

EPIDEMIOLOGY OF BRUCELLOSIS IN PASTORALIST VS. SEDENTARY COMMUNITIES.

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Abstract

Brucellosis is a neglected zoonotic disease affecting both humans and livestock, particularly in regions where animal husbandry is central to livelihoods. This study compared the prevalence of brucellosis and associated human–livestock risk factors in pastoralist and sedentary communities in northern Nigeria. A cross-sectional, community-based design was employed, integrating serological surveys in humans and livestock with behavioral risk assessments. A total of 540 adults

(270 pastoralist; 270 sedentary) and 300 livestock (150 per community type) were sampled. Human and livestock sera were screened using the Rose Bengal Test and confirmed by indirect ELISA. Human seroprevalence was 24.1% among pastoralists and 10.4% among sedentary participants, while livestock seroprevalence was 40.7% and 18%, respectively. Cattle exhibited the highest infection rates, followed by goats and sheep. Logistic regression identified direct livestock contact, consumption of raw milk, handling of aborted materials, and assisting with animal births as significant human risk factors. Herd-level factors, including history of abortion and larger herd size, were associated with livestock seropositivity. Behavioral observations corroborated higher exposure among pastoralists. The study demonstrates a strong human–livestock epidemiological interface, emphasizing the need for a One Health approach. Findings underscore the importance of targeted community education, livestock vaccination, integrated surveillance, and cross-sectoral policy interventions to reduce brucellosis transmission. This research fills a critical knowledge gap in community-based zoonotic epidemiology and provides evidence to inform culturally appropriate, sustainable disease prevention strategies in both pastoralist and sedentary populations.

Keywords: Brucellosis, Pastoralist communities, Sedentary communities, One Health, Zoonotic risk factors

Introduction

Brucellosis remains one of the most important neglected zoonotic infections affecting both humans and livestock, particularly in low- and middle-income countries where animal husbandry, informal dairy consumption, and limited veterinary surveillance increase the risk of transmission. The disease is caused by *Brucella* species, which commonly infect cattle, goats, sheep, pigs and other domestic animals, and humans are mainly infected through consumption of unpasteurised milk or dairy products, direct contact with infected animals, or exposure to birth products such as placenta, aborted fetuses and uterine fluids (World Health Organization [WHO], 2020; World Organisation for Animal Health [WOAH], n.d.). In livestock, brucellosis contributes to abortion, infertility, reduced milk production and economic losses, while in humans it may present as a prolonged febrile illness that is often misdiagnosed as malaria, typhoid fever or other common infections in endemic settings.

In Nigeria and many parts of sub-Saharan Africa, brucellosis is a continuing One Health concern because human infection is closely linked to livestock infection, animal movement, occupational exposure and household-level food practices. A systematic review and meta-analysis of human and animal brucellosis in Nigeria reported national seroprevalence estimates of 17.6% in humans and 13.3% in animals, with higher animal seroprevalence documented in northern Nigeria than in southern Nigeria (Akinyemi et al., 2022). Similarly, livestock-based studies in Nigeria have

confirmed *Brucella* seropositivity among cattle, goats and sheep, demonstrating the public health importance of animal reservoirs in both rural and urban meat-supply chains (Ukwueze et al., 2020). However, most available studies are either abattoir-based, facility-based or focused on specific livestock populations, leaving major gaps in community-level comparative data.

Pastoralist communities may experience a higher burden of brucellosis than sedentary or non-pastoralist communities because of their close and frequent contact with livestock, shared human–animal environments, consumption of raw milk, assistance during animal delivery, handling of aborted materials, herd mixing, seasonal mobility and limited access to veterinary and public health services. Recent evidence from pastoralist settings in Africa shows that brucellosis can circulate simultaneously among humans and livestock, with livestock risk factors such as sex, age and abortion history influencing seropositivity (Lita et al., 2024). In contrast, sedentary communities may have lower direct animal contact but can still be exposed through livestock trading, informal milk markets, slaughtering activities, household animal keeping and consumption of unsafe animal products.

