



Pregnancy Wastage in Sheep and Goats in the Sahel Region of Nigeria

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SUMMARY

A retrospective cohort study on slaughter-mediated pregnancy wastage in abattoirs and slaughter points record from January 1998 to December 2009 in the Sahel region of Nigeria revealed an incidence of 22.78 % in sheep and 17.88 % in goats. During the study period, a total of 440,917 sheep and 826,435 goats were slaughtered. Out of these, 321,869 (73%) were ewes and 338,838 (41%) were does. Season wise, higher frequencies of pregnancy wastage occurred during March–May period of each year; when 28.21 ± 2.97 % pregnant ewes and 25.82 ± 2.06 % pregnant does were slaughtered. Similarly, the highest incidence of pregnancy wastage occurred during first trimester with 51 % in sheep and 53 % in goats. Fetometry on 48 foetal–lambs and 49 foetal–kids enabled determination of foetal morphometric parameters that aided in categorizing recovered foetuses into respective trimesters. The cohort age of presentation ranged from 0 – 5 months for both sheep and goats. Foetal crown–rump length (CRL) ranged from 3 – 55 cm and bi-parietal diameter (BPD) ranged from 1.1–8.5 cm, corresponding to 21–151 days of gestation. The CRL and BPD of the foetuses significantly correlated with gestational age and weights of the foetus. Continual data collection and analysis on pregnancy wastage is valuable indicator of the trend of slaughter-mediated foetal loss in the Sahel region of Nigeria. It is vital to educate livestock breeders, meat handlers, quality regulators and consumers about the dangers of indifference to pregnancy wastage in the Sahel region of Nigeria.

KEYWORDS: Sheep, goat, sahel, pregnancy wastage.

INTRODUCTION

Sheep and goats constitute the sole domestic small ruminants in Nigeria. The common breeds of sheep include Balami, Yankassa, Udda, Koroji and West African dwarf while the breeds of goats are Sokoto red, Borno white, Kano brown and

West African dwarf (Mohammed *et al.*, 1996; Ojo, 1996; Bokko *et al.*, 2003). Sheep and goats provide bulk of protein, various essential minerals and vitamins vital to the human body. The average animal protein intake/head/day in Nigeria is 19.2 g compared to European/North American averages of 45.3 ± 1.1 g/head/day for women and 56.4 ± 2.6 g/caput/day for men (Hamilton *et al.*, 1991; Lemon, 2000; Okoli *et al.*, 2005; Bilsborough and Mann, 2006). From a global view point, Nigeria falls below average per head consumption of animal protein. This arises partly from diminution in the number of sheep and goats in the Sahel region of Nigeria consequent to reproductive wastage (Chaudhari and Bokko, 2000) due to microbial infections (Okoh *et al.*, 1981; Chukwu, 1985; Zain-Eldin *et al.*, 1985), malnutrition (Wilson, 1976; Meaker and Niekerk, 1977; Njau *et al.*, 1988) and slaughter of pregnant dams (Gongnet and Abassa, 1988; Wosu and Dibua, 1992; Chaudhari and Bokko, 2000).

The preponderant slaughter of gravid sheep and goats in the Sahel region results in wastage of unborn offsprings and loss of reproductively active dams (Abassa and Tine, 1988; Cadmus and Adesokan, 2009). Moreover, the Sahel region is noted for short rainy season with low forage and prolonged hot dry season that result in scanty feeds for the most of the year (Bokko and Chaudhari, 2001; Bokko *et al.*, 2003). Grazing animals over wide areas in search of feed coupled with harsh climate, forces livestock to thrive at subsistence level. This further precipitates the continual diminution of livestock number in the region. Earlier reports indicate that pregnancy wastage through slaughter of gravid dams ranged from 3.7 – 13.65 % for sheep and 13 to 40 % for goats (Bourzat, 1980; Dumas, 1980; Wilson, 1982; Okoh, 1986). In Kano, Nigeria, abattoir survey showed that 34.3 % and 26.1% slaughtered

