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Prevalence and Trends of Abattoir-Detected Diseases in Slaughtered Livestock between 2021-2024 at Sokoto Metropolitan Abattoir, Sokoto State, Nigeria

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ABSTRACT

A four-year retrospective study (2021–2024) was conducted using abattoir records from the Sokoto Modern Abattoir, Nigeria, to assess the prevalence and seasonal distribution of major livestock diseases. Data on cattle, sheep, goats, and camels were analysed using descriptive statistics and trend analysis. The results showed a progressive decline in Contagious Bovine Pleuropneumonia (CBPP) prevalence from 2.5% in 2021 to 0.6% in 2024, with higher cases recorded during the dry season. Bovine and Camel Tuberculosis maintained relatively stable prevalence rates of 0.2% and 3.0%, respectively, with slight increases during the rainy season. Fasciolosis prevalence decreased from 5.0% to 2.8% without clear seasonal variation, possibly due to routine annual deworming campaigns. Overall, the declining trend in disease occurrence suggests improved surveillance, vaccination coverage, and animal health management. However, the persistence of zoonotic infections such as tuberculosis highlights the need for enhanced diagnostic capacity and stricter control measures. Continued vaccination, deworming, and the establishment of an abattoir-based diagnostic laboratory are strongly recommended.

Keywords: *Abattoir, Diseases, Livestock, Metropolitan, Nigeria, Prevalence, Sokoto State*

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INTRODUCTION

An abattoir is a premises approved and registered for hygienic slaughtering, inspection, processing, and preservation of meat products for human consumption (Tolera *et al.,* 2022), there are several types of abattoirs, which differ in infrastructure and facilities, sanitation and PPE practices, and adherence to regulations. In each abattoir facility, worker exposure to animals and animal products increases their risk of infection from zoonotic pathogens (Rodarte *et al.*, 2023). During meat production, a large number of wastes are generated that consist of feces, tissue waste, blood, fat, bone, animal trimmings, intestinal content, and urine that can be potential risk to humans and the environment (Tsegay *et al.*, 2017), Abattoir operations produce a large number of organic wastes with relatively high levels of suspended solids, liquid and fat (Ahmad *et al.*, 2019). In low-income countries, there is rapid urban growth resulting in high amount of abattoir waste in the urban areas, unless appropriate action is taken, abattoir activities can result in environmental pollution. This portends hazard to both human and animal health (Swai *et al.*, 2013).

Abattoir facilities serve as the main locations for cattle slaughter and processing and have the responsibility of following strict meat inspection processes to detect and remove organs and carcasses that could pose health hazards. The organ condemnation process, which is vital in these inspections, entails the rejection of organs that are unsuitable for human consumption due to diseases or contamination (Asare *et al.*, 2024). Inspection of animals pre- and post-slaughter in abattoirs functions to ensure the safety of meat products for human consumption, and has also been used for active surveillance of animal and zoonotic diseases (Thomas-Bachli *et al.*, 2014). Meat inspection at the abattoir is often carried out by trained veterinary technicians and environmental officers who may be limited in certain aspects of knowledge regarding meat inspection and disease detection (Meslin, 2008).

There is evidence supporting the sensitivity of meat inspection for detecting specific diseases in animals and condemnation rate information from abattoirs has been used to guide control strategies for common infectious diseases in livestock (Gebeyehu and Tsegaye, 2022). Meat inspection is one of the strategies used to produce wholesome meat, and meat is rich in essential protein and valuable nutrients for human health. Despite these benefits, it is a favorable medium of microbial growth and transmission to humans. Especially, meat contaminations from meat handlers' bodies, the hide of animals (Mochankana and Robertson, 2016). Post mortem inspection of carcasses/meats (head, pluck, organs and muscles) was conducted to determine the presence of lesions of common zoonotic or economically important livestock diseases such as bovine tuberculosis, contagious bovine pleuro-pneumonia, camels cysticercosis, contagious caprine pleuro-pneumonia and fascioliasis (Njoga *et al.*, 2023). The objectives of the study are to assess the prevalence and trends of diseases detected in slaughtered livestock in Sokoto abattoir over a four years period.

