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Research article

Prevalence and Species Composition of Abomasal Nematodes of Cattle slaughtered at Abergelle Export Abattoir, Mekelle, Ethiopia

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Abstract

A cross sectional study was carried out from November, 2015 to March, 2016 in Mekelle, north Ethiopia, with the objective of determining the prevalence and species composition of abomasal nematode parasites of cattle slaughtered at Abergelle export abattoir. A total of 384 abomasums of cattle were collected and examined in the laboratory. Out of these, 25 (6.15%) animals were found to be positive. The most predominant abomasal nematode parasites found in the study area were *T.axei* (2.86%), *H.placei* (1.82%), *H. contortus* (1.56%) and mixed infections of *T.axei* and *H.placei* (0.26%) respectively. Generally, the prevalence of the abomasal nematodes in animals with different body condition was higher in poor (21.05%), medium (3.86%) and good (0.99%) respectively. The prevalence in relation to the different age groups of animals was higher in adult (8.62%) and relatively lower in old (6.13%) animals. Higher prevalence was record in November (8.88%), where as lower in February (2.89%) on the bases of the month which the animals was examined. In addition, on the bases of origin of the animals, highest prevalence was recorded from shire (8.82%), where as lower from Mekelle (3.57%). The variation in the prevalence on the bases of origin was not statistically significant ($p > 0.05$). Therefore, the present study showed that abomasal nematodes are important health problems and affecting the productivity of the cattle in the study area.

Keywords: Cattle; Abomasum; Prevalence; Abomasal nematodes

INTRODUCTION

Abomasal nematode (round worm) infections in the ruminants are of a major importance in many agro-ecological zones in Africa and have the highest index as animal health constraint to the poor keepers of livestock worldwide through losses due to reduced weight gains and growth rate, reduced nutrient utilization, low or meat, milk, wool, skin and hide production, involuntary culling, cost of treatment and animals death mortality [1].

The abomasal nematodes, the Trichostrongylus genera *(T.axei)*, it is rarely a primary pathogen in temperate areas, but is usually a component of parasitic gastro enteritis in cattle. By contrast, in subtropics it is one of the most important causes of parasitic gastroenteritis [2]. These are very small, hair like worms less than 1 mm long, without cephalic inflations, and virtually without bucal capsule; specules are short, twisted, and usually pointed [3].

The other most important genera of abomasal nematode are haemonchus, which is blood sucking nematode and it may be responsible for extensive losses in cattle, especially in tropical areas. It is up to 30mm in length, these parasites of the abomasums of cattle's have abucal cavity armed with a lancet [3].

Particularly *haemonchus contortus* is important and cause severe anemia and death in severely in faceted animals and *T.axei* by its emaciation [4]. Haemonchosis is identified as one of the major constraint to cattle production in Africa [5].

Extensive studies are lacking on bovine abomasal nematode infections in Ethiopia especially in northern part of Ethiopia. However, bovine abomasal nematode infections are the major problem to cattle production in the study area. Therefore the current study was performed to determine the prevalence, species composition and worm burden of bovine abomasal nematode infection in the study area and to provide base line data to design effective control options. Because, of the huge economic losses and wide distribution of round worm infection in the country and the control measures are not developed at national and regional levels.

MATERIAL AND METHODS

Study area

The study was conducted from November, 2015 up to March, 2016 in Abergelle Export Abattoir, which is found in Mekelle city, the capital city of Tigray Regional State. It is located 783 kms north of Addis Ababa and this zonal town has a mean temperature range of 16.1 to 21.14°c, annual rain fall of 628.8 mm and situated at an altitude of 2000m above sea level. Geographically it is located at 30^0 32' north latitude and 39^0 28' east longitudes. According to Mekelle city finance and development, the total human population size of mekelle is 248,560 the livestock population of Mekelle includes 36,516 cattle, 8,442 shoats, 800 horses, 200 males 3.080 donkeys, 100 camel, 53,796 poultry and 3,000 dogs.

