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Studies on West African Dwarf sheep : incidence of perinatal mortality in Nigeria

OTESILE (E.B.), ODUYE (O.O.). Études sur le mouton nain d'Afrique de l'ouest : incidence de la mortalité périnatale au Nigeria. *Revue Élev. Méd. vét. Pays trop.*, 1991, **44** (1) : 9-14

La mortalité périnatale des agneaux a été étudiée jusqu'au 30e jour sur le mouton nain d'Afrique de l'Ouest, à Ibadan (Nigeria), pendant une période de trois ans. Un taux de mortalité totale périnatale à 30 jours (PMR 30) de 19,9 p. 100 a été enregistré avec la répartition suivante : avortements 3 p. 100, agneaux mort-nés 2,7 p. 100, mortalité néonatale 15,6 p. 100. Le taux de mortalité par avortement était significativement plus élevé dans les gestations à foetus multiples et pendant la saison sèche, avec P < 0,01 et P < 0,05, respectivement. A l'inverse, le taux des agneaux mort-nés était légèrement plus élevé pour les naissances mono-foetales (P < 0,05). Le taux de mortalité des agneaux jusqu'à 30 jours était de 17,1 p. 100 pour les mâles et de 13,4 p. 100 pour les femelles. Le poids optimal de survie à la naissance pour cette race semble être compris entre 2,6 et 3 kg. Les données n'étaient pas significativement différentes (P > 0,05). De même, le taux de mortalité à 30 jours n'était pas significativement différent pour les naissances mono-foetales (14,4 p. 100), les jumeaux (15,4 p. 100) et les triplés (26,7 p. 100). L'analyse de régression a révélé une augmentation de 28,3 p. 100 du poids à la naissance et tous les agneaux nés vivants avec des poids égaux ou inférieurs à 0,9 kg sont morts pendant la période néonatale telle que définie ci-dessus. Environ les deux tiers de toutes les morts néonatales (67,2 p. 100) sont survenues durant la première semaine d'existence. Aucun effet significatif de la saison n'a été noté sur le taux de mortalité à 30 jours. Les taux de mortalité périnatale enregistrées dans la présente étude sur le mouton nain d'Afrique de l'Ouest ne semblent pas différer significativement de ceux déterminés de façon comparable dans d'autres parties du monde. *Mots clés* : Mouton nain ouest-africain - Agneau - Avortement - Mortalité - Nigeria.

INTRODUCTION

The occurrence of a drought which decimated the livestock of Nigeria in the early 1970s created similar results in the neighbouring countries thus inducing widespread meat shortage in this part of the continent. Consequently, there is increased need for the intensification of livestock production in the region. In the Southern (rain forest) area which is heavily infested by tsetse flies, most studies on ruminant production have involved sheep and goats because these species are more trypanotolerant than cattle (16) and are thus believed to have greater chances of survival in the area. Disease has been identified as a major constraint to development of small ruminant flocks in tropical Africa, leading to a high mortality (7, 9, 20). In a report by the International Livestock Centre for Africa (7) chances of survival of lambs to one year of age was only 55 %, with most deaths (up to 25.6 %) occurring in lambs under one month of age.

Previous studies in this environment have shown that most cases of perinatal deaths results from starvation (14), whereas infectious diseases and parasitism are mostly responsible for deaths in lambs over one month of age (13). The common observation that lamb mortality rate is highest during the first month of life (3, 7, 15, 20) has led to the assertion that perinatal lamb mortality is a major cause of lowering productivity of sheep (3, 7). Obviously then there is need for studies on both the epizootiology and aetiology of perinatal mortality under various ecological and managemental systems.

As part of an effort to achieve rapid multiplication of livestock in Nigeria, both Federal and State Governments are setting up sheep multiplication centres. The centres serve as sources of breeding stock for citizens who wish to set up sheep farms. The present study was carried out on one of such farms and was intended to provide information on perinatal mortality in sheep under ranching condition in a humid rain forest environment. Related studies have been carried out in rural (village) environments in Nigeria (7) and elsewhere (1). The present study covered the period April 1981 to March 1984 and involved a flock of West African Dwarf sheep, which is the most numerous sheep breed in the more humid areas of West Africa (21).

