

A Retrospective Study on the Mortality Rate of Camel Calves, Leading Causes, and Associated Risk Factors in Borana Zone, Oromia Regional State, Ethiopia

Studi Retrospektif tentang Tingkat Kematian Anak Unta, Penyebab Utama, dan Faktor Risiko Terkait di Zona Borana, Negara Bagian Regional Oromia, Ethiopia

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ABSTRACT

Background: *Camelus dromedarius* (one-humped camel) is an important livestock species uniquely adapted to arid and hot environments. **Purpose:** This study aims to determine the mortality rate of camel calves and to investigate the potential risk factors associated with it. **Methods:** Retrospective data were collected through interviews with livestock owners using a semi-structured questionnaire from February 2020 to January 2021. During the study period, a total of 1,249 calves were born. This allowed for assessment of annual mortality rate and its main contributing factors. **Results:** The average annual mortality rate was 26% (1.29 ± 1.77), while the overall mortality rate was 55% (1.30 ± 1.85). Malnutrition (5%), unexplained causes (6%), and diseases (24%) were the three leading causes of calf mortality. Diarrhea (57%), nonspecific diseases (45.4%), respiratory diseases (23%) were significant among the diseases. Mistakes in the management of young livestock included limiting access to colostrum and milk for human consumption, as well as poor care and health management. **Conclusion:** The results of this study suggested that the pastoral livestock production system used in Borena has a serious problem with calf mortality. The first month of life had the highest mortality rate of 26%. Diseases, starvation, and unexplained causes were the leading causes of calf mortality. In addition, calf mortality was associated with the timing of birth and colostrum feeding.

ABSTRAK

Latar Belakang: *Camelus dromedarius* (unta berpuncuk satu) adalah spesies ternak penting yang secara unik beradaptasi dengan lingkungan kering dan panas. **Tujuan:** Penelitian ini bertujuan untuk mengetahui tingkat kematian anak unta dan untuk menyelidiki faktor-faktor risiko potensial yang terkait dengannya. **Metode:** Data retrospektif dikumpulkan melalui wawancara dengan pemilik ternak menggunakan kuesioner semi terstruktur dari Februari 2020 hingga Januari 2021. Selama masa studi, total 1.249 anak sapi lahir. Ini memungkinkan penilaian tingkat kematian tahunan dan faktor utamanya. **Hasil:** Tingkat kematian tahunan rata-rata adalah 26% (1,29 ± 1,77), sedangkan tingkat kematian keseluruhan adalah 55% (1,30 ± 1,85). Malnutrisi (5%), penyebab yang tidak dapat dijelaskan (6%), dan penyakit (24%) adalah tiga penyebab utama kematian anak sapi. Diare (57%), penyakit nonspesifik (45,4%), penyakit pernapasan (23%) adalah signifikan di antara penyakit. Kesalahan dalam pengelolaan ternak muda termasuk membatasi akses ke kolostrum dan susu untuk konsumsi manusia, serta perawatan dan manajemen kesehatan yang buruk. **Kesimpulan:** Hasil penelitian ini menunjukkan bahwa sistem produksi ternak penggembalaan yang digunakan di Borena memiliki masalah serius dengan kematian anak unta. Bulan pertama kehidupan memiliki tingkat kematian tertinggi sebesar 26%. Penyakit, kelaparan, dan penyebab yang tidak dapat dijelaskan adalah penyebab utama kematian anak sapi. Selain itu, kematian anak sapi dikaitkan dengan waktu kelahiran dan pemberian kolostrum.

