A Five-Year Retrospective Study Reveals Significant Temporal Variation and Substantial Potential Economic Value of Foetal Wastage in Kubwa Abattoir, Abuja, Nigeria

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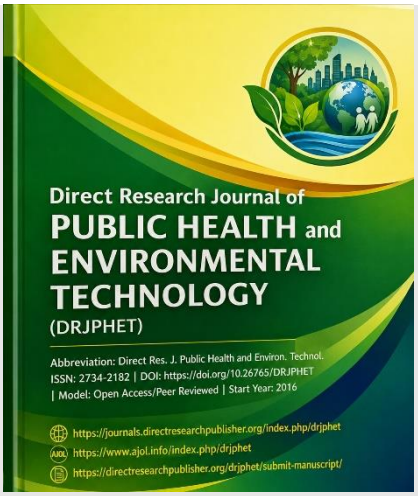
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ABSTRACT

Foetal wastage associated with the slaughter of pregnant cattle represents a loss of potential livestock production. However, evidence on its occurrence and temporal distribution in Nigerian abattoirs remains limited. This study characterised the occurrence and temporal distribution of detected foetal losses among female cattle slaughtered at Kubwa Abattoir, Abuja, between 2021 and 2025. A retrospective analysis of monthly abattoir records from January 2021 to December 2025 was conducted. Records included the number of female cattle slaughtered and the number of foetal losses detected during post-mortem inspection. Foetal-loss proportions were calculated annually and monthly. Differences between years were assessed using a chi-square test, while monthly variation was examined using a binomial regression model accounting for year. The relationship between the number of female cattle slaughtered and detected foetal losses was assessed using Spearman correlation. A total of 8,136 female cattle were slaughtered during the study period, with 857 foetal losses detected, giving an overall foetal-loss proportion of 10.53%. The annual proportion varied from 2.70% in 2021 to 18.11% in 2025 and differed significantly between years (χ^2 = 209.26, d.f. = 4, P < 0.001). Monthly variation was also significant after accounting for year (likelihood-ratio χ^2 = 130.06, d.f. = 11, P < 0.001), with higher aggregated foetal-loss proportions observed between July and October. Year was independently associated with foetal-loss detection (likelihood-ratio χ^2 = 186.51, d.f. = 4, P < 0.001), and the number of female cattle slaughtered was positively correlated with the number of detected foetal losses (Spearman ρ = 0.645, P < 0.001). Detected foetal losses were a recurring finding among female cattle slaughtered at Kubwa Abattoir, with substantial variation across years and months. The findings highlight the value of routine abattoir surveillance, ante-mortem pregnancy identification and veterinary oversight to better characterise and potentially reduce avoidable foetal wastage. Further studies incorporating animal, management, environmental and health-related variables are needed to investigate the factors underlying the observed variation.

Keywords: *Abuja, Five-Years, Foetal Wastage, Kubwa Abattoir, Retrospective Study and Temporal Variation*



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INTRODUCTION

Livestock production is an important component of food and nutrition security in sub-Saharan Africa, where animal-source foods provide highly bioavailable protein and essential micronutrients that support growth, development and health (Adesogan *et al*., 2026). Livestock also contribute to household food access and dietary diversity. In Nigeria, livestock ownership has been associated with greater household food expenditure and dietary diversity (Dare *et al*., 2025), although the relationship between livestock ownership and child nutritional outcomes varies across settings (Ogunniyi *et al*., 2021). Similarly, evidence from households across several sub-Saharan African sites indicates that livestock ownership is generally associated with greater consumption of animal-source foods, although the nutritional benefits differ according to the type of livestock and food available (Hetherington *et al*., 2017; Kebede *et al*., 2023). Despite the importance of livestock to food systems in the region, livestock production remains constrained by low productivity, climate-related pressures, conflict and inadequate infrastructure (Balehegn *et al*., 2021; Boyomo *et al*., 2024). Sub-Saharan Africa accounts for a relatively small share of global meat and milk production despite its substantial livestock resources (Erdaw, 2023). In Nigeria, conflict and insecurity have also been associated with reductions in cattle holdings and lower consumption of animal-source foods (Fadare *et al*., 2022; Fadare *et al*., 2024).

Losses within livestock production can further reduce the contribution of animals to food systems. Among these losses, foetal wastage represents the loss of a potential offspring before it can contribute to future livestock production (Nabasirye *et al*., 2024). In cattle, pregnancy loss can occur at different stages of gestation, with substantial losses occurring during early embryonic development (Reese *et al*., 2020; Mercadante *et al*., 2020). Foetal wastage can also occur at the point of slaughter when pregnant cattle are presented for processing (Nabasirye *et al*., 2024; Njoga *et al*., 2026). Unlike many forms of reproductive loss that occur before animals reach the abattoir, such losses are directly observable through abattoir inspection and can therefore provide an important measure of reproductive wastage within the slaughter population. The occurrence of pregnant cattle at slaughter has been documented across different regions, although reported proportions vary considerably between locations and study periods (Sanusi *et al*., 2020; Fanadzenyuy *et al*., 2018; Zitterer and Paulsen, 2021).

