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Full Length Research Paper

Epidemiology of urinary schistosomiasis and knowledge of health personnel in rural communities of South-Western Nigeria

Awosolu O. B.

Department of Zoology, University of Ilorin, Ilorin, Nigeria.

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Human schistosomiasis is a major water-borne parasitic disease in Nigeria with limited control programme. This study was conducted to determine the prevalence and intensity of urinary schistosomiasis, and knowledge of local health personnel in rural communities of the south-western states of Osun and Kwara, Nigeria, by using a filtration technique and a pre-tested structured questionnaire. Of the 620 individuals examined, 346 (55.8%) had an infection with a mean intensity of 65.60 eggs/10ml urine. The age-related prevalence was unimodal with the highest prevalence, 65.9% and mean intensity 67.4eggs/10 ml of infection in the age group of 10 to 14 years. There was a significant difference (P<0.005) in infection rate with respect to male and female (61.9 vs 47.3%) individuals. Of the 92 health personnel interviewed, 32.6% were clinicians, 22.8% health care assistants, and 44.5% consists of others like chemists and pharmacists. The knowledge of health personnel on urinary schistosomiasis varied significantly (p<0.005). Though 46.7% of the clinicians have good knowledge of the treatment and control measure, and 56.7% have a fair knowledge of prevention of schistosome, a very high number of the interviewee (46.7%) consisting of most of the Auxiliary health workers, and others like chemists and pharmacists have no knowledge of the infection. The high prevalence and intensity of *Schistosoma haematobium* infection in the current study area clearly indicated that this infection remains unabated and as such, local health personnels should be adequately trained on handling urinary schistosomiasis cases in these communities.

Key words: Urinary schistosomiasis, rural communities, health personnel, prevalence, intensity, South-western Nigeria.

INTRODUCTION

Schistosomiasis is a water-borne parasitic disease of public health importance, ranked second to malaria, and it is the most devastating disease in the developing world (WHO, 1993). Global statistics indicates that close to 800 million individuals were at risk of infection, 207 million were infected worldwide and 93% of these cases occur in

E-mail: awosconik@yahoo.co.uk. Tel: +2348101130381.

tropical Africa (Hotez and Kamath, 2009).

According to Chitsulo et al. (2000) and Steinmann et al. *(*2006), 120 million suffered from clinical disease while 20 million exhibit severe morbidity. The prevalence of the disease is attributable to extensive water contact activities, poor personal hygiene and other cultural practices (Oladejo and Ofoezie, 2006).

In Nigeria, both urinary and intestinal schistosomiasis, caused by *Schistosoma haematobium and Schistosoma mansoni* respectively, are prevalent (Opara et al., 2007; Oladejo and Ofoezie, 2006) though urinary schistosomiasis is more distributed (Ofoezie, 2002), and widespread in both rural and urban communities with prevalences of infection ranging between 2 and 90% with many cases occuring among school-aged children, especially the poor and marginalized (Ofoezie et al., 1997; Okoli and Odaibo, 1999; Ugbomoiko, 2000; Mafiana et al., 2003; Okoli and Iwuala, 2004; Oladejo and Ofoezie, 2006; Opara et al., 2007; Hotez and Kamath, 2009).

Thus, Nigeria has the highest burden of schistosomiasis infection in Africa with about 29 million infected individuals (Steinmann et al., 2006; Hotez and Kamath, 2009). Despite the heavy impact of schistosomiasis infection on human populations in Nigeria, there are limited control measures and programme, thus the impact of local health personnel with knowledge in the prevention, control and treatment of urinary schistosomiasis cannot be underestimated. Therefore, this research focuses on the prevalence and intensity of urinary schistosomiasis infection and the knowledge of the health personnel on the disease, in some selected rural communities of Osun and Kwara States, Nigeria.

