Prevalence and Distribution of CBPP in Cattle at Chamwino DC, 2020 to 2023

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SUMMARY

Contagious Bovine Pleuropneumonia (CBPP) is notifiable disease posing a substantial burden on livestock keepers, including those in the Chamwino District Council. This retrospective study was conducted to determine the prevalence and spatial distribution of CBPP in Chamwino District from 2020 to 2023 using secondary data from district archives. Disease surveillance reports from the 36 wards of Chamwino DC were analyzed, focusing on affected wards, CBPP cases, population at risk, and deaths. Out of 171,424 cattle, 2,874 CBPP clinical cases, and 98 deaths, resulting into a prevalence of 1.68%, a case fatality rate of 3.41%, and a crude mortality rate of 0.06% reported to Zonal Veterinary Center. Zajilwa ward reported the highest number of cases (379), followed by Manda (250), Itiso (242), and Haneti (211). These wards are predominantly inhabited by Sukuma, Maasai, and Gogo communities, who engage in pastoralism and agro pastoralism, managing large herds of cattle under extensive livestock management systems, presence of prominent large livestock markets and bordered with other districts. CBPP cases peaked during the dry (July-October) and rainy (November-January, April) seasons. The study identified livestock movement to markets and extensive herd management as key risk factors in CBPP spread. To effectively control CBPP in Chamwino District, it is crucial to enforce livestock movement regulations and implement vaccination programs targeting pastoral and agro pastoral communities, such measures are essential to reducing the prevalence of CBPP and safeguarding the livelihoods of livestock keepers in the district.

Keywords; Contagious Bovine Pleuropneumonia (CBPP), Chamwino DC, Agro pastoral community

INTRODUCTION

In Tanzania livestock sector plays a vital role in rural livelihoods and contributes 7.1% of to the national GDP equivalent to 27% to the agricultural economy (Herrero *et al*.,2013). However, livestock production is affected by many factors including low genetic potential of cattle breeds, disease prevalence, limited water and pasture, and weak market structures hinder the sectors growth (Kibona *et al*.,2022). Contagious Bovine Pleuropneumonia (CBPP), caused by *Mycoplasma mycoides subsp. mycoides*, is one of the most concerning transboundary animal diseases (TADs), an economically devastating disease that impairs animal health and reduces productivity, posing serious challenges to the welfare of farmers and to Tanzania's economic potential (Malago *et al*.,2013). This highly contagious bacterial pneumonia spreads through close

contact among animals and can also travel in saliva, urine, and other discharges, especially in conditions favorable to bacteria survival, reaching distances of up to 200 meters (Tardy *et al*.,2011). CBPP presents with a variable incubation period and symptoms that range from mild to severe, making early diagnosis challenging due to overlap with other respiratory conditions. The disease, however, has distinct clinical and post-mortem features, particularly in the lungs, which often show a marbled appearance along with significant yellowish fluid accumulation in the thoracic cavity (Admassu *et al*., 2015).

CBPP has a major impact across Africa, with outbreaks reported in 20 countries, most notably Ethiopia, Angola, Cameroon, and Nigeria (Molla *et al*., 2021). Although Tanzania had eradicated CBPP by the 1960s, the disease re-emerged in the 1990s, spreading across various regions and causing significant productivity and income losses. To combat CBPP, the Tanzanian government invested over 1 billion Tanzanian Shillings (USD 1 million) to procure around 15 million vaccine doses (Matthew *et al*., 2016). This study focused on examining CBPP prevalence and distribution in Chamwino District, providing critical data to inform improved control strategies for sustaining livestock productivity and enhancing rural livelihoods.

MATERIALS AND METHODS

Study Area

The study was conducted in Chamwino District Council, one of the seven districts within Tanzania's Dodoma Region. Located on the central plateau, Chamwino lies in the western sector along Dar es Salaam Road, stretching between latitudes 4º and 8º south and longitudes 35º and 37º east. The district spans a total area of 8,056 square kilometers. According to the 2022 census by the National Bureau of Statistics (NBS), Chamwino's population stands at 443,867 people, with 229,392 females and 214,475 males. The district also supports a significant livestock sector, with a cattle population of 295,081.

