

Full Length Research

Case Based Study of Gastro Enteritis and Gastrointestinal Parasitosis in Crossbred Dairy Calves Reared by Harc, Dairy Farm Central Areas of Ethiopia

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Calf diarrhea has been regarded as the most common cause of neonatal morbidity and mortality. A case study was conducted from September 2018 to August 2019 as health monitoring and routine follow-up of cross breed calves in HARC dairy farm with objectives of determining gastrointestinal health problems of calves in the farm. A total of 469 clinical cases of crossbred calves were diagnosed with gastrointestinal health problems. Among these, 95.75 % (449) of the cases were diagnosed as gastroenteritis of crossbred calves whereas 4.05 % (19) of the calves suffered from GIT parasitosis cases. The analysis indicated that, diarrhea was the major syndrome of gastroenteritis in calves. The syndrome of diarrhea showed a statistically significant association (p-value=0.00^{*}) with gastroenteritis. Sex wise evaluation of gastroenteritis and GIT parasitosis showed no statistically significant difference of the cases between male and female calves (P=0.0116). Beside this, majority of the male and female calves were diagnosed and experienced cases of gastroenteritis. Generally, the gastrointestinal health problem is the major contributing factor to calf morbidity and mortality in HARC dairy farm. Therefore, appropriate prevention and control measures of gastrointestinal health problems should be instituted and adopted against diseases of calves and enhance replacement females and economic gain from the dairy sector.

Key words: Calves, Dairy, Diarrhea, Gastroenteritis, GIT parasitosis, Holata, , Ethiopia

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INTRODUCTION

Livestock is an integral part of the Ethiopian agricultural production system and plays a significant role in the national growth programs. Dairy industry is one of the subsectors of livestock production in which calves are future assets. Success of any breeding program of a dairy enterprise and its future depends on the survival of the calf crop and better management practices (Balusami,

2015). The cattle industry has made incredible improvements in herd management, animal facilities and care, feeding and nutrition, and timely use of biopharmaceuticals (Bremel *et al.*, 2001). However, calf diarrhea is still problematic, likely because of the multifactorial nature of the disease with numerous infectious and noninfectious factors. Factors influencing the pathogenesis of diarrhea are pathogen exposure, environmental conditions, management, nutritional state,

and immune status(Klein-Jöbstl *et al.*, 2014). A complex community of bacteria, viruses, fungi, protozoa, and other microorganisms inhabit the gastrointestinal tract of ruminants and play important roles in gut health and disease(Gomez and Weese, 2017).

Gastroenteritis is inflammation of the lining of the stomach and small and large intestines (Zainalabidin *et al.*, 2015). Most cases are infectious, although it may occur after ingestion of drugs and chemical toxins. Various pathogenic viruses such as bovine rota virus, bovine corona virus, and recently identified norovirus, astrovirus, nebovirus, enterovirus and torovirus have been well characterized in cattle, causing a range of diseases *via* acute, persistent, or latent infections. Bovine rotavirus (BRoV) typically causes diarrhea in calves less than 3 wk of age. Typically, pale yellow, nonbloody, profuse diarrhea is observed, often containing large amounts of mucus in which diarrhea usually lasts between 4 to 8days. Bovine coronavirus (BCoV) has been associated with gastrointestinal and respiratory diseases in cattle including diarrhea in neonatal calves, winter dysentery, and respiratory tract illness(Gomez and Weese, 2017). Parasitic gastroenteritis (PGE) is a complex disease associated with a number of nematode species with considerable economic importance in grazing animals. Gastroenteritis is characterized by diarrhea, less than optimum productivity (subclinical disease), seasonal appearance, and hypoalbuminaemia. Parasites of nematode species, mostly strongyles are associated with this condition.