MATERIALS AND METHODS

Study area

The study was conducted in three selected rural communities, namely Ilie in Osun State, Ajase ipo and Bacita in Kwara state, Nigeria. The Ilie is located in the rain forest zone on latitude 4°34' and 4°36'E, and Longitude 7°56' and 7°58'N in Osun State with a population of about 2,268 (National Population Commission, 1991). Ajase ipo with a population of 8953 (National Population Commission, 1991), located on latitude 8°13’ 60 N and longitude 4°49’ 0 E, and serves as the major junction for other cities and towns in Kwara state, including Ilorin which is Kwara state capital, Omu- aran, Offa and Igbaja, while Bacita which is about 78km to Ilorin and having a population of 2541 (National Population Commission, 1991) is located on latitude 9°4' 59.99"N and longitude 4°57' 0.00"E. The local climate of these rural communities is tropical with dry (November to March) and rainy (April to October) seasons. The mean annual rainfall is 1100 mm for Ilie, 1238 mm for Ajase ipo and 1143 mm for Bacita while the mean annual temperature is 27°C for Ilie, 26°C for Ajase ipo and 27.9°C for Bacita (Ayoade, 1982). These rural communities have rivers and streams on which the community members depend for their domestic water supply, fishing and other water related activities and also have similar ecological, socio-economic and cultural characteristics.

Study population and design

A student-based study was conducted between February and July, 2012. The consent of the parents, teachers and local government was sought prior the commencement of sample collection. After detail explanation of the study processes, interested students who volunteered were selected randomly. However, any girl observed menstruating during sample collection was exempted. Also, each health care centre in the study area was visited to interview the health personnels.

Data collection

Relevant information and data were collected from the students and health personnels using pre-tested structured questionnaire and qualitative interview method in the language that each student and health personnel understand best (English or Yoruba). The questionnaire was used to obtain student’s information on name, gender, age, father’s occupation, source of water supply, mode of infection transmission, symptoms of infection among others and health personnels were qualitatively interviewed on the source of infection, description of intermediate host, symptoms of infection, prevention of infection, control and treatment of infection. The health personnels’ knowledge level of the infection was scored by calculating the number of positive answers from 5 related items in the questionnaire.

Each item has a maximum score of 2 points which is graded as 0, 1, and 2 points. The average score, which was qualitatively graded on a scale of 1 to 10 was calculated in percentage and classified as “no idea” (<40%), “fair idea” (40 to 59%) and “good idea” (≥60).

A single urine sample was collected between 10:00 am and 14:00 pm h from each subject in a pre-labelled, sterile, wide-mouthed, screw-capped plastic container and immediately checked for microhaematuria and proteinuria using commercial reagent strip (Medi-test combur-9; Analyticon Biotecnologies, Lichtenfels, Germany), in accordance with the manufacturer’s instructions. Immediately after these procedures, samples were transported to the Laboratory of Zoology, University of Ilorin.

Thereafter, 10 ml of each sample was passed through an 8-µm-pore membrane filter in order to retain any *S. haematobium* egg present, which is then viewed and counted under a light microscope (WHO, 1993). Intensity of infection was graded as light (≤50 eggs/10 ml), moderate (51 to 499 egg/10 ml) and heavy (≥500 egg/10 ml).

Ethical clearance

The study protocol was reviewed and approved by the Research and Ethical Committee of the University of Ilorin Teaching Hospital. The village heads and the guardians or caregivers of each child were fully informed on the objective of the study. Thereafter, informed written consent was obtained from each adult subject and the guardians or caregivers of each child investigated prior the subjects were enrolled in the study.

Statistical analysis

Data analysis was performed using the version 16.0 of the statistical package for social sciences (SPSS) for Windows software package (SPSS Inc, Chicago, IL). Comparisons of prevalence by age and sex were made using chi square tests. The mean egg count was explored using Student’s t-test to obtain dichotomous variable while variable with more than two levels were obtained using the one way analysis.