sheep and goats respectively were pregnant. Prevalence of 16.59 % foetal wastage in goats was reported in Zaria (Okoh, 1980). In eastern Nigeria, late term pregnancy losses consequent to slaughter were 31.0 % in does and 33.9 % in ewes (Wosu and Dibua, 1992). Dumas (1980) reported a prevalence of 25 % pregnancy wastage amongst breeding does and 3.7 – 6.5 % of breeding ewes in the humid and sub-humid zones. The pregnancy wastage in goats by breed was 16.57 % in Sokoto Red, 16.45% in Kano-brown and 17.08 % in West African dwarf goats in Zaria (Ojo, 1996). Wilson and Traore (1988) reported that in Mali the average ages of recovered fetuses were 3.1 months in goats and 3.6 months in sheep. In Senegal, 7.19 %, 13.66 % and 79.13 % of dead fetuses collected at the slaughter house in Dakar were 1–2, 2–3 and 3–5 months old, respectively (Kombate and Abass, 1987; Abassa and Tine, 1988; Gongnet and Abassa, 1988). Investigations into pregnancy wastage in sheep and goats are punctuated in general. Furthermore, the extent of pregnancy wastage is not expansively reported due to haphazard record keeping. This problem is further exacerbated by lax enforcement of the laws on prevention of foetal wastage as well as lack of pregnancy diagnosis facilities in abattoirs and slaughter points. Moreover, the compensation policy has long been jettisoned and most of the livestock owners do not have alternative source of immediate income other than their stocks. The present study was designed to determine the prevalence of pregnancy wastage in the Sahel zone of Nigeria from January 1998 to December 2009. The Sahel zone holds 80 % of the ruminant livestock slaughtered for consumption in Nigeria (Ikeme, 1996; Adubi and Aromolaran, 1998). This article will also attempt to proffer ways to reduce the incidence of the wastage to allow increased livestock production, and the role of government policies and implementation and better method of pregnancy diagnosis.

MATERIALS AND METHODS

Data Collection

The data used in this study was collected from selected slaughter points and municipal abattoirs in the north eastern Nigeria from January 1998 to December 2009. During the visitations, informal interviews of the abattoir personnel and meat handlers were conducted.

Detailed records of the slaughtered sheep and goats were obtained. Data on the total number of male and female animals, slaughtered pregnant dams and the ages of the recovered fetuses were collected. The data were analysed to determine the prevalence of pregnancy wastage.

Ante-mortem and postmortem observation of the slaughtered sheep and goats

To substantiate the cohort, deliberate attempts were made at ante-mortem identification of pregnant dams by visual assessment and abdominal palpation and then tagged. Ewes or does suspected to be pregnant were selected via a systematic random sampling formula $f = n/N$ where n is the average number slaughtered daily, N is the number of the dams to be assessed and f is the sample fraction (Thrushfield, 1994). The potentially pregnant dams were tracked till postmortem inspection and confirmed by dissecting the uteri. For this study, the sample that conclusively established the diagnosis post-mortem was dead fetus.

Fetometry and morphometric measurements

Morphometric measurements were carried out on recovered conceptuses; 48 foetuses for sheep and 49 foetuses for goats respectively. The weights of the dead foetuses were recorded. Foetal age was estimated by measuring the crown-rump length (CRL in cm) and bi-parietal diameter (BPD in cm) of the foetuses as described by Richardson *et al.* (1990) and Hussein (2008). Briefly, to measure the CRL, the foetuses were laid in lateral recumbent position and the measurement was taken from the crown to the rump. The BPD was carried out by scanning the head on the transverse axial plane (the widest distance between the outer borders of the cranium at an angle of 90° to the falx cerebri midline dividing the hemisphere into two equidistant parts with head as oval as possible) and measurements taken from the outer surface of the calvarium to the inner surface of the distal calvarium. The estimated foetal ages were used to classify and allot the foetuses into appropriate trimesters depicting the three stages of gestation. Data generated were analyzed using descriptive analysis such as simple average ratios and percentages.

RESULTS

The recorded number of slaughtered sheep and

goats in selected slaughter points and municipal abattoirs in the Sahel zone between January 1998 and December 2009 was evaluated using a retrospective cohort analysis. This geographic region was chosen for this study because it holds about 80% of the livestock population in Nigeria. The ages of the slaughtered sheep and goats ranged from 1 – 5 years. There was a steady increase in the number of sheep and goats slaughtered from January 1998 to December 2009 (Tables I & II). The abattoirs and slaughter points settings were characterized by inadequate water supply, dysfunctional waste disposal facilities and absence of sanitary inspectors. Animals brought for slaughter were mishandled, inhumanely slaughtered and processed improperly.

