

# Reterospective Study On Calf Mortality In Dairy Farms In Gondar Town

Esubalew Sisay, Debeb Dessie

University of Gondar, Faculty of Veterinary Medicine, Gondar, Ethiopia; phone +251 918 316 583  
email: [sislakew@gmail.com](mailto:sislakew@gmail.com)

Veterinary Drug and Animal Feed Administration and Control Authority, Amhara Region Branch Office, p.o.box 31303, Bahr Dar, Ethiopia  
phone +251 928 504 167  
email: [dessievet@gmail.com](mailto:dessievet@gmail.com)

**Abstract:** A retrospective study was conducted on calf mortality in dairy farms in Gondar town from October 2013 to May, 2014 with the objective assessing the extent of calf mortality, investigating potential risk factors related to calf death. A total of 909 calves born from September 2010 to November 2013 in 20 dairy farms in the town were included in the study. Data on calf mortality and associated risk factors were collected by using a pretested questionnaire and from farm records. The overall calf mortality rate was 21.45%. Disease conditions or syndromes recorded or mentioned as causes of calf death were diarrhoea (11.55%), pneumonia (3.74%), septicaemia (3.41%), hypothermia (0.99%), trauma (1.21%) and other miscellaneous causes (0.55%). Among the 12 risk factors assessed for their association with calf mortality, parity of the dam, feeding of colostrums, calves care takers and their experience, calving pen, bedding and measures taken to treat sick calves were significantly related to calf mortality. Calves of exotic (37.5%) breed were having the highest mortality rate. Calves from older cows (30.5%) and heifers (24.8%) also showed high mortality rate. Low mortality rate (20.02%) and (4.23%) were recorded in calves feeding colostrum and having calving pens than non-feeders and calves born in multiple cow calving pens (33.68%) and (22.91%) respectively. Mortality rate of 13.23, 16.35, 27.3 and 27.08% were recorded from educated, with more experience, non-educated and with less experienced attendants, respectively. Large numbers of calf mortality (25.51%) were recorded in farms assessed by technicians as compared to taking to clinic (17.24%) and veterinarians' supervision (16.36%). In conclusion, high calf mortality was observed in Gondar town due to various factors. Therefore, dairy owners should give prime attention to calf management especially in avoiding calf diarrhoea and pneumonia, and should give emphasis to colostrum feeding to reduce calf mortality.

**Keywords:** Calf, Dairy Farms, Gondar town, Mortality, Retrospective study, Risk Factors;

## INTRODUCTION

Livestock production consists one of the principal means of achieving improved living standards in many regions of developing world. In sub Saharan African countries, livestock plays a crucial role both for the national economics and the livelihood of rural communities.<sup>[19]</sup> Ethiopia has the largest livestock in Africa and ranks 10<sup>th</sup> in the world. The country's agro-climate is suitable for livestock production. Moreover, livestock is the source of protein, fuel and animal products and by products in general. Currently a number of urban and peri-urban dairy farms are major suppliers of milk and milk products to the consumers.<sup>[30]</sup> Dairying is one of the most important parts of livestock sector.<sup>[24]</sup> 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 condition, presents new disease problems.<sup>[26]</sup> Presently the per capita milk consumption in Ethiopia is only 20kg per year, which is lower than the average for sub Saharan Africa.<sup>[30]</sup> 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 morbidity and mortality rates generally occur in baby calves prior to weaning.<sup>[8]</sup> Several factors affect the health of the calves immediately after birth.<sup>[28]</sup> 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), but the environment and how it is managed has a significant influence on the exposure a calf has to disease pathogens.<sup>[21]</sup> The poor immune system and lack of previous exposure to infection make new born calves susceptible to infectious diseases and poor management.<sup>[8]</sup> How calves are reared will set the tone for the lifetime productivity of the animal.<sup>[15]</sup> The tenets of good calving management to improve calf viability and health are provision of a suitable maternity site, adequate but not intrusive calving supervision, correct obstetrical techniques and judicious utilization of veterinary assistance.<sup>[3]</sup> Knowledge of the causes of death and factors influencing mortality are of vital importance in identifying opportunities to improve the health status of calves.<sup>[29]</sup> A few studies conducted on calf mortality 0-half years in Ethiopia show mortality that range from 3.6 to 22%.<sup>[33]</sup> The key to low mortality and high profits of feeding and management carried out by individuals who are both experienced and interested in calves.<sup>[5]</sup> Although there were some research works carried out in certain parts of the country, on problems of calf mortality and its economic significance no study on calf mortality was conducted in Gondar town. Therefore, the objectives of this study were:-To assess the extent of calf mortality in Gondar town and to identify potential risk factors associated with calf mortality in the study area.