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INTRODUCTION

Camelus dromedarius (one-humped camel) is an important livestock species uniquely adapted to arid and hot environments. It produces milk, meat, wool, and hides, and is used for riding, as a pack animal, and as a draft animal for agriculture and short-distance transportation (Keskes *et al.*, 2013). It is estimated that there are approximately 28 million large domesticated camelids worldwide (Faye, 2015). This number is certainly underestimated, especially in Ethiopia and the Sahelian nations of Mali, Mauritania, Chad, Niger, and Sudan. More than 80% of camels live in Africa, with 60% of them living in the East African nations of Ethiopia, Sudan, Kenya, and Somalia (Faye, 2015). These nations are major exporters of dromedary camels to Egypt and the Arabian Peninsula. Camels are an essential source of food, income, and other services for pastoral and agropastoral populations living in such challenging environments (Tura *et al.*, 2010; Al-Juboori and Baker, 2012). To address the persistent and often worsening problems of food insecurity in East Africa, camel farming could be a viable option (Schwartz *et al.*, 1992). However, numerous challenges impede the performance of camel populations in the region, such as inadequate health and extension services, widespread feed shortages and diseases, and poor husbandry systems, which consequently reduce their livelihood and economic contributions.

Ethiopia is home to the largest population of animals in the world, with an estimated 2.4 million camels (Behnke, 2010). Despite the impressive number of animals, the country's income from livestock is relatively low. This is due to several factors, including subpar nutrition, poor genetics in the native breeds, and issues with animal health. This is similar to the situation in some low-income African nations, where the per capita consumption of foods with a livestock origin is low. This is primarily due to unchecked animal diseases, poor farming practices, and inadequate infrastructure. There are many ethnic groups in Ethiopia that maintain camels, including the Oromo (Gabra, Karayu, Bale, Boran, and Guji tribes), Somali, Afar, and Kunama peoples. While the Guji and Boran pastoralists have recently begun camel rearing, the Somali and Afar peoples have long been known for their camel rearing traditions. It is postulated that camels were first introduced to the Borana Plateau by the Gabra and Somali peoples, who had been raising camels for generations (Coppock, 1994). In addition, communities of farmers and agro-pastoralists in mid-altitude regions who had not previously engaged in camel farming have recently begun doing so.

The high mortality rate of calves in their pre-weaning period represents a significant barrier to the expansion of camel herds and their potential for production under pastoral/agro-pastoral production systems in East Africa. Low reproduction rates caused by delayed maturation, long intercalving intervals, and long gestation periods further exacerbate the issue (Bremaud, 1969; BZPADO, 2009). Eastern Ethiopia has been reported to have a high mortality rate of camel calves of up to 53.1% before reaching one year of age (Getahun and Kassa, 2002), with the majority of these losses attributed to

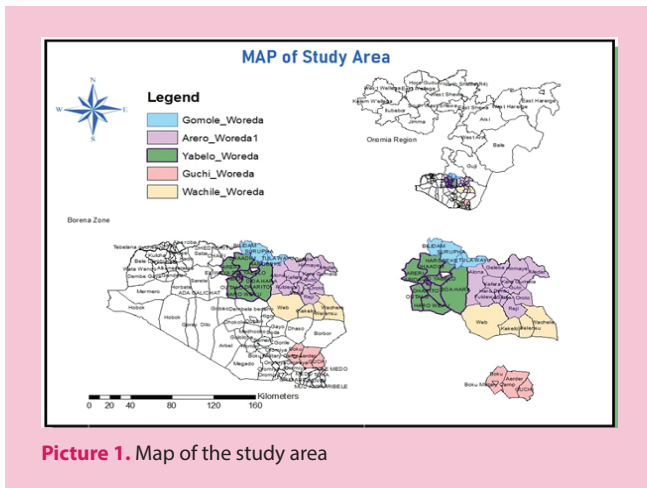
widespread illnesses, hunger caused by household competition for milk, and predators (Yesihak and Bekele, 2003; Keskes *et al.*, 2013; Tadesse *et al.*, 2014). Research conducted in East Africa indicates that camel calves are susceptible to a variety of illnesses, including as pneumonia, infestations by tick and mite, contagious ecthyma, contagious skin necrosis, diarrhea, and pox (Al-Juboori and Baker, 2012; Keskes *et al.*, 2013). Colostrum deprivation was identified as a significant contributor to high rates of disease-related mortalities due to the perception among pastoralists that it caused fatal scouring (Schwartz *et al.*, 1992; Kamber *et al.*, 2000).