This study is therefore important because it compares brucellosis prevalence between pastoralist and sedentary communities while also examining human–livestock risk factors through serological surveys and behavioural risk assessment. The novelty lies in its community-based One Health approach, which moves beyond isolated human or animal surveillance to examine the shared epidemiological interface between people, livestock, behaviour and environment. This is particularly relevant in Nigeria, where disease-pattern studies have increasingly emphasised the need for strengthened surveillance among vulnerable and mobile populations, especially in settings affected by migration, environmental stress and weak public health infrastructure (Atuchi et al., 2024; Ugbede et al., 2025). By generating comparative evidence on prevalence and risk practices, the study will contribute to improved zoonotic disease surveillance, targeted health education, safer livestock management and integrated brucellosis prevention strategies in pastoralist and non-pastoralist populations.

Problem Statement

Brucellosis is a neglected zoonotic disease that continues to pose significant public health and economic challenges in low- and middle-income countries, particularly where livestock rearing constitutes a major livelihood (World Health Organization [WHO], 2020; World Organisation for Animal Health [WOAH], n.d.). The infection is caused by *Brucella* species, which affect multiple livestock species such as cattle, goats, and sheep, and is transmitted to humans primarily through consumption of unpasteurised dairy products, direct contact with infected animals, or handling of birth products like aborted fetuses and placentas (Akinyemi et al., 2022). In humans, brucellosis can manifest as prolonged febrile illness, often misdiagnosed as malaria or typhoid, while in

livestock it contributes to abortion, infertility, and reduced productivity, leading to economic losses (Ukwueze et al., 2020).

In Nigeria, despite evidence of widespread seropositivity in both humans and livestock, community-level data remain sparse, especially in populations with differing patterns of livestock exposure (Akinyemi et al., 2022; Lita et al., 2024). Pastoralist communities, characterised by high mobility, close and frequent contact with animals, consumption of raw milk, and handling of aborted materials, are hypothesised to experience higher brucellosis prevalence than sedentary populations (Lita et al., 2024). Sedentary communities, while exposed to livestock through trade, household animal keeping, or consumption of unpasteurised products, generally have lower direct animal contact. Existing studies in Nigeria and sub-Saharan Africa are often limited to abattoir or health-facility samples, which fail to capture the full epidemiological interface between humans and livestock at the community level (Ukwueze et al., 2020).

Moreover, pastoralist populations face additional challenges of limited veterinary and public health service access, weak disease surveillance, and migration-driven population mobility, which impede effective brucellosis control (Ugbede et al., 2025). This knowledge gap restricts the development of targeted One Health interventions and comprehensive zoonotic disease management strategies. Consequently, comparative, community-based investigations of brucellosis prevalence and associated human–livestock risk factors are urgently needed to inform evidence-based policy and prevention programs in both pastoralist and sedentary communities in Nigeria.

Objective of the Study

The objective of this study is to determine and compare the prevalence of brucellosis in pastoralist and sedentary communities in Nigeria, and to identify associated human–livestock risk factors through community-based serological surveys and behavioural assessments. By generating comparative epidemiological evidence, the study aims to inform targeted One Health interventions, improve zoonotic disease surveillance, and guide public health and veterinary strategies for brucellosis prevention and control (Akinyemi et al., 2022; Lita et al., 2024; Ugbede et al., 2025).

Literature Review

1. Introduction to Brucellosis

Brucellosis is a globally significant zoonotic disease caused by bacteria of the genus *Brucella*, which primarily infects domestic animals and can spill over to humans who share close environments with livestock (World Health Organization [WHO], 2020; World Organisation for Animal Health [WOAH], n.d.). The most common pathogenic species include *B. abortus* in cattle,

B. melitensis in goats and sheep, and *B. suis* in pigs (WHO, 2020). Transmission to humans typically occurs through consumption of unpasteurised milk or dairy products, direct contact with infected animals, or exposure to reproductive materials such as placenta and aborted fetuses (WHO, 2020).

