



Survey on Assessment of the Major Calf Morbidity and Mortality in Small Scale Dairy Farm in Negele Arsi and Shashamane Districts of West Arsi Zone Oromia Region

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Abstract

Background: The major constraints to herd expansion and genetic improvement in the dairy sector are calf mortality. The calf morbidity and mortality studies in Africa indicate high calf loss both in the subsistence and market-oriented dairy production systems. The study was cross-sectional study that conducted December 2022 to June 2023.

Objective: the objectives of the present study were: To assess the major causes of morbidity in calves in the study areas and to identify risk factors associated and mortality in smallholder dairy farms areas.

Methods: The data for this particular study was collected from 77 farms which means, 34 from Shashamane and 43 from Negele Arsi purposely selected dairy farms respectively, based on the size of farm, the willingness of the farm owners to be part of this study.

Results: Of the 123 calves that were monitored from birth to 6 months of age, 52.03% (64) were female and 47.96% (59) were male. Based on sex, 18 (14.63%) male and 22 (17.89%) female calves were found infected with coccidian oocyst (Table 2). whereas 5 (4.07%) male and 4 (3.25%) female calves were found infected with ascaris. In addition to other health problems, parasitic infection was the most prevalent in investigated smallholder dairy farms. Out of 123 examined calves, 15 (12.20%) and 2(1.63%) calves aged less than 2 months were positive for Coccidia and positive for Ascaris, respectively.

Conclusion: Generally, housing hygiene, floor condition, introduction of new animals and calf size in the farm seem to be the major factors for diseases incidences in the present study.

Keywords: Calf; Diarrhea; Ascaris; Coccidian; Prevalence

Introduction

Ethiopia holds a huge potential for dairy cattle development [8]. The development of the dairy sector in Ethiopia has considerable prospective opportunity for smallholder employment and income generation and may contribute significantly to poverty alleviation and food and nutrition security [6]. However, livestock production and productivity is low because of poor genetic potential of indigenous breeds, frequent seasonal drought, feed shortage in quantity and quality, high prevalence of rampant animal diseases, and poor infrastructure and animal health services [2].

Calf mortality is considered as one of the major constraints to herd expansion and genetic improvement in the dairy sector [1,8]. In Africa studies indicate there is high calf loss by calf morbidity and mortality both in the subsistence and market-oriented dairy production systems [10]. Studies of calf mortality on smallholder farms indicate preweaning and early postweaning mortality rates in the range of 15% to 25% [3]. As many study shows, in some African countries, for instance in Tanzania, calf mortality rates range from 9% to 45%, and in Mali, the range is 10% to 25%. In Sudan, 4.9% mortality was reported in dairy farms in Khartoum [6,12]. In Ethiopia, 30% preweaning calf mortality rate was reported in

mixed crop-livestock production systems in the Amhara region, and 18% mortality rate was reported in market-oriented dairy farms in Central Ethiopia. Neonatal calf mortality is the most important constraint in young stock and accounted for 8.7 to 84% of the total calf mortality [4].

Both infectious and noninfectious causes contributed to the morbidity and mortality of the calf. Calf diseases that cause morbidity and mortality are the results of the complex interaction of the management practices, the environment, infectious agents, and the animal itself. Mortality of neonates was mainly attributed to conditions such as diarrhea and pneumonia associated with poor housing, hygiene, and nutrition [7]. Different management and environmental factors such as colostrum feeding, housing, calving assistance, production system, herd size, season, and hygiene of microenvironment were reported to affect significantly calf morbidity and mortality [5].

The current Ethiopian livestock breeding policy emphasizes upgrading the genetic makeup of the local stock through crossing with high-grade exotic breeds of cattle. As a result, the proportion of crossbred calves is gradually increasing in the smallholder dairy farms mainly in the highlands of the country, suggesting a susceptible population that will need improved health and proper management. One of the major health and management intervention areas recently proposed in the Livestock Development Master Plan is aimed at reducing young and adult stock mortality [11].

Efficient production and limited losses are important for the livestock producers to realize benefits from their livestock resource. In order to minimize losses, the causes of animal morbidity and mortality and the associated risk factors need to be identified, and appropriate control measures are implemented.

Diseases have numerous negative impacts on productivity and fertility of herds that is. Losses due to mortality and morbidity, loss of weight, depressed growth, poor fertility performance, decrease physical power and the likes. This results from complex interaction of the management practice, environment, infectious agent and the calf itself. Major causes of calf diseases and deaths were diarrhea, pneumonia, joint problems, umbilical diseases, trauma, congenital abnormalities, nutritional deficiencies, dystocia and other infections. Calf losses were significantly reduced by introducing new techniques of management including on time colostrum feeding, housing, feeding and nutrition [4].