Evidence from Nigerian abattoirs indicates that foetal wastage at slaughter is not an isolated occurrence. At Lafenwa Abattoir, 44,713 foetal losses were reported among 353,503 female cattle slaughtered over nine years, corresponding to a wastage proportion of 12.65% (Adebowale *et al*., 2020). Similarly, a long-term study at Jalingo reported foetal wastage in 12.2% of female cattle slaughtered (Uko *et al*., 2024), while Zubairu *et al*. (2022) documented substantial foetal wastage at Hadeja, with most of the recorded losses occurring during the dry season. Other African studies have reported considerable variation in the detection of pregnant cattle or foetal wastage at slaughter, with higher proportions reported in some settings, including Bamenda and Gambella (Fanadzenyuy *et al*., 2018; Gelaye and Weldegebrial, 2024). Differences between studies may reflect variation in cattle populations, geographical and environmental conditions, slaughter practices, study duration and methods of pregnancy or foetal-loss detection. Nevertheless, the repeated documentation of foetal wastage across slaughter facilities suggests that the problem warrants continued surveillance.

The occurrence of foetal wastage at slaughter also raises questions about the practices used to identify pregnant cattle before slaughter. Ante-mortem veterinary inspection provides an opportunity to identify animals that should not proceed to slaughter where pregnancy makes slaughter avoidable under applicable regulations and veterinary guidance (Andoni *et al*., 2023). Evidence from Nigeria has highlighted the need for ante-mortem pregnancy diagnosis, effective veterinary inspection and stronger enforcement of measures intended to prevent the slaughter of pregnant cattle (Sanusi *et al*., 2020; Njoga *et al*., 2021; Njoga *et al*., 2026). Diagnostic approaches may also improve pregnancy detection before slaughter. In one study of 361 cows, pregnancy-specific protein B (PSPB) identified substantially more pregnancies than post-slaughter examination and showed higher diagnostic sensitivity (Abubakar *et al*., 2019). These findings indicate that abattoirs can provide not only a point of detection for foetal wastage but also an important intervention point for reducing avoidable reproductive losses. Despite the evidence from several Nigerian abattoirs, information on the occurrence and temporal distribution of foetal losses remains geographically fragmented. In particular, there is limited longitudinal evidence describing how detected foetal losses vary between years and months within an abattoir in the Federal Capital Territory. Understanding these patterns is important for characterising the scale of foetal wastage and identifying periods in which detection is more frequent. Abattoir records also provide an opportunity to examine whether foetal-loss detection varies in relation to the number of female cattle slaughtered, although such associations should not be interpreted as evidence of causation. This study therefore aimed to characterise the occurrence and temporal distribution of detected foetal losses among female cattle slaughtered at Kubwa Abattoir, Abuja, from 2021 to 2025, and to estimate their potential economic value. Specifically, the study quantified the number and proportion of detected foetal losses, characterised their monthly and annual temporal distribution, assessed the relationship between the number of female cattle slaughtered and the number of foetal losses detected, and

estimated the potential monetary value of the detected foetal losses.

MATERIALS AND METHODS

Study Area

The study was conducted at Kubwa Abattoir, located in Kubwa, Bwari Area Council, Federal Capital Territory (FCT), Abuja, Nigeria (Figure 1).

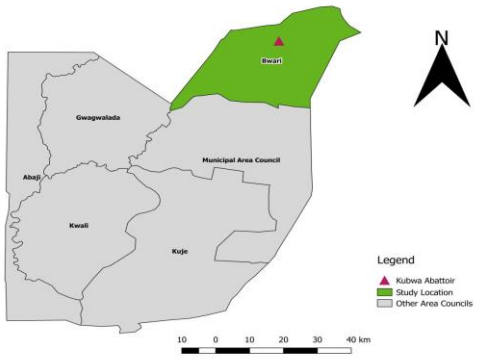


Figure 1: Map of Federal Capital Territory Abuja, Nigeria showing the location of Kubwa abattoir in Bwari Local Government Area.

The abattoir is one of the major livestock slaughter facilities serving the Abuja Municipal Area Council (AMAC) and surrounding communities, contributing to the supply of beef within the Federal Capital Territory. The FCT is situated in the North-Central region of Nigeria and experiences a tropical climate characterized by distinct rainy and dry seasons. The rainy season generally occurs between April and October, while the dry season extends from November to March.

A retrospective descriptive study was conducted using abattoir records from Kubwa Abattoir, Abuja, Nigeria. The study covered a five-year period from January 2021 to December 2025. Kubwa Abattoir receives cattle for slaughter and conducts routine inspection of slaughtered animals, during which foetal losses may be identified at post-mortem examination. The study used routinely recorded monthly data to characterise the occurrence and temporal distribution of detected foetal losses among female cattle slaughtered during the study period.