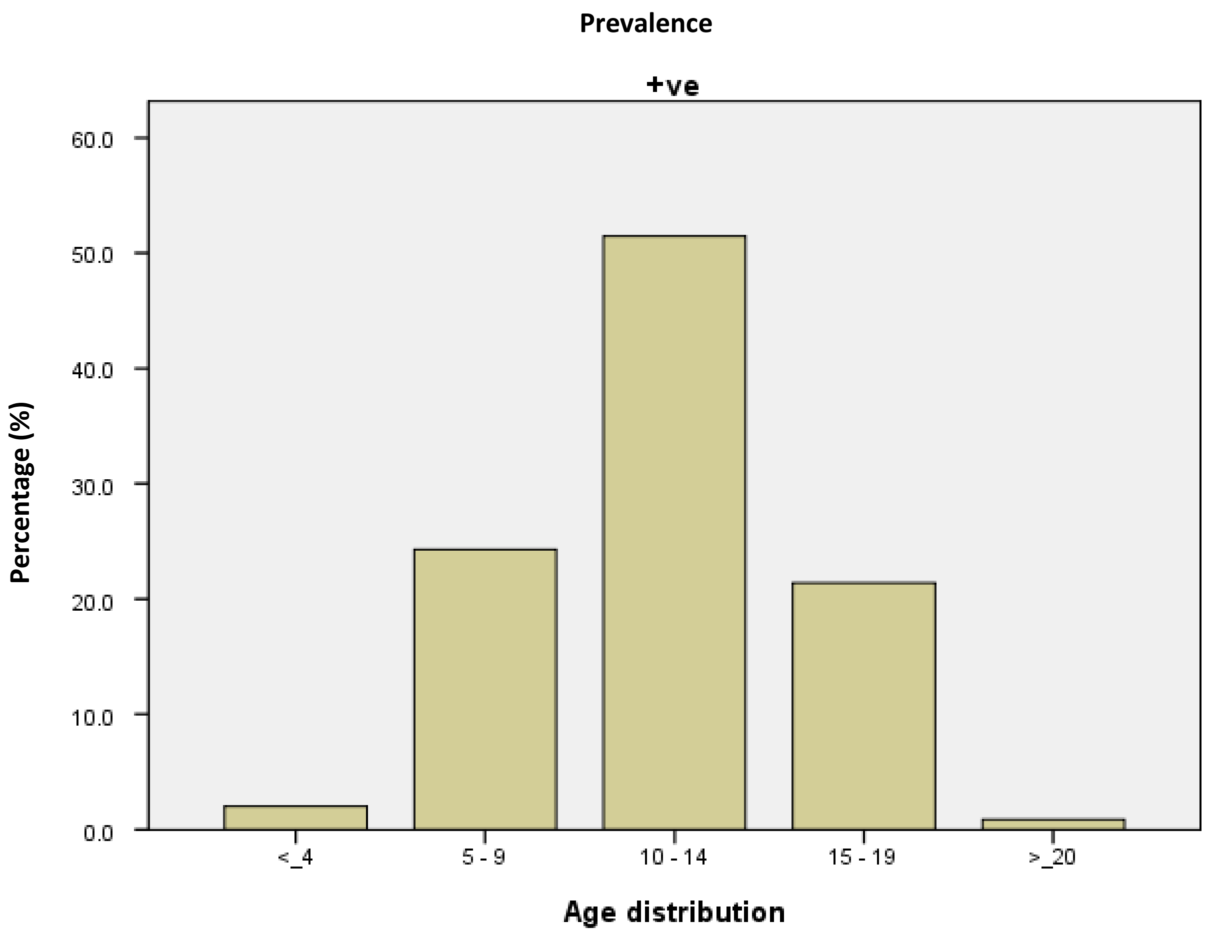

Figure 1. Prevalences of *S. haematobium* infection, according to the age groups of rural communities of Ilie, Ajase ipo and Bacita, south-western Nigeria.

RESULTS

Infection parameters of *S. haematobium* among the local subjects

A total of 620 (362 males and 258 females) was examined for *S. haematobium* infection, with age ranges between 3 to 22 years. The overall prevalence of *S. haematobium* infection was 55.8%, with a mean intensity (S.D) of 65.60 (0±59.3) eggs/10 ml urine. Prevalence of *S. haematobium* infection, according to the age groups of rural communities is shown in Figure 1.