Several factors affect the health and vigor of the calves immediately after birth. The poor immune system and lack of previous exposure to infection and poor management make new born calves susceptible to infectious diseases. Proper nutrition is fundamental for calf growth and for the general profitability of calf rearing enterprise [7]. In young stock, a good nutritional strategy optimizes rumen development and growth while minimizing stress and disease. Livestock housing conditions greatly affects health and productivity. Clean liness of the barn influences calf health, as calves housed in unclean barns are at higher risk of diseases than calves housed in clean barns.

The mode of passive transfer in neonates varies with the type of placentation and in the case of neonatal calves; it is based on an immediate post-partum ingestion of antibody rich colostrum's. The age of the calf is the most important factor affecting morbidity and mortality, approximately 75% of the mortality in dairy animals less than one year of age occurs in the first month of their life. Failure of passive transfer in heifer calves is linked with decreased rate and efficiency of growth and decreased first and second lactation milk production [9]. In developing parts of the world including Ethiopia there is a growing trend in the development of dairy farming which is becoming an important source of income particularly for stallholder farmers. However, this cannot be realized without the application of effective calf health and management practices as the future of any dairy farming production depends on the successful program of raising replacement animals (calves). With the above background, the objectives of the present study were

- To assess the major causes of morbidity and mortality in calves
- To identify risk factors associated with morbidity and mortality in smallholder dairy farms in study areas.

Materials and Methods

Study area

The study was conducted from December 2022 to June 2023 on purposely selected dairy farms in Shashemene and Negele Arsi Districts, Oromia Regional State, West Arsi Zone, and located 250 km southeast of the capital Addis Ababa. It has latitude of 7° 11'33" north and a longitude of 38° 35'33" east. The area lies within the Rift Valley, with an altitude ranging from 1700 to 2600 meters above mean sea level (AMSL). It receives an annual rainfall of 700-950 mm and has an annual temperature range of 12-27°C. Major crops grown around Shashemene area are cereals such as teff, barley, wheat, maize, sorghum, and root crops like potato and sweet

potato and vegetables such as cabbage, spinach and onion as cash crops. Annual crops are predominant and rain fed agriculture is mainly practiced using draught power. Total human population of this area is 285,176. The kebeles in the woreda are categorized as Kola (50%), Woinadega (29%) and Dega (21%) [8].

Study design

The study was cross-sectional and longitudinal prospective observational study that extended for six months from beginning of December 2022 to June 2023 because of budget deficit and convenience of time or season. The sampling units (calves) were identified individually and monitored throughout the study period. The questionnaire survey, clinical and laboratory examinations for parasite was conducted during the study period. But in case of this study even though it was planned to be conducted for six months both cross-sectional and longitudinal, because of lack of budget longitudinal study was cancelled and only cross-sectional study reported here.

Data collection

The data for this particular study was collected from 77 farms which means, 34 from Shashamane and 43 from Negele Arsi purposely selected dairy farms respectively, based on the size of farm, the willingness of the farm owners to be part of this study.

Cross-sectional study based on questionnaire.

The owners and/or attendants of the included dairy farms were interviewed using structured and open ended questionnaires. The questions included the gender and education background of the re-

sponsible personnel, calf size in the farm, feeding and housing of the animals, disease incidence, and mortality as well as the breed, age and sex of calves were also included.

Fecal sample collection

A fresh fecal sample was collected from the rectum of each calf using sterile disposable plastic gloves. The sample was placed in a labeled clean glass bottle container and was transported to the parasitology laboratory on the same day and was kept at 4°C in a refrigerator until processing within 48 hours of arrival. At the time of sampling, the name of the farm owner, date of sampling, age, sex, breed, tag number (if present) was recorded for each calf on a recording format and examine the infection rate of coccidian and internal parasites by using flotation technique at the Parasitology Laboratory of Asella Regional Veterinary Laboratory.

Data analysis

Data collected from study sites was entered and stored in a Microsoft excel spread sheet program and coded for analysis. Statistical analysis was done using Stata version 14.1 statistical software. Data generated was analyzed using descriptive statistics. Pearson’s chi square was used to evaluate the association between the prevalence of morbidity and mortality and different risk factors. As well as the association of parasitic infection with animal factors like age, sex and breed has been analyzed. P-value less than 0.05 (at 5% level of significance) was considered as significant in the analysis.

Results

The overall Prevalence rate of Coccidia and ascaris was 39.83% with 2.5680 ch2 value.