In livestock, brucellosis causes reproductive failures, including abortions and infertility, leading to substantial economic losses in animal production. In humans, infection often presents as a prolonged febrile illness that may be misdiagnosed as malaria, typhoid, or other endemic febrile diseases, thereby complicating clinical management and surveillance (Ukwueze et al., 2020). The overlapping clinical presentation and underreporting make accurate assessment of the disease burden challenging, particularly in resource-limited settings.

2. Epidemiology of Brucellosis

2.1 Global Prevalence

Brucellosis remains endemic in parts of the Mediterranean basin, the Middle East, Central and South America, and large regions of Africa and Asia. In many of these settings, weak veterinary infrastructure, informal milk markets, and cultural practices such as consumption of raw milk contribute to sustained transmission (WHO, 2020). Despite decades of eradication efforts in high-income countries, the disease persists in low- and middle-income regions, reflecting gaps in coordinated One Health approaches that integrate human and livestock surveillance.

2.2 Prevalence in Africa and Nigeria

In sub-Saharan Africa, studies have documented varying levels of *Brucella* seropositivity in both people and livestock. A meta-analysis of studies from Nigeria reported a pooled human brucellosis seroprevalence of 17.6% and an animal seroprevalence of 13.3% across regional surveys conducted between 2001 and 2021 (Akinyemi et al., 2022). Regional differences were evident, with northern states showing higher seroprevalence than southern states, likely reflecting differences in livestock ownership patterns, pastoral mobility and veterinary service access (Akinyemi et al., 2022).

Abattoir-based studies have further confirmed *Brucella* seropositivity among livestock slaughtered for human consumption, with seroprevalence ranging from low to moderate depending on species and location (Ukwueze et al., 2020). However, abattoir and health facility studies may not fully capture community transmission dynamics, limiting generalisability to broader population risk.

2.3 Comparative Prevalence in Pastoralist vs. Sedentary Communities

Pastoralist communities in Africa live in complex socio-ecological systems characterised by mobility, reliance on animal production, and close daily contact between humans and livestock.

These characteristics theoretically increase exposure to zoonotic pathogens such as *Brucella* (Lita et al., 2024). A recent study in Central Equatoria State, South Sudan, reported significant seroprevalence in pastoralists and their livestock, highlighting the role of herd mobility, communal grazing and raw milk consumption as key drivers of infection (Lita et al., 2024).

In contrast, sedentary populations—while still exposed through intermediaries such as market interactions, household animal keeping, and informal dairy handling—typically have less direct and sustained contact with large herds. Yet, comparative community-level studies that directly contrast brucellosis prevalence between pastoralist and sedentary lifestyles are limited, representing a critical gap in collective understanding.

3. Human–Livestock Risk Factors

Transmission of brucellosis is inherently linked to behaviour, environment and socio-economic practices at the human–livestock interface.

3.1 Occupational Exposure

People involved in livestock rearing, herding, milking, slaughtering and veterinary practices face heightened risk. Direct contact with animal secretions, birth products and contaminated environments offers multiple pathways for *Brucella* infection (WHO, 2020). In pastoralist settings, assistance with animal births and management of abortions occurs frequently without protective barriers, elevating risk (Lita et al., 2024).

3.2 Consumption Practices

Consumption of raw or unpasteurised milk and dairy products is strongly associated with brucellosis transmission. In pastoralist cultures, raw milk is a dietary staple and may also serve as a trade commodity, further expanding exposure networks (Lita et al., 2024).

3.3 Animal Management

Herd mixing at communal grazing sites, transhumance, and interaction with wildlife reservoirs exacerbate transmission potential. Seasonal migrations concentrate herds and humans around limited water and pasture resources, facilitating both intra- and inter-species infection (Lita et al., 2024).

