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*Research Paper*

# EPIDEMIOLOGY OF GASTROINTESTINAL HELMINTHIASIS OF CROSSBRED CALVES IN SELECTED SITES OF BAHIR DAR ZURIA AND GOZAMEN DISTRICTS OF AMHARA REGION, NORTHWEST ETHIOPIA

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A cross sectional study aimed at determining the prevalence of crossbred calf helminthiasis was conducted in Bahir Dar zuria and Gozamen districts of Amhara region from September 2010 to April 2011. A total of 148 small holder dairy producers were interviewed using a structured questionnaire about their calf management practices. Coprological examination was carried out for qualitative as well as quantitative analysis of calf internal parasites using floatation and sedimentation technique. Degree of nematode infection and magnitude of concurrent calf helminthiasis was determined by using standard parasitological procedures. A total of 173 crossbred calves were sampled for the investigation of calf helimenthiasis. Of which, 96 calves were found to be positive for helminth parasite comprising an overall prevalence of 55.5%. Higher prevalence was recorded for *Strongyle* spp. (21.4%) and Fasciola (20.8%) followed by Paramphistomum (17.9%), *Schistosoma* (13.9%) and Monezia (5.8%). A statistical significant differences ($P < 0.05$) was observed in the prevalence of *Schistosoma* and *Strongyle* spp infection across study location. Fasciolosis infection was also found statistically significant ($P < 0.05$) across sex of calves by using Chi-square ($\chi^2$) test. In conclusion, in view of the current result, calf helminthiasis could be considered as a major calf health problem in the study areas. It is therefore, suggested that implementation of improved calf management practices with strategic application of worming chemicals and provision of worm safe pasture would significantly reduce calf helminthiasis in the study areas.

***Keywords:*** Bahir Dar, Crossbred calf, Gozamen, EPG, Helimentiasis

## INTRODUCTION

Parasitism is of supreme importance in many agro-ecological zones and still a serious threat to the livestock economy worldwide (Vercruysse and Claerebout, 2001). Gastrointestinal helminth infections are recognized as a major constraint

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to livestock production throughout the tropics and elsewhere (Githiori *et al*., 2004). They cause lowered productivity (Perry and Randolph, 1999), mortality (Sykes, 1994), and high economic losses (Iqbal *et al*., 1993) affecting the income of small holder dairy farming communities. 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. Calves under one year of age are more susceptible than older cattle who frequently have been exposed to the parasites and have developed a degree of immunity. Calves can be infected by roundworms (nematodes), tapeworms (cestodes) and flukes (trematodes). The major mode of transmission of internal parasites of cattle is through contamination of pasture herbage. Calves can be expected to become infected with parasites when they begin to graze.

For successful formulation and Implementation of an efficient and effective strategic helminth control regime, a periodic surveillance of the prevalence of gastrointestinal helminthiasis within given environment and associated risk factors that influence their transmission is required. Prevalence of gastrointestinal helminths has been reported ranging from 0.72 to 84.1% in domestic animals from various parts of the world (Bundy *et al*., 1983; Fikru Regassa *et al*., 2006; Khan *et al*., 2010). There are many associated risk factors influencing the prevalence of gastrointestinal helminthes including age, sex, weather condition and husbandry or management practices (Miller *et al*., 1998; Khan *et al*., 2009).

In Ethiopia, several studies have been conducted on ruminant helminthiasis of various regions reporting a prevalence range from 50.4-84.1% (Fikru Regassa *et al*., 2006). However, these surveys were entirely restricted to the vicinity of veterinary institutions which may not be representative to the various geographical regions in Ethiopia which are unknown before as documentation of helminths of different animal species is concerned. Unfortunately, scanty report so far has been published on the prevalence of calf helminthiasis in the present study areas. Therefore, the aim of this study was to collect information about the epidemiology of gastrointestinal helminth parasites of crossbred calves in selected sites of Bahir Dar zuria and Gozamen districts, Amhara Region.