Zone	District	No. observed	Results			Prevalence		X2	P- value
			Negative	Coccidia	Ascaris	Coccidia	Ascaris		
West arsi	shashamane	61	33	24	4	19.51%	3.25%	2.5680	Pr = 0.277
	Negele arsi	62	41	16	5	13.01%	4.07%		
	Total	123	74	40	9	O.P, 39.83%			

Table 1: Distribution among districts.

Zone	Sex	No. observed	Results			Prevalence		X2	P- value
			Negative	Coccidia	Ascaris	Coccidia	Ascaris		
West arsi	Male	59	36	18	5	14.63%	4.07 %	0.3625	Pr = 0.834
	Female	64	38	22	4	17.89%	3.25%		
	Total	123	74	40	9	O.P, 39.83%			

Table 2: Distribution among Sex.

Of the 123 calves that were monitored from birth to 6 months of age, 52.03% (64) were female and 47.96% (59) were male. Based on sex, 18 (14.63%) male and 22 (17.89%) female calves were found infected with coccidian oocyst (Table 2).whereas, 5 (4.07%) male and 4 (3.25%) female calves were found infected with ascaris.

In addition to other health problems, parasitic infection was the most prevalent in investigated smallholder dairy farms. Out of 123 examined calves, 15 (12.20%) and 2 (1.63%) calves aged less than 2 months were positive for Coccidia and positive for Ascaris, respectively (Table 3).

Zone	Age	No. observed	Results			Prevalence		X2	P- value
			Negative	Coccidia	Ascaris	Coccidia	Ascaris		
West arsi	=< 2 months	49	32	15	2	12.20%	1.63%	1.9942	Pr = 0.737
	3- 4 months	41	22	15	4	12.20%	3.25%		
	=> 4 months	33	20	10	3	8.13 %	2.44%		
	Total	123	74	40	9	O.P, 39.83%			

Table 3: Distribution among Age.

The calves Breed included in the study are cross-breeds of which 70.73% (87), local of which 14.63% (18) and exotic of which 14.63% (18). All the study calves were born in the farms. Based on

the breed 29 (23.58%) cross breed, 6 (4.88%) local breed and 5 (4.07%) exotic breed were infected by Coccidia whereas, 7 (5.69%) cross breed and 2(1.63%) local breed were infected by Ascaris (Table 4).

Zone	Breed	No. observed	Results			Prevalence		X2	P- value
			Negative	Coccidia	Ascaris	Coccidia	Ascaris		
West arsi	Local	18	10	6	2	4.88%	1.63%	2.4132	Pr = 0.660
	Cross	87	51	29	7	23.58%	5.69 %		
	Exotic	18	13	5	0	4.07 %	0.00 %		
	Total	123	74	40	9	O.P, 39.83%			

Table 4: Distribution among Breed.

Zone	Health condition	No. observed	Results			Prevalence		X2	P- value
			Negative	Coccidia	Ascaris	Coccidia	Ascaris		
West arsi	Normal	97	61	30	6	24.39%	4.88%	5.5520	Pr = 0.697
	Diarrhoea	13	7	5	1	4.07%	0.81%		
	GIT disturbance	1	0	1	0	0.81%	0.00%		
	Pneumonia	1	1	0	0	0.00%	0.00%		
	Others	11	5	4	2	3.25%	1.63 %		
	Total	123	74	40	9	O.P, 39.83%			

Table 5: Distribution among Health condition.

Of the 123 calves examined, 21.13% (n 26) had manifested one or more clinically visible health problems.

Generally, housing hygiene, floor condition, introduction of new animals and calf size in the farm seem to be the major factors for

Zone	Owner education status	No. observed	Results			Prevalence		X2	P- value
			Negative	Coccidia	Ascaris	Coccidia	Ascaris		
West arsi	Non educated	16	11	2	3	1.63%	2.44%	8.2942	Pr = 0.081
	primary	49	25	20	4	16.26%	3.25%		
	Secondary and above	58	38	18	2	14.63%	1.63%		
	Total	123	74	40	9	O.P, 39.83%			

Table 6: Distribution among Owner education status.

Zone	House hygiene	No. observed	Results			Prevalence		X2	P- value
			Negative	Coccidia	Ascaris	Coccidia	Ascaris		
West arsi	Poor	76	35	32	9	26.02%	7.32%	17.7664	Pr = 0.000
	Clean	47	39	8	0	6.50 %	0.00%		
	Total	123	74	40	9	O.P, 39.83%			

Table 7: Distribution among House hygiene.