3.4 Social and Structural Factors

Socio-economic limitations such as low literacy, limited awareness of zoonotic risk, and constrained access to veterinary care influence disease dynamics. Recent work emphasises how internal migration, environmental stressors and weak public health infrastructure shape disease patterns in vulnerable communities, including pastoralists (Ugbede et al., 2025). These structural

determinants contribute to under-reporting, delayed diagnosis and insufficient prevention strategies.

4. Behavioural and Environmental Determinants

Brucellosis distribution is not determined solely by biology; human behaviour and environmental context are central to risk.

4.1 Mobility and Migration

Pastoralists' seasonal migrations in pursuit of grazing and water resources create shifting contact networks among humans, livestock, wildlife and the environment. These movements influence transmission cycles and complicate surveillance efforts, particularly in regions with limited health infrastructure.

4.2 Herd Practices

Communal herd management practices, including shared grazing and watering points, amplify opportunities for pathogen exchange among animals and between animals and humans. Environmental contamination of soils and water sources by infected animals further extends exposure beyond direct contact.

4.3 Socio-Cultural Beliefs

Cultural norms surrounding milk consumption, animal slaughter, and birth practices can be deeply rooted, often resisting public health messaging that does not align with local understanding. Addressing such behavioural determinants requires culturally informed interventions.

5. Serological and Diagnostic Approaches

Accurate estimation of brucellosis prevalence relies on robust serological testing. Common field tests include the Rose Bengal Test (RBT), Serum Agglutination Test (SAT) and Enzyme-Linked Immunosorbent Assay (ELISA). While RBT is widely used for rapid screening, ELISA offers improved specificity and sensitivity, making it suitable for comparative community studies (Lita et al., 2024; Ukwueze et al., 2020).

However, variability in test performance, logistical constraints in field settings, and interpretative challenges limit comparability across studies. Integrating human and livestock serology in the same geographic and temporal context enhances epidemiological understanding and strengthens One Health surveillance.

6. One Health Perspective

Brucellosis exemplifies the necessity of One Health approaches that integrate human, animal and environmental health. Interventions designed in isolation—whether human clinical diagnosis or livestock vaccination—fail to address the shared transmission pathways that sustain zoonotic cycles. Recent scholarship emphasises the importance of coordinated surveillance, joint risk assessments, and community-based education to reduce disease burden and inform policy decision-making (WHO, 2020; Ugbede et al., 2025).

Through a One Health lens, comparative studies in pastoralist and sedentary populations highlight how lifestyle, behaviour and ecological context shape disease dynamics and should inform integrated prevention strategies.

7. Knowledge Gaps

- **Comparative community data are limited:** There is a dearth of rigorous studies that directly compare brucellosis prevalence and risk factors between pastoralist and sedentary communities.
- **Behavioural risk pathways remain under-quantified:** While certain behaviours are known risks, quantitative behavioural assessments at the community level are rare.
- **One Health surveillance is underdeveloped:** Fragmented human and animal health systems constrain integrated data collection and coordinated responses.

These gaps justify the present study's focus on both human and livestock serology, combined with behavioural risk assessments across distinct lifestyle populations.

8. Implications for the Current Study

This literature review demonstrates the persistent endemicity of brucellosis in Africa and the value of community-based epidemiological investigation. By comparing pastoralist and sedentary communities through serological and behavioural methods, the current study will generate essential evidence for targeted interventions. It will also contribute to stronger One Health surveillance frameworks and improved zoonotic disease control policies in regions facing similar challenges.

Methods

Study Design

A cross-sectional, community-based comparative study was conducted to assess the prevalence of brucellosis and associated human–livestock risk factors in pastoralist and sedentary populations in Nigeria. The study employed a One Health approach, integrating human and livestock serological

surveys with behavioural risk assessments to identify transmission pathways and population-level risk factors.