Prevalence of pregnancy wastage

A total of 440,917 sheep and 826,435 goats were slaughtered during the study period. Out of these, 321,869 (73 %) were ewes and 338,838 (41 %) were does. The proportions of pregnant ewes and does slaughtered were 22.78 % (Table I) and 17.88 % (Table II) respectively. These values also indicate that the prevalence of pregnancy wastage in sheep was 22.78 % (Table I) and 17.88 % in goats (Table II) during the January 1998 to December 2009 period. The slaughter mediated-foetal loss incidence was highest in the first trimester for both sheep (51 %) and goats (53 %). Thirty-one percent of the ewes were in second and 18 % in the third trimesters of gestation. Similarly 26 % of does slaughtered were in the second and 21 % were in the third trimesters of gestation. The annual average pregnancy wastage ranged from 17.63% in 2007 to 26.82% in 2003 in sheep (Table I) and from 13.23 % in 2008 to 22.41 % in 2003 in goats (Table II). The percentage of slaughtered ewes ranged from 64.72 % in 2003 to 76.77 % in 1999 and 35.53 % in 2007 to 52.17 % in 1999 amongst does.

There were higher numbers of sheep and goats slaughtered in the months of December, March, April and May; and lowest from August – October throughout the study period with an annual average of 36,743 (26,823 ewes) sheep (Table I) and 68,869 (28,236 does) goats (Table II). Higher frequencies of pregnancy wastage occurred in the months of March, April and May throughout the study period when 28.21 ± 2.97

% pregnant ewes and $25.82 \pm 2.06\%$ pregnant does were slaughtered. This period coincides with peak of the dry season (December – May) when feed is scarce and the farmers cannot keep large number of livestock. Additionally, this period follows the rainy season when feed is abundant, characterized by upsurge of mating and many ewes and does become pregnant. The owners owing to the lack of feed thereafter sell off the gravid dams that look healthier to fetch a higher price. This account for the significant increase in the female:male slaughter ratios and higher pregnancy wastage.

TABLE I: Proportion of pregnant ewes slaughtered in the selected abattoirs and slaughter points in the Sahel zone of Nigeria annually from 1998 to 2009.

Year	Total sheep	No of ewes	% ewes	No pregnant	% pregnant
1998	29,231	21,870	74.82	4,957	22.67
1999	28,850	22,148	76.77	5,603	25.31
2000	35,927	26,922	75.94	5,939	22.06
2001	32,784	23,689	72.26	5,793	24.45
2002	36,348	25,236	69.43	6,050	23.97
2003	31,811	20,587	64.72	5,934	26.82
2004	38,357	28,325	73.85	6,325	21.33
2005	39,762	29,218	73.48	5,431	18.59
2006	40,999	27,986	68.26	5,878	21.01
2007	41,613	32,295	77.61	5,694	17.63
2008	42,997	32,725	76.11	6,171	18.86
2009	42,238	30,875	73.09	5,748	18.62
Total	440,917	321,876	73.02	69,523	22.78
Annual Mean	36,743	26,823	73.02	5,793	22.78

The prevalence of pregnancy wastage showed a downward trend from 2007 to 2009 in sheep (Table I & Figure 1) and 2008 to 2009 in goats (Table II & Figure 1). The prevalence during these periods is significantly lower ($P < 0.05$) than the mean pregnancy wastage overall average in Table I for sheep and Table II in goats. The overall number of pregnant ewes slaughtered steadily rose (Figure 1). The number of pregnant ewes slaughtered rose slightly in 2004 but assumed a steadier pattern. The number of slaughtered does showed dramatic fluctuations peaking in 2003 and returning to about the same level as that of 1998 in 2008 and 2009 (Figure 1).

TABLE II: Proportion of pregnant does slaughtered in the selected abattoirs and slaughter points in the Sahel zone of Nigeria annually from 1998 to 2009.

Year	Total goats	No of does	% does	No pregnant	% pregnant
1998	49,882	25,460	49.04	4,403	17.28
1999	50,358	27,032	52.17	5,193	19.21
2000	59,759	26,904	45.02	4,741	17.62
2001	63,888	27,469	42.95	4,967	18.08
2002	65,731	29,736	44.23	5,842	19.65
2003	68,692	27,838	40.53	6,237	22.41
2004	73,297	28,025	38.23	6,039	21.55
2005	72,398	27,318	37.73	4,431	16.22
2006	76,557	29,236	38.19	4,685	16.02
2007	79,867	28,378	35.53	5,475	19.29
2008	81,648	31,159	38.16	4,121	13.23
2009	84,358	30,283	35.89	4,260	14.07
Total	826,435	338,838	41.47	60,313	17.88
Annual Mean	68,869	28,236	41.47	5,026	17.88

Fetometry and morphometric analysis

The mean foetal weights from ewes and does were within the normal ranges for sheep (Table III) and goats (Table IV). The total cohort age of presentation of fetuses ranged from 0 – 5 months for both sheep and goats. The age at diagnostic biopsy ranged from 0.75 – 4.5 months. One lamb fetus from the second trimester was slightly anemic, and the cotyledon-caruncle attachment was poor, suggesting imminent pregnancy failure. A kid foetus from the second trimester had both low foetal weight and CRL. No other signs of disease or apparent abnormalities were observed in the fetuses recovered during the study period.