## MATERIALS AND METHODS

### Study Area Description

This study was carried out in Bahir Dar zuria and Gozamen districts of Amhara Region, Ethiopia from September 2010 to April 2011. Bahir Dar zuria district is located around Bahir Dar town, 565 km North West of Addis Ababa. It has 191,085 (97,919 Male; 93,166 Female) human population. The mean altitude of the district is 1,800 m above sea level and the temperature of the district ranges from 10 to 38 $^0$C through out the year with mean annual rainfall of 750 mm. The livelihood of major section of the population in the area depends on crop-livestock mixed farming. The district comprises 121,528 cattle, 2,346 shoats, 37,839 equine and 62,012 poultry (Bahir Dar zuria BoA Report, 2002). Whereas, Gozamen District is located in Eastern Gojam administrative zone which is 300 km away from Addis Ababa and has a total human population of 160,355 (80,673 Male; 79,684 Female). The mean altitude of the district

is 2,400 m above sea level. The average temperature for the area is $21^0$C and the area receives with a minimum and maximum annual rainfall of 1,448 to 1,808 mm respectively. The livelihood of the major section of the population in the area depends on crop-livestock mixed farming. The district comprises 160,067 cattle, 113,738 shoats, 21,839 equine, 46,368 poultry (Gozamen woreda BoA Report, 2002).

## Study Population, Study Design and Sample Size

Study animals were crossbred dairy calves (Local Zebu crossed with Holstein frisian) of pre-weaning age. Crossbred calves in Bahir Dar zuria and Gozamen Districts constituted as the study population. A Cross-sectional study was carried out to study the prevalence of gastrointestinal helminthiasis of cross breed calves and to assess crossbred calf management practices from September 2010-April 2011 in selected districts of Bahir Dar zuria and Gozamen districts of Amhara region. Study sites and households were selected purposively (based on the availability of cross breed animals). A total of 148 respondents who owned crossbred calves of pre weaning age were sampled and interviewed. Fecal sample were taken from 173 crossbred calves. To study the epidemiology of calf helminthiasis, the sample size was calculated according to Martin *et al.* (1987). Since no previous study was conducted on crossbred calf helminthiasis in the study area, 50% expected prevalence was considered during sample size determination. The other determinants considered in sample size determination are 95% confidence interval and 5% desired absolute precision.

Hence: $n = \frac{(Z\alpha/2)^2 P(1-P)}{\Delta^2}$

where $n$= sample size

$P$ = Expected prevalence (50%)

$Z\alpha/2$= Confidence interval (1.96)

$\Delta^2$ = Precision level (5%)

Hence: $n = \frac{(1.96)^2 0.5(1-0.5)}{(0.05)^2} = 384$ heads of crossbred calves.

However, due to limited number of crossbred calves under weaning age in the study area, only 173 crossbred calves were sampled for this study.

## Data Collection

### *Questionnaire Survey*

A structured questionnaire which has been composed of various questions focused on calf management practices was administered to 148 households.

### *Fecal Sample Collection*

During collection of faecal samples from study calves, all data was recorded with pre-designed format. The individual calf details such as animal Id, Sex, Age, Blood level and District were also registered together. After the initial identification of the animal detail is taken and recorded, fecal samples (approximately 10 g) were collected directly from the rectum of the calf then fecal sample was then put into 10% formalin filled universal sampling bottle. After labeling with specific identification number, each sample was dispatched to Bahir Dar Animal Health Investigation and Diagnostic laboratory, Parasitology department for Coprological examination.

### *Examination of Faecal Samples*

Sedimentation technique for *Trematode* egg and floatation technique for *Nematod*e and *Cestode*

egg counting was employed. To determine the degree of calf Nematode infection, Egg per Gram of Feces (EPG) count was carried out by using a standard parasitological procedure (Hansen and Perry, 1994). All parasitological laboratory works were undertaken at Bahir Dar Animal Health Investigation and Diagnostic laboratory, Parasitology department.

### Data Management and Analysis

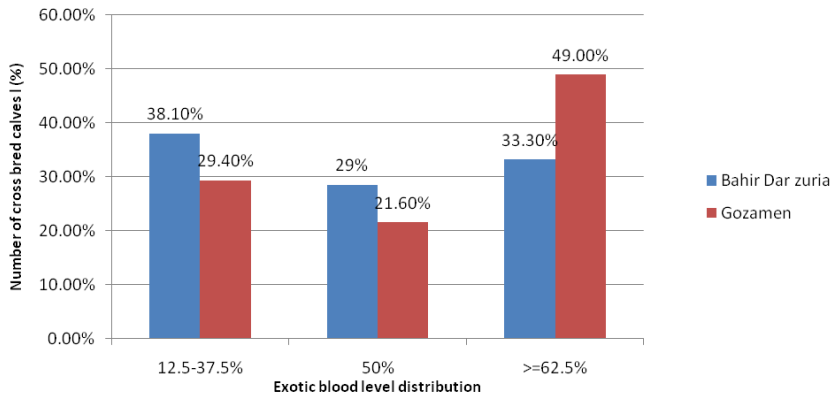
All data was first entered and managed using Microsoft Excel and analysis of data was made through Statistical Package for Social Sciences software version 16 (SPSS, 2007). To describe household characteristics, number of crossbred calf distribution across districts, calf management practices, degree of Nematode and concurrent helminth infection in the study districts, descriptive statistics was employed. While Chi-square ($\chi^2$) test was employed to measure the effect of risk factors (location/district, exotic blood level, age, sex) on gastrointestinal helminth infection. A significance level ($P$<0.05) and confidence level (95%) was set to determine the presence or absence of statistically significant difference between the given parameters.