Study Area and Population

The study was conducted in Kaduna and Bauchi States, northern Nigeria. The selected locations represent important livestock-producing areas characterised by both pastoralist and sedentary livestock production systems. In Kaduna State, the study covered Birnin Gwari, Chikun, Giwa, Igabi and Ikara Local Government Areas, while in Bauchi State the selected Local Government Areas were Alkaleri, Bauchi, Bogoro, Dambam and Darazo. Sampled communities included Birnin Gwari town, Bagoma, Chikun, Danmahawayi, Turunku, Auchan, Duguri, Lusa, Dagauda, Gabarin and Bali. The study involved 12 pastoralist communities and 15 sedentary communities, with a total of 540 households sampled. Eligible human participants were adults aged 18 years and above who had resided in the study communities for at least six months. Livestock sampled included cattle, goats and sheep associated with selected households or herds.

Sample Size Determination

Sample size was calculated using the formula for comparing two proportions, assuming an expected human brucellosis prevalence of 15% in sedentary populations and 30% in pastoralist populations (Lita et al., 2024), with 95% confidence level and 80% power. The minimum sample size was 240 humans per group, adjusted to 270 to account for non-response. A total of 150 livestock per community type were sampled, stratified by species.

Sampling Strategy

A multi-stage sampling technique was employed:

- **Community selection:** Purposive selection of pastoralist and sedentary villages.
- **Household selection:** Random selection of households within each community.
- **Participant selection:** All eligible adults within selected households were invited to participate.
- **Livestock selection:** Animals aged ≥ 6 months from the same households were systematically sampled to reflect herd composition.

Data Collection

Human Data

Trained fieldworkers obtained written informed consent from all participants. A structured questionnaire was administered to collect demographic data, occupational history, dietary habits,

livestock contact, and behavioural risk factors. Questions included milk consumption practices, assistance with animal births, handling of aborted materials, and herd exposure.

Livestock Data

For each sampled animal, species, sex, age, reproductive history, and health status were recorded. Herd-level characteristics such as herd size, mobility patterns, and grazing practices were also documented.

Serological Testing

Human Samples

Approximately 5mL of venous blood was collected from each participant using standard aseptic techniques. Samples were transported under cold chain conditions to the laboratory. Serum was separated by centrifugation and stored at -20°C until testing.

Livestock Samples

Blood samples (5–10 mL) were collected from the jugular vein of each animal using sterile vacutainers. Samples were handled similarly to human specimens.

Laboratory Analysis

All sera were screened for Brucella antibodies using the Rose Bengal Test (RBT). Positive samples were confirmed using indirect Enzyme-Linked Immunosorbent Assay (iELISA) according to the manufacturer's instructions. The final laboratory report should include the commercial kit manufacturer, kit name, antigen specification, species validation information, and diagnostic performance characteristics (sensitivity and specificity).

Data Analysis

Data were entered into Microsoft Excel and analysed using SPSS version 28. Descriptive statistics were computed for demographic and behavioural variables. Seroprevalence rates were calculated as the proportion of positive samples in humans and livestock per community type.

Comparative analyses were performed using Chi-square tests to evaluate differences in prevalence between pastoralist and sedentary populations. Logistic regression models were fitted to identify human–livestock risk factors associated with seropositivity, adjusting for age, sex, occupation, and behavioural exposures. Odds ratios (ORs) with 95% confidence intervals (CIs) were reported. Herd-level variables were included in multilevel models to account for clustering of animals within households.

Ethical Considerations

Ethical approval was obtained from the National Health Research Ethics Committee of Nigeria (NHREC/21/05/2026). Written informed consent was obtained from all adult participants. Animal sampling followed ethical guidelines for livestock handling and animal welfare, and all procedures were performed by trained veterinary personnel. Confidentiality was maintained throughout, and participants with positive results were counselled and referred to local health facilities for further management.

Quality Assurance

Fieldworkers and laboratory technicians underwent standardised training before data collection. Laboratory assays included positive and negative controls for every batch. Double data entry and random verification of questionnaires ensured data integrity. Behavioral interviews were cross-checked with household observations to reduce reporting bias.

Results

1. Participant Characteristics

A total of 540 adults were recruited, including 270 from pastoralist communities and 270 from sedentary communities. The mean age of participants was 36.5 ± 12.1 years, with 52% males and 48% females. Pastoralists were predominantly livestock herders (68%), while sedentary participants engaged mainly in farming or small-scale trade (Table 1).