Data source, data management and quality control

Monthly abattoir records for 2021–2025 were reviewed and compiled into a single dataset. The dataset contained four variables: month, year, number of female cattle slaughtered, and number of foetal losses detected. Foetal loss here referred specifically to foetal losses recorded during post-mortem inspection. The monthly records were entered into a structured spreadsheet and checked for completeness, consistency and duplicate entries before analysis. Monthly records were retained as the unit of observation. Annual totals were obtained by summing the corresponding monthly records for each year, while the overall study totals were calculated by summing records across all five years. Data were subsequently imported into R statistical software for analysis.

Estimation of foetal-loss proportion

The proportion of detected foetal losses among female cattle slaughtered was calculated for each year and for the overall study period using:

Foetal-loss proportion (%) = (Number of detected foetal losses ÷ Number of female cattle slaughtered) × 100.

Monthly proportions were similarly calculated using the number of foetal losses detected and the number of female cattle slaughtered for each month. These proportions were interpreted as the proportion of detected foetal losses among female cattle slaughtered, rather than population prevalence or incidence.

Economic estimation of potential foetal wastage

The potential economic value associated with detected foetal losses was estimated using the approach described by Njoga *et al*. (2026). A unit value of ₦80,000 per calf, as reported in their study, was used as a benchmark for estimating the potential market value of the recorded foetal losses. The gross potential economic value was calculated by multiplying the number of individual foetal losses recorded by the assumed unit value. A secondary estimate was obtained by applying a 5% post-partum mortality adjustment, following the approach of Njoga *et al*. (2026). The resulting estimates were interpreted as indicative valuations of the potential market value of the offspring represented by the recorded foetal losses, rather than direct measurements of financial losses incurred by farmers or livestock traders. The estimates did not account for differences in gestational age, actual calf survival, future reproductive potential, or other long-term production effects.

Statistical analysis

Descriptive statistics were used to summarise the number of female cattle slaughtered and detected foetal losses by month and year. Annual differences in the proportion of detected foetal losses were assessed using a chi-square test of independence. The strength of association was assessed using Cramer's V.

Monthly variation was further examined using a binomial regression model, with the number of detected foetal losses and the number of female cattle without a recorded

foetal loss specified as the binomial response. Month and year were included as explanatory variables to assess whether monthly differences remained after accounting for variation between years. Likelihood-ratio tests were used to assess the overall effects of month and year. Odds ratios with 95% confidence intervals were calculated for annual comparisons, using 2021 as the reference year.

The relationship between the monthly number of female cattle slaughtered and the monthly number of detected foetal losses was assessed using Spearman's rank correlation coefficient (ρ) because the variables were count data and their relationship was not assumed to meet the requirements of parametric correlation. The analysis was based on the 60 monthly observations from January 2021 to December 2025.

All statistical tests were two-sided, and $P < 0.05$ was considered statistically significant.

Data visualisation

Temporal patterns in female cattle slaughtered, detected foetal losses and foetal-loss proportions were visualised using line plots showing monthly observations across the five-year study period. Annual foetal-loss proportions were also presented graphically. The relationship between female cattle slaughtered and detected foetal losses was illustrated using a scatter plot with a fitted regression line and 95% confidence interval.

Ethical considerations

The study used routinely collected, retrospective abattoir records and did not involve direct interaction with animals or animal owners. No personal identifying information was included in the dataset. Appropriate permission to access and use the abattoir records was obtained from the relevant authorities before data analysis. Where applicable, institutional requirements for the use of retrospective routinely collected data were followed.

RESULTS

Magnitude and annual variation in detected foetal losses among female cattle

In total, 8136 female cattle were slaughtered at Kubwa Abattoir from 2021 to 2025, with 857 cases of foetal loss detected, representing a foetal loss proportion of 10.53% (Table 1). The number of female cattle slaughtered varied across the study period, increasing from 1,184 in 2021 to 2,139 in 2024, before declining to 1,292 in 2025. Significant inter-year differences in the number and percentage of foetal loss detections were also observed (Table 1). In 2021, 32 foetal losses were detected among 1,184 female cattle, giving a proportion of 2.70%. This rose significantly in 2022 when 214 losses occurred in 1,543 female cattle (13.87%). Although the number of female cattle slaughtered increased further in 2023, the number of detected foetal losses declined to 130, corresponding to a proportion of 6.57%. The number of foetal losses rose again in 2024 to 247 (11.55%) out of 2,139 females. Although fewer female cattle were slaughtered in 2025 than in the previous two years, a higher proportion of the females had foetal losses (Table 1), with 234 foetal losses out of 1,292 female cattle slaughtered in 2025 (18.11%).