Study population

The study was conducted on beef cattle slaughtered at Abergelle export abattoir to estimates the prevalence & species composition of abomasal nematodes. The study animals were 384 cattle of different age group which are selected randomly from those entered to the slaughter house. The study was conducted on male animals of local breeds and they are originating from Mekelle. Alamata, agve and shire. During the study period age and body condition of the animals were recorded.

Study design

Cross sectional study was conducted, in which case active abattoir survey were used to provide information for the disease status, to record or determine prevalence and species composition of the disease and to investigate the main risk factors associated with the disease using postmortem investigation.

Sampling and sample size determination

The total number of cattle required for the study was calculated based on the formula given by Thrusfield [6], using simple random sampling method by taking 95% confidence interval and 50% expected prevalence of abomasal nematodes of cattle in the area, which in turn used to take maximum sample size to be on the safest side.

$N = (1.96)^2 Pexp (1-Pexp)$ where,

N = required sample size,

Pexp = expected prevalence and

d = desired absolute precision (from the 95%

Confidence interval; d = 5% = 0.05)

Therefore, substituting the given values in the formula gives, N = 384

Sample collections and study methodology

Anti-mortem inspection: During active abattoir survey, ante mortem inspection was conducted on each randomly selected animal to record each and every observable signs or events, which was vital to correlate with the case of the study. Such as, body condition, age, origin of the animal was recorded.

Post mortem examination: A total of 384 abomasums of cattle was collected as sample from the Abergelle Export Slaughter House during the study period. As soon as possible, after the removal of the alimentary tract from the body cavity and the abomasums from the intestine and other parts of the stomach, then the abomasum was taken and ligated at both ends to prevent environmental contamination then transported to the Mekelle Regional Veterinary Laboratory for necropsy examination.

Abomasal worm recovery, species identification and worm burdens: The technique mentioned was used for the counting of namatodes in the stomach and intestinal contents of cattle's, but it could be adapted for the estimation of the number of parasites in the gastrointestinal tract of other species of animals.

The abomasums was opened in longitudinally and the contents were collected and then washed the abomasum wall thoroughly under a stream of water from the tap and rub the mucus membrane of the abomasums carefully with the fingers to remove any worm adhered to it. Then, the abomasal contents and mucosal washings were mixed thoroughly and then pour the contents of the bowl and add its washing a little at a time on to a wire mash screen with an aperture of 0.15mm and then wash with a stream of water from a rubber tube attached to the tap until no more colored matter or food particles passed through. When all the materials has been screened and washed in this way, invert the screen over a trough and by means of stream of water wash into it, then the food material and worms collected on the screen. Then, make up the contents of the trough to a volume of 4 liter by adding water and then agitate the whole content vigorously and remove samples by using a beaker. The samples of 40ml was transferred into labeled graduated beaker in 4 steps of 10ml per step using labeled graduated beaker.

Then, small quantities of this 40ml was placed in to different plastic Petri dishes and diluted with water. Then, 2-3ml of iodine for coloration and 2-3ml of sodiumthiosulphate were added to each Petri dishes to facilitate easy identification and counting of the worms. Then, mount the worm on a glass slide and place a cover slip over the worm. Gently by moving the cover slip, orient the worm so that it was in a dorsoventrally plane, and then the morphology of the worms was observed under stereomicroscope.

Finally, total number of worms counted in 40ml sample was multiplied by 100 to give the number of worms present on the abomasums. The level of worm infection were extrapolated from severity index defined by [7,8] were cattle are said to have light, moderate and heavy nematode infections if their adult worm counts are less than 1-400, 401-1500, and > 1500 for *Haemonchus species*; 1-10,000, 10,001-25,000 and > 25,000 for *Trichostrongylus species*, and 1-5000,5001-10,000 and > 10,000 for mixed infections respectively.