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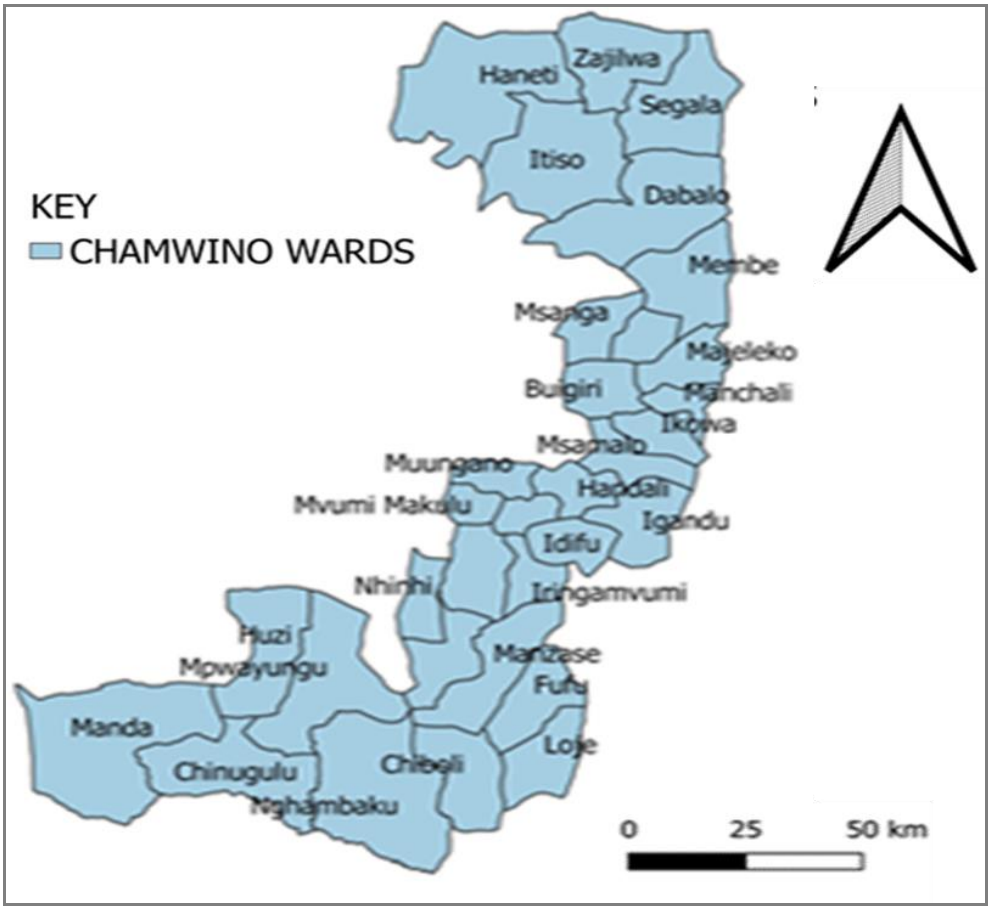

Figure 1: A map showing study area (Source; PO-RALG)

Study design

Cross sectional study design conducted using retrospective study collecting surveillance archives data from Chamwino Livestock section from January 2020 to December 2023 covering 36 wards. The key variables captured were; Name of ward, name of village, geographical coordinates (latitudes and longitudes), and population of cattle at risk, number of CBPP cases, death reports, village names, and observation date**.**

Data analysis and management

The data collected was entered and cleaned using Microsoft Office Excel® 2010, and descriptive statistics were employed to express the magnitude of the disease. The pattern of disease occurrence (both temporal and spatial) was identified, and the crude mortality and case fatality rates for Contagious Bovine Pleuropneumonia (CBPP) were estimated. The distribution of CBPP in Chamwino District Council was visualized on a map using Quantum Geographic Information System (QGIS) software. The map was created using the ward coordinates where the disease cases were reported**.**