MATERIALS AND METHODS

The sheep farm is situated on the outskirts of Ibadan which lies about 7°26' N and 3°54' E and has a two-peaked rain fall pattern and a dry season of three to four months during which vegetation is retarded (11). The West African Dwarf sheep were raised on *Cynodon nlemfuensis* and *Centrosema pubescens* pastures. Supplementary maize based concentrate ration was offered as available. The sheep were housed overnight in groups of 50-150 animals. They were routinely dewormed with thiabendazole or fenbendazole at intervals of two months. Rams ran with the ewes and breeding took

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Reçu le 13.7.1990, accepté le 23.10.1990.

place throughout the period of study. The mean monthly sheep population during the study period is presented in table I.

TABLE I Mean monthly West African Dwarf sheep population, April 1981 to March 1984.

Months	Sheep population (mean + s.d.)
April	316 + 42.2
May	305 ± 38.1
June	321 ± 41.1
July	342 ± 14.5
August	346 ± 5.3
September	348 ± 1.2
October	335 ± 10.3
November	338 ± 22.0
December	353 ± 19.7
January	340 ± 31.1
February	341 ± 35.9
March	327 ± 27.6
April 1981 to March 1984	334 ± 14.3

Farm visits were made at about 07.00 hours in order to collect carcasses. Individual records were kept for all newborn lambs. The birth weight, sex, type of birth (single, twins and triplets ; abortion, still-birth and live birth) were recorded except for (i) 14 live-born lambs whose type of birth (single or twin) could not be ascertained because of sporadic cases of adoption of newborn lambs by other dams. The 14 lambs were excluded from the analysis of effect of type of birth on mortality rates (table II), and (ii) 68 live-born lambs whose precise birth weights were not known were excluded from the analysis of effect of birht weight on mortality rates (table III). These were lambs weighed with a spring balance at the beginning of the study. The balance investigate was later found to be insufficiently sensitive for the range of weight of the lambs studied and was substituted with a Wyamaster baby scale. Deaths were recorded up to 30 days *post partum*.

TABLE II The effects of sex, type of birth and season on neonatal mortality rate in West African Dwarf sheep.

Influence	No. of lambs		Mortality rate (%)
	Live born	Dead	
Sex			
Males	421	72	17.1
Females	461	62	13.4
*Type of birth**			
Singles	450	65	14.4
Twins	403	62	15.4
Triplets	15	4	26.7
Season			
Wet (Mar.-Oct.)	562	82	14.6
Dry (Nov.-Feb.)	320	52	16.3
Total	882	134	15.2

** The type of birth of 14 lambs could not be ascertained (see Materials and Methods, vide supra) ; 3 of the 14 lambs died during the neonatal period.*

TABLE III The effect of birthweight on neonatal mortality rate in West African Dwarf sheep.

Birthweight (kg)	No. of lambs*		Mortality rate (%)
	Live born	Dead	
Under 1.0	31 (3.8)	31 (24.0)	100
1.0-1.5	157 (19.3)	31 (24.0)	19.7
1.6-2.0	329 (40.4)	51 (39.5)	15.5
2.1-2.5	232 (28.5)	13 (10.1)	5.6
2.6-3.0	47 (5.8)	1 (0.8)	2.1
3.1-3.5	18 (2.2)	2 (1.6)	11.1
Total	814** (100)	129** (100)	15.8

** Figures in parenthesis represent percentage (%).*
*** Birthweights of 68 live born lambs were not recorded (see Materials and Methods, vide supra) ; 5 of the lambs died during the neonatal period.*

Terminologies

Foetus

The product of conception after it has taken form in the uterus to the moment of birth (19).

Abortion

The expulsion of a foetus that has reached a recognizable size but is not capable of independent life (non-viable foetus).

Still-birth

The expulsion of a dead foetus after it has attained capacity for independent life (this includes viable foetuses which die before or during the process of parturition).

Neonatal period

Period immediately after birth of live lambs and continuing through the first 30 days of life (2).