These include; *Heamonchus*, *Trichostrongylus*, *Oesophagostomum*, *Cooperia*, and *Strongyloides*(Firdaus *et al.*, 2017). The clinical signs of parasitic gastroenteritis are characterized by diarrhoea, loss of body weight, anaemia, lethargy, tachypnea, tachycardia, and collapse(Eysker *et al.*, 2005). The occurrence of parasitic gastroenteritis in many cases has been associated with the age of animals as younger animals are more susceptible, environmental factors favoring larval survival and growth, peri-patourient rise (PPR) during pregnancy, genetic influences and the nature of farm management (Roeber *et al.*, 2013).

Parasitic gastroenteritis often results in mucosal epithelial disruption with the seepage of plasma into the lumen resulting in hypoproteinemia and immunosuppression(Evering and Weiss, 2006). Generally, the factors involved in the occurrence of calf diarrhea can be summarized as peripartum calving management, calf immunity, and environmental stress or contamination(Cho and Yoon, 2014). The pathophysiology of diarrhea secondary to enteritis in adult ruminants is similar to young ruminants. Limited works regarding pathogenic causes of enteritis and parastosis in calves have been executed, but research studies concerning the aggregation of cases due to unknown cause in the crossbred calves was substantially

low. Understanding the occurrence of cases in the farm and its associated potential factors would be required to reduce young calf morbidity, mortality, and replacement and production losses in the farm. Therefore, the current study was conducted to determine gastroenteritis and gastroparasitosis from the recent clinical cases and its associated factors in young crossbred calves through case based study.

MATERIALS AND METHODS

Study area

The present study was conducted in Holeta Agricultural Research Center dairy farm which is located in Walmara district of Oromia Regional State, Ethiopia. Walmara is a part of the Oromia Special Zone surrounding Finfinne and bordered by Sebeta Hawas on the south, by west Shewa Zone on the west, by Mulo on North, by Sululta on Northeast, and by the city of Finfinne on the East(Rao and Ketema, 2016). The highest point in this woreda is mount wechacha(3191 m asl) (Tola *et al.*, 2016). The district is located at 8° 54' 59.99" N latitude and 38° 34' 59.99" E longitude. Holeta is an administrative town of Walmara district which lies at a distance of 40 km west of Shagar at an altitude of 2400 m asl. It experiences a bimodal pattern of rainfall with a long rainy season extending from June to September and a short rainy season during March and April(Shiferaw *et al.*, 2003).

Study design and selection of the study animals

A cross sectional study was conducted from September 2018-August 2019 with the objective of assessing the dynamics of gastroenteritis and GIT Parasitosis in dairy calves reared by HARC. The breeds of calves recruited into the current study were Borana, Borana X Holstein Friesian and High-grade one. Calves with the symptoms of profuse or watery diarrhea, diarrhea and bloody diarrhea were purposively considered as target study animals. Based on the symptom of diarrhea observed on each calf and quantitative analysis of epg, tentative diagnosis was made as either it was due to gastroenteritis or gastrointestinal parasitosis.

Method of eggs count

To diagnosis and count helminth eggs in faecal samples of study calves, McMaster technique was employed (Foreyt 1989). Briefly, 4 grams of fecal sample from each study calf was mixed with 56ml of floatation solution. Then the mixture was stirred thoroughly and filtered through tea strainer into the other container. The filtrate in

the second container was stirred with Pasteur pipette and subsample withdrawn as the filtrate is being stirred. Then, the two compartments of McMaster were filled with this subsample and allowed to stand for 5 minutes. Finally, it was observed under compound microscope at 10 x10 magnification. The number of eggs per gram was calculated by counting the number of eggs within the grid of each chamber and multiplied by 50(Foreyt 1989).

Treatment regime

Based on the tentative diagnosis and quantitative analysis of epg count made, the calves were treated with appropriate antibiotics for bacterial and viral cases of gastroenteritis and with anti-helminthes for GIT parasitosis. Severely dehydrated calves were treated with lactated ringers through oral or intravenous route to replace the lost fluid and electrolyte (Berchtold and Vet 2009) . Additionally, calves showing the sign of diarrhea were separated from other health calves and attended at separated shelter until they gate normal.