## MATERIAL AND METHODS

### The Study Area

The study was conducted at Gondar town which is located in North Gondar zones; Amhara regional state. The town is located at Northwest part of Ethiopia at a distance of about 750 km from Addis Ababa. It is located between 12°36'N and 33°28' E at an altitude of about 2300 m.a.s.l with an average temperature of 21<sup>o</sup>c and an average rainfall of 1800mm. The city is with a spread of different mountains, slopes, valleys and small streams of rivers. It has a total population of about 206,987.<sup>[7]</sup> The livestock population comprises about 8,202, cattle, 22,590, goats, 2,695, sheep, 1,065, horses and 9,001, donkeys.<sup>[14]</sup> Dairy farms in Gondar town mainly kept cross breeds but some farms also kept local as well as exotic breeds. They have zero grassing system. Farms are owned by private individuals or governmental sectors and located either together or fare from the living house. Both concentrate and roughage feeds are avilavel in the town but concentrates are very scarce and expensive, this reduces the dairy farms productivity. There is vaccination program in the town in accordance with the type of disease outbreak.<sup>[23]</sup>

### The Study Population

The study population was dairy cattle kept in Gondar town for dairy production. The study unit was dairy calves under six month of age; which were born in the year between September 2010 and November 2013 in Gondar town.

### Study Design, and Sampling Method

A retrospective study was conducted by analysing the information obtained from records of the farms and questionnaire survey. A total of 20 dairy farms were selected systematically from 40 farms which were registered in the district agriculture office. A total of 909 calves from 20 dairy farms, were born in the year between September 2010 and November 2013.

### Data Collection

Data on calf mortality and associated causes and risk factors were collected by using questionnaire and from farm records when available. The format was filled directly by face to face interviewing the owners or farm attendants. Farm characteristics, calf management technique including feeding, housing and previous history of calf disease were recorded. In this study, mortality was defined as death of calves above the age of 24 hours. Symptoms associated with calf mortality were categorize as; diarrhoea, pneumonia, septicaemia, hypothermia, and trauma. The data related to risk factors were classified as indicated in (Table 2).

**Table 1:** potential risk variables considered in the analysis and their categories

Variable	Description of categories
Breed	Local
	Cross
	Exotic
Parity of dam	First

**Table 2:** Major symptoms or syndromes of calf mortality in Gondar dairy farms.

	Second Third Greater than third
Colostrums feeding	Yes No
Methods of colostrums feeding	Suckling Bucket
Calves care takers	Formal education No formal education
Experience in year	Less than 5 Greater or equal to 5
Calving pen	Yes No
Separate housing	Yes No
Bedding	Yes No
Measures to treat sick calves	Taking to clinic Calling veterinarian Calling technician
Herd size	Small scale Medium scale Large scale
Age of farm in year	≤5 5–10 ≥10–15 ≥15

### Data Management and Analysis

The data from questionnaire studies were entered to Excel spread sheet and descriptive statistics was employed to summarize the data and analyzed using SPSS version (16.0) statistical software. The total calf mortality rate was calculated by dividing the number of calf deaths during specific age by the number of live births times one hundred and different rates were calculated as follows.<sup>[31]</sup>

Cause specific mortality rate (CSMR) =  $\frac{\text{number of death from specific cause}}{\text{Number of births}} \times 100$

Proportional mortality rate (PMR) =  $\frac{\text{number of death from specific cause}}{\text{Total number of deaths}} \times 100$

All tests of statically significance were considered significant when the *p* value were less than 5%.

