SSRG International Journal of Veterinary Science
ISSN: 2455–0868 / https://doi:10.14445/24550868/IJVS-V11I1P102

Volume 11 Issue 1, 6-11, Jan-Apr 2025
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Original Article

Study on Occurrence of Calf Mortality and Farm Management Practices in Shashemene City

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Received: 23 February 2025 Revised: 28 March 2025 Accepted: 14 April 2025 Published: 29 April 2025

Abstract *- Ethiopia has the largest livestock in Africa and ranks 10th globally. Among all animals present on a dairy farm, the highest mortality rates generally occur in baby calves. This study aimed to assess the occurrence of calf mortality and associated risk factors in Shashemene town. A cross-sectional study was conducted from November 2018 to April 2019. A structured questionnaire was designed and introduced to the 55 purposely selected dairy farm owners. Various questions focused on calf mortality, management, and health concerns were answered directly by face-to-face interviews with 55 heads of households. Descriptive statistics was used to analyze the association between the risk factors and calf mortality using SPSS version 22. Among the risk variables considered for analysis, Navel treatment (χ2=5.47, P=0.031), Herd size (χ2=10.8, P=0.001), Calf caretaker experience (χ2=9.15, P=0.03), and method of colostrum's feeding (χ2=10.8, P=0.001), was a significant predictor of calf mortality. In this study, 56.4% calf mortality rates were recorded. In conclusion, calf mortality and management of calves are important components of total herd profitability. It is, therefore, suggested that the creation of awareness among farm owners on the major causes of calf mortality and their respective preventive measures could be of great importance in reducing calf mortality.*

Keywords *- Calf mortality, Navel treatment and Predictor.*

1. Introduction

Livestock production is a principal means of improving living standards in many developing countries. In sub-Saharan African countries, livestock plays a crucial role in the national economy and the livelihood of rural communities. Ethiopia has the largest livestock in Africa and ranks 10th in the world. The country's agro-climate is suitable for livestock production. Moreover, livestock is the source of protein, fuel animal products and by-products in general. Currently, many urban and peri-urban dairy farms are major milk and milk products suppliers to consumers [31]. Dairying is one of the most important parts of the livestock sector [24]. In Ethiopia, dairy cattle are maintained under different production systems, management and milking conditions, and there is also little knowledge about the science of dairying among the farmers.

The intensification of dairy production, especially under hot and humid conditions, presents new disease problems [25]. Ethiopia's per capita milk consumption is only 20kg per year, which is lower than the average for sub-Saharan Africa [30]. The productivity of the herd can be negatively affected by impaired growth of calves, decreased milk production of animals that experienced chronic illness as baby calves, spread of infectious diseases from calves to adult cows, increased veterinary costs, and the limited opportunity for genetic selection due to high mortality of replacement animals. Among all animals present on a dairy farm, the highest mortality rates generally occur in baby calves before weaning [8]. Several factors affect the health of the calves immediately after birth [27]. The calf's environment includes feed and water, materials and equipment used for handling and distributing feed and water, materials and equipment used for cleaning, and the physical housing environment, which provides shelter. Some attributes of the environment directly influence calf health (such as ventilation) and impact behaviour (individual versus group housing). However, the environment and how it is managed significantly influence calf exposure to disease pathogens [19]. The poor immune system and lack of previous exposure to infection make newborn calves susceptible to infectious diseases and poor management [27]. How calves are reared sets the tone for the lifetime productivity of the animal [10]. The tenets of good calving management to improve calf viability and health are providing a suitable maternity site, adequate but not intrusive calving supervision, correct obstetrical techniques and judicious utilization of veterinary assistance **[1].** The key to low mortality and high profits from feeding and management is carried out by individuals who are both experienced and interested in calves [5]. Although some research was carried

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out in certain parts of the country on problems of calf mortality and its economic significance, no study was conducted in Shashemene town.

Therefore, the objectives of this study were:-

To assess the occurrence of calf mortality in Shashemene town and to identify potential risk factors associated with calf mortality in the study area.

2. Materials and Methods

2.1. Study Area

The study was conducted in Shashemene, a town in Oromia Regional State. Shashemene is located in West Arsi Zone, Oromia Regional State, about 240 Km South of Addis Ababa, on the main highway road to Awasa. Geographically, the area is located at 7° 11' 33'' N altitude and 38° 35' 33'' E longitude. The area has an annual average temperature ranging from 12°C to 28°C. The rainfall ranges from 1500-2000 mm3. Agro-ecologically, the area is tropical forest. The 2007 national census reported a total population for this town of 100,454, of whom 50,654 were men and 49,800 were women. A plurality of the inhabitants practised Ethiopian Orthodox Christianity, with 43.44% of the population reporting they observed this belief. In comparison, 31.15% of the population said they were Muslim, 23.53% of the population were protestant, and 1.3% were Catholic.