Data Analysis

Risk factors such as sex and breed of calves, syndrome and diagnosis made were recorded into Microsoft excel® spread sheet. R Software version 4.0.3 was used to analyze the data's (Chambers 2008). Chi-square test was employed to evaluate the existence of association between risk factors and calves GIT problem. Descriptive statistics was also used to summarize the data using frequency distribution and percentage. The association of risk factors with gastroenteritis and GIT parasitosis was also measured by Firths bias reduced logistic regression (Heinze et al. 2013).

RESULT

A total of 469 calves were diagnosed for gastro intestinal health problems. Among these, 95.75%(449) calves had gastroenteritis, whereas 4.05%(19) of them suffered from GIT parasitosis. Diarrhea is indicated to be the major syndrome of gastroenteritis in calves. The result also showed that about, 97.9% and 95.45% of Borana X Fresian and high-grade calves had gastroenteritis, respectively (Figure 1).

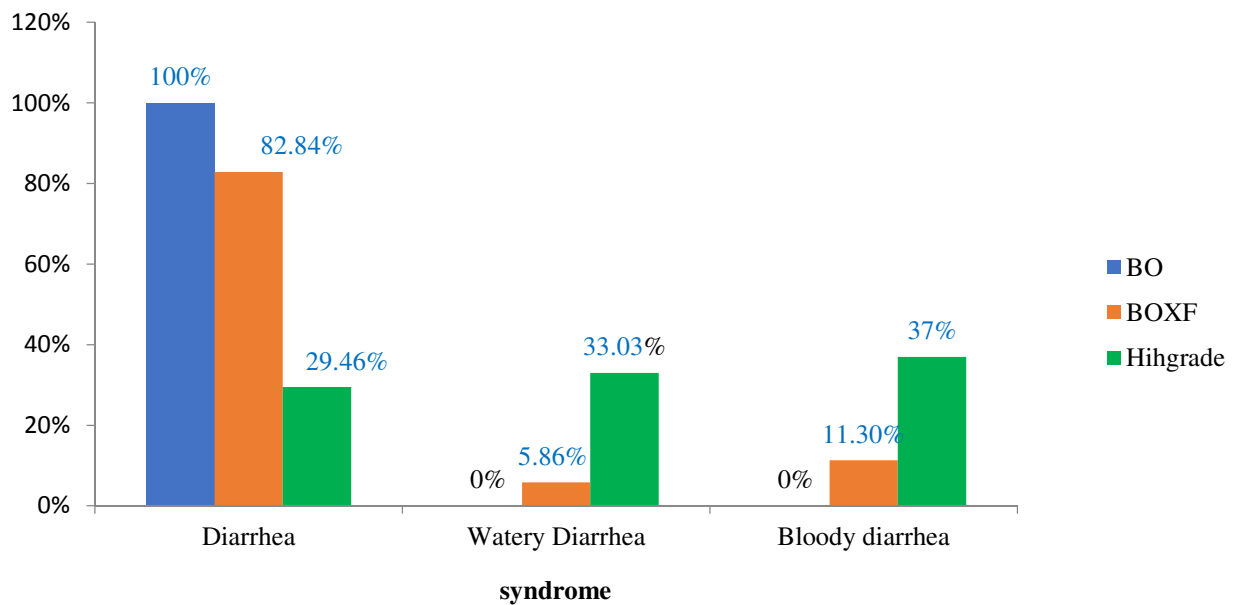


Figure 1. Gastroenteritis and GIT parasitosis syndromes encountered in crossbreed calves BO=Borana, BOXF=Borana X Holstein Fresian, Highgrade=75% cross breed

The chi-square test indicated that, there was no statistically significant difference of gastroenteritis and GIT parasitosis between male and female calves ($P=0.0116$). The breed of the calves was also considered as an important risk factors and showed no statistically significant difference of gastroenteritis and GIT parasitosis cases ($p=0.069$). Of the 469 calves diagnosed for gastrointestinal health problems, majority of them showed diarrhea (53.9%) as a typical syndrome followed by bloody diarrhea (23.66%) (Table 1).