For livestock farmers to maximize the profitability of their livestock resources, it is essential to minimize losses and optimize production. Identifying the causes of animal illness and mortality, as well as the associated risk factors, is crucial for implementing effective control measures to reduce losses. A more thorough understanding of the underlying factors that contribute to the mortality of young livestock and the associated patterns can assist in the identification of major management issues and areas for improvement, as well as educating the staff about the significant management and control issues that arise in a variety of production systems. This study aims to assess the mortality rate of young camels and the key factors that affect livestock productivity, as well as the management-related risk factors associated with the mortality of young livestock death in pastoral livestock production systems in the Borana Zone.

MATERIALS and METHODS

Study Area

The study was conducted between February 2020 and January 2021 in selected camel herds of the Arero, Wacile, Guchi, Gomole and Yabello districts in the Borna Zone, South Ethiopia. The Borana Zone is divided into 13 districts, with Yabello as the capital city of the zonal town and is situated at a distance of 570 km south of Addis Ababa. The zone is bordered in the east by the Guji Zone, in the west and north by the Southern Nations, Nationalities, and Peoples Regional State (SNNPRS), in the southeast by the Somali region, and in the south by Kenya. The zone is home to 2,021,416 cattle, 1,154,926 sheep, 1,923,695 goats, 452,630 chickens, 305,284 camels, 5,092 mules, and 110,114 donkeys (BZLRDA, 2020). The Borena Zone is primarily characterized by semi-arid conditions. The annual temperature range is between 21 and 38 degrees Celsius, with an annual precipitation of 350 to 900 millimeters, as well as significant temporal and spatial variability in both the quantity and distribution (CARE Ethiopia 2009). The long rainy season (Genna), which lasts from mid-March to mid-May, and the erratic short rain season (Haggaya), which lasts from mid-September to mid-November, are the defining characteristics of the region's bimodal rainfall patterns. The cold dry season (Adolessa), which lasts from June to August, and the main dry season (Bona), which lasts from December to February, are the other seasonal patterns (BZPADO, 2009). Animal husbandry in the region is distinguished by a complex system of livestock production and seasonal mobility (BZPADO, 2009).



Picture 1. Map of the study area

Study Population

The study population consisted of households that kept dromedary camels and were located in the villages of Silala, K/Gumata, Weeb, Kakalo, Buya, Harobake, Bake, Didahara, Guchi Magala, and Guchi Badiya. Among these villages, the Arero, Wacile, Guchi, Gomole, and Yabello districts were selected for this study due to their accessibility to camel herds, large population, and diversity of production systems in the zone.

Study Design

A retrospective study was conducted on a dataset of the mortality of young camels from February 2020 to January 2021 by evaluating the results of a questionnaire. This study aims to determine the mortality rate of young livestock, the main variables contributing to it, and the management risk factors in the study region that are related to young stock mortality.

Production System and Sample Size

This study was conducted in an extensive production system with a large herd size. The application of an epidemiological formula for the calculation of sample size was challenging due to a lack of previous study regarding the mortality rate of camel calves.

Data Collection

The data were collected using a semi-structured questionnaire, which were administered face-to-face to the pastoralists. In this study, young livestock were defined as animals under eight months old at the time of weaning. Selected pastoralists provided one-year retrospective data from February 2020 to January 2021 on their experiences with young livestock mortality, which was used to calculate the mortality rates. Each participating pastoralist was interviewed to obtain data on the occurrences of births and deaths of young livestock and their causes over the past year. In addition, data on the management strategies for calves, such as feeding, housing, and history of calf disease, were collected. Diarrhea, respiratory diseases, bloat, Navel ill, skin diseases (e.g., pox and mange), and other conditions were classified as diseases or disease signs associated with calf mortality.