The proportion of detected foetal losses differed significantly between years ($\chi^2 = 209.26$, d.f. = 4, $P < 0.001$). The association between study year and foetal-loss status was, however, relatively weak, with a Cramer's V of 0.16. This shows that while the differences between the years were statistically significant, year of pregnancy alone explained only a relatively small amount of the variation in foetal-loss status. The greatest deviation from the overall pattern was observed in 2021, which had the lowest foetal-loss proportion, whereas 2025 had the highest proportion (Table 1). The findings show considerable year-to-year variation in the number and proportion of foetal losses detected, with the highest proportion occurring in 2025 and the lowest in 2021. These results support statistical evidence of the annual variation observed and suggest that the magnitude of this annual variation was moderate and not fully dependent upon study year.

Monthly and annual temporal distribution of detected foetal losses

The monthly distribution of detected foetal losses varied substantially across the study period, with the timing and magnitude of peaks differing between years (Figure 2a). In 2021, foetal losses were highest in May, when 14 losses were detected, after which the number declined, and no losses were recorded from August to December. In 2022, foetal losses increased during the middle of the year and reached a peak of 48 in August, followed by 35 in September and 39 in October. In 2023, foetal losses remained relatively low through most of the year but increased to 34 in October, the highest monthly count for that year. The largest monthly peak was observed in 2024, when foetal losses increased sharply to 66 in July before declining through the remainder of the year. In 2025, foetal losses were concentrated between May and November, increasing from 20 in May to 42 in July and 53 in August, before declining to 42 in September 26 in October and 19 in November (Figure 2b).

The monthly foetal-loss proportions showed a similar temporal pattern, although the magnitude varied between years (Figure 2 1c). Across the five years, the aggregated proportion was lowest in December (3.02%) and January (4.41%), increased from May onwards, and was highest between July and October, ranging from 13.76% in July to 15.49% in October. The trend was more noticeable at the annual level in 2024 and 2025, where the percentage of higher proportions was noticeable over several months. For the year 2024, the proportion was 20.75% in July, and it was over 16% from August to November, while during

Table 1: Annual number and proportion of detected foetal losses among female cattle slaughtered at Kubwa Abattoir, Abuja, 2021–2025

Year	Female cattle slaughtered	Foetal losses detected	Foetal-loss proportion (%)
2021	1,184	32	2.70
2022	1,543	214	13.87
2023	1,978	130	6.57
2024	2,139	247	11.55
2025	1,292	234	18.11
Total	8,136	857	10.53