The age-specific patterns in the prevalence of infection in this study significantly (p <0.001) indicated age group 10 to 14 years with the prevalence of 65.9% as the highest prevalence among the age groups studied. This was closely followed by age group 5 to 9 with 53.8% prevalence. In subjects with age group greater than 14 years, the prevalence significantly declines gradually with increasing age to reach the prevalence of 33.3% at age ≥20 years (Table 1). The prevalence patterns of infection were also significantly gender-related (p<0.001). The male subjects have an overall highest prevalence of infection (61.9%) than their female counterparts (47.3%) (Table 1). The mean intensity of infection was related to age and gender. There are decreases in intensity with increasing age of the subjects which peak in age group ≥20 with a mean intensity (S.D) of 33.7 (0±11.8) eggs per 10 ml urine. The intensity (S.D) of infection in male (69.3 (± 69.0) eggs per 10 ml urine) was higher than in female (58.8 (± 34.6) eggs per 10ml urine) (Table 1).

Father's occupation was found to be significantly associated with the prevalence of infection (p<0.001) with farming having the highest prevalence of 66.2%. Among the father's educational level recorded, incomplete primary education gave the highest prevalence and intensity of infection (Table 2). Infection appeared to be strongly associated with the river as a source of water supply since those having river as their main source of water supply have the highest prevalence and intensity than other sources (Table 2). It is also more likely that engaging in agricultural activities form the major contact

Table 1. Prevalence and intensity of urinary schistosomiasis with respect to demographic factors among rural communities of Ilie, Ajase ipo and Bacita, south-western Nigeria.

Variables	Number examined	Number infected (prevalence %)	Mean intensity± S.D
Age group (years)			
≤4	**17**	7 (41.2)	80.1 ± 54.3
5-9	**156**	84 (53.8	77.8 ± 97.0
10-14	**270**	178 (65.9)	67.4 ± 44.1
15-19	**168**	74 (44.0)	47.4 ± 18.6
≥20	**9**	3 (33.3	33.7 ± 11.8
Total	**620**	346 (55.8)	65.6 ± 59.3
P –value	**-**	<0.001	0.017
Gender			
Male	362	224 (61.9)	69.3 ± 69.0
Female	258	122 (47.3	58.8 ± 34
Total	620	346 (55.8)	65.6 ± 59.3
P –value	-	<0.001	0.017
Communities			
Ajase ipo	212	121 (57.1)	64.41±53.2
Ilie	203	119 (58.6)	70.91±80.1
Bacita	205	106 (56.0)	60.99±32.6
Total	620	346 (55.8	65.60±59.3
P –value	-	0.335	0.541

Table 2. Prevalence and intensity of urinary schistosomiasis with respect to socio-economic factors among rural communities of Ilie, Ajase ipo and Bacita, south-western Nigeria.

Variable	No. examined	No. infected (prevalence %)	Mean intensity ± S.D
Father's occupation			
Fishing	15	9 (60.0)	109.3±110.7
Farming	263	174 (66.2)	64.7±63.5
Trading	161	86 (53.4)	61.4±41.3
Salary earner	132	55 (41.7)	68.8±64.4
Wage earner	49	22 (44.9)	63.1±38.6
Total	620	346 (55.8)	65.6±59.3
P-value	15	P<0.001	P=0.236
Father's educational level			
Complete primary	477	242 (50.7)	58.9±41.5
Incomplete primary	143	104 (72.7)	81.3±86.1
Total	620	346 (55.8)	65.6±59.3
	-	P<0.001	P=0.001
Main source of water supply			
Tap	71	35 (49.3)	53.4±24.0
Well	309	134 (43.4)	63.0±50.9
River	237	176 (74.3)	70.1±69.3
Others	3	1 (33.3)	51.0
Total	620	346 (55.8)	65.6±59.3
Water contact habit			
Play or bath	137	84 (61.3)	67.7±63.2

Table 2. Contd.

Washing	344	214 (62.2)	60.7±47.3
Agricultural work	51	39 (76.5)	82.2±93.1
Fishing	13	8 (61.5)	92.0±88.6
No contact	75	1 (1.3)	56.0
Total	620	346 (55.8)	65.6±59.3
-	-	P<0.001	P=0.167

Table 3. Demographic and socio-economic characteristics of the health personnel's (n=92) in rural communities of Ilie, Ajase ipo and Bacita, south-western Nigeria.