Neonatal and perinatal mortality

Death of lambs during the neonatal period. Death of foetuses and lambs occurring before or during birth or during the first 30 days of life (3).

Formulae for mortality rates

All rates are expressed per 100.

Abortion rate

(No. abortions)/(No. abortions + still-births + live-births) x 100

Still-birth rate

(No. still-births)/(No. abortions + still-births + live-births) x 100

Neonatal lamb mortality rate (LMR)

(No. neonatal deaths)/(No. live-births) x 100

Perinatal mortality rate (PMR)

(No. abortions + still-births + neonatal deaths)/(No abortions + still-births + live-births) x 100

Statistical analyses

The mortality rates among sexes, types of birth and groups were compared by the statistic z-test while the influence of birht weight on mortality rate was assessed by chi-square and regression analyses (17).

RESULTS

Lambings took place throughout the year and the mean monthly incidence of abortions, still-births, live-births and noenatal deaths are presented in figure 1. The findings on abortion are summarised in table IV. There were 15 incidents of abortion involving 27 foetuses. Abortion rate for males (3.7 %) was slightly ($P > 0.05$) higher than for females (2.4 %). The rate was significantly ($P < 0.01$) influenced by type of birth (number of foetuses carried by the dam) with the lowest and highest abortion rates being associated with single foetuses and triplets, respectively. A significantly ($P < 0.05$) higher abortion rate was recorded in the dry season (4.19 %) compared to the wet season (2.26 %). A summary of the findings on still-born foetuses is presented in table V. There were 21 incidents of still-births involving 25 lambs. Sex did not significantly ($P > 0.05$) influence still-birth rate. Although the highest still-birth rate was recorded in single foetuses, the overall difference due to type of birth was slight ($P > 0.05$). A significantly higher still-birth rate occurred in the wet (3.52 %) compared to the dry season (1.18 %).

The neonatal lamb mortality rate (LMR) up to 30 days of age was 15.2 % (table II). The difference between the

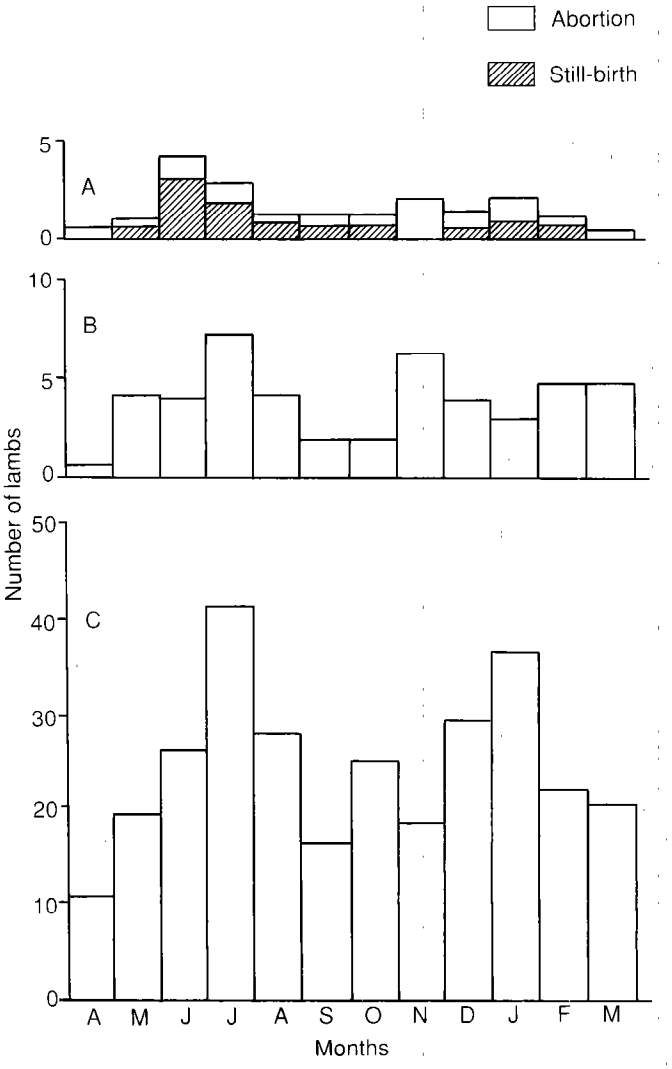

Fig. 1 : Mean monthly incidence of abortions, still-births, neonatal deaths and livebirths. A : Abortions and still-births ; B : Neonatal deaths ; C : Livebirths.