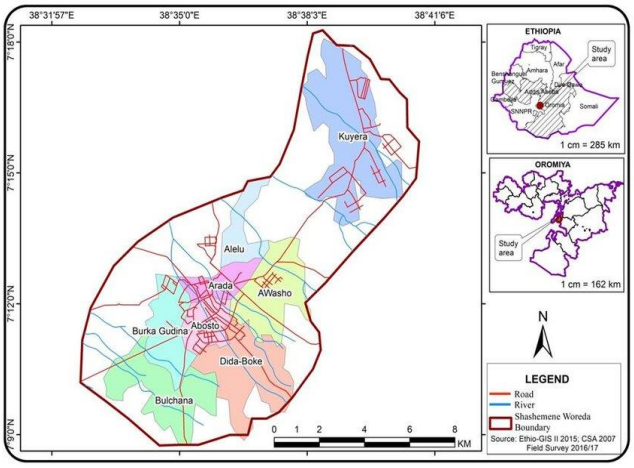

Fig. 1 Map of Shashemene town

Source: http://www. Ethio GIS II 2015

2.2. Study Animals and Sampling Technique

The study unit in this study was dairy calves under six months of age. A total of 55 dairy farms were selected purposely from 113 dairy farms registered in the agriculture office.

2.3. Study Design

Cross-sectional study design methods were used to collect data from 55 purposely selected dairy farms in Shashemene town. The dairy farms were selected based on the willingness of the farm owners.

2.4. Data Collection

A structured questionnaire, which was composed of various questions focused on calf mortality, management, and health concerns, was filled out directly by a face-to-face interview with 55 heads of households. Major risk factors, including navel treatment, calf caretaker experience, sex, time and method of colostrum feeding, were the different variables covered during the interview. Calf death history, feed type, and healthcare data were also recorded.

2.5. Data Management and Analysis

The data from questionnaire studies were entered into Microsoft Excel, and descriptive statistics were employed to summarize the data and analyzed using SPSS version (22) statistical software to evaluate the association between the risk factors and calf mortality. A statistical significance was set at a p-value of <0.05.

3. Results

3.1. Description of Farms

Of the total 55 dairy farms, about 31 (56%) showed calf mortality from September 2017 to April 2019. Based on the questionnaire study, most respondents were educated; as indicated, 41.8% were elementary, 18.2% were high school, 29.1% were professional, and the rest, 10.9%, were illiterate. Most dairy farm owners (54.5%) use dairy farms as the primary source of income, whereas (45.5%) of owners depend on the farm for secondary income.

3.2. Calves Management

The study indicated that 85.5% (n=47) of the respondents know the importance of colostrum feeding, and the rest 14.5% (n=8) do not know. Among dairy farmers and /or attendants, 58.2% (n=32) responded that they allow free calf colostrum feeding of their new-born calves by leaving with their dams, while 41.8% (n=23) dairy farmers practised hand feeding for their newborn calves. Of all the respondents, 100% (n=55) of farm owners practice colostrum feeding of their calves within 6 hours post-delivery. Most farmers fed concentrate and hay for calves as supplementary feed. Calves were housed separately away from adult animals in 43.6% (n=24) of the farms. Farms in the area have not introduced any milk replacer to feed calves. All farms feed their calves only milk. The daily frequency of house cleaning showed 16.4% (n=9) once, 25.5% (n=14) twice, and 58.2% (n=32) three times.

3.3. Association of Risk Factors with Calf Mortality

Among the risk variables considered for analysis, Navel treatment, Herd size, Calf caretaker experience and method of colostrum feeding were found to be significantly associated (P<0.05) with calf mortality and location of calf pen, Educational status of the owner, Awareness about the importance of colostrum to neonatal calves, and the presence or absence of bedding material in calf house are potential risk variables which were statically non-significant association with calf mortality (P>0.05).

Table 1. Management factors in 55 dairy farms were given in a questionnaire survey

Factor	Category	Frequency	Percent (%)
The owner uses the farm as a source of income.	Primary income	30	54.5
	Secondary income	25	45.5
Breeding method used	AI	38	69.1
	Natural mating	17	30.9
Awareness about the importance of colostrum	Yes	47	85.5
	No	8	14.5
Complete or partial colostrums feed calves	Partial colostrum	19	34.5
	Complete colostrums	36	65.5
Method of calf feeding	Suckling	32	58.2
	Hand feeding	23	41.8
Frequency of calf house cleaning	Once per day	9	16.4
	Twice per day	14	25.5
	Three times	32	58.2
Type of floor	Concrete	48	87.3
	soil	7	12.7
To which group of calves give better attention	Female	50	90.9
	Both	5	9.1

Table 2. Association of the presence of the calves' death with different variables