Variable	Heath personnel's No. (%)
Sex	
Male	41 (44.6)
Female	51 (55.4)
Total	92 (100)
Occupation	
Clinicians	30 (32.6)
Auxiliary health workers	21 (22.8)
Others	41 (44.6)
Total	92 (100)
Education level	
Secondary	37 (40.2)
Tertiary	55 (59.8)
Total	92 (100)
Years of experience	
<2 years	6 (6.5)
2-5 years	55 (59.8)
6-10 years	21 (22.8)
>10 years	10 (10.9)
Total	92 (100)

medium for the transmission of urinary schistosomiasis. Those who have contact with the river through agricultural work have the highest prevalence of infection (Table 2).

Local health personnel's

The survey study included 92 volunteered health personnel's (44.6% male and 55.4% female) with ages ranging from 25 to 55. Their average age was 40 years old. Of the 92 health personnels interviewed, 32.6% were clinicians, 22.8% Auxiliary health workers, and 44.5% consists of others like chemists and pharmacists. The numbers of health personnels with secondary and tertiary education are 37 (40.2%) and 55 (59.8%) respectively (Table 3).

The respective knowledge of each health personnel on each question item was significantly dependent on their occupation (Table 4). Despite the fact that the number of clinicians examined is relatively few, 53.3 and 43.3% of them have a fair and good knowledge of the source of schistosome infection respectively. However, a very high number of others, such as chemists (75.6%) have little or no knowledge of the source of infection. Though, most of the health personnels (77.2%) especially all others, such as chemists cannot describe the intermediate hosts of *S. haematobium*, few clinicians (46.7%) have a fair knowledge of the intermediate host description (Table 4).

Most of the health personnels (52.2%) tend to have a fair knowledge of symptoms of infection (Table 4). Although 46.7% of the clinician have good knowledge of the treatment and control measure, and 56.7% have a

Table 4. Occupation with respect to knowledge of the health personnels (n=92) in rural communities of Ilie, Ajase ipo and Bacita, south-western Nigeria.

Knowledge item	Occupation	Health personnel No. (%)	No idea No. (%)	Fair idea No. (%)	Good idea No. (%)	p-values
Source of infection	Clinicians	30 (32.6)	1 (3.3)	16 (53.3)	13 (43.3)	<0.001
	Auxiliary health workers	21 (22.8)	9 (42.9)	9 (42.9)	3 (14.3)	
	Others	41 (44.6)	31 (75.6)	8 (19.5)	2 (4.9)	
	Total	92 (100)	41 (44.6)	33 (35.9)	18 (19.6)	
Intermediate host	Clinicians	30 (32.6)	11 (36.7)	14 (46.7)	5 (16.7)	<0.001
	Auxiliary health workers	21 (22.8)	19 (90.5)	1(4.8)	1 (4.8)	
	Others	41 (44.6)	41 (100)	0	0	
	Total	92 (100)	71 (77.2)	15 (16.3)	6 (6.5)	
Symptoms	Clinicians	30 (32.6)	0	15 (50.0)	15 (50.0)	<0.001
	Auxiliary health workers	21 (22.8)	4 (19.0)	16 (76.2)	1 (4.8)	
	Others	41 (44.6)	23 (56.1)	17 (41.5)	1 (2.4)	
	Total	92 (100)	27 (29.3)	48 (52.2)	17 (18.5)	
Prevention	Clinicians	30 (32.6)	1 (3.3)	17 (56.7)	12 (40.0)	<0.001
	Auxiliary health workers	21 (22.8)	12 (57.1)	8 (38.1)	1 (4.8)	
	Others	41 (44.6)	35 (85.4)	6 (14.6)	0	
	Total	92 (100)	48 (52.2)	31(33.7)	13 (14.1)	
Treatment and control	Clinicians	30 (32.6)	2 (6.7)	14 (46.7)	14 (46.7)	<0.001
	Auxiliary health workers	21 (22.8)	11 (52.4)	7 (33.3)	3 (14.3)	
	Others	41 (44.6)	30 (73.2)	7 (17.1)	4 (9.8)	
	Total	92 (100)	43 (46.7)	28 (30.4)	21 (22.8)	

No idea, fair idea and good idea means <40% score, 40-59% score and ≥60% score respectively.

fair knowledge of prevention of schistosome infection in these communities, a very high number of the subject population of 52.2 and 46.7% have no knowledge of both prevention of treatment and control measures respectively (Table 4).