MATERIAL AND METHODS

Study Area

Sokoto modern abattoir is located in the Sokoto North Local Government Area of Sokoto State, Nigeria. Sokoto State is located in northwestern part of Nigeria between longitudes 4º8' E and 6º54' E and latitudes 12º N and 13º58' N (Bala *et al.*, 2018). The state shares boundaries with the Niger Republic to the north, Kebbi State to the west and Zamfara State to the east. Sokoto State covers a total land area of about 32,000 km^2, as of 2022 it has an estimated population of more than 6.3 million. The state was ranks second in terms of livestock population in Nigeria with an estimated 3 million cattle, 3 million sheep, 5 million goats, 4,600 camels, 52,000 donkeys and a number of other local and exotic poultry species (Okeke *et al.*, 2014). This facility is among the oldest in the sub-zone, established around the same period as other major abattoirs in the region Kano Abattoir (1963), Sokoto Abattoir (1962), Kawo (1978), and Zango (1978) in Kaduna State (Lawan *et al.*, 2013). Animals processed at the Sokoto Abattoir are sourced from within Sokoto State and beyond, including Talata Mafara (Zamfara State), Mai Gatari (Jigawa State), Wudil (Kano State), and Niger Republic. The premises consist of two slaughtering facilities the ultra-modern abattoir and the old abattoir a cattle market (Kara Market) for housing livestock, a holding pen for cattle awaiting slaughter, and a now-defunct waste treatment plant. The facility handles the slaughter of various livestock species, including cattle, camels, sheep, and goats, for processing and distribution both within and outside the state. The geographical focus on the Sokoto Abattoir enabled a targeted assessment of organ condemnation and the potential impact of improved meat inspection practices (Figure 1).

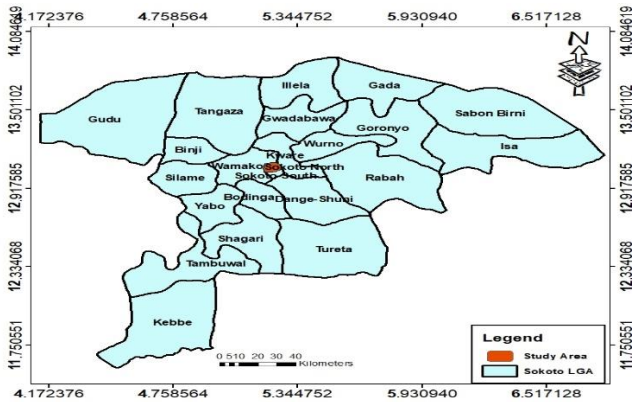

Figure 1: Map of Sokoto Metropolitan Abattoir

Study Design

The research employed a retrospective observational study design, which involved examining past abattoir record to analyze trends in organ condemnation at the Sokoto abattoir from 2021 to 2024. This approach allowed for a comprehensive assessment of historical data, providing insights into long term patterns of organ condemnations and prevalence of diseases detected in the abattoir.

Study Population

The study population are livestock (Cattle, sheep, goat and camel) slaughtered and processed for human consumption in the selected abattoir.

Sampling

The study includes all recorded cases of organ condemnation at the Sokoto abattoir from 2021 to 2024, ensuring a comprehensive analysis of organ condemnation trends over the specified timeframe. By including data from multiple years, the study aimed to capture variations in organ condemnation rates over time and assess the effectiveness of interventions implemented during the study period.

Parameters Collected

Species, age, sex, origin, disease conditions, organs condemned, and reasons for condemnation.

Data Collection

Secondary data on organ condemnations, including details such as the type of organ condemned, reasons for condemnation, and the number of condemnations, were collected from the records maintained by the Sokoto Abattoir over the specified four-year period (2021-2024). These records provided a valuable source of information for assessing the frequency and nature of organ condemnations over time.