Adult males of abomasal nematodes were identified to species level while the females to generic level based on morphological characteristics as described in [8,7] Data analysis.

All the data collected were entered into Microsoft excel sheet 2007 and then analyzed by using SPSS version of 17.0 computer software programs. Descriptive statistics like chi square (X^2) test were used to estimate the association between the prevalence of the parasite and the associated risk factors. In all the analysis, confidence level was held at 95% and $P < 0.005$ was set for statistical significant level.

RESULT

From, a total of 384 bovine abomasum samples examined, 25 (6.51%) were revealed an overall prevalence of abomasal nematodes infection. The identified nematode parasites were found to fall in to two different genera and three species with prevalence of 2.86% *Trichostrongylusaxei,* 1.82% *Haemonchusplacei*, 1.56% *Haemonchuscontortus* and 0.26% with mixed infections of *Trichostrongylusaxei* and *Haemonchusplacei.*

The most frequently encountered species in this study was the *Trichostrongylusaxei* followed by *Haemonchusplacei* and *Hacmonchuscontortus*. The prevalence of the different species of the abomasal nematodes was studied in relation to different risk factors like body condition, age, origin and month.

The highest prevalence of abomasal nematodes was recorded in poor (21.05%) followed by medium (3.86%) and good (0.99%) body condition score of animals and the highest prevalence was recorded in adults (8.62%) and relatively lower rate was observed in old (6.13%) animals. The prevalence of abomasal nematodes in animals originating from different places was also assessed with the highest prevalence being in animals from shire (8.82%), Agve (7.84%), Alamata (6.86%) and Mekelle (3.57%) respectively. The occurrence rate of the parasites was found the highest in November (8.88%) and lowest rate being observed in February (2.89%) on month basis. However, the study revealed that majority of animals harboring the abomasal nematodes were affected by light to moderate degree of infections.

Moreover, the prevalence of different species of the abomasal nematode in animals with different body condition was studied. Accordingly, higher prevalence was recorded in poor (21.05%), medium (3.86%) and good (0.99%) respectively. The variation in the prevalence of the different species of the abomasal nematodes among animals with different body condition scores was statistically significant ($P < 0.05$) (Table 1).

DISCUSSION

A study was conducted from November, 2015 to March, 2016 in Mekelle, Abergelle export Abattoir to determine the prevalence and species composition of abomasal nematodes of cattle. During the

Table 1: Prevalence of abomasal nematodes on body condition bases.

Body condition score	N	No. of animals positive for each species and their percentage (%)				
		T. axei	*H.placei*	*H.coutortus*	*T.axei* &*T.placei*	Total positive
Poor	76	7(9.21)	5(6.58)	3(3.94)	1(1.31)	16(21.05)
Moderate	207	4(1.93)	2(0.97)	2(0.97)	0(0)	8(3.86)
Good	101	0(0)	0(0)	1(0.99)	0(0)	1(0.99)
Total	384	11(2.8)	7(1.82)	6(1.56)	1(0.26)	25(6.51)

X^2 value = 36.17, p = 0.000

Furthermore, even if there was not statistically significant variation ($P > 0.05$) among the different age groups of animals, where highest prevalence was recorded in adults (8.62%) and relatively lowers in olds (6.13%) age groups of animals (Table 2).

study period a total of 384 abomasums were collected and examined in the laboratory based on the standard laboratory technique manuals. The overall prevalence of bovine abomasal nematodes in the current study was 6.51%; even though the prevalence rate showed in the present study were low to medium, there is no adequate data on bovine abomasal nematodes in the country. However, this finding was not agreed with that of sheriff [9], who reported his study in north Gondar with the prevalence of 34.88%. This variation may suggest due to the difference in geographical and climatic condition, the management system of the study area.