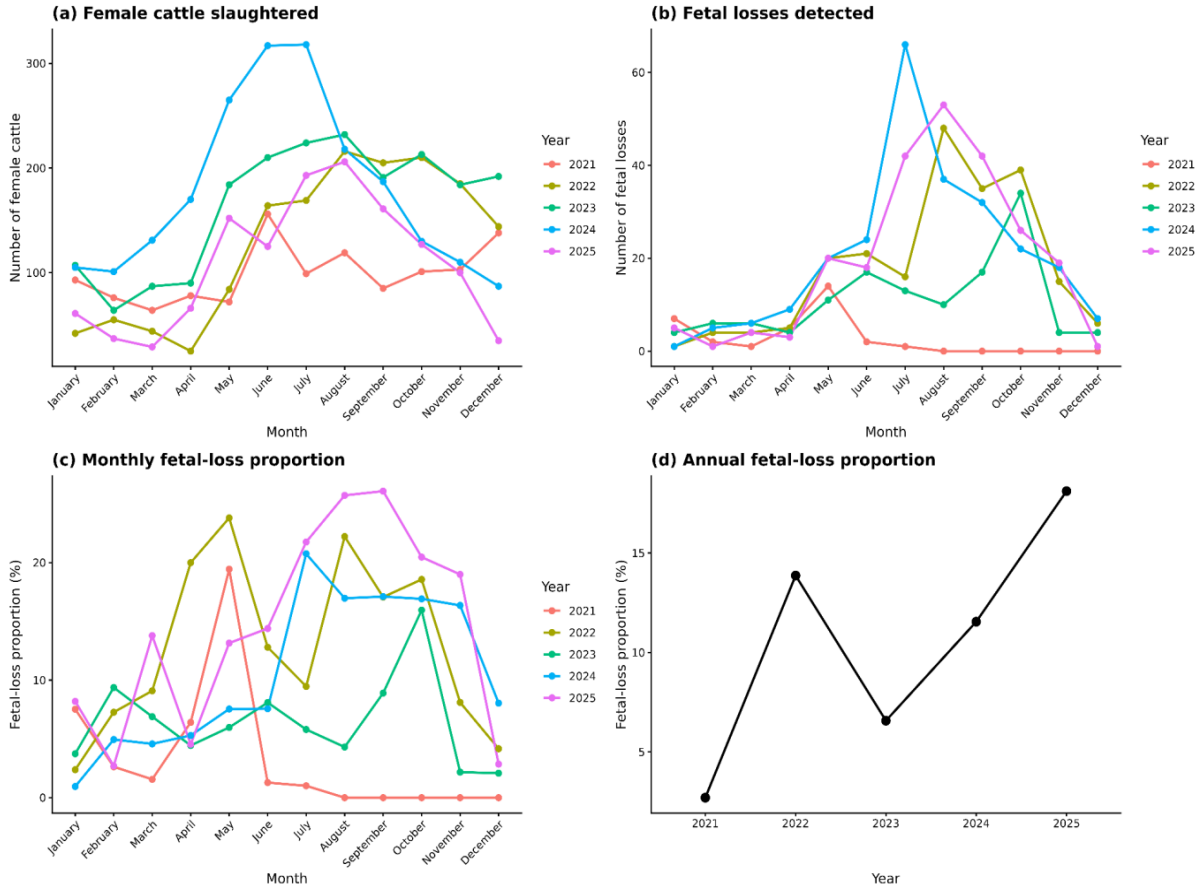


Figure 2: Monthly and annual temporal distribution of female cattle slaughtered and detected foetal losses at Kubwa Abattoir, Abuja, 2021–2025**.** *The figure shows (a) the monthly number of female cattle slaughtered, (b) the monthly number of foetal losses detected, (c) the monthly foetal-loss proportion, and (d) the annual foetal-loss proportion. Each coloured line in panels (a–c) represents one study year. The monthly distributions demonstrate substantial variation in both the number and proportion of detected foetal losses across years.*

the year 2025, the proportion was 21.76% in July, 25.73% in August and 26.09% in September, before dropping to 20.47% in October and 19.00% in November (Figure 2c). The monthly variation found was still significant when the yearly differences were taken into account. A binomial model with month and year indicated a significant association between month and the probability of foetal loss (likelihood-ratio $\chi^2 = 130.06$, df. =11, $P < 0.001$). Also, there was a significant association between foetal-loss detection and year (likelihood-ratio $\chi^2 = 186.51$, df. = 4, $P < 0.001$). Relative to 2021, the odds of detecting foetal loss were higher in 2022 (OR = 4.97, 95% CI: 3.39–7.28), 2023 (OR = 2.29, 95% CI: 1.55–3.41), 2024 (OR = 4.34, 95% CI: 2.97–6.33) and 2025 (OR = 6.62, 95% CI: 4.52–9.69) (Supplementary Table S2). However, the monthly pattern was not accounted for by the difference in female cattle slaughter between years. At the annual level, the foetal-loss proportion increased from 2.70% in 2021 to 13.87% in 2022, declined to 6.57% in 2023, and increased again to 11.55% in 2024 and 18.11% in 2025 (Figure 2d). In general, foetal loss was found to be highly seasonal, occurring mainly in the middle and late months of the year, and with the highest annual level of foetal loss being detected in 2025.

