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A Study on Some Factors Affecting Mortality Rates in Sudanese Nubian Kids

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Abstract: This study was conducted under natural range conditions at a semi-arid region of Sudan (Abu Deleig), during 1998 B 2000. One hundred and eighteen Sudanese Nubian kids, of both sexes were allowed to suckle freely colostrum for the first three days following parturition. Thereafter, they were allowed to suckle all the morning milk and half of the evening milk, for three months and then weaned. The incidence of death among the kids, were closely monitored and related to a number of factors: including type of birth, sex of kid, birth weight, dam parity order, season of kidding and age of kid. The results revealed that the abortion, pre-weaning and overall kid mortality rates were 21.2, 15.2 and 36.4%, respectively. Type of birth, sex of kid, birth weight of kid, parity order, season of kidding and age of the kid significantly affect kid mortality rates. The study indicated that, by instituting adequate management improvement action in addition to selection for larger kids at birth, the productivity of goat could be improved.

Key words: Mortality rate, Nubian goat kids, traditional range

INTRODUCTION

Kid mortality has a direct effect on genetic progress by its effect on selection pressure, that is, the percentage of the kids which must be retained as replacement, moreover high kid mortality rate can seriously affect the economic viability of small ruminant farming and jeopardize the beneficial impact of fecundity and litter size of the flocks. Non-genetic factors, are largely expected to contribute to kid mortality (Alexandre *et al*., 1999; Ameh *et al*., 2000; Nnadia *et al*., 2007). Several factors had been reported in the literature, to affect mortality rate in goat kids (Awemu *et al*., 1999; Ramírez-Bribiesca *et al*., 2001; Donkin and Boyazoglu, 2004; Hailu *et al*., 2006).

The magnitude of each factor on mortality rate, differs among different husbandry and management practices. The study of such factors will help the goat breeder to be more competent in minimizing his losses. Little is known about the effect of these factors on mortality rates of Nubian goat kids, hence, the present experiment, aimed to assess the effect of factors including sex, age and birth weight of goat kids, litter size parity order and season of kidding of dams on Nubian goat's kid mortality rate.

MATERIALS AND METHODS

One hundred and eighteen male and female Sudan Nubian goat kids, were used in this study. The kids were born during the period extending between October 1998 to August 2000, to parent stock raised on traditional pastroralism, at Abu Deleig, 100 km Northeast of Khartoum. The prevailing metrological conditions of the grazing domain and pasture composition are shown in Table 1 and 2, respectively. The parent stock was randomly divided into three groups A, B and C (fifteen goats in

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Table 1: Some meteorological data of the region during the experimental period of the study

	Year								
	1998			1999			2000		
Month	RH_s (%)	Temp. (°C)	$R.F_s$ (mm)	RH (%)	Temp. (°C)	RF (mm)	RH (%)	Temp. (°C)	RF (mm)
January	26	20.8	-	28	23.7	-	36	22.9	-
February	21	23.0	-	24	28.4	-	33	24.1	-
March	17	26.1	-	15	27.1	-	21	26.2	-
April	15	31.7	-	14	31.2	Trace	18	31.7	Trace
May	18	34.1	-	22	35.2	Trace	26	34.3	0.1
June	22	34.5	-	25	34.8	4.7	26	35.7	-
July	39	33.9	1.4	44	31.5	42.2	36	32.8	2.5
August	50	30.7	34.7	51	30.3	51.3	39	32.5	2.0
September	52	31.3	87.6	44	31.1	20.4	39	31.7	16.3
October	37	32.0	7.2	36	31.5	4.2	30	30.2	24.1
November	25	32.9	-	26	28.0	-	27	26.7	-
December	28	25.5	-	33	25.0	-	29	22.5	-

RH: Relative humidity; RF: Rain fall

Table 2: Chemical composition of natural pastures in the study area

			Type			
Botanical name	Local name	DM (%)	CP (%)	CF (%)	EE (%)	Ash (%)
Acacia ehrenbergiana	Salam	Bark and branch	12.66	27.51	1.95	6.36
Acacia ehrenbergiana fruit	Salam fruit	Fruit	1.67	16.00	3.00	8.25
Acacia ehrenbergiana flower	Salam flower	Flower	0.71	16.50	1.00	9.75
Acacia mellifera	Kitir	Tree	16.30	30.30	1.80	8.70
Acacia tortilis sub-sp. Radiana	Seyal	Tree	12.14	28.55	2.12	4.14
Schoenefeldia gracilis	Dembelab	Grass	4.90	36.70	1.00	15.50
Aristid spp.	Gau	Grass	5.70	38.40	0.50	10.00
Urochloa trichopus	Taffa	Grass	8.30	34.30	0.90	13.90
Cymbopogon nervatus	Nal	Grass	6.40	31.90	1.40	8.40
Tribulus terrestris	Dirasa	Grass	26.17	33.00	4.00	24.00
Targus berteronianus	Shara	Grass	9.88	8.84	1.36	210.00
Ipomoea cordofana	Hantoot	Grass	18.38	17.50	1.50	22.00
Aristida adscension	Humra	Grass	2.98	43.00	2.22	8.75
Sorghum straw	Gasab feterita	Stem	1.58	24.50	0.50	7.00