Data Analysis

The data obtained from the questionnaire studies were entered into Excel. Descriptive statistics were used to summarize the data using percentages (%), frequency tables, and graphs. For statistical inference, a regression approach was used to compare means (linear regression) and proportions (logistic regression) across predictor variables, such as calve management practices. The statistical analyses were performed using SPSS version 16.0. The average annual mortality rate of young livestock was calculated by dividing the total number of pre-parturient and birth-to-weaning deaths by the number of expected births. Meanwhile, the total annual mortality rate was calculated by dividing the total number of pre-parturient and birth-to-weaning deaths by the number of expected births.

Herd Structure and Size

This study was conducted in the Arero, Wacile, Guchi, Yabelo and Gomole districts of the Borana Zone. A total of 250 camel owners were selected, with an average herd size of 30.7 ± 31.8 camels (95% CI: [26.7, 34.7]). Overall, there were 7,688 camels. In addition, the owners tended to keep more female camels than male camels. The majority of livestock were raised in pastoral systems, with an average age at weaning being 11 months (10 to 12 months). Approximately 86% of camel owners relied on the income derived from the keeping of two or more species of ruminants.

RESULTS

Estimated Mortality Rates

It was estimated that 55% of calves were lost before weaning (95% CI: [8.38, 10.77]), with 26% of these losses occurring between birth and weaning (95% CI: [5.57, 6.98]). The average annual mortality rate between birth and weaning was higher in the Guchi district at 38% (95% CI: [25.4, 45.1%]) compared to other districts, namely Yabello at 29% (95% CI: 22.6, 47.5), Wacile at 28 (95% CI: [27.6, 38]), Arero at 20.6% (95% CI: [17.2, 23.4]), and Gomole at 14.7 (95% CI: [15.4, 25.4]) (Table. 1).

Table 1. The distribution of average annual mortality rates of young livestock by age group.

Age category	Calf mortality	
	(%)	(95% CI)
Stillbirth	21.5	0.82 1.08
Perinatal (<48 hrs)	27	0.34 0.80
Neonatal (48 hrs to 1 month)	38.7	4.61 5.08
Early pre-weaning (1-3 months)	8.4	1.40 1.61
Late pre-weaning (>3 months)	11.5	0.42 0.76
Average annual mortality between birth and weaning*	26	5.57 6.98
Overall annual mortality**	55	8.38 10.77

Note: The average birth-to-weaning mortality was determined in relation to the total number of live-born camel calves (n = 1249).

In this study, perinatal mortality was relatively higher in the Guchi district at 55% (95% CI: [7.2, 21.6]), compared to other districts, namely Wacile (51%), Yabelo (43.9%), Gomole and Arero (21.5%). Among the causes of perinatal death according to the pastoralists were calf illnesses that occurred before

birth. These included viral, bacterial, and parasite infections. Calves that did not receive enough colostrum or milk might suffer from malnutrition and die. The health of the mother camel can affect the health of the calf. If the mother camel is sick, she may not be able to produce enough milk for the calf, pass on her illness to the calf, or experience labor complications, such as dystocia. The age of calves had an inverse relationship with mortality. Perinatal and neonatal mortality rates were observed to be greater in younger age groups, but lower in the older age groups.

Causes of Calf Mortality

Diseases were identified as the primary cause of calf mortality based on the results of interviews with the pastoralists. Other significant causes included by unexplained causes, malnutrition, weakness at birth, predation, and poor mothering (Table 2). Birth-related deaths of small, frail calves were also considered significant since owners might not provide their animals with the necessary care. Unexplained causes were associated with sudden fatalities. One potential issue was identified as malnutrition.

Gastrointestinal problems causing diarrhea were particularly prevalent in neonates during the first month of life. Significant mortality was observed in relation to general (non specific) disease syndromes, such as anorexia, fever, shivering and sudden death. In addition, a few pastoralists reported skin disease outbreak in the past year.