## RESULTS

### Description of Household and Livelihood Characteristics

The majority of respondents were male (72.5 %) and the rest (27.5 %) were female. The average age of the respondents was 44.13 years with a minimum and maximum of 20 to 80 years respectively. As far as households literacy rate concerned; 50% of the respondents were illiterate, read and write (23.6%), primary and secondary school completed 13.6 % and 12.8% respectively. In the surveyed districts, average family size was 6.36 ranging from 1 to 15. An average land holding per household was 2.25 ha. About 91.1% of households' livelihood was entirely dependent on agriculture, respondents who were engaged in other non agricultural activities were; Merchant (2.7%), Retired (2.7%) and Government employed (2.5 %). The average numbers of local and crossbred calves per household were 1.54 and 1.51 respectively. While, the average numbers of local and crossbred cows per household were 2.02 and 1.53 TLU respectively. Of total crossbred calves considered, 38.5%, 35.3% and 26.3% were calves having exotic Frisian blood level of above 62.5%, 12.5-37.5% and 50% respectively. Crossbred calves distribution across study districts is indicated from Figure 1.

**Figure 1: Crossbred Calves Distribution Across Study Districts**



## Crossbred Calves Management Practices in the Study Areas

The questionnaire survey result has showed that 68% and 42% of the respondents keep their cross bred calves in complete free grazing and partial indoor management respectively. About 39.2% of the respondents feed their calves colostrum, where as 60.8% of respondents did not feed their calves. Of those who feed colostrum, only 10.1% feed colostrum to their calves immediately after birth within 6 h. Method of milk feeding was suckling (75.0%) and bucket feeding (25.0%). In the surveyed districts, 48.0% of the respondents feed their calf only hay and straw, (31.1%) improved forage, straw and hay and (10.8%) concentrate, hay and straw.

## Overall Prevalence of Calf Helminthiasis

A total of 173 faecal samples were collected and examined. Out of total calves sampled, 96 (55.5%) calves were found to be positive for helminth parasites.

## Specific Prevalence of Calf Helminthiasis

Of total positive cases, 20.8%, 17.9%, 13.9%, 21.4% and 5.8% was found to be infected with *Fasciola, Paramphistomum*, *Schistosoma*, *Strongyle* spp. *and Monezia* respectively (Table 1). A significant differences ($P<0.05$) were observed in Schistosoma (15.4% vs 8.1%) and Strongyle Spp prevalence (17.6% vs 35.1%) from Bahir Dar Zuria and Gozamen districts respectively (Table 2). Whereas the prevalence of fasciolosis was significantly higher in female than male calves ($p<0.05$) (Table 2).

## Egg per Gram of Feces (EPG) Analysis of Nematode infection in calves

All Strongyle eggs identified during laboratory work were subjected to EPG count. As presented from (Table 3) 37.8%, 45.9% and 16.2% of calves were found positive with light, mild and heavy degree of nematode infection respectively. In general, Mean EPG of calf nematode infection was 430 ranging from 50 to 1200, which indicates the level of Nematode infection in the population was mild.

## Level of calf helminth Concurrent Infection

A total of 42 calves were found positive with two or three helminth parasites concurrently. Of total, 21.4% of calves were positive with mixed infection of two parasites *Fasciola* and *Paramphistomum follo*wed by *Schistosoma* and *Strongyle* spp. (14.3%), *Fasciola* and *Strongyle* spp. (14.3%) and *Strongyle* spp. and

**Table 1: Over All Infection Prevalence of Calf Helimintiasis in the Study Areas**

| Type of Helimenth Parasite Identified at Genus Level | Number of Calves Examined | Number of Calves Positive | Prevalence |
|---|---|---|---|
| *Fasciola* | 173 | 36 | 20.8% |
| *Paramphistomum* | 173 | 31 | 17.9% |
| *Schistosoma* | 173 | 24 | 13.9% |
| *Strongyle* spp. | 173 | 37 | 21.4% |
| *Monezia* | 173 | 10 | 5.8% |
| **Total** | **173*** | **96**** | **55.5 %***** |

**Note:** **number of calves positive for any one of the parasites considered; ***proportion of calves positive for at least one of the helimenth; and * Total calves sampled for fecal sample.