Table 1: Status of gastroenteritis and GIT Parasitosis in calves and associated risk factors

Variables	No of diagnosed	Cases of Gastroenteritis (%)	Cases of GIT Parasitosis(%)	X ²	P-value
Sex					
Male	218	213(97.7)	5(2.3)	2.475	0.116
Female	250	236(94.4)	14(5.6)		
Breeds					
Borana	5	5(100)	0(0)	5.346	0.069
Borana X Fresian	239	234(97.9)	5(2.09)		
High Grader	224	210(95.45)	14(6.25)		
Syndromes					
Watery diarrhea	469	85(18.1)	3(0.64)	7.25	0.026*
Diarrhea		253(53.9)	16(3.41)		
Bloody diarrhea		111(23.66)	0(0)		

*Statistically significant

The firths bias reduced logistic regression analysis indicated that only diarrhea showed statistically significant association (p-value=0.00*) with gastroenteritis. Borana X Fresian crossbred calves were 3 times more likely to be infected by gastroenteritis than Pure Borana calves (OR = 3, 95% CI: 0.022-32.9) (Table 2).

Table 2: Multivariable firth bias reduced logistic regression analysis of factors associated with gastroenteritis in crossbred calves

Variables	No of cases diagnosed	Cases of Gastroenteritis (%)	OR	95%CI	P-value
Breed					
Borana	5	5(100)	Ref	Ref	Ref
Borana X Fresian	239	234(97.9)	3	(0.022,32.99)	0.505
High Grader	224	210(95.45)		(0.0034,4.57)	0.542
Syndromes					
Watery diarrhea	469	85(18.1)		(0.00913,1.3)	0.081
Diarrhea		253(53.9)		(0.00022, 0.23)	0.000
Bloody diarrhea		111(23.66)		Ref	Ref

In this study, high grade calves were 2.17 times more prone to gastro intestinal parasitosis than Borana calves (OR = 2.175, 95% CI: 2.2-29.32). The risk of infection was increased in male than female calves in the farm (Table 3).

Table 3: Multivariable Firth bias reduced logistic regression analysis of factors associated with GIT parasitosis in calves

Variables	No of cases diagnosed	Cases of GIT Parasitosis (%)	OR	95%CI	P-value
Sex					
Male	218	5(2.29)		(0.213,1.82)	0.432
Female	250	14(5.6)	Ref	Ref	Ref
Breed					
Borana	5	0(0)	Ref	Ref	Ref
Borana X Fresian	239	5(2.1)	3	(0.022,32.99)	0.529
High Grader	224	14(6.25)	2.175	(0.22, 293)	0.571
Syndromes					
Watery diarrhea	469	3(0.64)	8.09	(0.766,1094)	0.0876
Diarrhea		16(3.41)	34.03	(4.32, 4395)	0.000
Bloody diarrhea		0(0)	Ref	Ref	Ref

DISCUSSION

Calf diarrhea (NCD) is the most common cause of morbidity and mortality in pre-weaned dairy calves, causing substantial economic and productivity losses to the dairy industry worldwide and is the greatest single cause of death. If the calves didn't feed an appropriate amount of colostrum during their first 2-6hrs of age after birth, they will not be immune toward numerous causative agents and become susceptible to diarrhea cases (Klein-Jöbstl *et al.*, 2014). The etiologic agents of the calf diarrhea are reported to be multifactorial (Olaogun *et al.*, 2016) and numerous studies were carried out to rule out the causative agent's calf diarrhea. Vagh and Jani (2010) conducted a study to find the different serotypes of *E. coli* isolates from young cattle and buffalo calves affected with calf scour. *Salmonella enterica Typhimurium*, and occasionally other serovars, may cause severe mucoid or haemorrhagic diarrhoea in calves of all ages which leads to gastroenteritis. Study's conducted by Vaatstra (2018) indicated rotavirus and cryptosporidium as the major causative agents of gastroenteritis. Investigation of the interaction between viral and other microorganisms of the gastrointestinal tract infection of the calf was also made and found scarce. However, several studies elucidated calf diarrhea to have high rates of co-infection (Gomez and Weese, 2017). In the current study, the gastrointestinal health problems of calves were assessed. A total of 469 calves were diagnosed, among which 95.75% (449) calves have had gastroenteritis, whereas 4.05% (19) of them suffered from GIT parasitosis. The relatively higher prevalence of gastroenteritis in calves might be due to the high stock density of animals in the farm, the absence of timely ingestion of appropriate amount of colostrum, in appropriate cleaning and decontamination of the calf pen and feeding bottle which create a favorable condition for transmission of pathogenic microorganisms.