## RESULT

### Calf Mortality

This study was conducted in Gondar town dairy farms to find out the extent of calf mortality and determine the major symptoms and risk factors associated with calves' mortality. From 20 dairy farms, 909 calves were borne from these 195 were died from September 2010 to November 2013. Therefore, calf mortality rate was 21.45%.

From disease conditions (symptoms) assessed calf diarrhoea was the most common symptom associated with calf mortality (Table 3) followed by pneumonia and septicaemia.

Disease condition	N <sup>o</sup> of death	Proportional mortality rate	Cause specific mortality rate
Diarrhoea	105	53.85	11.55
Pneumonia	34	17.44	3.74
Septicaemia	31	15.89	3.41
Hypothermia	9	4.615	0.99
Trauma	11	5.64	1.21
Others	5	2.56	0.55

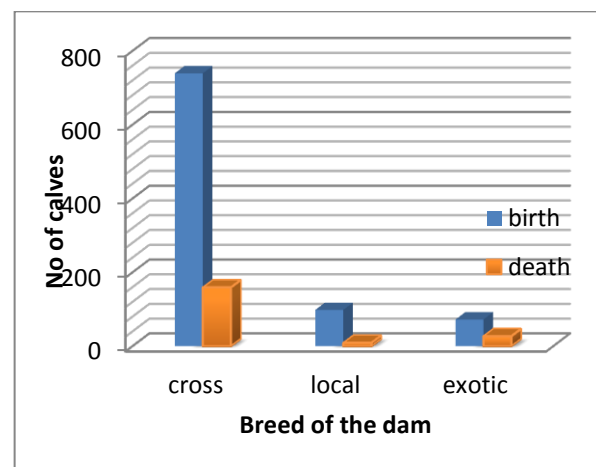
**Potential Risk Factors**

In this study from the 12 risk factors associated with calf mortality, parity of the dam, feeding of colostrums, calves care takers and their experience, calving pen, bedding and measures taken to treat sick calves were found to be significantly associated with calf mortality. Table 4, Indicates management risk factors that were significantly associated with calf mortality that occurs before the calves became sick.

**Table 3:** Manage mental risk variables which were significantly associated with calf mortality.

Variable	Categories	N <sup>o</sup> of birth	N <sup>o</sup> of death	Mortality rate	$\chi^2$	p-value
Colostrums Feeding	Yes	814	163	20.02	9.420	0.002
	No	95	32	33.68		
Calves care takers	Formally Educated	378	50	13.23	25.9	0.000
	No formally educated	531	145	27.30		
Experience in year	<5	432	117	27.08	15.493	0.000
	≥5	477	78	16.35		
Calving pen	Available	71	3	4.23	13.564	0.000
	No available	838	192	22.91		
Bedding	Available	103	14	13.59	4.259	0.039
	No available	806	181	20.55		

In this study mortality of the calf was also significantly associated with the breed of the dam ,parity of the dam and measures taken to treat sick calves ( $P<0.05$ ) (Fig. 2, 3 and 4 respectively). The extent of calf mortality was high in exotic breeds (37.5%) than cross (21.51%) and local (9.18%) breeds. High mortality was also accounted in calves from cows’ calved more than three calves (30.5%) followed by heifers (24.8%) but relatively optimum between the two (15.98-17.27 %). Relatively large number of calf mortality (25.51%) was recorded in calling technicians as compared to taking to the clinic (16.36%) and veterinarian super vision (17.24%).