**Table 2: Prevalence of Calf Helminthiasis With Respect To Study Location, Age, Sex and Exotic Blood Level**

| Risk Factors | Type of Helimenth Parasite Identified in Genus Level | | | | | |
|---|---|---|---|---|---|---|
| Location | N | *Fasciola* | *Schistosoma* | *Strongyle* Spp. | *Paramphistomum* | *Monezia* |
| B/Dar zuria | 136 | 30 (22.1%) | 21 (15.4%)* | 24 (17.6%)* | 26 (19.1%) | 9 (6.6%) |
| Gozamen | 37 | 6 (16.2 %) | 3 (8.1%) | 13 (35.1%) | 5 (13.5%) | 1 (2.7%) |
| Total | 173 | 36 (20.8%) | 24 (13.9) | 37 (21.4) | 31(17.9%) | 10 (5.8%) |
| Age | | | | | | |
| Up to 3month | 43 | 10 (23.3%) | 8 (18.6 %) | 10 (23.3%) | 4 (9.3 %) | 4 (9.3%) |
| 4-6 month | 68 | 17(25.0 %) | 9 (13.2 %) | 14 (20.6%) | 14 (20.6%) | 5 (7.4 %) |
| 7-11month | 49 | 7 (14.3 %) | 8 (16.3) | 10 (20.4%) | 12 (24.5%) | 1 (2.0%) |
| 12 and above | 5 | 1 (20.0 %) | 0 | 1 (20.0%) | 1 (20.0%) | 0 |
| Total | 165 | 35 (21.2%) | 25 (15.2%) | 35 (21.2%) | 31 (18.1%) | 10 (6.1%) |
| Sex | | | | | | |
| Male | 90 | 12 (13.3%) | 16 (19.3%) | 18 (20.0%) | 14 (15.6%) | 3 (3.3%) |
| Female | 83 | 24 (28.9%)* | 10 (12.0%) | 19 (22.0%) | 17 ( 39.2) | 7 (8.4%) |
| Total | 173 | 36 (20.8%) | 26 (15.0%) | 37 (21.0%) | 31 ( 17.9) | 10 (5.8%) |
| Exotic blood level | | | | | | |
| 12.5-37.5% | 50 | 8(16%) | 6 (12.0%) | 9 (18.0%) | 9 (18.0%) | 1 (2.0%) |
| 50% | 48 | 12(25.0%) | 8 (16.7%) | 13 (27.1%) | 9(18.8%) | 2 (4.2%) |
| 62.5% | 39 | 6(15.4%) | 6(15.4%) | 8 (20.5%) | 10 (25.6%) | 5 (12.8%) |
| 75% and above | 36 | 10(27.8 %) | 6 (16.7%) | 7 (19.4%) | 3 (8.3%) | 2 (5.6%) |
| **Total** | **173** | **36 (20.8%)** | **26 (15.0%)** | **32 (21.4%)** | **31(17.9%)** | **10 (5.8%)** |

**Note:** N = number of calves examined; *=Significant difference ($P < 0.05$).

*Paramphistomum* (14.3%) and multi parasitism were recorded among *Fasciola, Strongyle* spp. and *Monezia* (2.4%) and *Fasciola, Paramphistomum* and *Monezia* (2.4%) (Table 4).