Data Source

Official abattoir records, including post-mortem reports, condemnation records, and monthly abattoir reporting form under the NADIS plat form.

Data Analysis

Data obtained were first recorded in Microsoft Excel Spreadsheet Version 19. Data analysis was performed using Statistical Package for Social Sciences (SPSS Version 27).

Descriptive statistics were employed to analyze trends in organ condemnation rates over the study period. This involved summarizing and presenting key findings related to the frequency and distribution of organ condemnations by type and cause.

RESULTS

The total number of animals slaughtered per year is presented in (Table 1). The data show a steady increase in cattle slaughter over the years, with the highest number (27,346) recorded in 2024 and the lowest (25,693) in 2021. In contrast, the number of sheep and goats slaughtered shows a declining trend, as the highest figure (17,037) was observed in 2021 and the lowest (14,160) in 2024. Similarly, camel slaughter followed the same upward trend as cattle, increasing from 2,132 in 2021 to a peak of 3,188 in 2024. The prevalence of Contagious Bovine Pleuropneumonia (CBPP) is presented in (Table 2). The data indicate a steady decline in prevalence over the years, with the highest rate of 2.5% recorded in 2021 and the lowest rate of 0.6% observed in 2024. The prevalence of Bovine Tuberculosis is presented in (Table 3). The data show a relatively stable trend over the years, maintaining an average prevalence of about 0.2%, with a slight increase observed in 2023 (0.25%). The prevalence of Camel Tuberculosis is presented in (Table 4). The data indicate a relatively stable trend similar to that of Bovine Tuberculosis, with the highest prevalence (3.6%) recorded in 2022 and the lowest (2.8%) observed in 2023. The prevalence of fasciolosis is presented in (Table 5). The data reveal a declining trend in the occurrence of the disease over the years. The highest prevalence was recorded in 2021 at 5.0%, while the lowest prevalence was observed in 2024 at 2.8%, indicating a steady reduction in fasciolosis cases during the review period.

The prevalence of hydatidosis in sheep and goats is presented in (Table 6). The data show a fluctuating trend over the years, with the highest prevalence recorded in 2021 (1.0%). This declined to 0.75% in 2022 and further to 0.3% in 2023, before rising again to 0.70% in 2024. The seasonal trend of Contagious Bovine Pleuropneumonia (CBPP) cases is illustrated in (Figure 2). The data indicate that the number of CBPP cases was consistently higher between September and April each year throughout the four-year period under review. The yearly variation in the number of Contagious Bovine Pleuropneumonia (CBPP) cases over the review period shows a progressive decline, with the highest number of cases recorded in 2021 and the lowest observed in 2024 (Figure 3). The seasonal variation in Bovine tuberculosis is described in (Figure 4), the number of cases of bovine tuberculosis was seen to be increasing from July to December every year. The seasonal trend of Camel Tuberculosis is illustrated in (Figure 5). The results show a consistent increase in the number of tuberculosis cases from August to December

Table 1: Number of Animals Slaughtered Annually Over the Four-Year Period under Review.

Species	Bovine	Ovine/Caprine	Camelids
2021	25693	17037	2132
2022	24793	15560	1666
2023	26296	13172	2791
2024	27346	14160	3188

Table 2: Prevalence of Contagious Bovine Pleuropneumonia (CBPP) over the four-year period under review.

Year	Total Cattles Slaughtered	Number of CBPP Cases	Prevalence (%)
2021	25693	634	2.5
2022	24793	473	1.9
2023	26296	416	1.5
2024	27346	178	0.6

Table 3: Prevalence of Bovine Tuberculosis over the four-year period under review.

Year	Total No. Cattles Slaughtered	Number of Bovine TB Cases	Prevalence (%)
2021	25693	59	0.2
2022	24793	52	0.2
2023	26296	68	0.25
2024	27346	29	0.19

Table 4: Prevalence of Camel Tuberculosis over the four-year period under review.