**Figure 1:** breed of the dam and Calves mortality

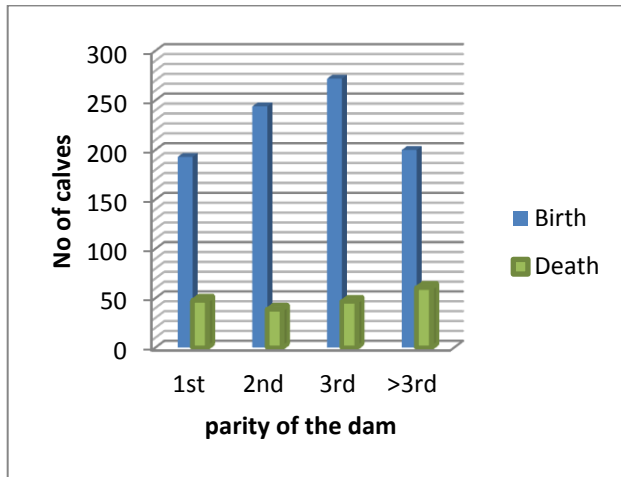


Figure 2: Parity of the dam and calf mortality.

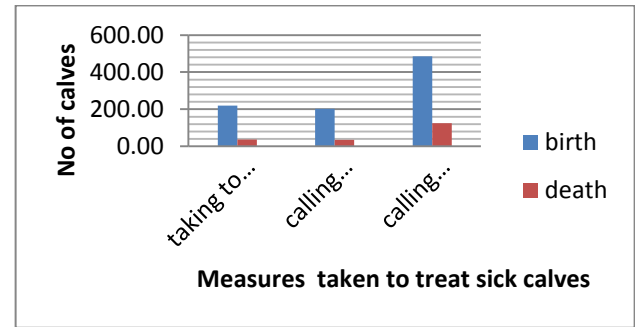


Figure 3: measures taken to treat sick calves and Calves mortality.

Table 4: Potential risk variables which were statically non- significant association with calf mortality

Variable	Categories	N° of birth	N° of death	Mortality rate	X <sup>2</sup>	p-value
Methods of colostrums feeding	Suckling	543	125	23.02	1.968	0.161
	Bucket	366	70	19.12		
Separate Housing	Available	184	46	25	1.723	0.189
	No available	725	149	20.55		
Age of farm in year	≤5	413	101	24.45	4.522	0.210
	5-10	30	7	23.33		
	≥10-15	222	40	18.01		
	≥15	244	47	19.26		
Herd size	Small	329	64	19.45	2.388	0.303
	Medium	445	96	21.57		
	Large	135	35	25.92		

## DISCUSSION

In this study, the mortality rate of calves from September 2010 to November 2013 was found to be 21.45%. These findings are much higher than the 3 to 5% calf mortality that can be achieved through good calf management.<sup>[18]</sup> A few studies conducted on calf mortality 0- half year in Ethiopia show mortality that range from 3.6 to 22%. The result of the present study was between the ranges of the previous studies<sup>[33]</sup> but it accounts the highest pike. This might be due to lack of encouragement and awareness how to rear and give attention to their calves from concerned bodies and inaccessibility of animal clinics in the study area. On the other hand, the present finding was lower than the 25% and 50% reported by Sisay and Ebro<sup>[24]</sup> and Hassan<sup>[17]</sup> respectively. The main symptoms or syndromes of calf death revealed in this study were calf diarrhoea, pneumonia, septicaemia, hypothermia and trauma. Calf diarrheaa was found to be the predominant calf health problem with cause specific mortality rate of 11.5% followed by pneumonia (3.74%) and septicemia (3.41%). These findings are in agreement with reports of Lemma *et al*<sup>[20]</sup> and Wudu *et al*.<sup>[33]</sup> On the other hand, there are studies which found pneumonia as the leading cause of calf mortality.<sup>[25]</sup> It was also explained by Gulliksen *et al*.<sup>[16]</sup> as the most respiratory disease associated with overcrowded and poor ventilation. In Ethiopia, several factors have been reported in association with dairy calf diseases. Hygiene, nutrition and management problems were the major problems associated with high mortality.<sup>[20]</sup> In this study, among the 12 risk factors assessed for their associations with calf mortality, parity of the dam, feeding of colostrums, calves