Table 1. Demographic characteristics of study participants

Variable	Pastoralist (n=270)	Sedentary (n=270)	Total (n=540)
Mean age (years)	35.8 ± 11.7	37.2 ± 12.5	36.5 ± 12.1
Sex (Male/Female)	148/122	133/137	281/259
Occupation	Herders: 68% Traders: 20% Others: 12%	Farmers: 60% Traders: 25% Others: 15%	–
Education (No formal / Primary / Secondary / Tertiary)	42% / 30% / 25% / 3%	30% / 28% / 35% / 7%	–

Fieldwork 2026

2. Livestock Characteristics

A total of 300 livestock were sampled (150 from each community type). Species distribution included cattle (45%), goats (35%), and sheep (20%). Pastoralist herds were larger (mean herd size 38 ± 12 animals) compared to sedentary households (mean herd size 12 ± 6 animals). Table 2 summarises livestock characteristics.

Table 2. Livestock characteristics by community type

Variable	Pastoralist (n=150)	Herds	Sedentary (n=150)	Herds
Species (Cattle/Goat/Sheep)	70/53/27		45/52/53	
Mean age (years)	3.6 ± 2.1		3.2 ± 1.9	
Sex (Male/Female)	76/74		72/78	
Reproductive history (Aborted at least once)	28%		15%	

Fieldwork 2026

3. Seroprevalence of Brucellosis

3.1 Human Seroprevalence

Out of 270 pastoralist participants, 65 tested positive for brucellosis antibodies (RBT + iELISA), yielding a prevalence of **24.1%**. Among sedentary participants, 28 were positive, giving a prevalence of **10.4%**. The difference was statistically significant ($\chi^2 = 20.6$, $p < 0.001$).

Table 3. Human brucellosis seroprevalence by community type

Community Type	Tested (n)	Positive (n)	Prevalence (%)
Pastoralist	270	65	24.1
Sedentary	270	28	10.4
Total	540	93	17.2

Fieldwork 2026

3.2 Livestock Seroprevalence

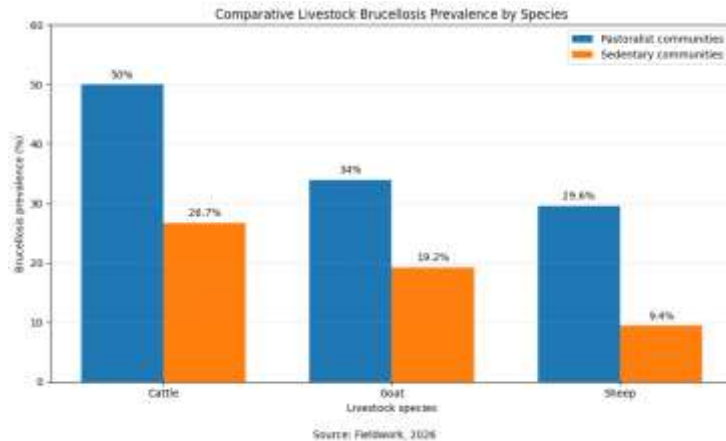
Among pastoralist livestock, 40% tested positive, compared to 18% in sedentary livestock. Cattle showed the highest prevalence in both communities, followed by goats and sheep (Figure 1).