## DISCUSSION

This study has showed that an over all prevalence calf helminthiasis was 55.5% in Bahir Dar zuria and Gozamen districts. Of the positive cases, 20.8%, 17.9%, 13.9%, 21.4% and 5.8% was found to be infected with *Fasciola, Paramphistomum*, *Schistosoma*, *Strongyle* spp. *and Monezia* respectively. It is not possible to compute the over all prevalence result of the present study with other research work which has been done on the previous status of calf helminthiasis in these study areas. But a comparable result of fluke infection was reported by Asressa (2011) which

**Table 3: EPG Analysis of Nematode Mixed Infection of Calves in the Study Districts**

| Degree of Nematode Infection (mixed) | Frequency | Percent (%) | Mean EPG | Range |
|---|---|---|---|---|
| Light (EPG=50-200) | 14 | 37.8 | 430 | 50-1200 |
| Mild (EPG=201-800) | 17 | 45.9 | | |
| Heavy (EPG >800) | 6 | 16.2 | | |
| Total | 37 | 100 | | |

Note: EPG = egg per gram of feces.

were the prevalence of *Fascioliasis*, 15.79%; *paramphistomiasis*, 22.37% and *Schistosomiasis,* 10.53% fogera cattle at Andassa Livestock Research Center. The slight difference might come from due to host age and management variations among the study animals, better animal management practice is expected in Andassa Livestock Research Center than small holder dairy producers.

In the present study, *Schistosomiasis* infection across study districts was found to be statistically significant across study districts with prevalence of *Schistosomiasis (*15.4%) and (8.1%) in Bahir Dar zuria and Gozamen districts respectively. The prevalence variation of fluke infection among the study districts might be attributed to the differences in geographical location, calf management practices and climatic differences. In this regard, geographically, Bahir Dar Zuria district is located around Lake Tana and Blue Nile River, make epidemiologically favorable habitat for the development and multiplication of intermediate hosts for *Schistosoma* and *Fasciola* (Spithill *et al*., 1999). Fluke's infection arises in conditions that promote snail populations (Snails are needed in the fluke life cycle) like poorly drained pastures and stagnant pools of water (ponds and ditches) in the pasture area. The prevalence of *Strongyle* spp. was also found statistically significant across districts; showed higher prevalence (35.1%) in Gozamen and lower prevalence (17.6%) in Bahir Dar zuria. The discrepancy probably arises from due to variations in calf management practices among the study districts. Unlike Bahir Dar zuria district, in Gozamen, crossbred calves were poorly managed and driven to outside for free grazing on fields where other livestock population grazes together which allows calves to get infected larvae from the grazing land. The current prevalence of calf *Schistosomiasis* recorded in Bahir Dar Zuria, is smaller than that of the previous results recorded in the same area; Almaz (2011), prevalence of *Schistosoma bovis* (37.3%) in cattle. The discrepancy might be due to sample size, age of study animals and egg detection techniques of flukes.

Female animals showed were affected higher infection rates of *Fasciolosis* than males despite similar management practice. This finding supports with the general understanding of helminth infections that female animals are more susceptible to helminthiasis. It is assumed that sex is a determinant factor influencing prevalence of parasitism (Maqsood *et al*., 1996; Valcárcel and García, 1999). Mean EPG of calf nematode

**Table 4: Illustration of Mixed Parasitism of Calves in the Study Districts**

| Type of Helimenth Mixed Infection | Frequency | Percent (%) |
|---|---|---|
| *Schistosoma* and *Strongyle* spp. | 6 | 14.3 |
| *Fasciola* and *Strongyle* spp. | 6 | 14.3 |
| *Fasciola* and *Paramphistomum* | 9 | 21.4 |
| *Schistosoma* and *Paramphistomum* | 4 | 9.5 |
| *Monezia* and *Strongyle* spp. | 1 | 2.4 |
| *Fasciola* and *Schistosoma* | 5 | 11.9 |
| *Strongyle* spp. and *Paramphistomum* | 6 | 14.3 |
| *Monezia* and *Paramphistomum* | 2 | 4.8 |
| *Monezia* and *Fasciola* | 1 | 2.4 |
| *Fasciola, Strongyle* spp. and *Monezia* | 1 | 2.4 |
| *Fasciola, paramphistomum* and *Monezia* | 1 | 2.4 |
| Total | 42 | 100.0 |

infection in the study areas was 430 which is categorized in the range of mild degree of infection (201-800) (Hansen and Perry, 1994).

## CONCLUSION AND RECOMMENDATION

Calf helminthiasis is found to be an important calf health problem in the study areas. This will be a hindrance in livestock production by causing remarkable direct or indirect losses in the study areas. As the productivity of individual cows and whole herds depend on the production of calves, application of improved calf health management practice through strategic application of worming and fluckicidal chemicals and provision of clean pasture would significantly reduce calf parasitism. More over, avoid calves from free grazing with adult animals, grazing from marshy land and poorly drained pasture also plays considerable success for the control of calf helimenthiasis in the study areas.

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