A positive linear correlation was established between the foetal weight, CRL and the BPD in sheep (Table III) and goats (Table IV). The CRL and BPD of the fetuses significantly correlated with gestation period; and is commonly used as an indicator of the foetal skeletal frame and to estimate the age of the foetus. No significant difference ($P > 0.05$) was found in the mean CRL or BPD for either sheep or goats at all stages of gestation (Tables III & IV). Foetal CRL ranged from 3 – 55 cm, corresponding to 21 – 151 days of gestation. Using foetal CRL, trimesters were categorized as the midpoint of 50-day intervals. A CRL range of 0 – 5 cm and BPD range 0 – 1.74 cm was equivalent to 0 – 50 days of gestation representing the first trimester. The CRL range 6 – 21 cm and BPD range 1.75 – 4.5 cm

corresponded to 51 – 100 days of gestation representing the second trimester and the CRL range of 22 – 50 cm and BPD 4.6 – 8.5 cm tightly correlated with 101 – 154 days of pregnancy indicative of third trimester in sheep and goats. The foetal weights showed linear correlation to the CRL and the BPD (Table III & IV). This study also revealed that the state-regulating agencies are unable to enforce abattoir operating regulations.

TABLE III: Mean \pm SEM^a values for the morphometric measurements made at trimesters 1, 2 and 3 in sheep.

Gestation	Trimester 1	Trimester 2	Trimester 3
CRL (cm)	3.91 \pm 0.21 (n=19)	18.72 \pm 1.48 (n= 14)	39.09 \pm 4.66 (n=15)
BPD (cm)	1.19 \pm 0.12	2.24 \pm 0.14	5.45 \pm 0.37
Foetal wt (g)	4.43 \pm 0.24	302.8 \pm 12.2	2726 \pm 196

Trimester I represents gestation period of 1–50 days while trimester II covers 51–100 days and trimester III means 101–150 days of gestation. n indicates sample size.

TABLE IV: Mean \pm SEM^a values for the morphometric measurements made at trimesters; 1, 2 and 3 in goats.

Gestation	Trimester 1	Trimester 2	Trimester 3
CRL (cm)	3.52 \pm 0.12 (n=18)	17.96 \pm 1.35 (n= 14)	35.19 \pm 3.54 (n=17)
BPD (cm)	1.13 \pm 0.11	2.32 \pm 0.22	4.78 \pm 0.93
Foetal wt (g)	4.27 \pm 0.32	289.3 \pm 11.7	2467 \pm 179

Trimester I represents gestation period of 1–50 days while trimester II covers 51–100 days and trimester III means 101–150 days of gestation. n indicates sample size



FIGURE 1: Mean values of ewes and does slaughtered annually in abattoirs and slaughter points from 1998 to 2009 in the Sahel region of Nigeria.

DISCUSSION

From the cohort, the prevalence rate of pregnancy wastage in sheep was 22.78 % and 17.88 % in goats from January 1998 to December 2009 in the Sahel region of Nigeria. These figures indicate that slaughter of pregnant does and ewes is a major cause of prenatal losses

in the region. From this study, the preponderance of pregnancy wastage in the Sahel region may be higher than reported, as sizeable number of sheep and goats are slaughtered on makeshift slaughter slabs, away from abattoirs and slaughter points. Wastage of conceptus through slaughter of pregnant dams is one of the most brazen act of cruelty to animals, significant cause of foetal destruction by man and the most easily preventable reproductive wastage in small ruminants in the Sahel region. This unfortunate practice coupled with strain inflicted by disease and malnutrition constitute the core of impediments to the development and profitability of the livestock industry (Chaudhari and Bokko 2000); moreso that sheep and goats make up about 56 % of the domestic ruminant population in the Sahel region of Nigeria.