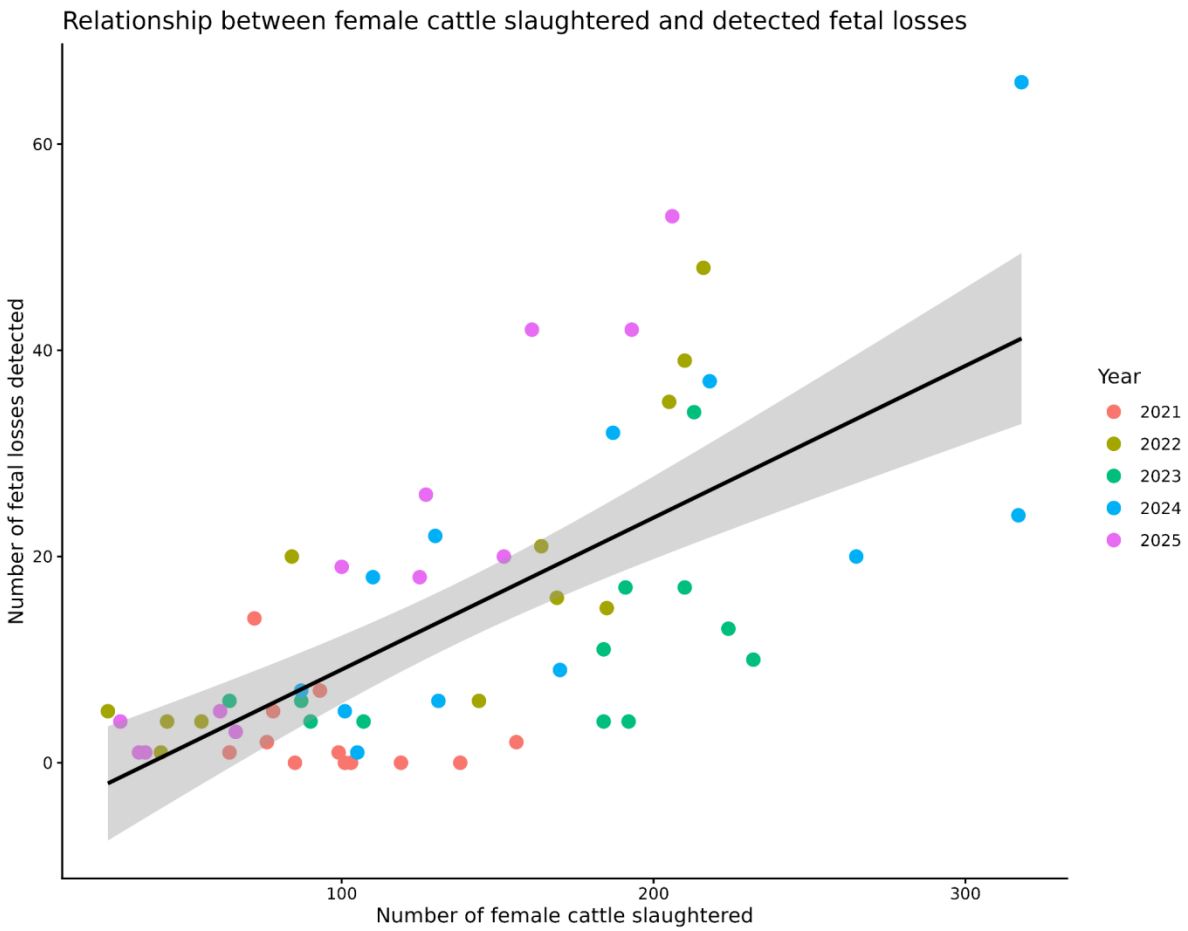


Figure 3: Relationship between female cattle slaughtered and detected foetal losses at Kubwa Abattoir, Abuja, 2021–2025**,** *Each point represents a monthly observation, with colours indicating the study year. The fitted line shows the positive relationship between the number of female cattle slaughtered and detected foetal losses, with the shaded region representing the corresponding confidence interval.*

Relationship between female cattle slaughtered and detected foetal losses

There was a positive association between the number of female cattle slaughtered and the number of foetal losses detected across the 60 monthly observations from 2021 to 2025. Spearman correlation analysis showed a moderate positive correlation between the two variables ($\rho = 0.645$, $P < 0.001$), indicating that months with higher numbers of female cattle slaughtered generally tended to have higher numbers of detected foetal losses. This relationship is illustrated by the upward pattern of the fitted regression line in (Figure 3), although considerable variation was observed around the fitted line.

This association was also not consistent across years, as revealed by the distribution of observations. The months with relatively high numbers of female cattle slaughtered tended to be correlated with higher foetal losses, especially for 2022, 2024 and 2025 observations. There was considerable variation, however, in the number of female cattle slaughtered from one month to the next, as some months with comparable numbers of female cattle slaughtered had very different numbers of detected foetal losses (Figure 3). The overall results confirm that there is a statistically significant positive correlation between the number of female cattle slaughtered and the number of foetal losses identified during the study period.

Economic estimation of potential foetal wastage

Based on the unit value of ₦80,000 per calf reported by Njoga *et al*. (2026), the 857 individual foetal losses recorded during the study period represented an estimated gross potential market value of ₦68,560,000. After applying the 5% post-partum mortality adjustment used by Njoga *et al*. (2026), the estimated value was ₦65,132,000 (Table 2). These estimates represent the indicative potential market value of the offspring associated with the recorded foetal losses and are based on the published unit-price benchmark rather than a verified market price for Abuja during the study period.

Table 2: Estimated economic value of detected foetal losses at Kubwa Abattoir, Abuja, 2021–2025.

Parameter	Value
Number of individual foetal losses	857
Assumed unit value per calf (₦)	80,000
Gross potential market value (₦)	68,560,000
Estimated value after 5% mortality adjustment (₦)	65,132,000

Note: The unit value and 5% post-partum mortality adjustment were adopted from Njoga et al. (2026). The estimates are indicative and do not represent verified current market prices or direct financial losses.

DISCUSSION

This study retrospectively characterised detected foetal losses among female cattle slaughtered at Kubwa Abattoir, Abuja, using abattoir records collected over five years (2021–2025). Across the study period, 8,136 female cattle were slaughtered, among which 857 foetal losses were detected, corresponding to an overall foetal-loss proportion of 10.53%. The occurrence of foetal loss varied considerably across the study period, both between years and between months. Annual foetal-loss proportions ranged from 2.70% in 2021 to 18.11% in 2025, while monthly variation was particularly evident during the middle and later months of the year. Foetal-loss detection was also positively associated with the number of female cattle slaughtered, with months having greater female-cattle throughput generally recording more detected foetal losses. The overall proportion observed at Kubwa is comparable with findings from other Nigerian abattoirs. Adebowale *et al*. (2020) reported a foetal-wastage proportion of 12.65% among 353,503 female cattle slaughtered at Lafenwa over nine years, while Uko *et al*. (2024) reported a proportion of 12.2% at Jalingo over 11 years. Similar evidence has also been reported from Hadeja, where an annual average of 16.7% was recorded (Zubairu *et al*., 2022). The consistency of these findings across different Nigerian locations indicates that foetal wastage at slaughter is not restricted to a single abattoir. The present study therefore adds longitudinal evidence from Abuja to the existing Nigerian evidence base, while also demonstrating that the magnitude of detected foetal loss can vary substantially over time.

