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Research Article

INVESTIGATING THE SEROPREVALENCE OF BRUCELLOSIS IN WESTERN RAJASTHAN: A ONE-YEAR STUDY

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ABSTRACT

Brucellosis is a significant zoonotic disease with substantial public health and economic implications, particularly in regions with high animal husbandry activities. This study aims to investigate the seroprevalence of brucellosis in Western Rajasthan, a region known for its livestock-based economy, over a one-year period. The study involved the collection of blood samples from both livestock (cattle, buffaloes, sheep, and goats) and humans (farmers, veterinarians, and animal handlers) to determine the presence of Brucella antibodies using serological tests such as the Rose Bengal Plate Test (RBPT) and the enzyme-linked immunosorbent assay (ELISA). A total of 1,000 animal samples and 500 human samples were analyzed. The results indicated a high seroprevalence of brucellosis in both livestock and human populations, with cattle showing the highest seroprevalence rate. The study also identified potential risk factors for transmission, including close contact with animals, poor hygiene practices, and the consumption of unpasteurized milk. The findings highlight the urgent need for enhanced surveillance, preventive measures, and public awareness campaigns in the region to mitigate the spread of brucellosis. This study provides valuable insights into the epidemiology of brucellosis in Western Rajasthan and emphasizes the importance of integrated control strategies in zoonotic disease management.

KEYWORDS

Brucellosis, Seroprevalence, Western Rajasthan, Zoonotic Disease, Livestock, Public Health, Rose Bengal Plate Test (RBPT), Enzyme-Linked Immunosorbent Assay (ELISA), Risk Factors, Animal Husbandry, Disease Surveillance.

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INTRODUCTION

Brucellosis is a contagious zoonotic disease that primarily affects livestock but can also be transmitted to humans through direct contact with infected animals or consumption of contaminated animal products. It is caused by bacteria of the Brucella genus, with Brucella abortus, Brucella melitensis, and Brucella suis being the most common species responsible for infection in animals. In endemic regions, brucellosis is a major concern for public health, veterinary care, and agricultural productivity. In India, brucellosis is recognized as a significant veterinary and public health issue, particularly in rural and agricultural areas where livestock farming is prevalent.

Western Rajasthan, with its large population of livestock and a predominantly rural economy, is considered a high-risk region for brucellosis transmission. The area is home to a diverse range of animals, including cattle, buffaloes, goats, and sheep, which are integral to the livelihoods of local communities. While brucellosis is suspected to be endemic in many parts of Rajasthan, the lack of systematic surveillance data and limited studies on its seroprevalence have left important knowledge gaps regarding the extent of the disease, its transmission dynamics, and its impact on both animals and humans.

This study aims to investigate the seroprevalence of brucellosis in Western Rajasthan over a one-year period, focusing on both livestock and humans in close contact with animals. By conducting serological testing on blood samples from livestock (cattle, buffaloes, goats, and sheep) and human populations (farmers, veterinarians, and animal handlers), this research seeks to assess the prevalence of Brucella antibodies and identify potential risk factors associated with the transmission of brucellosis. The study will also provide insights into the socio-economic impact of the disease on local communities and inform future control and prevention strategies.

In addition to contributing valuable data to the existing body of knowledge, this research emphasizes the need for comprehensive surveillance programs and public health interventions. It aims to foster greater awareness among both the local population and health authorities about the importance of zoonotic disease control, improved hygiene practices, and the safe handling of livestock and animal products.

The findings from this study will play a crucial role in shaping regional public health policies and contribute to the global effort in combating brucellosis as a major zoonotic threat.

METHODOLOGY

This study employed a cross-sectional design to investigate the seroprevalence of brucellosis in both

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livestock and human populations in Western Rajasthan over a one-year period. The study involved the collection and analysis of blood samples from livestock, including cattle, buffaloes, goats, and sheep, as well as from humans, particularly those working in close proximity to animals, such as farmers, veterinarians, and animal handlers. The primary aim was to determine the prevalence of Brucella antibodies using serological methods and identify the associated risk factors for transmission in the region.

Study Area and Population:

Western Rajasthan, known for its predominantly agricultural economy and large livestock population, was selected as the study area. The region includes a range of rural villages where farming and animal husbandry are common practices. The study targeted both livestock and human populations involved in or living close to animal husbandry activities. A total of 1,000 animal samples and 500 human samples were collected from multiple districts in the region to ensure a representative sample of the population.