Year	Total Camel Slaughtered	Number of Camel TB Cases	Prevalence (%)
2021	2132	64	3.0
2022	1666	60	3.6
2023	2791	79	2.8
2024	3188	94	2.9

Table 5: Prevalence of Bovine Fasciolosis Over the Four-Year Period under Review.

Year	Total Cattles Slaughtered	Number of Bovine Fasciolosis Cases	Prevalence (%)
2021	25693	1298	5.0
2022	24793	1118	4.5
2023	26296	1128	4.2
2024	27346	777	2.8

Table 6: Prevalence of hydatidosis in sheep and goats over the four-year period under review.

Year	Total Sheep and Goat Slaughtered	Number of Hydatidosis Cases	Prevalence (%)
2021	17037	167	1.0
2022	15560	117	0.75
2023	13172	43	0.30
2024	14160	101	0.70

each year throughout the four-year period under review. The seasonal occurrence of Bovine Fasciolosis is presented in (Figure 6). The chart reveals no distinct seasonal pattern, with irregular fluctuations observed throughout the year, indicating that cases of the disease can occur at any time during the four-year review period. The seasonal occurrence of Hydatidosis is presented in (Figure 7). The chart reveals no distinct seasonal pattern, with irregular fluctuations observed throughout the year, indicating that cases of the disease can occur at any time during the four-year review period.

DISCUSSION

This study conducted a retrospective analysis of abattoir records on cattle, sheep, goats, and camels slaughtered between 2021 and 2024, focusing on the annual number of suggestive cases recorded. The detection rate of cases appeared to be influenced by seasonal variations, with higher incidences observed during stressful periods such as inter-seasonal and peak-season periods. Increased slaughter activities during religious festivals and socio-cultural ceremonies also contributed to the elevated