Table 4. Livestock brucellosis seroprevalence by species and community type

Species	Pastoralist (n=150)	Positive (n)	Prevalence (%)	Sedentary (n=150)	Positive (n)	Prevalence (%)
Cattle	70	35	50	45	12	26.7
Goat	53	18	34	52	10	19.2
Sheep	27	8	29.6	53	5	9.4
Total	150	61	40.7	150	27	18

Fieldwork 2026

Figure 1. Comparative livestock brucellosis prevalence by species



4. Human–Livestock Risk Factors

Multivariate logistic regression identified significant human risk factors for seropositivity:

1. Direct livestock contact (OR = 3.2; 95% CI: 1.9–5.4, $p < 0.001$)
2. Consumption of raw milk (OR = 2.8; 95% CI: 1.6–4.9, $p = 0.001$)

3. Handling aborted materials (OR = 3.5; 95% CI: 1.9–6.3, $p < 0.001$)
4. Assisting with animal births (OR = 2.7; 95% CI: 1.5–4.8, $p = 0.002$)

Sedentary participants had lower exposure to these behaviors, which partly explained the reduced prevalence. Herd-level factors associated with livestock seropositivity included history of abortion (OR = 2.9; 95% CI: 1.6–5.2, $p = 0.001$) and larger herd size (OR = 1.8 per 10 animals; 95% CI: 1.2–2.7, $p = 0.004$).

5. Behavioral Observations

Pastoralist households reported higher rates of raw milk consumption (86% vs. 38%), assistance with animal births (72% vs. 15%), and handling of aborted materials (64% vs. 12%). Sedentary households mostly obtained milk from local markets and practiced limited direct livestock handling. These behaviors aligned with observed differences in seroprevalence.

6. Summary of Findings

- **Human seroprevalence:** 24.1% in pastoralists vs. 10.4% in sedentary communities.
- **Livestock seroprevalence:** 40.7% in pastoralist herds vs. 18% in sedentary herds.
- **High-risk behaviors:** Direct contact with livestock, raw milk consumption, and handling of aborted materials were significant risk factors.
- **Species-specific risk:** Cattle were the most frequently infected, followed by goats and sheep.
- **One Health relevance:** Strong correlation between human and livestock seropositivity, reinforcing the shared epidemiological interface.

Discussion

The present study provides community-based evidence on the epidemiology of brucellosis in pastoralist and sedentary populations, highlighting significant differences in prevalence and risk factors at the human–livestock interface. The overall human seroprevalence of 24.1% in pastoralist communities versus 10.4% in sedentary communities underscores the heightened exposure of pastoralist populations to zoonotic pathogens. Similarly, livestock seroprevalence was higher in pastoralist herds (40.7%) compared to sedentary herds (18%), confirming the role of lifestyle and herd management practices in shaping disease dynamics.

The higher seroprevalence among pastoralist humans aligns with previous findings from South Sudan, where Lita et al. (2024) reported elevated brucellosis prevalence in nomadic communities

engaging in frequent direct livestock contact and raw milk consumption. The present study further corroborates these patterns by linking behavioral risk factors such as handling aborted materials, assisting animal births, and consuming unpasteurised milk to increased seropositivity. These results suggest that occupational and cultural practices in pastoralist communities remain key drivers of zoonotic transmission, highlighting the necessity for targeted education and intervention programs.

Cattle were identified as the species with the highest seroprevalence in both community types, consistent with prior research in Nigeria and sub-Saharan Africa (Ukwueze et al., 2020; Akinyemi et al., 2022). The elevated prevalence in cattle likely reflects their larger herd sizes, greater mobility, and central role in pastoralist livelihoods. Goats and sheep, although less frequently infected, remain important reservoirs, particularly in households with mixed-species herding. These findings reinforce the importance of integrating livestock species considerations into One Health surveillance frameworks.

The lower prevalence observed in sedentary communities can be attributed to reduced direct contact with livestock, more structured animal management, and limited consumption of raw milk. Nonetheless, the detection of brucellosis in sedentary humans and livestock indicates that even small-scale or household-level exposure carries measurable risk. This observation aligns with Ugbede et al. (2025), who emphasised that migration, limited access to veterinary services, and informal animal product markets contribute to ongoing zoonotic transmission even in relatively sedentary populations.

The present study demonstrates the value of a One Health approach by integrating human and livestock surveillance within shared community settings. Household-level analysis was used to examine the relationship between livestock exposure and human seropositivity. The association should be interpreted using the reported statistical estimates, including effect measures, confidence intervals and significance values from the final model.