The importance of this finding lies in the fact that foetal wastage represents a loss of potential future livestock production at the point of slaughter. Livestock are important contributors to food and nutrition security in sub-Saharan Africa, where animal-source foods provide highly bioavailable protein and micronutrients, while livestock ownership is associated with greater household food expenditure and dietary diversity in Nigeria and other African settings (Adesogan *et al*., 2026; Ogunniyi *et al*., 2021; Hetherington *et al*., 2017). However, the present study did not quantify the food-production or nutritional consequences of the detected foetal losses. Its contribution is therefore more specifically to documenting the occurrence and temporal pattern of this form of livestock loss at a major slaughter facility. The magnitude of detected foetal loss differed markedly between years, with the proportion increasing from 2.70% in 2021 to 13.87% in 2022, declining to 6.57% in 2023, and then increasing to 11.55% in 2024 and 18.11% in 2025. This pattern does not represent a consistent year-on-year increase, but rather substantial interannual variation. The highest proportion occurred in 2025 despite a lower number of female cattle being slaughtered than in 2023 and 2024, suggesting that the annual pattern was not determined solely by the number of females processed.

Variation in foetal wastage between periods has also been reported elsewhere. At Hadeja, 73.8% of 3,763 wasted foetuses were recorded during the dry season, indicating substantial temporal concentration in that setting (Zubairu *et al*., 2022). Similarly, studies from other African slaughter facilities have reported marked differences in foetal-wastage frequency between locations and periods (Uko *et al*., 2024; Gelaye and Weldegebrial, 2024). However, the available evidence does not establish a consistent direction of annual change across cattle populations. Differences between studies may reflect variation in cattle populations, study duration, slaughter practices, environmental conditions and the methods used to identify and record foetal losses.

Several factors described in previous studies could contribute to such variation, including feed availability, climatic conditions, infectious disease and management practices (Mellado *et al*., 2016; Van Loo *et al*., 2021; Morais *et al*., 2026). In Nigeria, dry-season feed scarcity and socioeconomic pressures have also been proposed as factors associated with foetal wastage and the slaughter of pregnant cattle (Zubairu *et al*., 2022; Uko *et al*., 2024). These factors provide plausible explanations for temporal differences, but they cannot be directly evaluated in the present study because the available records contained only month, year, number of female cattle slaughtered and detected foetal losses. The observed annual differences should therefore be interpreted as temporal variation rather than evidence of a specific underlying cause.

The monthly distribution provided further evidence that detected foetal losses were not evenly distributed throughout the year. Across the five years, the aggregated foetal-loss proportion was lowest in December (3.02%) and January (4.41%) and was highest between July and

October, reaching 15.49% in October. This pattern was particularly pronounced in 2024 and 2025, when elevated proportions persisted across several consecutive months. Importantly, the association between month and foetal-loss detection remained significant after accounting for year, indicating that the observed monthly variation was not simply a consequence of differences between study years.

Previous studies provide evidence of similar temporal variation, although the timing of peak occurrence differs between settings. Yaqoob *et al*. (2016) reported the highest number of cattle abortions during summer, while Zubairu *et al*. (2022) found that most foetal wastage at Hadeja occurred during the dry season. Monthly variation has also been reported in Ethiopia, where foetal wastage differed significantly between months and reached its highest reported value in November (Gelaye and Weldegebrial, 2024). In contrast, the relatively similar dry- and rainy-season proportions reported at Jalingo suggest that temporal patterns are not consistent across all Nigerian abattoirs (Uko *et al*., 2024). These differences may reflect local variation in climate, feed availability, cattle movement, production systems and disease exposure rather than a common pattern across all cattle populations.

The present study also identified a moderate positive association between the number of female cattle slaughtered and detected foetal losses ($\rho = 0.645$, $P < 0.001$). This finding is consistent with evidence from Lafenwa, where female-cattle throughput and foetal wastage were strongly positively correlated ($r = 0.74$) (Adebowale *et al*., 2020). The relationship is expected to some extent because a greater number of female cattle available for inspection provides more opportunities for foetal losses to be detected. However, the variation around the relationship in the present data indicates that slaughter volume alone does not explain the occurrence of foetal losses. This interpretation is also consistent with reports of substantial differences in pregnancy detection between abattoirs despite differences in the numbers of female cattle processed (Sanusi *et al*., 2020; Fanadzenyuy *et al*., 2018; Nielsen *et al*., 2019).