care takers and their experience, calving pen, bedding and measures taken to treat sick calves were found to be significantly associated with calf mortality whereas, methods of colostrums feeding, separate housing, age of the farm and herd size were non-significantly associated with calf mortality. Calves are born with no immunity against disease. Until they can develop their own natural ability to resist disease, through exposure to the disease organisms in their surroundings, they depend entirely on the passive immunity acquired by drinking colostrum from their dam.<sup>[32]</sup> In this study; feeding colostrum was significantly associated with calf mortality. This is in line with other previous studies.<sup>[33]</sup> Low mortality rate (20.02%) was recorded in calves feeding colostrum than those were not feed with high mortality rate (33.68%). The present study revealed that education and experience of the farm attendant were found to be statistically significant. Low calf mortality was seen in herds owned by older and more experienced managers which were in accordance with.<sup>[18],[1]</sup> Farms attend with personals having formal education, have low calf mortality rate (13.23%) as compared to those non- educated with high mortality rate of 27.30%. More experienced attendant or manager of the farm reduce the health problem of the farm.<sup>[18]</sup> In this study farm attendants who spent more than five years indicated low calf mortality (16.35%) than those spent less than five year with mortality rate of 27.08%. Less calf disease events were expected from improved hygiene and lack of overcrowding of cows (and calves) within the single cow calving pens in comparison to the multiple cow calving pens, thus limiting degree of exposure to potential pathogens in the former group.<sup>[20],[33]</sup> Similar



with Lema *et al* [20] and Wudu *et al* [33] this study also find out a significant difference in risk of calf mortality among calves born in single cow calving pens with mortality rate of 4.23% as compared to calves born in multiple cow calving pens with high difference mortality rate (22.91%). In this study bedding was found to be significantly associated with calf mortality. Farms having calf bed have lower mortality rate 13.59% as compared to those non-bedded with high mortality rate (20.55%) of calves because, a dry bed will reduce humidity in the shed, and result in less contact with dung and urine with subsequent reduction in disease risk and exposure. It also provides an absorptive surface as well as insulation from the cold.<sup>[16]</sup> According to this study the calves of exotic (37.5%) followed by cross breed (21.51%) were accounted higher mortality rate. It indicates that the presence of significant variation in cattle in terms of resistance to disease.<sup>[11]</sup> On the other hand, there are also studies, which revealed higher mortality in local breeds of calves than cross breeds of calves.<sup>[1]</sup> and mortality rates un related to breed.<sup>[8]</sup> Similarly, in conformity with other studies,<sup>[4]</sup> dam parity class have a significant effect on calf mortality (Fig. 3). As the result indicated high mortality was accounted in cows calved more than three calves (30.5%) followed by calves from heifers with mortality rate (24.8%). This might be due to inadequate amount of milk production leading to failure of passive transfer although; other study<sup>[1],[33]</sup> reported a statistically non-significant influence. According to El-Nazeir<sup>[10]</sup> and El-Zubeier and Mahala<sup>[9]</sup> dairy farms must be under supervision of veterinarians and reported that most of the workers give the treatment without consultation of the veterinarians. In addition to prevention, the farm should take appropriate measures to treat sick calves. This study (Fig.4) indicates that measures taken after the calves became sick were significantly associated with calves' mortality. In Gondar town most dairy farms employed (per time) an animal health technician who take the responsibility regarding to the health aspect of the farm this might be the reason why the result indicates a large number of calf mortality (25.51%) as compared to taking clinic (16.36%) and veterinarians supervision (17.24%) because diagnosis of disease and medical treatment of sick animals is the responsibility of veterinarians. Calves that receive their colostrum through nursing the dam have increased failure of passive immunoglobulin transfer compared to those that are hand fed.<sup>[6]</sup> On the other hand, Gaya *et al* [12] suggested that a restricted suckling system works well, than traditional bucket rearing systems. Unlike the above studies in this study, there is no significant association between the methods of feeding and calf mortality. Therefore, the method of colostrums feeding to calves might be under the hands of the management system of the farm because, the amount of milk available to the calf determined by the quantity of milk remaining after milking<sup>[22]</sup> and other managerial factors like, colostrum management after milking. In this study keeping calves in the same bar together with cows or in individual calf pen did not show significant difference on calf mortality. This contrast with other studies.<sup>[1],[20],[34]</sup> This might be due to the farms management system because having separate calf pen by itself does not make the farm successful unless the housing system is properly managed. For example, in this