male LMR (17.1 %) and that for females (13.4 %) was not statistically significant ($P > 0.05$). There was no significant difference ($P > 0.05$) between the LMR for single-born (14.4 %), twin-born (15.5 %) and triplets (26.7 %). The effect of season on LMR was not significant as the rate recorded in the dry season (16.3 %) was not significantly higher ($P > 0.05$) than that for the wet season (14.5 %).

The mean birth weight of all live-born lambs (1.89 ± 0.42 kg) (data not presented). The mean birth weight of male lambs (1.93 ± 0.4 kg) was not significantly different ($P > 0.05$) from that of females (1.85 ± 0.48 kg). Similarly, the mean birth weight of single lambs (2.00 ± 0.46 kg), twins (1.77 ± 0.37 kg) and triplets (1.49 ± 0.69 kg) were not significantly different ($P > 0.05$) from one another. The

TABLE IV Findings on abortions in West African Dwarf sheep.

Parameters	No. of foetuses	Rate** (%)	Mean weight ± s.d. (kg)
Sex			
Males	16	3.7	0.51 ± 0.21
Females	17	2.4	0.44 ± 0.22
Total	27	3.0	0.48 ± 0.21
Type of birth			
Singles	2	0.4	0.45 ± 0.07
Twins	19*	4.5	0.49 ± 0.22
Triplets	6	28.6	0.6 ± 0.15
Season			
Dry (Nov.-Feb.)	14	4.19	0.45 ± 0.19
Wet (Mar.-Oct.)	13	2.26	0.52 ± 0.24

* *Three non-viable foetuses were born co-twin to live lambs.*
** *Rate : abortion rate (see Materials and Methods).*

TABLE V Findings on still-births in West African Dwarf sheep.

Parameters	No. of foetuses	Rate** (%)	Mean weight ± s.d. (kg)
Sex			
Males	11	2.46	1.75 ± 0.82
Females	14	2.88	1.58 ± 0.52
Total	25	2.68	1.65 ± 0.65
Type of birth			
Singles	16	3.42	1.79 ± 0.74
Twins	9*	2.09	1.40 ± 0.35
Triplets	0	0	–
Season			
Dry (Nov.-Feb.)	4	1.18	1.43 ± 0.61
Wet (Mar.-Oct.)	21	3.52	2.20 ± 0.87

* *One viable but dead foetus was born co-twin to a live lamb.*
** *Rate : still-birth rate (see Materials and Methods).*

effect of birth weight on LMR is presented in table III. All lambs with birth weights lower than 1.0 kg died during the neonatal period.

Afterwards mortality decreased as birth weights increased to 2.6-3.0 kg, which was apparently the optimum weight class for survival of the West African dwarf lambs. Khi^2 analysis showed a significant influence ($P < 0.01$) of birth weight on mortality rate while the regression analysis revealed a 28.3 % increase in mortality rate for every kilogram decrease in birth weight.

The LMR during the first week of life was significantly higher ($P < 0.01$) than during each of the second, third and fourth weeks. In fact, most of all neonatal deaths (67.2 %) occurred by the end of the first week of life (table VI).

TABLE VI Age incidence of neonatal mortality in West African Dwarf sheep.