Table 2. The cause-specific mortality and its relative relevance in young livestock.

Cause of mortality	Relative relevance to each cause (%) a Calves	Cause-specific mortality (%) b Calves
Disease	24%	6%
Malnutrition	5%	1.2%
Poor mothering	1.5%	0.4%
Weakness at birth	2.5%	0.64
Predation	2.5%	0.64%
Unknown reason	6%	1.5%

Note: a* Each cause expressed as the number of deaths due to the specific cause relative to the number of deaths in camel calves (n = 320). b* Cause-specific mortality rate for each cause relative to the number of live births in camel calves (n = 1249).

Table 3. The distribution of diseases and syndromes in young livestock mortality

Disease/Syndrome	Calves Proportion (%)
Diarrhea	57
Respiratory diseases	23
Bloat	22
Navel ill	10.3
Skin diseases	14.2
Nonspecific	45.4

Note: A total of 77 calves died between birth and weaning.

Effects of Management Practices on Calf Mortality

Approximately 60.4% of the pastoralists were aware that providing colostrum to calves within six hours of birth had more benefits than providing them with regular milk. However, 39.2% of the pastoralists lacked awareness of the benefits of early colostrum feeding. As a consequence, the calves were compelled to suckle partial residual colostrum, which was

sometimes collected for human consumption, before being permitted to receive it more recently. The pastoralists believed that feeding newborn calves with whole colostrum could cause gastrointestinal issues. Sucking accounted for 70.8% of colostrum feeding, while hand feeding accounted for 27.2%. Only 82.8% of the pastoralists had a separate calf enclosure, with the remaining 17.2% keeping their camels in the same barn. The calves grazed both alone (83.2%) and alongside other camels (16.4%). A number of popular management practices and host-related variables were evaluated to determine their effect on calf mortality. The timing of birth and colostrum feeding were identified as risk factors for calf mortality (Table 4). However, no statistically significant relationships ($p > 0.05$) were observed between any other management practices and mortality.

DISCUSSION

To maximize of the potential of their livestock resources, pastoralists must implement effective strategies to mitigate losses and enhance livestock production. The most challenging aspect of raising livestock is young animal mortality, which represents a significant financial and emotional burden for the pastoralists who must wait for another year to recoup the losses. The identification of the main management issues in the herds and potential areas for improvement can be facilitated by a deeper understanding of the underlying causes of young livestock fatality and mortality trends. This study found that 26% of calves died between February 2020 and January 2021. This showed that a significant issue in the pastoral livestock production system is young livestock mortality. This figure is significantly lower than the mortality rates of 60% reported by Bremaud (1969), Wilson (1984), Simpkin (1996), Kaufmann (1998), and Njanja (2007) in Northern Kenya, as well as the mortality rates of 32.5% to 35.2% in the Somali region and 50.2% in the Afdem District of Somali (Tsegaw, 2016), as well as 31.4% and 27.3 in Rendille and Somali, respectively (Kaufmann, 2000). These differences may be attributed to the various methods of calf handling across pastoral environments. For example, some pastoralists may wean their calves earlier, while others may keep them with their mothers for a longer period. The health and survival of calves can be significantly impacted by the age at which they are weaned, with prematurely weaned calves potentially unable to consume enough nutrients from their mothers' milk and more susceptible to illness. In addition, the availability of veterinary facilities varies significantly across pastoral settings. Veterinary care may be available to certain pastoralists, but not to others. Calves in communities where veterinary care is available may have a higher chance of surviving illnesses if they receive timely treatment. The climate also plays a significant role in calf mortality. Calves born in harsh environments may have a higher risk of dying from environmental factors. Furthermore, they may more susceptible to infections transmitted by animals or insects. There may be significant differences in disease prevalence across pastoral settings. For example, the prevalence of diseases, such as parasitic infections, pneumonia, and diarrhea, may be higher in certain pastoral settings. Exposure

Table 4. The results of logistic regression analysis of management-related risk variables for calf mortality.