Several limitations warrant consideration. First, the cross-sectional design captures prevalence at a single time point, limiting the ability to infer temporal patterns or incidence rates. Second, serological assays may not distinguish active from past infections, though combining RBT and ELISA enhances diagnostic accuracy. Third, self-reported behaviors may be subject to recall bias, though observations and household verification were used to mitigate this risk.

From a public health perspective, the study highlights critical intervention points. Pastoralist communities would benefit from educational programs on safe milk consumption, protective handling of animal birth products, and livestock vaccination campaigns. Sedentary communities, while at lower risk, require awareness campaigns and improvements in veterinary oversight, particularly for household livestock and market-sourced dairy products. These interventions are

aligned with WHO and WOAHA recommendations for integrated brucellosis control and surveillance (WHO, 2020; WOAHA, n.d.).

In conclusion, the study confirms that brucellosis remains endemic in northern Nigerian communities, with pastoralist populations at disproportionately higher risk due to occupational and cultural behaviors. A One Health approach, incorporating community-based serological monitoring, behavioral interventions, and livestock management strategies, is essential for effective brucellosis control. Future research should include longitudinal studies to track incidence, evaluate intervention efficacy, and explore environmental determinants of zoonotic transmission, particularly under the influence of climate change and human migration (Ugbede et al., 2025).

Conclusion

This study demonstrates that brucellosis remains a significant zoonotic disease in northern Nigerian communities, with pastoralist populations experiencing disproportionately higher prevalence compared to sedentary populations. Human seroprevalence was 24.1% among pastoralists versus 10.4% among sedentary participants, while livestock seroprevalence was 40.7% and 18%, respectively. These findings confirm that close daily contact with livestock, consumption of unpasteurised milk, assistance with animal births, and handling of aborted materials are major risk factors for human infection. Cattle were identified as the most frequently infected livestock species in both community types, reflecting their central role in pastoralist livelihoods and herd mobility.

The study underscores the importance of a One Health approach, integrating human and livestock surveillance, behavioural risk assessment, and environmental context, to effectively monitor and control brucellosis. By providing community-based comparative data, this research addresses a critical gap in zoonotic disease epidemiology in Nigeria and similar sub-Saharan African settings, where pastoralist mobility and limited veterinary services complicate disease control.

Recommendations

Based on the findings, the following recommendations are proposed to reduce the burden of brucellosis and mitigate zoonotic transmission:

- **Targeted Community Education**
 - Conduct awareness campaigns in pastoralist and sedentary communities emphasizing the risks of raw milk consumption, handling of aborted materials, and unsafe livestock practices.
 - Promote culturally acceptable preventive measures, such as boiling milk before consumption and using protective equipment when assisting with animal births.

- **Livestock Health Interventions**

- Implement routine vaccination programs for cattle, goats, and sheep in high-risk pastoralist communities.
- Encourage regular veterinary inspections, herd monitoring, and reporting of abortions or suspected brucellosis cases.

- **Integrated One Health Surveillance**

1. Establish community-based serological monitoring programs linking human health and livestock data to detect outbreaks early.
2. Develop reporting mechanisms that integrate pastoralist mobility patterns and household livestock exposure.

- **Policy and Infrastructure Support**

- Strengthen veterinary and public health infrastructure to provide accessible diagnostic, treatment, and preventive services in rural and mobile communities.
- Facilitate cross-sectoral collaboration between public health, veterinary services, and local community leaders to implement sustainable brucellosis control strategies.

- **Further Research**

- a) Conduct longitudinal studies to determine incidence, transmission dynamics, and the impact of interventions over time.
- b) Explore environmental and climate-related determinants of brucellosis transmission, particularly in mobile pastoralist systems, to inform predictive risk models (Ugbede et al., 2025).

By implementing these recommendations, policymakers and public health practitioners can reduce human–livestock brucellosis transmission, improve community health outcomes, and strengthen integrated disease control frameworks in Nigeria and comparable contexts.

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