DISCUSSION

The result of the present study showed that Ilie, Ajase-ipo and Bacita rural communities of south-western Nigeria fall within the world health organization (WHO) classification as endemic for urinary schistosomiasis (WHO, 2002). The overall prevalence of 55.8% was observed in these rural communities. This is higher than the national Nigerian mean of 13% (Ofoeze, 2002), and the prevalence of infection in many rural communities and farm settlements in Nigeria (Ekejindu et al., 2002; Ejima and Odaibo, 2010; Houmsou et al., 2012).

However, similarly high prevalence of *S. haematobium* infection has been reported by some other authors in areas where the infection is endemic within and outside Nigeria (Akokun et al., 1994; Anosike et al., 1999; Oladejo and Ofoeze, 2006; Oniya and Olofintoye, 2009; Ekpo et al., 2010; Ugbomoiko et al., 2010; Senghor et al., 2014). The high rate of the prevalence reported in the present study may be an indication of the rate of *S. haematobium* transmission in various areas in these communities. The rivers are the main transmission points in these communities. They serve as a natural water source and a meeting point for the schistosome parasites, their intermediate host and the people. The people depend on these rivers for their farming and fishing activities, bathing, swimming and other domestic needs.

These provide an avenue for infection transmission and reinfection. This prevalence is however, lower than the prevalence rate of 98.0% reported from an Agricultural settlement near Yola, and some other areas within and outside Nigeria (Akogun, and Akogun, 1996; Ologunde et al., 2012). This difference in the prevalence rate may be influenced by peculiar ecological characteristics, the degree of exposure of people to water bodies through some indigenous water contact activities, and the presence or absence of intermediate snail hosts in the local river.

In the present study, more than half of the subjects (52.6%) harboured moderate infection. This can easily become aggravated to heavy infection that may lead to low human performance, reduced physical and intellectual function, and infertility (King, 2010). The infection pattern in the present study showed a typical high prevalence in the early adolescence with males having a higher rate of 61.9% prevalence than their female counterparts having 47.3% prevalence. Similar trends have been recorded before in endemic settings, in Nigeria and elsewhere in Africa (Chandiwana et al., 1988; Amankwa et al., 1994; Ofoezie et al., 1997, 1998; Okoli and Odaibo, 1999; Aryeetey et al., 2000; Okoli and Iwuala, 2004; Yapi et al., 2005; Rudge et al., 2008; Otuneme et al., 2014). Some other studies have found no significant differences in gender prevalence (Wilkins, 1977; Mafiana et al., 2003; Ekpo et al., 2010). This high prevalence in male may be due to the fact that males tend to go to river water on regular bases to fetch water for domestic use, play or bath, to swim, and to fish unlike the females that may not necessarily attach any importance to such water-contact activities but rather prefer to stay close to their mother at home while assisting with domestic chores. Also in this research, it was observed that the highest prevalence of 65.9% occurs in the age group 10 to 14 years.

In subjects with age group greater than 14 years, prevalence gradually declines with increasing age to reach the least prevalence of 33.3% at age ≥20. This is probably due to a reduction in exposure pattern and acquired immunity (Woolhouse et al., l991). The intensity patterns of infection showed that the age group ≤4 has the overall highest level of mean intensity. The subjects revealed that contact with river water, particularly for subjects aged ≤4 was due to their mothers' activities such as washing, fishing and bathing children in such river water. This high intensity is in agreement with results of previous studies in other *S. haematobium* endemic areas (Wilkins, 1987; El-Harvey et al., 2000; Abdel-Wahab et al., 2000). This high intensity in children may be attributed to increased worm burden and low immunity against the parasite, while the opposite was encountered in adult subjects who probably have reduced schistosome worms and high immunity (Ogbe, 1995). The differences in the male and female intensities of infection may reflect the degree of exposure to intense water contact activities by the males, since they usually engage in all the water contact activities such as washing, drinking, swimming, fetching, farming and fishing (Bala et al., 2012).