study, all the farms having separate pen have group housing system, so overcrowding of calves and pens with poor ventilation might be exposed the calves to respiratory disease and also creates stress.<sup>[15]</sup> This study further statically analyzed the age of the farm with respect to calf mortality, however, it was found to be non-significantly associated with calf death problems ( $p>0.05$ )(Table 5). This result is in agreement with Wudu, *et al* [33] but in contrast with. [18] The study of Heinrichs and Radostits<sup>[18]</sup> might be true if the manager of the farm is permanent or constant but when there was a change from time to time the new comers became new to the management system, even though the farm account so many years. These conditions might be occurs in this study. In this study herd size did not significantly affect calf mortality although the number of calves cared per operator in the big farms was higher than in the small ones. This might be due to the operator taking care of calves is likely more qualified and dedicates longer time to this activity compared with small farms. The result was in lined with Zucali<sup>[34]</sup> but conflicts with Gullisken *et al* [16] and Abdullatief *et al* [1] showed an increase in calf mortality rates as herd size increases; this is probably due to a reduction of time spent in the barn for the daily inspection of each individual animal.

## CONCLUSIONS AND RECOMMENDATIONS

Several factors (environment, host and management system related) affect the health of the calves immediately after birth. The poor immune system and lack of previous exposure to infection make new born calves susceptible to infectious diseases. The calf mortality rates found in this study were higher than economically tolerable and that can be achieved through good management. Higher rates of calf mortality will be great hindrance to improve productivity of dairy production. In this study parity of the dam, feeding of colostrums, calves care takers and their experience, calving pen, bedding and measures taken to treat sick calves were the most determinant of health problems. The study also showed that calf diarrhoea was the predominant calf health problem responsible for the majority of calf deaths followed by calf pneumonia and septicemia, respectively. However, calf diarrhoea is a syndrome of great etiological complexity and hence a more comprehensive study should be conducted to identify the major infectious causes involved. Based on the above conclusion the following recommendations are forwarded:

- ❖ Dairy farms should give prim attention to calf management to reduce calf mortality to optimum level.
- ❖ Efforts should be made to increase calving supervision, improve management of newborn calves, and prevent respiratory diseases and diarrhoea.
- ❖ It is better; the concerned body should stop the activities of irresponsible personnel from their activities.
- ❖ Extension services among dairy farms owners and labours should give on proper dairy farm practices regarding housing condition, colostrum feeding and other managerial related practices.

- ❖ Research must focus on the causative agents of calf diarrhoea and calf pneumonia in order to control and prevent losses due to these diseases.