Zone	Floor condition	No. observed	Results			Prevalence		X2	P- value
			Negative	Coccidia	Ascaris	Coccidia	Ascaris		
West arsi	soil	54	28	20	6	16.26%	4.88%	3.6027	Pr = 0.165
	Concrete	69	46	20	3	16.26%	2.44%		
	Total	123	74	40	9	O.P, 39.83%			

Table 8: Distribution among Floor condition.

Zone	Calf size	No. observed	Results			Prevalence		X2	P- value
			Negative	Coccidia	Ascaris	Coccidia	Ascaris		
West arsi	< 5 calf	91	48	35	8	28.46%	6.50%	8.0323	Pr = 0.018
	>5 calf	32	26	5	1	4.07%	0.81%		
	Total	123	74	40	9	O.P, 39.83%			

Table 10: Distribution among Calf size.

Zone	introduction of new animals	No. observed	Results			Prevalence		X2	P- value
			Negative	Coccidia	Ascaris	Coccidia	Ascaris		
West arsi	no	75	51	21	3	17.07%	2.44%	6.0598	Pr = 0.048
	yes	48	23	19	6	15.45%	4.88%		
	Total	123	74	40	9	O.P, 39.83%			

Table 10: Distribution among introduction of new animals.

diseases incidences in the present study. Hence, calves with introduction of new animals were more often at risk than calves with no introduction of new animals. That has been significantly associated ($P < 0.05$) with dairy calf morbidity.

Conclusion and Recommendations

Among the potential risk factors evaluated for their association with the occurrence of calf health problems; risk factors associated with diseases occurrences and deaths indicating, introduction of new animals, floor conditions, farm size and sex as potential risk factors.

Based on the above conclusion the following recommendations are forwarded

- Greater attention should be given to risk factors associated with disease occurrences and deaths indicating such as hygienic conditions and optimum time of colostrum feeding to minimize calf health problems and hence their mortality.
- More research should be conducted to identify the causative agent of the major health problems identified in this research as this is crucial in formulating effective preventive and control strategies like use of vaccination or other methods.
- Extension services need to focus on awareness creation among dairy farm owners about good calf management practices and their roles in productivity of dairy farming investments.

Bibliography

1. Elsa L., *et al.* "Factors Influencing Livestock Productivity". *Environmental Stress and Amelioration in Livestock Production* 3 (2012): 978-1007.
2. Faber SN., *et al.* "Effects of colostrum ingestion on locational performance". *The Professional Animal Scientist* 21 (2005): 4-25.
3. Heinrichs AJ., *et al.* "Health and production management of dairy calves and replacement heifers. In: Radostits, O.M. (ed.), Herd Health, Food Animal Production Medicine, 3rd edition. Philadelphia, W. B. Saunders Company (2001): 333-395.
4. Singla LD., *et al.* "Antigen based diagnosis of *Cryptosporidium parvum* infection in cattle and buffalo faeces". *The Indian Journal of Animal Sciences* 83.1 (2013): 37-39.
5. Svensson C. "Survival of oocysts of *Eimeria alabamensis* pasture under different climatic conditions in Sweden". *Acta Veterinaria Scandinavica* 36 (1995): 9-20.
6. Svensson C., *et al.* "Morbidity in Swedish dairy calves from birth to 90 days of age and individual calf level risk factors for infectious diseases". *Preventive Veterinary Medicine* 58 (2003): 179-197.
7. Abdullatief EM., *et al.* "Department of Dairy Production, Faculty of Animal Production, University of Khartoum, Sudan". *Journal of Veterinary Medicine and Animal Health* 6.5 (2014): 145-153.
8. Tizard I. "Veterinary Immunology, 4th edition". W.B. Saunders Company, Philadelphia (1995).
9. Wudu T., *et al.* "Calf morbidity and mortality in smallholder dairy farms in Adealiben, districts of Oromia". *Ethiopia Tropical Animal Health and Production* 40 (2008): 369-376.
10. Wymann MN. "Calf mortality and parasitism in periurban live-stock production in Mali. Philosophisch-Naturwissenschaftlichen Fakultät, der Universität Basel, Ph D Thesis (2005).
11. Yayneshet T. "Feed resource availability in Tigray Region, Northern Ethiopia, for Production of Export Quality Meat and Livestock". Ph.D. Dissertation, Mekelle University, Ethiopia (2010).
12. Yohannes A. "Background information on Contagious Bovine pleuropneumonia in Ethiopia" (2002): 125-134.
13. Zegeye Y. "Imperative and challenges of dairy production, processing and marketing in Ethiopia (2003): 61-67.