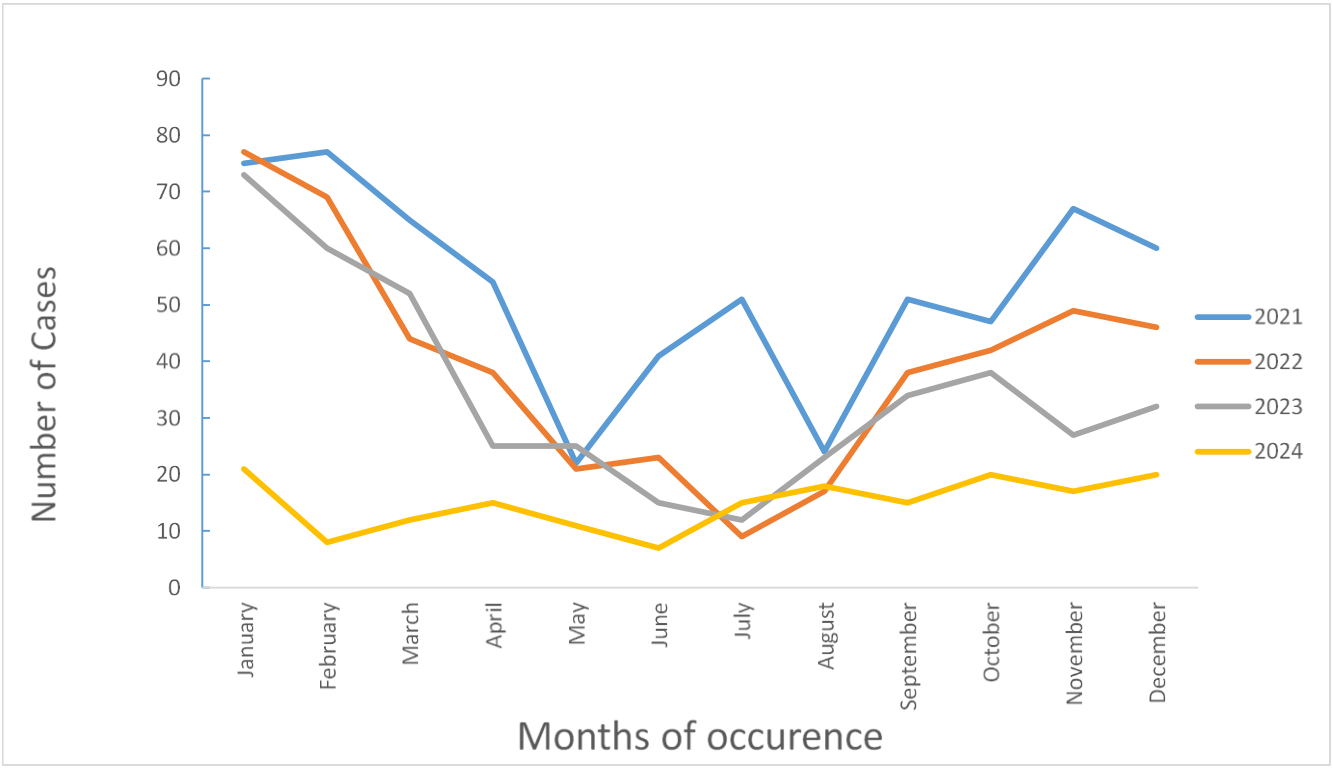

Figure 2: Seasonal Trends in Contagious Bovine Pleuropneumonia Cases by Months from (2021-2024).

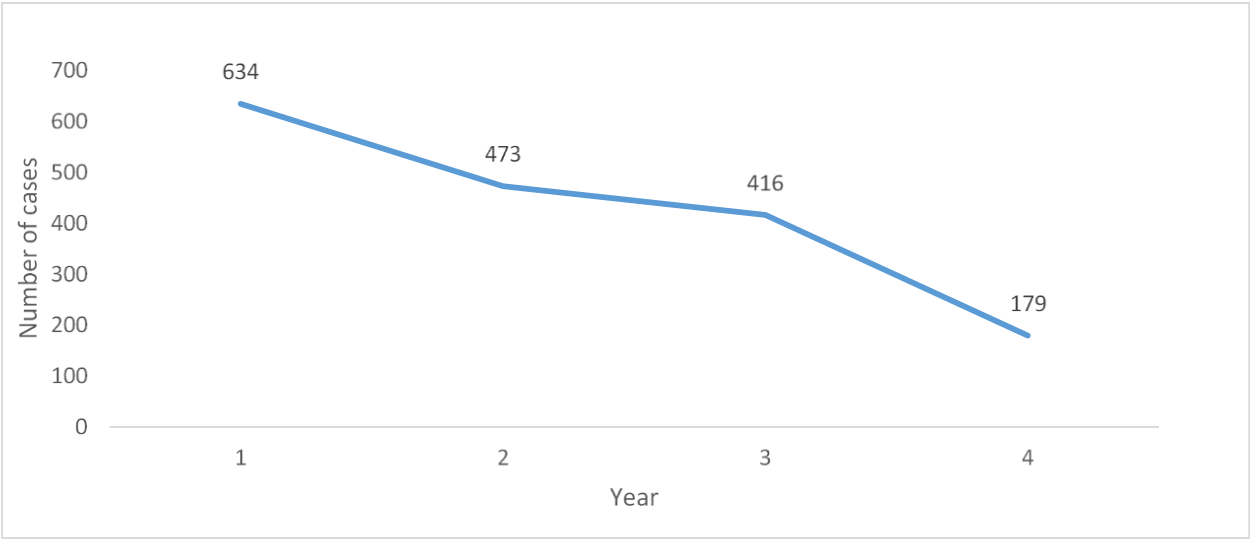

Figure 3: Variation in the Number of CBPP Cases Recorded from 2021 to 2024

detection rates. However, the wide fluctuations in the annual detection rates throughout the study period were not clearly understood. The analysis revealed a distinct temporal pattern of Contagious Bovine Pleuropneumonia (CBPP) cases in the selected abattoir, with higher occurrences consistently recorded between October and March each year. These findings align with a study conducted in Uganda in 2017(Mngumi *et al.,* 2020), which also reported increased CBPP cases between November and January.