Age at death	Dead lambs		ASMR* (%)
	Number	Percentage	
0-24 hours	38	28.4	4.3
Over 24-48 hours	26	19.4	2.9
Over 48-72 hours	11	8.2	1.2
Over 3-7 days	15	11.2	1.7
0-7 days	90	67.2	10.2
Over 7-14 days	7	5.2	0.8
Over 14-21 days	11	8.2	11.2
Over 21-30 days	26	19.4	2.9
Total (0-30 days)	134	100.0	15.2

* *Age Specific Mortality Rate.*

DISCUSSION

The abortion and still-birth rates recorded in this study may be conservative estimates since they represent only the foetuses that were seen inside the sheep houses. The possibility of other foetuses being dropped in pasture, and being missed, cannot be ruled out. An abortion rate of less than 5 % is considered to be within normal limits, such abortions being sporadic and non-infectious (10). Incomplete starvation is a common cause of foetal resorption, still-births and weak offspring (2). Although the aetiology of foetal losses was not investigated during the period of this study, it seemed that incidents of abortions coincided with periods of shortage of concentrate supplementation. A significantly higher abortion rate was recorded in the dry season. Furthermore, since (i) no malformed foetuses, suggestive of congenital infections, were seen and (ii) since the abortion rate was highest in dams with triplets and lowest in those with single foetuses, it was considered that the foetal losses were non-infectious. This view is in keeping with the previous finding that dams with multiple foetuses tend to be more susceptible to abortions due to nutritional deficiencies (2).

In contrast to cases of abortion, the highest still-birth rate was recorded in single lambs and during the wet season. From field observations, it was apparent that a proportion of still-births resulted from dystocia due to a relative foetal over-size and that young primiparous ewes were mostly involved (12). It seemed that natural mating of immature ewes contributed, at least in part, to the incidence of still-births recorded and that the effect was more pronounced during the wet season when pasture was abundant.

When the neonatal LMR was considered together with the abortion and still-birth rates, a perinatal mortality rate of 19.9 % with extension up to 30 days of age (PMR 30) was obtained during the study period. This is close to the PMR

28 of 15 to 10 % for Australia (3) and for up to 6 weeks of age in Britain (6). Such a mortality rate occurring up to the first month of life only is considered to be high (3, 4, 7, 15, 20). In cattle, a calf mortality rate of 20 % can reduce net profit by up to 38 % (8). It has been pointed out that overall lamb mortality rates may be higher than commonly believed since accurate survey data are likely to come from the best managed farms (18). During the first year of study, it was not unusual to retrieve stranded or abandonned lambs from pastures while the ewes were locked up in the sheep accommodation. As a result, newborn lambs were subsquently confined in the sheep house with their dams for up to a week or longer after birth. During this period, the dams were maintained on a concentrate ration. Thus, if the management had been less efficient, a higher mortality rate might have been recorded.

In spite of the fact that slightly less (421) males were born compared to females (461), the mortality rate of males was slightly higher than that of females. Higher death rates have been previously reported for males compared to females (9, 17) and it has been suggested that a higher incidence of difficult births, due to higher birth weights, may be one of the factors involved in the higher death rate of male lambs (4). However, another worker (9) found that the death rate of males was generally higher than that of females in every time period up to weaning. Contrary to previous reports of higher mortality rates in twin lambs than in single lambs (9, 15, 20), no significant difference was found between the overall single and twin lamb mortality rates in this study.

The present observation on birth weights is consistent with established influence of birth weights upon mortality rates (reviewed in 9). Since birth weights were recorded to the nearest 0.1 kg, it is accurate to state that all West African dwarf lambs that weighed 0.9 kg or less died during the neonatal period. Mortality then progressively decreased as birth weights increased to 3.0 kg (table III). Thus, the mean birth weight of live-born lambs (1.89 kg) was about two-thirds the optimum weight for survival. The smallest lambs tended to take longer to suckle successfully and were prone to early deaths (20). On the other and, mortality at high birth weights have been associated with lambing difficulties (5). Most of all neonatal deaths (67.2 %) had occurred by the end of the first week of life (table VI). In Australia, DENNIS (3) reported that 86.6 % of neonatal deaths had occurred by 72 hours *post partum*. Therefore, in an attempt to stem neonatal lamb mortalities, more efforts should be devoted to the study of causes of deaths during the first week of life.

CONCLUSION

The present results do not seem to indicate that perinatal mortality rates obtained in this study differ significantly from those obtained in other parts of the world. It should, however, be pointed out that in southern Nigeria, sheep and goats are commonly raised in small holdings (7) and it is usually difficult to obtain figures from large numbers of the animals in epidemiological studies. Hence, further studies are usually needed to confirm the findings obtained in such studies such as for example those on mortality rates in the present study.