The impact of local health personnels in the treatment, prevention and control of schistosome infection in endemic areas cannot be underestimated. A total of 92 health personnel participated in the questionnaire survey. The knowledge of health personnel which include clinicians for example, doctors and nurses, auxiliary health workers and others, such as chemists were exploited in these communities. The knowledge of these health personnels on schistosome infection is an indication of their ability to effectively carry out their duty with respect to treatments, control, and prevention of urinary schistosomiasis in these study communities. Although, there were multiple risks for potential *S. haematobium* infections in these communities, knowledge level on schistosomiasis was relatively low among health personnels in these areas.

This was corroborated by the result of Zenq et al. (2011) that showed the majority of the health personnel to have relatively low knowledge of schistosomiasis infection in the study area as a result of lack of adequate training.

Generally, utilization rates are often low in rural clinics because of the peoples' attitude (Zenq et al., 2011) and also, health care workers often lack the training required to attend effectively to the infected individuals (Zenq et al., 2011). Though the clinicians have fair and good knowledge of schistosome infection, their knowledge score shows that they need more training on neglected tropical diseases especially on the endemic schistosome infection.

Conclusion

The disease, urinary schistosomiasis is still endemic in the study area, and there is the need for adequate training of health personnel in order to equip them for proper control of the disease.

RECOMMENDATIONS

Control program for urinary schistosomiasis and training of health personnel should be encouraged in the study area.

Conflict of Interests

The authors have not declared any conflict of interests.

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Full Length Research Paper

A study on prevalence of gastrointestinal helminthiasis of sheep and goats in and around Dire Dawa, Eastern Ethiopia

Samuel Kelemework[1], Alebachew Tilahun[2]*, Eskziaw Benalfew[3] and Abebaw Getachew[4]

[1]Clinician in Guba Korcha Governmental Clinic, Ethiopia.
[2]School of Veterinary Medicine, Wolaita Sodo University, Ethiopia.
[3]Bench Maji Zone Urban Development Department, Ethiopia.
[4]Agarfa Federal Agricultural Technical and Vocational Education Training, Ethiopia.

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A cross sectional study on gastrointestinal parasite of small ruminants was conducted from November, 2011 to April, 2012 in Dire Dawa with the objective to determine the prevalence of infestation, and to identify the gastrointestinal helminth parasite in sheep and goats. A total of 768 coprological examinations were performed on 384 fecal sample each from sheep and goats. Taking the overall parasitic infestation into consideration, 91.4% sheep and 86.2% were found to harbor egg of gastro intestinal helminth. The coprological findings were Strongyle (45.01%), *Nematodirus* (11.11%), *Trichuris* 12.8%, *Moniezia* 13.67%, *Fasciola* 6.84%, *Strongyloides* 10.54% in sheep while Strongyle (39.88%), *Nematodirus* (15.10%) *Trichuris* 16.31%, Monezia 12.08%, *Fasciola* 6.04%, *Strongyloides* 6.51% in goats. Upon coproculture, accurate differentiation of each genera of nematode were identified prevalent for those animal which were positive for strongyle egg type 138 (sheep), and 97 (goat) sample was cultured. Based on faecal culture, six genera of nematode were identified including *Bunostomum* 20.29%, *Oesophogostomum* 25.64%, *Chabertia* 23.19%, *Haemonchus* 28.99%, *Cooperia* 24.64%, *Trichostrongylus* 40.33% in sheep while in goats *Bunostomum* 20.62%; *Oesophogostomum* 24.74%; *Chabertia* 23.71%; Haemonchus 32.99%; *Cooperia* 25.77% and *Trichostrongylus* 40.1%. The majority of sheep and goats were having mixed infestation with more than one helminth. The study shows that gastrointestinal (GIT) parasite was a major problem of small ruminant in the study area. Therefore, comprehensive study on GIT parasite, cost effective strategic treatment and awareness creation to the smallholder should be instituted in the study area.

Key words: Dire Dawa, Eastern Ethiopa, GIT Helminth, Goat, Nematode, Sheep.

INTRODUCTION

Ethiopia possess the largest livestock population in Africa with an estimated population of 7.8 million equine, 1 million camel, 47.5 million cattle, 39.6 million chicken, 26 million sheep and 21.7 million goats (CSA, 2009).