## REFERENCES

- [1] Abdullatief, E. M., Mansour, I., Atif, E., Abdelgadir, Ibtisam, E. M. and Zubeir, E. I., 2014. Major causes and risk factors associated with calf mortality in dairy farms in Khartoum State, Sudan. *Journal of Veterinary Medicine and Animal Health*, 6(5), p. 145-153
- [2] Amuamuta, A., B., Asseged, G. and Goshu., 2006. Mortality analysis of Fogera calves and their Friesian crosses in Andassa Cattle Breeding and Improvement ranch, North West Ethiopia. *Revue De Medecine Veterinaire*, 157, P. 525-529.
- [3] Andrew, B., 1988. Causes of dystokia in Friesian dairy heifers and its effects on subsequent performance. *International journal of current research*, 6, p. 143-151.
- [4] Asseged, B. and Birhanu, M., 2004. Survival analysis of calves and reproductive performance of cows in commercial dairy farms in and around Addis Ababa. *Tropical Animimal Health Production.*, 36, p.663-672.
- [5] Bath,D.L.,Dckinson,F.N.,Tucker,H.A.andAppleman,R.D.,1998.*Dairycattle:principles,practices,problems,profits.*3<sup>rd</sup> ed. USA: LEA and Fibiger and Philadelphia.
- [6] Beam, A.L., Lombard, J.E., Koprak, C.A., Garber, L.P., Winter, A.L., Hicks, J.A. and Schlater, J.L., 2009. Prevalence of failure of passive transfer of immunity in newborn heifer calves and associated management practices on U.S. dairy operations. *Journal of Dairy Science*, 92, p. 3973-3980.
- [7] CSA, 2008. Data for livestock population in Gondar city.
- [8] Darsema, G., 2008. Major causes of calf mortality in dairy farm and two cattle ranches in Western region, North Western Ethiopia. *Ethiopian veterinary journal*, 12, p. 59-68.
- [9] El -Zubeir, and Mahala, A. G., 2011. An overview of the management practices and constrains at the dairy camps in Khartoum State, Sudan. *Research Opinions in Animal and Veterinary Sciences*, p. 425-428.
- [10] El-Nazeir, B. A., 2005. An assessment of management and husbandry practices in some dairy farms in Khartoum State. MSc. Thesis, University of Khartoum, Sudan. Ethiopia. Faculty of veterinary medicine, Addis Ababa University, Debre Zeit, Ethiopia.
- [11] Fries, R. and Ruvinsky, A. , 1999. The genetics of cattle. 3<sup>rd</sup> ed. UK: Cabi Publishing.
- [12] Gaya, H., Delaitre, J.C. and Preston, T.R., 2004. Effect of Restricted suckling and bucket feeding on the Growth Rate of Males and on milk Yield Research carried out with technical assistance provided by the FAO/UNDP project.
- [13] Godden, S.M., 2008. Colostrum management for dairy calves. *Veterinary Clinics of North America: Food Animal Practice* 24, p. 19–39.
- [14] GARDOG, 2012. Gondar Agricultural and Rural Development Office, North Gondar Zone. .Agricultural Office Report of Livestock Resource.
- [15] Gorden, P.J. and Plummer. P., 2001. Control, management and prevention of bovine respiratory disease in dairy calves and cows. *Veterinary Clinics of North America: Food Animal Practice*, 26, p.243-259.
- [16] Gulliksen, S.M., Lie, K.I., Loken, T., Osterås, O., 2009. Calf mortality in Norwegian dairy herds. *Journal of Dairy Science*, 92, p.82-95.
- [17] Hassen, Y. and Brannag, E., 1996. Calving performance and mortality in Danish Jersey cattle at Ada Berga state farm, Ethiopia. The proceeding of the 10<sup>th</sup> conference of Ethiopian veterinary Association, Addis Ababa, Ethiopia.
- [18] Heinrichs, A. J. and Radostits, O.M., 2001. Health and production management of dairy calves and replacement heifers. 3<sup>rd</sup> ed. Philadelphia: Saunders Company.
- [19] ILCA, 1998. Anima reproduction for African countries, report of a joint seminar by international foundation for science and Swedish international program on animal production ILCA 1997-1998, Addis Ababa, Ethiopia.
- [20] Lema, M., Kassa, T. and Tagagne, A., 2001. Clinically manifested major health problems of cross breed dairy herds in urban and peri-urban production systems in the central high land of Ethiopia. *Tropical Animimal Health Production*, 33, P. 85-93.
- [21] Lundborg, G. K., Svensson, E. C. and Oltenacu, P. A., 2005. Herd-level risk factors for infectious diseases in Swedish dairy calves aged 0-90 days. *Preventive Veterinary Medicine*, 68, 123-143.
- [22] Mdegela, R. H., Kusiluka, L. J. M., Kapaga, M., karimuribo, E. D., Turuka, F. M., Bundala, A., Kivaria, F., Kabula, B., Manjurano, A., Loken, T. and kamarage, D.M., 2004. Prevalence and determinants of mastitis and milk borne zoonoses in small holder dairy farming sector in kibaha and morgoro districts in Eastern Tanzania. *Journal of Veterinary Medicine*, 51, p. 123-128.