The observed seasonal trend may be attributed to drought conditions common during this period, which lead

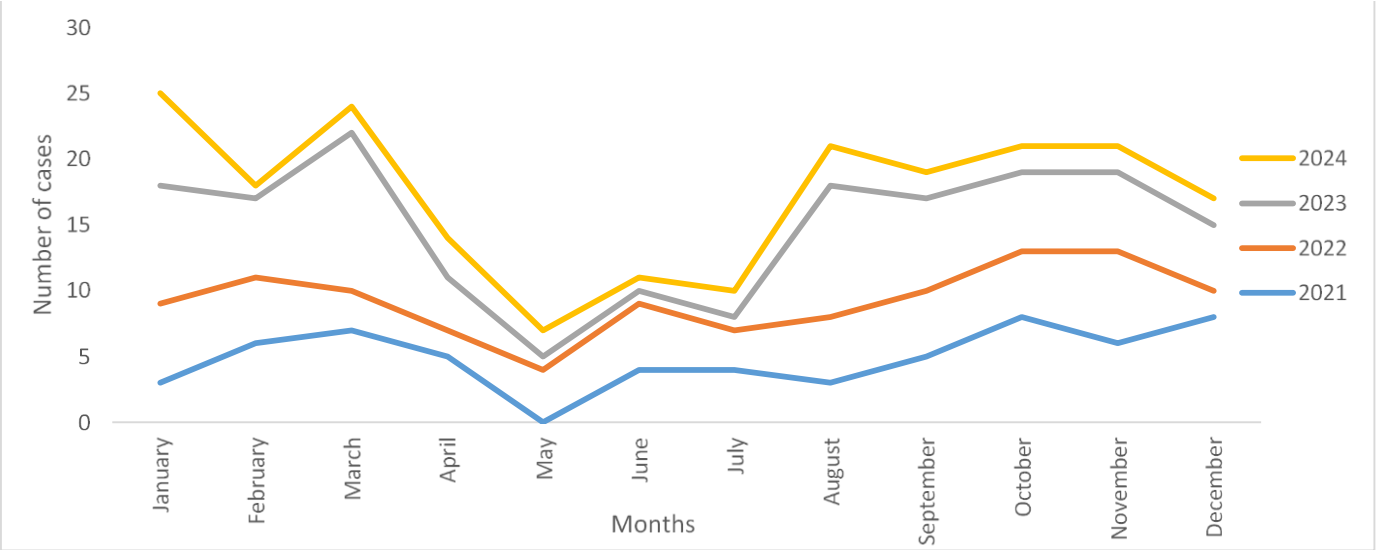

Figure 4: Seasonal Trends in Bovine Tuberculosis Cases (2021–2024).