Prevalence, crude mortality and case fatality analysis

According to Joffe *et al*., (2011), the prevalence of CBPP was calculated using the formula: Prevalence (P)= n/N where: P is the prevalence, n is the number of sick animals at a particular time and place, and N

is the population at risk at the same time point. Crude mortality was calculated by dividing the number of cattle that died during the reference period by the population at risk during the same period (Chaudhary *et al*., 2013). Case fatality was assessed by dividing the number of cattle that died due to CBPP by the number of CBPP cases reported (Ghani *et al*., 2005).

RESULTS

Prevalence of CBPP

The overall prevalence of CBPP from 2020 to 2023 was 1.68% (2,874/171,424). The number of affected wards, cases, deaths and population at risk for each year from 2020 to 2023 are indicated in Table 1. More cases are reported during the last trimesters of the year (October – December) as demonstrated in Figure 2.

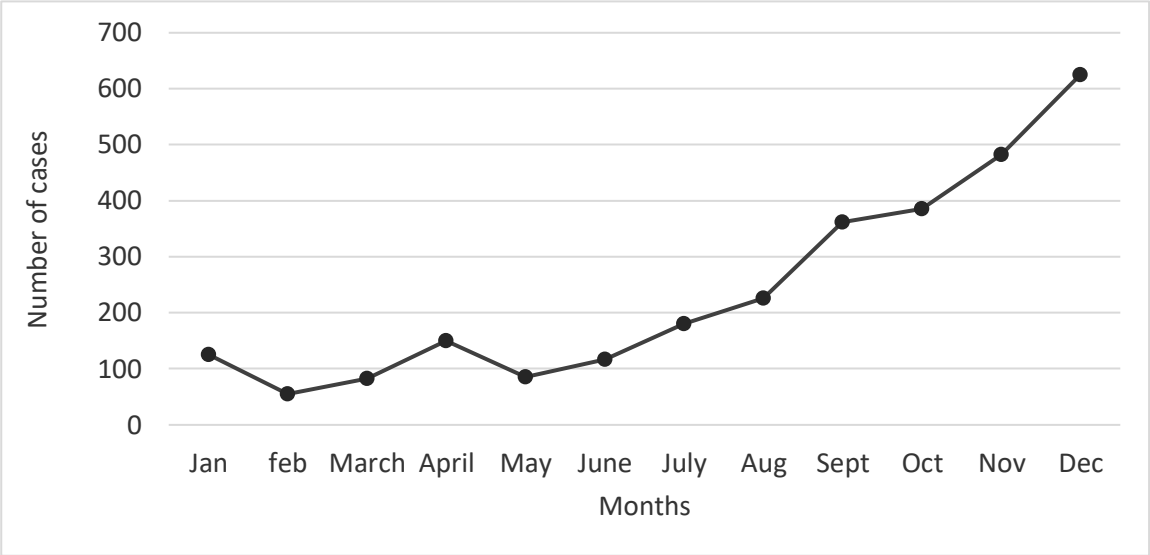

Figure 2. CBPP \cases in different months of Chamwino district (2020–2023)

Crude Mortality and Case fatality due to CBPP

Mortality due to CBPP was recorded at 0.06% (98 deaths out of 171,424 cattle). These deaths were reported across 20 wards, while 14 wards reported CBPP cases without any associated mortalities. Additionally, two wards reported no CBPP cases throughout the four-year period. The case fatality rate was estimated at 3.41% (98 deaths out of 2,874 cases).