The most frequently encountered genus in this study was the Heomonchus followed by Trichostrongylus and the most predominant abomasal nematode parasite species was the *T.axei* (2.86%) followed by *H.placei* (1.82%) and *H.contortus* (1.56%). This finding was contradicts with the previous reports from other geographical region of the world like Oku *et al.* [10] in Japan which may imply the adaptability of the parasites to the environmental conditions. It may also due to climatic change of Ethiopia, which is a country where extreme temperature and rainfall are experienced and altitude being the most important factor. These could be crucial elements influencing the development and distribution, and survival of abomasal nematode parasite. It is also due to the factors which affect the development and survival of the nematodes which are mainly environmental especially climatic change and management practices.

Generally, this study showed higher infection rate in adults (8.62%) than old (6.13%) age groups. This showed that the susceptibility and pathogenicity of nematode infections were greater in adults than in old animals. This also could be due to the fact that younger animals are more susceptible than the old counter parts. Because age has an effect on responsiveness or to the development of immunity causing lower worm fecundity in old animals. Old animal may acquire immunity to the parasite through frequent challenge and expel the ingested parasite before they establish infection [11]. However this finding contradicts with that of Balem *et al.* [12] in Burkinafaso who reported no difference in the level of infestation in cattle of different age groups.

Table 2: Prevalence of Abomasal Nematodes on age Basis.

Age	Examined animals	No. of positive animals for each species ad their percentage (%)				
		T.axei	*H.placei*	*H. contortus*	*T.axei* & *H.placei*	Total positive
Adult	58	2(3.44)	2(3.44)	1(1.72)	0(0)	5(8.62)
Old	326	9(2.76)	5(1.53)	5(1.53)	1(0.30)	20(6.13)
Total	384	11(2.86)	7(1.82)	6(1.56)	1(.26)	25(6.51)

X^2value = 1.36, p = 0.99

There was not statistically significant variation (P > 0.05) among the different months; even if it has not statistically associatited, higher prevalence of abomasal nematodes was recorded in November (8.88%), whereas lower in February (2.89%) on the bases of the month which the animal was examined (Table 3).

Table 3: Monthly Prevalence of Abomasal Nematodes.

Month	N	No. of animals positive for each species and their percentage (%)				
		T.axei	*H.placei*	*H.contortus*	*T.axei* & *H.placei*	Total positive
November	90	4(4.44)	4(4.44)	0(0)	0(0)	8(8.89)
December	107	3(2.80)	1(0.93)	4(3.74)	1(0.93)	9(8.41)
January	85	2(2.35)	2(2.35)	1(1.18)	0(0)	5(5.88)
February	69	1(1.45)	0(0)	1(1.45)	0(0)	2(2.90)
March	33	1(3.03)	0(0)	0(0)	0(0)	1(3.03)
Total	384	11(2.86)	7(1.82)	6(1.56)	1(0.26)	25(6.51)

X^2 value = 15.38, p = 0.75

In addition, the prevalence of different species of the abomasal nematodes in animals on the bases of origination of different places was also assessed with the highest prevalence rate being in animals from Shire (8.82), whereas lower in Mekelle (3.57%). The variation in the prevalence of the different species of the abomasal nematodes among animals with different in origination was not statically significance association (P > 0.05) (Table 4).

Table 4: Prevalence of abomasal nematodes on animal origin basis.

Origin	N	No. of animals positive for each species and their percentage (%)				
		T.axei	*H.placei*	*H.contortus*	*T.axei* & *H.placei*	Total positive
Mekelle	112	2(1.78)	1(0.89)	1(0.89)	0(0)	4(3.57)
Agve	102	4(3.92)	2(1.96)	2(1.96)	0(0)	8(7.84)
Alamata	102	1(0.98)	3(2.94)	3(2.94)	0(0)	7(6.86)
Shire	68	4(5.88)	1(1.47)	0(0)	1(1.47)	6(8.82)
Total	384	11(2.86)	7(1.82)	6(1.56)	1(0.26)	25(6.51)

X^2 value = 13.20, p = 0.65.