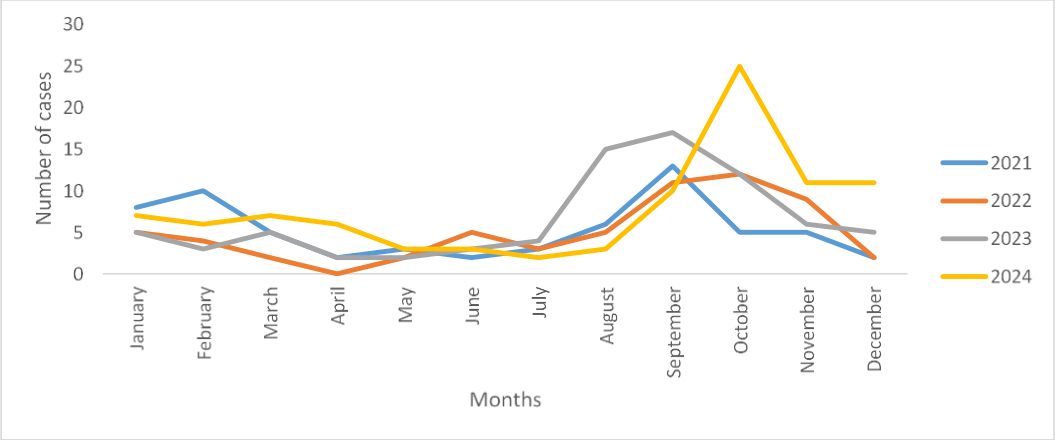

Figure 5: Seasonal Trends in Camel Tuberculosis Cases (2021–2024)

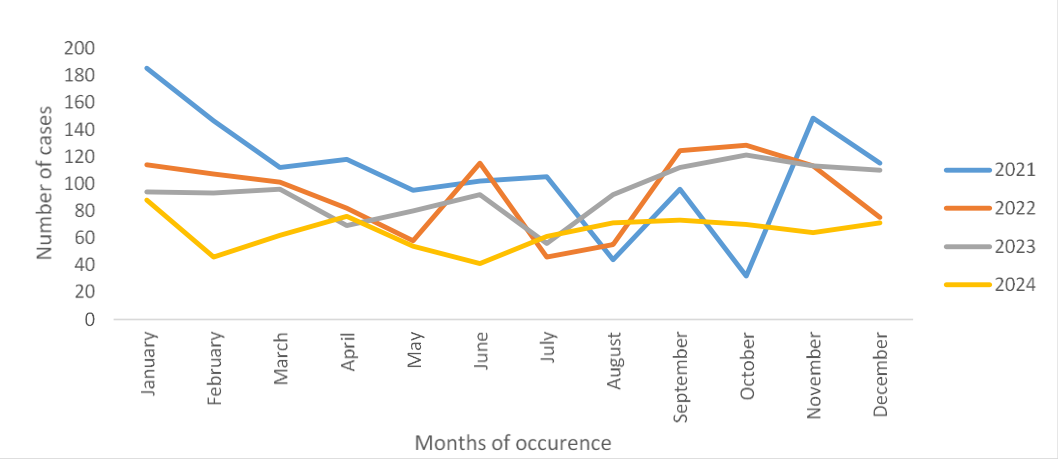

Figure 6: Seasonal occurrence of Bovine Fasciolosis for the four years under review.