Table 1: Number of affected wards, population at risk, CBPP cases, deaths, prevalence, mortality risk, and case fatality risk reported in Chamwino district from 2020 to 2023

Year	Affected ward	Population at risk	Cases	Death	Prevalence (%)	Crude Mortality (%)	Case fatality (%)
2020	16	146,890	350	21	0.24	0.01	6.0
2021	17	143,941	561	26	0.39	0.02	4.63
2022	24	216,988	326	20	0.15	0.01	6.13
2023	27	177,877	1637	31	0.92	0.02	1.89
Total		**171,424**	**2,874**	**98**	**1.68**	**0.06**	**3.41**

Distribution of Contagious Bovine Pleuropneumonia in Chamwino District Council

Figure 3 illustrates the distribution of CBPP cases over the four-year study period, showing that the disease affected most areas of the district except for Ikowa and Nghambaku, where no cases were reported.

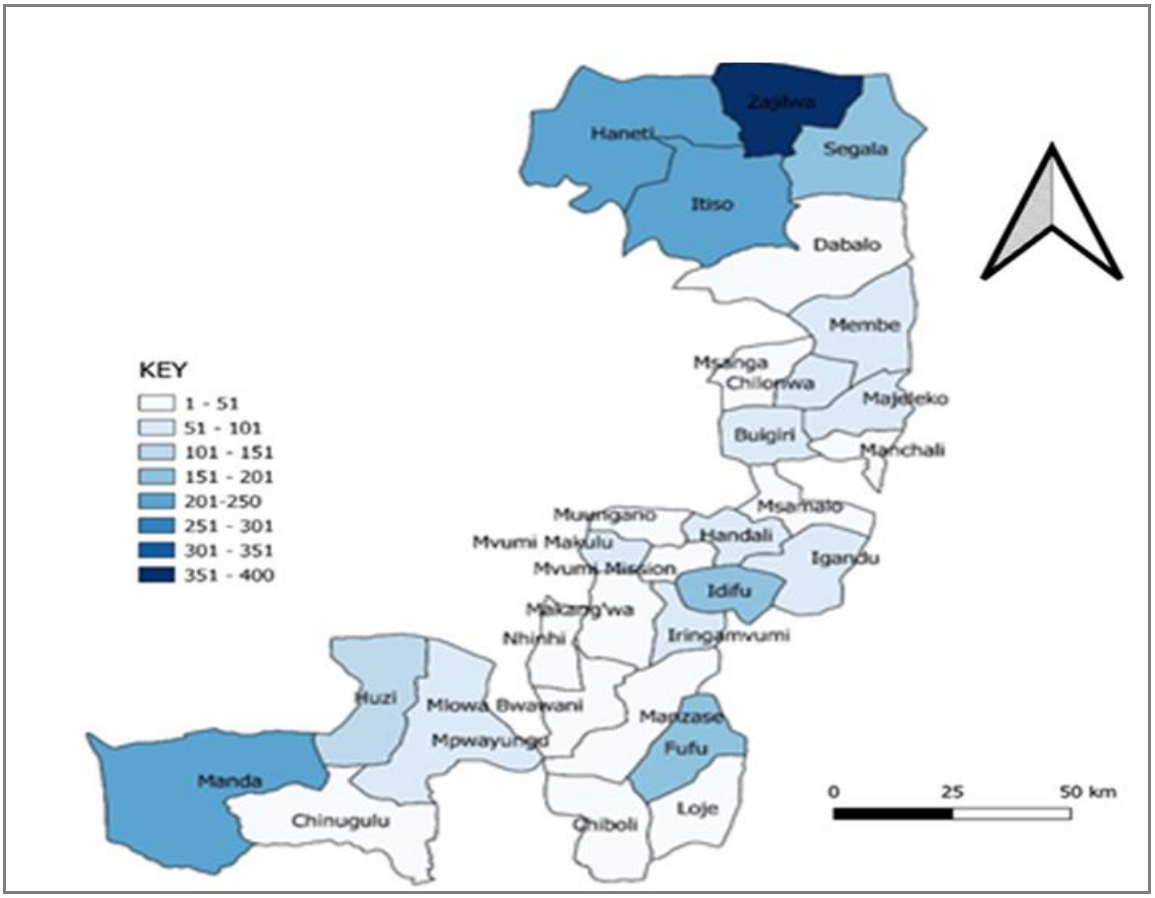

Figure 3. Spatial distribution of Contagious Bovine Pleuropneumonia in Chamwino DC (2020-2023)