OTESILE (E.B.), ODUYE (O.O.). Studies on West African dwarf sheep : incidence of perinatal mortality in Nigeria. *Revue Élev. Méd. vét. Pays trop.*, 1991, **44** (1) : 9-14

A study was conducted on the incidence of perinatal lamb mortality with extension up to 30 days of age (PMR 30) in West African Dwarf sheep in Ibadan, Nigeria, over a three year period. An overall PMR 30 of 19.9 % was recorded. This consisted of an abortion rate of 3.0 %, a still-birth rate of 2.7 % and a neonatal lamb mortality rate of 15.6 % up to 30 days of age (LMR). Abortion rate was significantly higher in pregnancies with multiple foetuses and during the dry season ($P < 0.01$ and $P < 0.05$ respectively). Conversely, the still-birth rate was slightly higher in single lambs ($P < 0.05$). The LMR for males (17.1 %) and that for females (13.4 %) were not significantly ($P > 0.05$) different. Also the LMR for single-born (14.4 %), twin-born (15.4 %) and triplets (26.7 %) did not significantly differ ($P > 0.05$). The optimum birth weight for survival of the breed appeared to be 2.6 to 3 kg. Regression analysis showed a 28.3 % increase in birth weight and all live-born lambs with birth weights of 0.9 kg or less died during the neonatal period. About two-thirds (67.2 %) of all neonatal deaths occurred during the first week of life. There was no significant effect of season on LMR. The perinatal mortality rates recorded among West African Dwarf sheep in this study do not seem to significantly differ from corresponding figures recorded in other parts of the world. *Key words* : West African Dwarf sheep - Lamb - Mortality - Abortion - Nigeria.

OTESILE (E.B.), ODUYE (O.O.). Estudios sobre el carnero nano de Africa del Oeste : incidencia de la mortalidad perinatal en Nigeria. *Revue Élev. Méd. vét. Pays trop.*, 1991, **44** (1) : 9-14

Se estudió durante tres años en Ibadan, Nigeria, la mortalidad perinatal de los corderos de raza nana de Africa del Oeste hasta el 30 día de edad, día cuando se notó una tasa de mortalidad total perinatal de 19,9 p. 100 con la repartición siguiente : abortos 3 p. 100, corderos mortinatos 2,7 p. 100, mortalidad neonatal 15,6 p. 100. La tasa de mortalidad por aborto era, significativamente, más elevada en las gestaciones con fetos múltiples y durante la estación seca con $P < 0,01$ y $P < 0,05$ respectivamente. A la inversa, la tasa de los corderos mortinatos era un poco más elevado en los nacimientos mono-fetales ($P < 0,05$). La tasa de mortalidad de los corderos hasta el día 30 de edad era de 17,1 p. 100 para los machos y de 13,4 p. 100 para las hembras. Se parece que el peso optimo de supervivencia al nacimiento se situa entre 2,6 y 3 kg. Los datos no eran significativamente diferentes ($P > 0,05$). Lo mismo, no era significativamente diferente la tasa de mortalidad para los nacimientos mono-fetales (14,4 p. 100), los gemelos (15,4 p. 100) y los trillizos (26,7 p. 100). El analisis de regresión mostró un aumento de 28,3 p. 100 del peso al nacimiento y todos los corderos nacidos vivos, con pesos iguales o inferiores a 0,9 kg, son muertos durante el periodo neonatal definido más arriba. Cerca de 2/3 de todas las mortalidades neonatales (67,2 p. 100) ocurrieron durante la primera semana de existencia. No se observó ningún efecto significativo concerniente la estación sobre la tasa de mortalidad al día 30. Las tasas de mortalidades perinatales notadas durante este estudió no parecen ser diferentes, significativamente, de las determinadas de modo comparable en otras partes del mundo. *Palabras claves* : Carnero nano de Africa del Oeste - Cordero - Mortalidad - Aborto - Nigeria.

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