The pattern of lamb wastage observed in this study was 51 %, 31 % and 18 % in ewes and kid wastage was 53 %, 26 % and 21% in does slaughtered during the first, second and third trimesters of pregnancy, respectively. This is surprising, given that pregnancies in the second and third trimesters can be readily detected even if the first trimester may go unnoticed. In this study the lowest percentage of slaughtered ewes was in 2007 and does in 2008. Cadmus and Adesokan (2009) also reported a downward trend of pregnancy wastage over the years, and pregnancy wastage was lower in 2005 than earlier years. The reason for occasional dipping in the pregnancy wastage is probably instantaneous. However, a consistent recurrent observation on pregnancy wastage is that relative lower prevalence was obtained during the rainy season when abundant feed prevail.

The proportion of slaughter was 73 % ewes and 41 % does during the study period. The low percentage of ram slaughter is attributable to the practice of setting rams aside and fattened before sale for specific occasions to fetch higher price than ordinary market days. Does on the other hand are preferred to bucks as they are highly prolific, show more hardiness to endemic livestock diseases compared to cattle and sheep (Kombate and Abassa 1987). The preceding results indicate that the Sahel region is losing about 13% of its future flocks through indiscriminate slaughter of pregnant ewes and does. This shows that “herd deletions” via

mortality and offtake rates exceed the “herd replacement” rate from births and restocking via purchase indicating that future demands of sheep and goats are potentially unsustainable. The economic loss from pregnancy wastage is enormous with an estimated loss of N63.27 billion (\$0.432 billion) per year in the Sahel region of Nigeria. Falling numbers of sheep and goats limits the affordability of dietary protein amongst low income earners.

The average days at which foetal ages were first determined by CRL and BPD was 16.98 ± 1.97 and 27.87 ± 3.48 days, respectively. All the foetal parameters significantly correlated ($P < 0.001$) with the gestational age. The age of embryo/fetus in sheep and goats can be accurately estimated by measuring the CRL and BPD. This agrees with Ang *et al.* (2006) and Woo, (2006). In addition, Memon and Ott (1980) reported that pregnancy diagnosis is easily achievable by a plethora of methods like rectal palpation, vaginal biopsy, ultrasonic techniques and serological tests. Ultrasound scans offer an alternative method of detecting gestation, stages of pregnancy and monitor foetal growth (Ang *et al.*, 2006; Woo, 2006). Definitive diagnosis can be obtained with 90 % accuracy after 40 days of gestation in ewes and does (Memon and Ott, 1980). Hormonal assays especially progesterone assays after the 20th day of gestation yielded 90% accuracy in ewes and does (Memon and Ott, 1980). Moreover, determining incidence of foetal loss in abattoirs is dependent on the reliability of the diagnosis of pregnancy ante-mortem. The prevalence of pregnancy wastage is a major factor exacerbating reproductive wastage in small ruminants and requires overcoming in tropical Africa. Foetal wastage receives no attention from regulatory authorities despite concerns by researchers over the impact of this single act on livestock (Cadmus and Adesokan, 2009). Animal owners sell pregnant dams as they fetch higher price. However, long term loss from slaughter of a pregnant dam by far outweighs the immediate gain even if the farmgate prices are unregulated. There is an urgent need for creating awareness amongst the animal breeders, meat handlers, quality regulating agencies and consumers about the dangers of indifference to pregnancy wastage amongst sheep and goats. A sure approach is to undertake the revision of regulations,

introduction of contemporary abattoir facilities to effectively obtain adequate data on number of animals slaughtered in all parts of the region and provides detailed facts on disease prevalence, pregnancy wastage and to enable continuous monitoring and control.

CONCLUSION

The prevalence of pregnancy wastage consequent to indiscriminate slaughter of gravid sheep and goats in the abattoirs and slaughter points in the Sahel region of Nigeria is very high. Slaughter of pregnant ewes and does cause the loss of fertile dams that would have actively added lambs or kids to the flock as well as the loss of lambs/kids that would have replenished the flock. Moreso, that the predominant systems of ruminant livestock production in these areas are traditional pastoral and sedentary rural husbandry method. For meat supplies to meet future demands, the incidence of deliberate slaughter of pregnant ewes and does must be halted completely. This can be attained by enacting and enforcing strict regulations that prohibits slaughter of pregnant dams and young animals. Stiff penalties must be instituted against such practice among meat handlers/workers and even lax enforcement of the applicable laws by the government appointed personnel. This along with comprehensive recording and monitoring pregnancy wastage at strategic livestock control posts, slaughter points and abattoirs will eradicate pregnancy wastage in sheep and goats in the Sahel zone of Nigeria.

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