DISCUSSION

The retrospective study of CBPP in Chamwino District from 2020 to 2023 provided important epidemiological insights, highlighting the disease's prevalence, mortality rates, seasonal trends, and spatial distribution. With a CBPP prevalence of 1.68%, a crude mortality rate of 0.06%, and a case fatality rate of 3.41%, these findings suggest a moderate but impactful presence of CBPP in Chamwino, albeit lower than those observed in comparable studies across Tanzania and Nigeria (Mngumi *et al.*, 2020; Francis *et al.*, 2018). The lower prevalence may reflect underreporting or inconsistent vaccination efforts, particularly given a notable drop in vaccination coverage below 70% in 2021 due to concerns about vaccine side effects and costs among pastoralist communities.

The data further revealed significant yearly variations in CBPP prevalence, with 2023 showing the highest recorded cases at 1,637 out of a total of 2,874 cases during the study period. This peak aligns with increased cattle movement in districts with livestock marts, particularly Zajilwa, Manda, Itiso, Segala (Izava), Haneti, Fufu, and Huzi. These wards, known for their large cattle populations and high levels of livestock trading activity, are at heightened risk for CBPP transmission due to the congregation of animals. Additionally, many of these wards border other districts, which further facilitates the movement of cattle across boundaries in search of better prices and grazing areas. Research supports this finding, as the movement and gathering of livestock have been shown to enhance disease spread, especially among nomadic and semi-nomadic communities where cattle travel long distances for trade and grazing (Alhaji *et al.*, 2016).

Seasonal analysis demonstrated that CBPP cases peaked during the dry season (July to October) and rainy season (November to January and April). Specifically, the months of September, October, November, and December showed the highest monthly case counts, with December reaching a peak of 625 reported cases in four years. These seasonal peaks align with findings by Gumel *et al.*, (2015) and Adamu and Aliyu (2006), who noted that increased cattle congregation during dry months due to limited water sources augments CBPP transmission risks. The rainy season, with its high humidity, also supports the survival of the CBPP pathogen in the environment, further elevating transmission risks during this period.

Another critical risk factor identified was the limited vaccination coverage, attributed to pastoralist resistance. This resistance, stemming from concerns over side effects and costs, compromised vaccination efforts and contributed to CBPP persistence, especially in wards where agro-pastoralists maintain large herds. For example, Zajilwa reported the highest number of cases (379), followed by Manda (250) and Itiso (242), underscoring the role of herd size and movement in disease spread. Targeted vaccination programs, combined with community engagement and educational initiatives, could mitigate these risks by addressing pastoralists' concerns, ultimately

improving vaccine uptake and disease control.

The study also underscored how weaknesses in the CBPP reporting system have likely contributed to the observed prevalence and mortality rates. The relatively low case fatality rate (3.41%) and crude mortality rate (0.06%) in Chamwino District are notable, yet likely do not fully capture the impact of CBPP due to underreporting and data gaps. Inconsistent reporting from remote wards, where pastoralists may lack access to veterinary services or understanding of reporting procedures, poses a significant challenge to accurate surveillance. This underreporting is exacerbated by limited resources for consistent data collection and follow-up, which can result in an incomplete picture of CBPP prevalence and mortality within the district. The study found that CBPP prevalence in Chamwino District peaked in 2023, largely due to increased livestock movement across high-risk wards with large cattle populations and livestock markets, especially in areas bordering other districts. This movement, driven by trade and grazing, contributed significantly to the spread of the disease.

To conclude, livestock movement, particularly around auction marts, plays a major role in spreading CBPP, as cattle are moved across districts for better prices. The lack of consistent vaccination coverage (below 70% in 2021) worsens the situation. Effective control of CBPP requires improving vaccination coverage, regular vaccination programs, controlling illegal livestock movement, enhancing disease surveillance, and increasing farmer education. Strengthening veterinary services and support for extension officers is also essential.

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