The findings of the current study are comparable with the earlier reports of (Asmare and Kiros, 2011) who reported 63.3% prevalence of calf diarrhea which is the principal manifestation of gastroenteritis in calves (Wudu *et al.*, 2008 ; Olaogun *et al.*, 2016). Diarrhea is by far the most common indication for fluid therapy in neonatal calves. Oral electrolyte solutions have classically been used to replace fluid losses, correct acid-base and electrolyte abnormalities, and provide nutritional support, because they are cheap and easy to administer on farm (Smith, 2009). Breed of the calves was one of the risk factors considered in the current case study. Briefly, three breeds of calves, namely, Borana, BoranaXHolstein Friesian and high grade, were clinically diagnosed for gastrointestinal health problems.

As a result, 449 calves experienced gastroenteritis whereas the rest of them were diagnosed with gastrointestinal parasitosis. This might be due to the multifactorial causes of gastroenteritis and GIT

parasitosis in the crossbreed calves. Of the clinically diagnosed calves, 100% of Borana breed, 97.9% of BoranaXHolstein Friesian and 95.45% of high grade calves experienced gastroenteritis. This might be associated with many different factors such as calf housing and feeding practices. In HARC, even though calves are housed individually, a single person will attend many calves without following strict hygienic rules which create a favorable condition for the transmission of causative agents of gastroenteritis from diseased calves to the healthy one.

Housing of calves outside the barn is thought to reduce the risk of disease (Marcé *et al.*, 2010) as indoor housing has disadvantages such as an increased pathogen load and risk for disease transmission (Klein-Jöbstl *et al.*, 2014). Healthy looking cows may also shed large amounts of infectious causative agents of gastroenteritis around the pen of calves or where they exercise. Thus, calves may get exposed to causative agents of gastroenteritis or gastro intestinal parasites in their pen or in the field. Concerned with the gastrointestinal parasitosis, a greater percentage of high-grade calves were found a carrier of certain parasite species. This might be due to the difference in immunity to parasite infestation.

CONCLUSION AND RECOMMENDATION

Gastroenteritis and GIT parasitosis are the major bottle neck to the dairy industry in Ethiopia through retardation of calf growth, cost of drugs, and generally by increased rate of calf morbidity and mortality. Due to this, enough replacement stock of calves for future breeding schemes might not be obtained. Based on the above conclusion, the following recommendations are worth mentioning

- 1-Strict follow-up of new born calves to ensure that they have fed enough amount of colostrum before 2 hrs pass after birth
- 2-Maintaining a good hygiene of newborn calves and maintain the cleanness of the living pen.
- 3-Avoiding the coexistence of different age group of calves in a single pen in order to minimize the cross transmission of the causative agents of gastroenteritis and GI parasites from one calf to another.
- 4- Avoiding co-existence of different age groups of calves and the new born calf should not live with her dam for so long since the healthy-looking cows can shed pathogenic microorganisms,

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Author's contribution

All authors were actively involved from the beginning of the research planning, implementation and analyzing of research data, drafting and the completion of the manuscripts.

Conflict of interest statement

There is no conflict of interest

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