Variables	Category	Frequency	Percent	Odds ratio (OR)	95% CI (OR)		χ^2	P value
Owner educational status	Illiterate	202	80.8	1.48	0.95	2.29	1.75	0.08
	Read and write	28	11.2					
	Elementary school	15	6.0					
	Secondary	4	1.6					
Awareness of colostrum to neonates	Tertiary	1	.4					
	Yes	151	60.4	0.93	0.61	1.40	-0.33	0.73
Method of feeding	No	98	39.2					
	Suckling	177	70.8	0.60	0.34	1.05	-1.76	0.07
	Hand feeding	68	27.2					
How to feed colostrum	Not fed	1	.4					
	Allowed full suckling	70	28.2	1.48	1.07	2.04	2.37	0.018
	Restricted suckling	56	22.6					
	Milked some for consumption	114	46.0					
Number of teats left for first two month	Stripped teats before calf suckling	8	3.2					
	One	9	3.6	1.22	.915	1.63	1.36	0.173
	two	52	20.8					
	Three	24	9.6					
Herding regimes of camel calves	four	165	66.0					
	Together with other camel	41	16.4	1.68	0.77	3.65	1.33	0.18
Housing type	Calves graze separately	208	83.2					
	Separate pen	207	82.8	2.22	0.720	6.86	1.39	0.16
Birth time	Together with camel barn.	43	17.2					
	Day	104	41.3	0.561	0.290	0.904	-2.31	0.021
	Night	146	57.9					

to these diseases may increase the risk of mortality in calves, and dietary alternatives have been associated with calf mortality. Calves may be unable to obtain the nutrients necessary for optimal development and growth if they are not provided with a nutritious diet.

Previous studies have shown high mortality rates of calves at 20.3% in pastoral areas of Ethiopia (Catley *et al.*, 2014), 22.3% in Gabra (Kaufmann, 2000), and up to 24.4% in commercial ranches in Kenya (Wilson, 1986). This could be attributed to a lack of understanding about optimal calf rearing practices. A healthy diet, access to clean water, and protection from predators environmental hazards are essential for calf survival. Failure to provide the necessary care can result in increased susceptibility to illness and mortality. The absence of vaccines and medications can exacerbate calf mortality. Calves are susceptible to a range of illnesses, and they are more likely to become ill and die if they lack access to the treatments and vaccinations they require. In addition, calf mortality can result from droughts because they can cause calves to experience a lack of food and water, which may result in starvation and dehydration. Dehydrated or malnourished calves are more susceptible to illness and death. Finally, calf mortality may also result from the area's lack of access to veterinary facilities. Timely veterinary care is essential for calves as they are more likely to become ill and die if they do not have access to veterinary care.

The period between one and three months of age was found to be a crucial transition period for camel calves in the research area under the pastoral production system. The results of this study suggested that calf mortality was negatively correlated with age, with the highest mortality reported in the first month of life. The percentage of calf mortality up to one month of age from the total annual mortality was in the range of 65.6%. This finding is similar to the finding of Tsegaw (2016), which revealed 53% mortality rate in Somalia's pastoral areas. Diseases, malnutrition, and unidentified causes account for a greater percentage of the causes of young livestock death than the other factors. Malnutrition accounted for 5% of young livestock mortality, unidentified causes for 6%, and diseases for 24%. These findings are consistent with those other studies (Tsegaw, 2016), which found that in the Afder District, diseases caused between 64% and 74% of young stock mortality, while starvation caused between 35% and 55% of it. These findings are also consistent with those of Catley *et al.*, (2014), who noted a substantial increase in disease-related mortality in a year of drought. The leading cause of stunted growth in camel calves is illness. Studies conducted by Simpkin (1996), Kaufmann (1998), and Njanja (2007) also identified illness as a significant factor in pre-weaned camel calf mortality. Malnutrition in the form of inadequate feed or milk supplies can compromise the immunity of young livestock and expose them to various diseases, thereby exacerbating the high disease