- [23] Nuraddis, I., Ashebir, A. and Shiferaw, M., 2011. Assessment of Reproductive Performances of Cross breed Dairy Cattle (Holstein Friesian X Zebu) in Gondar Town. *Global Veterinarian*, 6 (6), p. 561-566.
- [24] Razzaq, M. A., Bedair, M., Abbas ,S. and Al-Mutawa, T., 2009. Economic impact of calf mortality on dairy Farms in Kuwait. *Pakistan Veterinary Journal*, 29(3), p. 97-101.
- [25] Shiferaw, Y., Yohannes, A., Yilma, Y., Gebrewold, A., Gojjam, Y., 2002. Dairy husbandry and health management at holleta. Proceeding of the 16<sup>th</sup> conference of the Ethiopian veterinary association. Addis Ababa, Ethiopia. Pp. 103-119.
- [26] Shiferaw, Y., Bekana, M., Tenhagen, B.A. and Kassa, T., 2003. Reproductive performance of crossed dairy cows in different production Systems in the central high lands of Ethiopia. *Tropical Animal. Health Production*, 35, p. 55-561.
- [27] Sisay, A. and Ebro, A., 1998. Growth performance of Boran and Their Semmental cross calves. Proceeding of 6<sup>th</sup> national conference of the Ethiopian society of animal production (ESAP). Addis Ababa, Ethiopia.
- [28] Sivula, N.J., Ames, T.R. and Marsh, W. E., 1996. Management risk factor for Morbidity and mortality in Minnesota dairy heifer and calves. *Preventive Veterinary Medicine*, 27, p. 273-182.
- [29] Svensson, C., K. Lundborg, U. Emanuelson, and, Olsson, S.O., 2003. 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, P.179–197.
- [30] Tegegne, A. and Gebrewold, A., 1998. Prospects for peri-urban dairy development in Ethiopia. In Stoltenow, C.L. and Vincent L.L., 2003, Proceeding of 5<sup>th</sup> national conference, the Ethiopian society of animal production (ESAP), 15-17 May 1998, Addis Ababa, Ethiopia.
- [31] Thrusfield, M., 2005. *Veterinary epidemiology*. 3<sup>rd</sup> ed. Australia: Black well.
- [32] Waver, D. M., Tyler, J. W., Vanmeter, D. C., Hostlewr, D. E. and Barrington G. M., 2000. Passive transfer of colostral immunoglobulin in calves. *Journal of Veterinary Internal Medicine*, 14, p. 569-577.
- [33] Wudu, T., Kelay, B., Mekonnen, H. M., Tesfu ,K., 2008. Calf morbidity and mortality in smallholder dairy farms in Ada'a Liben district of Oromia. *Tropical Animal Health and Production*, 40, p. 369-376.
- [34] Zucali, M., 2013. Management risk factors for calf mortality in intensive Italian dairy farms. *Italian Journal of Animal Science*, 12(2), p. 35-33.



Sisay. E., received Doctor of Veterinary Medicine from University of Gondar, Faculty of Veterinary Medicine in 2014. Since February 2015 up to now worked in Amhara Regional state as animal health care expert.