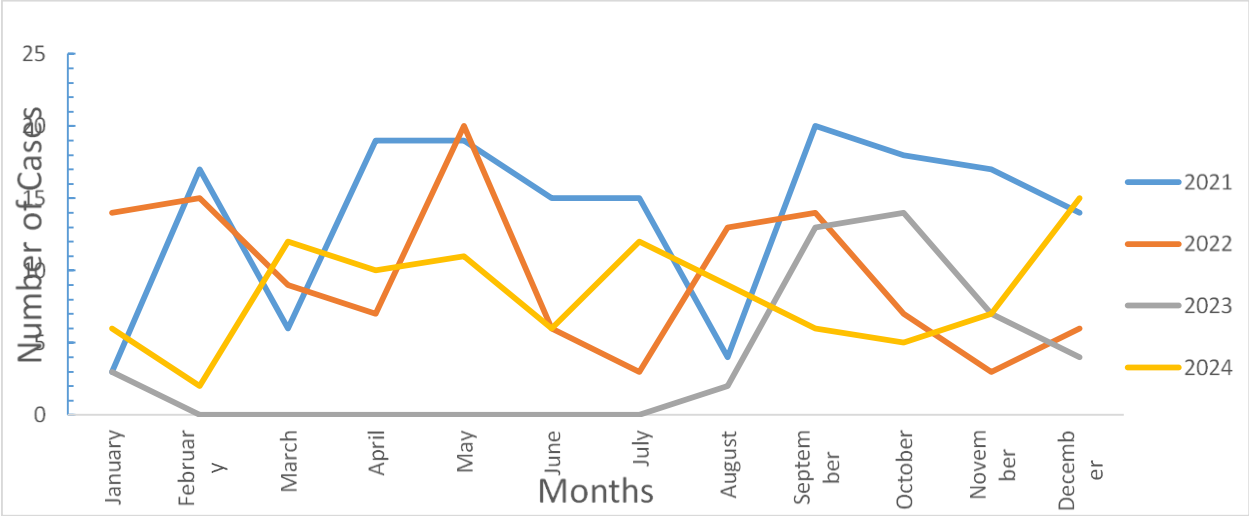

Figure 7: Seasonal Trends in Sheep & Goat Hydatidosis Cases (2021–2024).

to shortages of pasture and water. Consequently, animals congregate around limited grazing and water sources, increasing close contact between healthy and carrier animals and thereby enhancing disease transmission. The progressive decline in the number of cases over the years could be associated with the impact of the annual mass vaccination campaigns conducted across the state, which likely contributed to reducing disease prevalence and improving herd immunity. The prevalence of bovine and camel tuberculosis remained relatively stable throughout the four years under review, with calculated prevalence rates of 0.2% in cattle and 3.0% in camels. However, both species exhibited notable seasonal variations, with case peaks observed between July and October.

These findings are consistent with a study conducted in Jos (Okeke *et al.*, 2014) which reported that the number of tuberculosis lesions was highest in August and lowest in January. The relatively static prevalence observed in this study could be attributed to the absence of a test-and-slaughter policy in Nigeria, as well as the inadequate testing or inspection of animals imported from neighboring countries. The findings of this study also revealed that the occurrence of fasciolosis did not exhibit any distinct seasonal pattern. This result contrasts with the result of a study conducted in Malaysia (Girma *et al.*, 2025), who reported a marked increase in fasciolosis cases from June to October, with a peak in August.

The overall decline in disease prevalence observed across the study period may be linked to the implementation of routine annual deworming programs, which are conducted concurrently with other state-led vaccination campaigns. Such interventions likely contributed to reducing parasite load and interrupting transmission cycles within the livestock population. The result of this study shows no distinct seasonal pattern, with irregular fluctuations observed throughout the year, indicating that cases of the disease can occur at any time during the four-year review period. The result of our analyses dis agrees with the study conducted in Saudi Arabia and other countries which says sheep hydatidosis cases shows significant seasonal patterns. The highest condemnation rate is observed in summer and autumn (Toulah and Albalawi, 2019). In a recent study, the highest rate recorded was in winter and spring (Almalki, Al-Quarishy and Abdel-Baki, 2017). While in another study, the highest prevalence of hydatid cyst was in summer. However, this difference refers to the chance of sheep to contact with the final host acquiring the meta cestode regardless time and place proposed. These differences in rates of infection around the seasons referred to differences in climatic factors, likes temperature, humidity, rainfall, and the nature of grazing.

CONCLUSION

This retrospective study revealed important trends in the occurrence of major livestock diseases recorded at the abattoir between 2021 and 2024. The prevalence of Contagious Bovine Pleuropneumonia (CBPP) showed a gradual decline over the study period, which has translated into economic benefits for butchers through reduced lung condemnations. However, CBPP cases were observed to increase during the dry season, likely due to increased animal congregation around limited water and grazing areas that enhance disease transmission.

The prevalence of bovine and camel tuberculosis remained relatively stable, with slight increases recorded during the rainy season. This suggests the need for stronger surveillance, improved meat inspection, and enforcement of test-and-slaughter policies to reduce public health risks associated with zoonotic transmission. Fasciolosis prevalence exhibited a downward trend, possibly due to the impact of annual deworming programs conducted alongside state vaccination campaigns. Although no distinct seasonal pattern was detected, the disease is typically expected to rise during the rainy season when conditions favor the development of intermediate snail hosts.

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