Variables	Category	Positive farm number	Percentage Positive farm number	χ^2	p-value
Navel treatment	practiced	0	0.0	5.47	0.031
	Not practiced	31	100		
Herd size based on the number of cattle	1-5	6	19.5	10	0.001
	6-10	9	29		
	11-15	7	22.6		
	>16	9	29		
Location of calf pen	Together with dam	17	54.8	0.66	0.50
	In separate pen	14	45.2		
Calf caretaker experience	>5 year	3	9.7	9.15	0.03
	<5 year	28	90.3		
Method of colostrum feeding	Suckling	12	38.7	10.8	0.001
	Hand feeding	19	61.3		
Educational status of the owner	Illiterate	3	9.7	0.97	0.19
	Elementary school	12	38.7		
	High school	5	16.1		
	professional	11	35.5		
Awareness about the importance of colostrum	Yes	29	93.5	3.67	0.61
	No	2	6.5		
Bedding in calf house	Present	13	41.9	0.109	0.47
	Absent	18	58.1		

4. Discussion

In Ethiopia, cattle are important sources of dairy products and animal protein. Due to the rapidly increasing population, the demand for quality animal protein is also increasing. Challenges like early calf mortality are causing losses in milk and beef production and resulting in low genetic potential due to disruption in breeding plans. Early calf death results in losing quality sires for breeding and females for herd replacement. Diseases of newborn calf and calf mortality are the major causes of economic losses in livestock production [26].

The present study surveyed and described management practices in calf rearing on dairy farms in Shashemene town to identify risk factors of calf mortality on those farms. In the present investigation, a calf mortality rate of 56.4% was recorded, considered a higher mortality rate. This finding agrees with the 50% mortality rate reported by [12] but higher than 21.45% calf mortality reported by [9]. In contrast, the present finding was lower than the previous mortality, 58.37% reported by [7] in sululta and its environment.

In this study, mortality was statistically significant (p=0.031) in calves where navel treatment was not practised. Navel infection is one of the diseases that seriously impacts calves' survival [22]. According to [23], early disinfection accelerates the drying up of the umbilicus to reduce infections, reducing calf respiratory and enteric diseases and mortality. Prevention of 'navel illness' is based on good maternity pen hygiene, reducing calf residency time in unhygienic calving pens, and ensuring adequate early intake of good quality colostrum and navel antisepsis [18].

More experienced attendants or managers of the farm reduce the health problems of the farm [13]. The present study revealed that the farm attendant's experience was statistically significant (p=0.03). This finding is in agreement with [9].
In the present study, herd size was significantly (p=0.001) associated with calf mortality. This is in agreement with [6]. The most important determining factor of whether a herd had high or low calf mortality is the quality of calf management [2].

This study also showed that the housing system is statistically insignificant (p=0.50) regarding calf mortality. This is in line with [20]. Regarding sex, high mortality was observed in male calves, which means that of the total calves who died, 65.57% (n=40) were males, and 34.42% (n=21) were females. Similar findings were also reported by [16] and [28]. Male calves have less absorption ability of serum immunoglobulin than female calves, and they could become more immune deficient than female calves, as described by [15]. The other explanation for this finding could be that farmers watched female calves more carefully due to their economic importance and thus diagnosed many clinical cases more effectively. More male calves died probably because postnatal mortality for males and females had a very high genetic correlation, with direct heritability being highest for males [11]. According to the findings of [29], male animals in Tanga, Tanzania, were three times more likely to die than females. A similar result was obtained by [4] in India.

From the surveyed farm owners, all 100% (n=55) feed colostrum to their calves six hours after birth. To provide initial immune protection against infectious diseases, colostrum must be fed to calves 6 hours after birth in sufficient quantity [32, 31]. Delay in colostrum intake before 6 hours after birth results in the occurrence of calf health problems. [21] Reported that each hour of delay in colostrum ingestion increases the chance of a calf becoming ill by 10%.

In this study, bedding was found to be insignificantly associated with calf mortality (p=0.47). This is against the finding of [6] that reports bedding in calf houses is significantly associated with calf mortality. In this study method of colostrum feeding is significantly associated (p=0.001) with calf mortality. This finding is in line with [3]. Keeping calves in the same barn with cows or in individual calf pens did not significantly affect calf mortality. This is in contrast with other studies. [14] [17] This might be due to the farm management system because having a separate calf pen alone does not make the farm successful unless the housing system is managed correctly. [9]. In this study, the educational status of the owner (p=0.19) and awareness about the importance of colostrums to neonatal calves (p=0.61) were found to be insignificantly associated with calf mortality, which means (p>0.05).

5. Conclusion and Recommendations

In conclusion, calf mortality and management of calves are important components of total herd profitability. In this study, 56.4% calf mortality rates were higher than economically tolerable, which can be achieved through good management. It has also been found that factors such as herd size, navel treatment, calf caretaker experience, method of colostrum feeding and sex of calf were important determinant factors of calf mortality. Because of the complex nature of dairy management systems, various causes are responsible for diseases and calf mortality. Hence, overall management, feeding, and hygiene are the major factors contributing to calves' survival in contaminated environments. Therefore, based on the above conclusion, the following recommendations are forwarded:

- Implementation of improved management practices regarding calving and overall farm management.
- The creation of awareness among farm owners on the significant causes of calf mortality and their respective preventive measures could be of great importance in reducing calf mortality.
- Further comprehensive research on the causes of calf mortality is also recommended.

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