mortality rate. During early development, animals depend entirely on milk for sustenance. Therefore, providing the calves with milk is crucial, especially during the first three months of growth before they begin to graze. According to pastoralists, human competition for milk has led to malnutrition in camel calves, which is a leading cause of mortality in the pre-weaning period due to starvation and dehydration. A further cause of mortality was predator-related, contributing to a total of 2.5% of calf losses in this period. The majority of these deaths were caused by hyenas, which often prey on stray or lost animals. Therefore, the pastoralists should consider careful herding and minimize the occurrence of animal straying as fundamental elements of herd management techniques.

In this study, the most common syndromes or symptoms of calf death were diarrhea, respiratory diseases, bloat, navel illness, skin disease, and nonspecific diseases. Of these, diarrhea was found to be the most common health issue that caused 57% of mortality, followed by nonspecific diseases (45.4%) and respiratory diseases (23%). These findings are consistent with those reported by numerous studies in various regions of Ethiopia (Al-Juboori *et al.*, 2012; Keskes *et al.*, 2013) and neighboring nations (Gluecks, 2007; Njanja, 2007; Kuria *et al.*, 2011). According to the pastoralists, infectious diseases that cause diarrhea and respiratory diseases are responsible for young livestock mortality between birth and weaning.

A number of factors have been associated with the high calf mortality in Africa, including nutrition, hygiene, and management problems (Lema *et al.*, 2001). In this study, colostrum feeding and birth time were found to be significantly associated with calf mortality. Calves that received colostrum from their mothers within the first 24 hours of life were less likely to develop diarrhea or other diseases. Colostrum is a rich source of antibodies that help to protect calves from infection. Calves that are not fed colostrum are more likely to become ill and die. In addition, calves that are housed separately from their mothers were unable to receive the same level of care and protection. However, owner's educational status, awareness of colostrum feeding, and housing type were not found to be significantly associated with calf mortality.

According to traditional practices, if the milk content is too high, the calf will suffer. This can be attributed to the milk having an unusually strong or concentrated flavor. As a result, the calf is likely to develop diarrhea and may even die. From the first day of lactation onwards, the udder of high-yielding camels is partially milked for human consumption both every morning and evening. This finding is consistent with the findings of previous studies by Bollig (1992), Bornstein (1988), and Hartley (1984), which suggested that colostrum is detrimental to calves and that its consumption should be limited. Burgemeister (1975) noted that in Tunisian herds, colostrum is actively provided to calves that fail to stand up promptly after birth due to their perception that early intake is crucial. This study, however, differs from that of Njanja

(2007), who found that pastoralists who provided calves with unlimited access to colostrum reported that colostrum strengthened the calves and promoted their growth. Furthermore, competition for camel milk with calf mothers has led to significant mortality rates in Eastern Africa (Wilson, 1998; Farah *et al.*, 2004,).

A statistical analysis of the relationship between birth time and calf mortality revealed substantial differences ($p < 0.05$) (Table 4). This finding is in contrast to those of Tsegaw (2016) who found no statistically significant difference between the mortality rates of day and night deliveries. However, the mortality rate was relatively higher among night-born camels. Day births would be afforded a higher chance of being supported and receiving care, which may contribute to the low mortality rate. Camel calves are more likely to die at night than any other time of day because of their vulnerability to predators and cold temperatures at night. Additionally, the availability of additional assistance and support from people during daytime also contributes to the lower mortality rate during day births.

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CONFLICT of INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the results presented in this study.

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ETHICAL APPROVAL

This study received approval from the ethics committee and prior to its commencement, the pastoralists were informed about the purpose of this study.

AUTHORS' CONTRIBUTIONS

GA were involved in data collection, gathering, and assortment. GA and AK were involved in data analysis, manuscript writing, and giving comments. All authors contributed to the revision of the manuscript and approved the manuscript final version.

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