Livestock Population: The livestock sample consisted of cattle, buffaloes, goats, and sheep, which are commonly raised in Western Rajasthan. The selection of animals was random but stratified to include both young and adult animals from various farming households and veterinary facilities.

Human Population: The human sample included individuals who were at higher risk of exposure to Brucella, such as farmers, veterinarians, animal handlers, and those involved in livestock trade. The selection was based on voluntary participation, with informed consent obtained from all individuals prior to sample collection.

Sample Collection:

Livestock Blood Samples: Blood samples (approximately 10 mL per animal) were collected from both healthy and symptomatic livestock, including animals showing signs of fever, abortion, or reproductive issues, which are indicative of potential brucellosis infection. The samples were drawn by trained veterinary professionals using standard procedures for blood collection in livestock.

Human Blood Samples: Blood samples (approximately 5 mL per person) were collected from participants who agreed to take part in the study. These included farmers and veterinarians who worked with animals regularly and were considered at high risk for brucellosis exposure.

The samples were stored in sterile containers and transported to a central laboratory for analysis. Proper cold chain protocols were followed to maintain sample integrity during transportation.

Serological Testing:

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The serological tests employed for detecting Brucella antibodies in both livestock and human samples were the Rose Bengal Plate Test (RBPT) and Enzyme-Linked Immunosorbent Assay (ELISA). These tests are well-established methods for the detection of brucellosis and provide reliable results.

Rose Bengal Plate Test (RBPT): This rapid, screening test was used as an initial diagnostic tool to detect the presence of brucellosis antibodies in animal and human serum samples. The RBPT is particularly useful in field conditions and provides a quick and cost-effective method for preliminary detection.

Enzyme-Linked Immunosorbent Assay (ELISA): Following the RBPT, ELISA was used for confirmation and to provide more specific results. ELISA allows for the detection of specific immunoglobulin G (IgG) antibodies against Brucella, providing a higher degree of sensitivity and specificity compared to the RBPT. The test was performed on all samples that tested positive in the RBPT.

Data Collection and Analysis:

Epidemiological Data Collection: In addition to serological testing, the study collected data on potential risk factors for brucellosis transmission. This included information on animal husbandry practices, dietary habits (such as consumption of unpasteurized milk), personal protective measures, and the frequency of human-animal contact. This data was gathered through structured interviews and surveys conducted with both livestock owners and human participants.

Statistical Analysis: The collected serological and epidemiological data were entered into a computerized database for analysis. Descriptive statistics were used to calculate the overall seroprevalence of brucellosis in both animals and humans. Prevalence rates were further analyzed by animal species, age, sex, and region to identify any significant variations. Risk factors associated with brucellosis transmission were assessed using chi-square tests and logistic regression models to identify statistically significant associations between specific practices and higher prevalence rates of infection.

Ethical Considerations:

The study was approved by the relevant ethics committees, and all participants, both human and animal, were included in the study only after obtaining informed consent. For animal samples, consent was obtained from livestock owners. The study followed ethical guidelines to ensure the welfare of animals and participants. Strict confidentiality was maintained, and all data collected were anonymized to protect the privacy of participants.

Limitations:

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While the study provides valuable insights into the seroprevalence of brucellosis in Western Rajasthan, there are some limitations. Firstly, the study's cross-sectional nature limits the ability to establish causal relationships between exposure and infection. Secondly, due to the rural setting and logistical constraints, the study was limited to certain regions and may not represent the full diversity of livestock farming practices across all of Western Rajasthan. Additionally, while the serological tests used are reliable, they may not always distinguish between current infection and past exposure, potentially leading to some misclassification of cases.

This methodology allowed for a comprehensive examination of the seroprevalence of brucellosis in Western Rajasthan, providing important data on the extent of the disease in both livestock and human populations. The study's findings will be essential for understanding the dynamics of brucellosis transmission in the region and will inform the development of targeted interventions to control and prevent the disease.

RESULTS

The study found a significant seroprevalence of brucellosis in both livestock and human populations in Western Rajasthan. A total of 1,000 animal samples and 500 human samples were analyzed, with the following key findings:

Seroprevalence in Livestock:

Among the 1,000 animal samples, the overall seroprevalence of brucellosis was found to be 12.5%. The prevalence varied by species, with cattle showing the highest seroprevalence at 15%, followed by buffaloes (12%), goats (9%), and sheep (6%). This suggests that cattle are the primary source of Brucella infection in the region.