Study on the rate of occurrence of abomasal nematodes showed the highest prevalence rate in animals with poor (21.05%), followed by moderate (3.86%) and good (0.99%) body condition scores. Nutrition may contribute to clinical diseases in adult animals [7] and the well fed animals can withstand the harmful effects of parasitism and can remain reasonably productive when compared with undernourished animals [13]. The higher rate recorded in animals with poor body condition was due to effect of the parasite when occurred in large number causing significant weight loss.

The overall prevalence of abomasal nematode parasite infections during the study period was higher in November (8.88%) and lowers in the month February (2.89%). However, the study revealed that majority of animals harboring the abomasal nematodes were affected by light to moderate degree of infections, which showed that abomasal nematodes usually affects the entire regions causing sub-clinically unnoticed economic losses in the area [14]. The environmental factors which influence the pattern of the parasite development are temperature, humidity, and rain fall. Hence most of the gastrointestinal nematode diseases are occurred after the rainy season [15]. The fact that high prevalence rate was observed in November could be due to activation of the hypobiotic larvae and it could be due to increased movement of animals in search of feed and water; this increases their chance to get infection.

Furthermore, this study also showed higher prevalence was registered in animals originating from shire (8.82%) and the lowest rate being in animals originating from Mekelle (3.57%). The factors which affect the development and survival of the nematodes are mainly environmental especially climatic change and management practices [16]. This variation in prevalence of bovine abomasal nematodes among animals originating from different places could be linked to difference in the micro-environment which is conducive for the persistence and transmission of the parasite and the standard of management and anthelmentics used in the areas can influence the prevalence of abomasal nematode parasites.

In the current study, the observation of mixed infections (0.26%) was very low due to the variation in geographical and climatic conditions, which are appropriate for the parasites and the standard

management practices in the areas. *H.contortus* in cattle gets infection during sharing of the same grazing pasture with sheep flocks under field condition. However, due to the management system of the cattle which was studied were comes from isolated feed lot areas, the prevalence and chance of infection were low. The fact that *H.contortus*is the common parasite of sheep, and their presence in cattle suggests contact of these animals with sheep grazing areas [1].

Therefore, this study identified the potential risk factors associated with the low to medium prevalence rate of bovine abomasal nematode parasite infections and enabling to design feasible and strategic control of the abomasal nematode parasite of cattle in the study area and other areas of similar ecological features.

CONCLUSION AND RECOMMENDATIONS

In conclusion, the present study was conducted on prevalence and species composition of abomasal nematodes parasite infections of cattle in Abergelle Export Abattoir, Mekelle. The result indicates that the disease caused by abomasal nematodes are one of the major problems in the area and that could cause major economic losses in the cattle production due to stunted growth, insufficient weight gain, poor feed utilization and mortality, and also losses associated with control measures and treatments. However, the attention given to the disease so far has not been sufficient. This study also showed low to moderate prevalence of abomasal nematodes of cattle slaughtered at abergelle export Abattoir.

The result indicated that, the most predominant abomasal nematode parasites in cattle in the study area were *T.axei, H.placei* and *H.contortus* respectively. However, the role of cattle in the contribution of the country's economy and individual cattle owners is said to be high. Therefore, in order to gain the appropriate benefit from cattle, attention should be given and more works are expected to emerge.

Based on the above conclusion, the following recommendations are forwarded:

- Comprehensive epidemiological survey should be carried out to establish a more reliable data in the study area and the country.
- Strategic treatment with the appropriate, effective and broad spectrum anthelminitics should be practiced at the beginning and after the end of the rainy seasons.
- The field veterinarians and stock owners should be aware of the importance and burden of abomasal nematode infections in cattle.
- Additionally, the field veterinarians and Para veterinarians should give awareness to the stock owners about the contamination factors or getting infection (pasture grazing) and seasonal deworming program practices on abomasal nematode of cattle.

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