Date of collection: Between end of September and beginning of November (1998). Stage of collection: Late bloom stage, dried aerial part for grasses and fresh twigs for trees, CF: Crude fiber, CP: Crude protein, EE: Ether extract

each group). All three groups were allowed free grazing during day; from 7 am to 4 pm. Group A was offered sorghum grains at a rate of 500 g/head/day for 30 days, before parturition and throughout the lactation period. For the remaining time of their physiological cycle, this group was given sorghum grains at a rate of 170 g/head/day, while group B, was maintained according to the traditional management system in the area i.e., supplemented with 170 g of sorghum grains per head per day throughout their physiological cycle. Group C was offered molasses based diet, throughout the experimental period (Table 3). All groups were offered sorghum stalks at a rate of 500 g/head/day and allowed access to fresh pore-hole water twice a day in dry summer (March-June) and once daily during winter (November-February).

In autumn, the goats were taken outside Abu Deleig area to its surrounding plains, where night grazing was also practiced, in addition to day grazing. No dietary supplementation was offered during this period. Watering was once a day from running surface water (Khors) at the beginning of the wet season and from excavated ponds at the end of the season.

The kids born during the three seasons were allowed to suckle colostrums for the first three days following parturition, thereafter they were separated from their dams during the day. In the evening, half of their dam milk (i.e., one teat) was milked before the kids were released to suckle their dams

Table 3: Ingredients and proximate analysis of experimental diet (as fed basis)

	Ration			
Components (%)	A	B	C	Sorghum stalks
Molasses	-	-	50	-
Sorghum grains	100	100	-	-
Wheat bran	-	-	41	-
Groundnut cake	-	-	8	-
Salt	-	-	1	-
Total	100	100	100	
Proximate analysis (%)				
Dry matter	94.50	94.50	91.80	93.00
Crude protein	12.75	12.75	12.15	4.14
Crude fibre	2.87	2.87	6.10	24.50
Ether extract	2.46	2.46	2.71	0.50
NFE	74.34	74.34	51.08	47.83
Ash	2.08	2.08	9.09	7.68
ME (MJ kg^{-1})	12.84	12.84	9.51	6.22

throughout the night. The kids were weaned at three month of age. Data pertaining to abortion, mortalities, birth weight, sex, litter size (type of birth), parity order and season of birth were closely monitored.

The abortion and pre-weaning mortality rates, were calculated as percentages of all pregnancies. The data were analyzed using chi-square procedure.

RESULTS

The data indicated that the percentage (from all pregnancies) of aborted fetuses was 21.2%, the pre-weaning mortality rate was 15.2% and the overall mortality rate (abortion rate + pre-weaning mortality rate) was 36.4%.

The data in Table 4 indicated that dams feeding supplement had a significant ($p<0.01$) effect on abortion rate, the recorded data for kids born to dams of group A, B and C feeding supplement were 28, 48 and 24%, respectively. Dams feeding supplement also affected significantly ($p<0.005$) the pre-weaning mortality rate, the rates for kids born to dams of group A, B and C feeding supplement were 27.78, 55.55 and 16.67%, respectively. The overall mortality rate was also significantly ($p<0.005$) affected by dams feeding supplement, the rates for kids born to dams of group A, B and C feeding supplement were 27.91, 51.16 and 20.93%, respectively.

The data in Table 5, indicated that litter size had a significant ($p<0.005$) effect on abortion rate, the recorded data for single, twin and triplet sizes were 68, 32 and 0%, respectively. Litter sizes also significantly ($p<0.005$) affected the pre-weaning mortality rate, the rates for single, twin and triplet sizes were 61.11, 22.22 and 16.67%. The overall mortality rate was also significantly ($p<0.005$) affected by litter size.

The data in Table 6 showed that sex had a significant ($p<0.05$) effect on the pre-weaning mortality rate. The pre-weaning mortality rates for male and female kids were 61.11 and 38.89, respectively. Birth weight also had a highly significant ($p<0.005$) effect on pre-weaning mortality rate. The recorded pre-weaning mortality rates for kids of below and above average birth weight (2.34±0.56 kg) were 88.89 and 11.11%, respectively. Pre-weaning mortality rate was also significantly ($p<0.005$) affected by age of the kids. The recorded pre-weaning mortality rates for kids in 1st, 2nd and 3rd months of age were 72.22%, 11.11% and 16.67%, respectively.

The data in Table 7 indicated that parity order had a significant ($p<0.01$) effect on abortion rate of kids. The recorded data for abortion rates of first, second and third parity kids, were 24, 48% and 28%. The pre-weaning mortality rate was also highly significantly ($p<0.005$) affected by parity order.

