A study targeted children with sample size 153 patients, the most frequent presenting symptom was fever (77.12%). 41.2% of the patients had musculoskeletal symptoms, particularly arthralgia. the mean age was 7.75 ± 3.28 years with male majority (69.6%) [20-23].

Conclusion

Brucellosis known to be a commonest zoonotic disease worldwide; yet many of the endemic countries have controlled the prevalence over the years. Brucellosis has a widespread over all geographical areas of Saudi Arabia, however, high IRs found in the

central part, Perhaps this is due to the Bedouin heritage, which makes them vulnerable to disease (Figure 1).

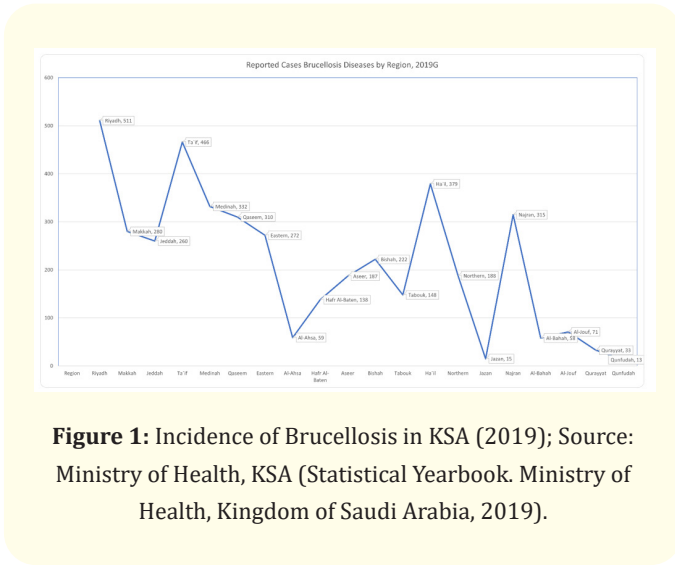


Figure 1: Incidence of Brucellosis in KSA (2019); Source: Ministry of Health, KSA (Statistical Yearbook. Ministry of Health, Kingdom of Saudi Arabia, 2019).

Also, the average diffusion of Brucellosis cases in 2019 was highest in Saudi males 68% especially the oldest (age 45 and above) and was lowest in non-Saudi females (only 4%) (Figure 2). This might be cause males are more involved in activities such as slaughter and handling of livestock and hence are at higher risk of infection than females.

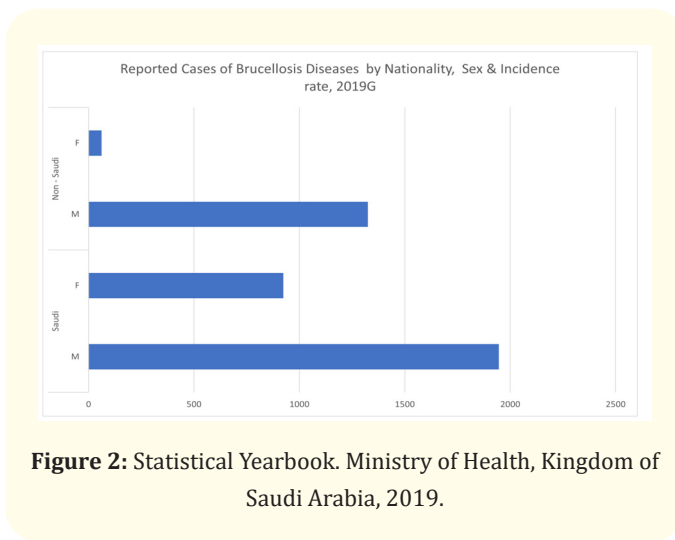


Figure 2: Statistical Yearbook. Ministry of Health, Kingdom of Saudi Arabia, 2019.

The symptoms of brucellosis in humans, according to earlier studies in KSA could range from asymptomatic to severe form of

disease and complications. Brucellosis is identified by fever, joint pain, headache, muscle pain, anorexia malaise and nausea or vomiting as reported in several studies and case reports conducted in KSA. Fever is the most common symptom of brucellosis.

Unlike other countries, the control of brucellosis in KSA is a difficult and challenged task, requires slaughter of infected animals which could be millions, that will lead to decrease the dairy products comparing to the high demand of it in Saudi Market. As we discussed about the prevalence of brucellosis among the people, effective control with a continuous efforts by health authorities are required. That’s why an active cooperation between health services and veterinary services to Introduce a health education program on the transmission of the disease and enhancing the awareness of brucellosis and brucellosis-related consequences is an important issue for its effective control.

Conflict of Interest

Author has no conflict of interests, and the work was not supported or funded by any company.

Competing Interests

The author declare that she has no competing interests.

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