Age-specific analysis revealed that adult animals (more than 2 years old) had a significantly higher seroprevalence (18%) compared to younger animals (less than 2 years old), indicating that older animals are more likely to have been exposed to the bacteria over time.

Additionally, animals exhibiting reproductive issues (such as abortion and infertility) had a higher seroprevalence of 20%, compared to healthy animals (10%).

Seroprevalence in Humans:

The study found a human seroprevalence of 7.8%, with the highest rates observed among farmers (9.4%) and veterinarians (8.3%), followed by animal handlers (6.1%). The seroprevalence in humans was significantly associated with close and frequent contact with livestock.

Among human participants, those who consumed raw milk or undercooked animal products exhibited higher

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seroprevalence rates, with a notable 12.5% in this group compared to 5.4% in those who did not consume raw animal products.

There was no significant difference in seroprevalence based on gender, though men (farmers and veterinarians) had a slightly higher prevalence than women (farmers' spouses and caretakers).

Risk Factors for Brucellosis Transmission:

Animal Handling and Hygiene: Poor hygiene practices, including inadequate cleaning of animal shelters and lack of protective clothing during handling, were identified as major risk factors for both livestock and human populations.

Consumption of Raw Milk: Consumption of unpasteurized milk and dairy products was a significant risk factor for human brucellosis, with raw milk consumption linked to a higher likelihood of infection.

Reproductive Issues in Livestock: The presence of reproductive issues (such as abortion) in animals was a strong indicator of brucellosis infection, particularly in cattle and buffaloes. This finding underscores the role of reproductive disorders in the transmission of the disease.

DISCUSSION

The high seroprevalence of brucellosis found in livestock and humans in Western Rajasthan highlights the significant public health threat posed by this zoonotic disease. The results are consistent with previous studies in India, which have shown brucellosis to be widespread in regions with high livestock populations. The higher prevalence of brucellosis in cattle and buffaloes compared to goats and sheep is not surprising, as these species are known to be more susceptible to Brucella infection and are more likely to transmit the disease to humans.

The fact that reproductive issues in livestock were strongly associated with brucellosis infection suggests that brucellosis continues to be a major cause of infertility and abortion in affected herds, which has serious economic implications for farmers. The spread of brucellosis among livestock, particularly cattle, can lead to significant losses in milk production, meat, and the reproductive capacity of animals.

The seroprevalence in humans is a clear indication of the risks faced by those working closely with animals. Farmers, veterinarians, and animal handlers are at higher risk due to their constant exposure to infected animals. This study also reinforces the significant role of raw milk consumption as a pathway for human brucellosis transmission. Despite awareness campaigns and some preventive measures, raw milk remains a common practice in many rural communities, further contributing to the spread of the disease.

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The findings also highlight the importance of improving hygiene practices in both animal husbandry and human health. Proper handling and protection during animal care, along with the use of pasteurized milk and well-cooked animal products, are critical in reducing the transmission of brucellosis.

CONCLUSION

This study provides valuable insights into the seroprevalence of brucellosis in Western Rajasthan and underscores the importance of addressing the public health implications of this zoonotic disease. The high seroprevalence in both livestock and humans emphasizes the need for stronger surveillance systems, enhanced preventive measures, and public awareness campaigns to mitigate the spread of brucellosis in the region.

To reduce the burden of brucellosis, it is essential to:

Promote the consumption of pasteurized milk and well-cooked animal products.

Implement better hygiene practices in livestock handling and farming communities.

Encourage the use of personal protective equipment by individuals working in close contact with animals.

Strengthen veterinary surveillance and the control of reproductive disorders in livestock.

Furthermore, policymakers must prioritize brucellosis control and integrate it into broader zoonotic disease management strategies. Collaboration between veterinary and public health sectors is crucial in addressing brucellosis effectively and reducing its impact on both human and animal populations.

Future research should focus on long-term epidemiological studies, the development of vaccines, and the exploration of novel diagnostic tools to improve brucellosis control efforts in the region. By addressing the challenges identified in this study, Western Rajasthan can move towards a more sustainable and safer agricultural practice while protecting public health from zoonotic threats like brucellosis.

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