The repeated detection of foetal losses at Kubwa, together with comparable reports from other Nigerian abattoirs, highlights an opportunity to reduce avoidable livestock losses through improved management at slaughter points. The present findings do not establish whether the detected foetal losses resulted primarily from deliberate slaughter of pregnant cattle, inadequate pregnancy detection, or other factors, because the available records did not contain information on pregnancy status before slaughter or the circumstances leading to slaughter. Nevertheless, evidence from Nigerian abattoir studies indicates that inadequate ante-mortem identification of pregnancy is an important area for intervention (Njoga *et al*., 2021; Njoga *et al*., 2026; Sanusi *et al*., 2020).

Evidence also suggests that pregnancy can be detected more effectively before slaughter than through post-slaughter examination. In a study of 361 cows, pregnancy-specific protein B (PSPB) identified 72 pregnant animals compared with 32 detected through post-slaughter examination, with substantially higher sensitivity for the ante-mortem approach (Abubakar *et al*., 2019). This supports strengthening veterinary ante-mortem inspection and, where appropriate and feasible, incorporating validated pregnancy-detection approaches into abattoir procedures. Farm-level identification of pregnant animals before they are transported for slaughter may provide an additional point of intervention (Zitterer and Paulsen, 2021).

The findings therefore support greater attention to veterinary oversight, pregnancy detection and enforcement of existing animal-welfare and slaughter regulations. Nigerian studies have specifically recommended ante-mortem pregnancy diagnosis, appropriate veterinary inspection and stronger implementation of regulations intended to prevent the slaughter of pregnant cattle (Sanusi *et al*., 2020; Njoga *et al*., 2021; Njoga *et al*., 2026). These measures should be accompanied by sufficient staffing, training, record-keeping, and practical implementation that enables livestock owners to keep pregnant animals when slaughter is not necessary. Other incentives, including compensation, have also been suggested under economic pressures that do not allow owners to postpone slaughtering (Sanusi *et al*., 2020).

The estimated gross potential value of ₦68.56 million (₦65.13 million after the 5% mortality adjustment) associated with the 857 foetal losses at Kubwa Abattoir highlights the economic implications of foetal wastage. Similar economic losses have been reported in Nigeria (Abida *et al*., 2010; Anyaku *et al*., 2019; Njoga *et al*., 2026; Ajanaku *et al*., 2026; Bakari *et al*., 2025) and other sub-Saharan African countries, including Uganda, Ethiopia, Tanzania and the Democratic Republic of Congo (Swai *et al*., 2015; Mutwedu *et al*., 2019; Wakayo and Abrham, 2021; Nabasirye *et al*., 2024). This evidence suggests that the problem extends beyond Abuja and Nigeria, affecting livestock production systems across the region. The wider economic concern is that repeated foetal losses mean fewer cattle available to sustain future production and generate income. For farmers, this can mean lost earnings and fewer opportunities to rebuild or expand their herds. Across Nigeria and other sub-Saharan African countries where similar losses have been reported, the cumulative effect may reduce the supply of cattle over time, put additional pressure on meat availability and prices, and weaken the incomes of those who depend on livestock farming and trade. In a country already facing economic pressures and challenges in food affordability, such avoidable losses add to the difficulty of maintaining an adequate and affordable supply of animal-source foods.

The results of the Kubwa study suggest that foetal wastage

is a recurring feature of cattle slaughter, with significant differences in the proportions recorded across years and months. The estimated potential economic value of these losses also highlights the financial implications of foetal wastage, which can reduce farmers' potential income and limit future livestock production. Similar losses reported elsewhere in Nigeria and sub-Saharan Africa suggest that the economic consequences may extend beyond individual abattoirs, with implications for livestock livelihoods and the availability and affordability of animal-source foods. Greater attention to pregnancy detection and veterinary surveillance at abattoirs could help identify and reduce avoidable foetal wastage. More detailed longitudinal recording would also enable future studies to investigate the animal, environmental, infectious and management factors underlying the observed temporal patterns. This study therefore provides a baseline for strengthening surveillance and evaluating interventions to reduce foetal wastage and its associated economic costs at cattle slaughter sites.

Conclusion

This study demonstrated that detected foetal losses were a recurring finding among female cattle slaughtered at Kubwa Abattoir, with 857 losses identified among 8,136 female cattle between 2021 and 2025, giving an overall foetal-loss proportion of 10.53%. The occurrence varied significantly between years and months, with the highest annual proportion recorded in 2025 and higher monthly proportions generally observed between July and October. A positive association was also observed between the number of female cattle slaughtered and detected foetal losses. **The estimated potential economic value of these losses was ₦68.56 million, or ₦65.13 million after applying a 5% mortality adjustment, highlighting the potential economic implications of foetal wastage. These estimates are indicative and are based on a published unit-price benchmark rather than verified market prices in Abuja during the study period. ** The findings indicate significant and varying foetal wastage at slaughter and the importance of regular identification of pregnancy and veterinary monitoring prior to slaughter. Better ante-mortem pregnancy screening, improved record keeping and continued surveillance may help clarify the level of avoidable foetal wastage and better support future research on the causes of foetal wastage.

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