Table 4: Effect of dam feeding supplement on kid mortality rate

	Kid mortality rate		
Dam feeding supplement	Abortion rate (%)	Pre-weaning mortality rate (%)	Overall mortality rate (%)
A	28.00	27.78	27.91
B	48.00	55.55	51.16
C	24.00	16.67	20.93

Table 5: Effect of litter size on kid mortality rate

	Kid mortality rate		
Litter size	Abortion rate (%)	Pre-weaning mortality rate (%)	Overall mortality rate (%)
Single	68	61.11	65.11
Twin	32	22.22	27.91
Triplet	0	16.67	06.98

Table 6: Effect of sex, birth weight and age on pre-weaning mortality rate

	Sex		Birth weight		Age (month)		
Factors	Male	Female	Below average	Above average	1st	2nd	3rd
Pre- weaning mortality rate (%)	61.11	38.89	88.89	11.11	72.22	11.11	16.67

Table 7: Effect of parity order on kid's mortality rate

	Kid mortality rate		
Parity order	Abortion rate (%)	Pre-weaning mortality rate (%)	Overall mortality rate (%)
First	24	50.00	34.88
Second	48	22.22	37.21
Third	28	27.78	27.91

Table 8: Effect of season of kidding on mortality rate

	Kid mortality rate		
Season of kidding	Abortion rate (%)	Pre-weaning mortality rate (%)	Overall mortality rate (%)
Winter	72	83.33	76.74
Dry summer	16	16.67	16.28
Wet summer	12	00.00	06.98

The pre-weaning mortality rates for first, second and third parity kids were 50.00, 22.22% and 27.78%, respectively. The overall mortality rate, was not significantly ($p>0.05$) affected by parity order.

The results in Table 8 showed that season of kidding had a highly significant ($p<0.005$) effect on abortion rate, pre-weaning mortality rate and the overall mortality rate of kids.

DISCUSSION

Kid mortality encountered in this study (36.4%), was very high, it almost approximated about two fifth of the whole kids expected to be produced by the flock. The fetal period seemed to be the most critical period in the kid's life, 21.2% of the expected kids were lost due to abortion, so abortion represents almost approximately more than half of the lost kids. The exact causes of the abortions were not known. However, as suggested by Shelton (1978), it may be true that goats being corpus luteum dependant species are more exposed to abortion when there is an interference with or absence of a functional corpus luteum.

The present study illustrated that kid mortality rates were high for kid born to dams of group B feeding supplement, while kids born to dams of group A were recorded the least mortality rates, these

results agreed favorably with Nnadio *et al*. (2007) and Mushi *et al*. (2007) this may be attributed to that the level of nutrition of group A was good and so kids were furnished with enough nutrient during their uterine and extra uterine periods.

In the present study it was evident that single born kids experienced significantly ($p<0.05$) higher mortality rate compared to their multi litter mates. This result comply with findings reported by Awemu *et al*. (1999) and Hailu *et al*. (2006). It was observed that most of the kidding in the traditional husbandry system were single birth and this may be attributed to the poor nutrition status that domain most of the year and consequently lower birth weight, that lead to high mortality rate.

Mortality rate among male kids was significantly ($p<0.05$) higher than in females. The rates for male and female kids were 61.11 and 38.89%, respectively. Turkson *et al*. (2004) reported findings indicating that in their study the mortality rates among male kids were significantly higher than in female kids.

Parity order has been shown to influence pre-weaning kid mortality. Kids born in parity one showed higher mortality rate when compared to those born to later ones (50.0, 22.22 and 27.78% for parity one, two and three, respectively). This may be due to that older does provided better prenatal and post-natal nourishment reflected on kids with heavier birth weights and subsequent faster growth rate which resulted in a better chance of survival. This result was in agreement with Rattner *et al*. (1994), Awemu *et al*. (1999) and Hailu *et al*. (2006).

Birth weight was found to influence the pre-weaning kid mortality rates (88.89 and 11.11% for kids weighed below and above average, respectively). This indicates that higher mortality rates were associated with excessively lighter birth weights. This may be due to that kids born with smaller birth weights were more susceptible to environmental hazards and/or natural selection than those born with weights above the average. The present result agreed favorably well with what had been indicated by Awemu *et al*. (1999), Ramírez-Bribiesca *et al*. (2001), Turkson *et al*. (2004) and Hailu *et al*. (2006).

The present study showed that the pre-weaning mortality rates were variable between seasons (83.33, 16.67 and 0% for winter, dry summer and wet summer, respectively). It is clear that higher rates were encountered in kids born in winter; this may be due to scarcity of feed and low ambient temperature. These results were in agreement with the findings of Turkson *et al*. (2004) for West African Dwarf goats and Hailu *et al*. (2006) for Borana and Arsi-Bale kids.

The observation that the mortality was highest during the early life and decreased with increase of age (72.22, 11.11 and 16.67% for 1st, 2nd and third month, respectively), is in line with the results reported by Sharif *et al*. (2005) for kid and lambs in farms in Jordan.

CONCLUSION AND RECOMMENDATIONS

The results verified that:

- Grazing supplementation reduced kid mortality rate
- Kids with lighter weight had a higher mortality rate
- Kids were more susceptible to mortality at early life
- Kid mortality was at its lowest level in wet summer season
- Studies must be carried to identify causes of kid mortality by different factors

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