*Corresponding author. E-mail: alebmen19@gmail.com.

Livestock ownership currently contributes to the livelihoods of an estimated 80% of the rural population. But this extensive livestock resources is not adequately harnessed because of many constraints of which poor animal production and management, improper evaluation of public health importance due to various individual parasitic disease and inadequate knowledge of the epidemiology of parasite where the distribution of the disease determines the type and scope of control measures to be applied (Ento, 2005).

In Eastern Ethiopia, livestock production is mainly pastoral where communities are entirely dependent on communal pasture and animal exposure to infective larval stages of parasite continues throughout the year. The most important Strongyle nematode of sheep and goat in African countries are: *Haemonchus, Trichostrongylus*, *Nematodirus, Cooperia, Bunostomum, Oesophgotomum* and *Chabertia* (Hansen and Perry, 1994). Small ruminants under extensive and intensive production systems are extremely susceptible to a wide range of GIT helminthes of sheep and goats to the genera of *Haemonchus, Triostrongylus*, *Bunostomum, Oesophgostomum, Trichuris (Nematode*); *Fasciola Paraphistomum* (Trematode) and *Moneiza, Avitetlinala* and *Stellesia (Cestode*) (Tekley, 1991; Tembely and Hansen, 1996).

Sheep and goat are mainly found in arid and semiarid areas of sub-Sahara Africa. They play a vital economics role through provision of meat and milk. They contribute more to household income, manure and skin compared to cattle and camels. Small ruminants contribute a large proportion of readily available meat in the diet of pastoralist. They have been estimated to provide up to 30% of the meat, and 15% milk supply in sub-Sahara Africa where they thrived in wide range of ecological region better than cattle. small ruminants have survive better under drought conditions than cattle due to their low body mass and low metabolic requirement, and maintenance needed in arid and semi-arid areas (Wesongh et al., 2003).

Improper care, unhygienic environment, extreme climate and close contact with infected animals leads to a variety of parasitic infestations (Jones, 2001).Thus, the subclinical parasite infestations are responsible for significant economic losses in terms of animal productivity (Kaplan, 2006; Tibbo et al*.,* 2006). Helminth parasites of small ruminants are ubiquitous in all agro climatic zones of Ethiopia with prevailing weather condition that favors their survival and development; their presence doesn't mean that they cause overt disease (Sissay et al., 2007).

Economic losses caused by GIT parasites vary from lowered fertility, reduced work capacity, involuntary culling, reduction in feed intake, lowered weight gain and milk production, treatment cost and mortality in heavily parasitized animals (Fikru et al., 2006). The direct losses caused by this parasites are attributed to acute disease and death, premature slaughter and rejection of some parts at meat inspection while indirect losses include the reduction in productive potential (Gonzalez and Gonzalez, 2004). Although, Ethiopia is endowed with large number of sheep and goats' population, little attempt has been made in the past, to study the health aspect of these animals. This study focus on the subsequent lack of a well-established data on the magnitude, and the distribution and predisposing factor of small ruminants GIT helminthes. Previously in Dire Dawa, no study was carried out on gastrointestinal helminthosis in small ruminants. However, information on the prevalence and type of helminth parasites infecting small ruminants is vital for their control. Therefore, the objectives of this study was to determine the prevalence of GIT helminth parasite in the study area

MATERIALS AND METHODS

Study area

The study was conducted at Dire Dawa administrative region which is located approximately between latitude 9°27 'and 9°49' North and longitude 41°38' and 42°19' East. It shares boundaries to the South, Southeast and Southwest with Eastern Haraghe zone of the Oromia regional state and to the North, Northeastern and West with Shinile zone of Somalia regional state. There are two farming system, namely, mixed and agro pastoral are noted in the rural area. Majority of agro -pastoral (a production system in which there they practiced growing crops and raising animals) and pastoral areas (rely only raising animals) located in the northeastern lowlands with rainfall that does not favor crop production. There are 16 peasant associations under this category. The mixed farming areas dominate the southeastern part of the region and are relatively better in crop farming. The rest 22 Keble (peasant association) are found in this agro ecological zone. In 2003, the livestock population of Dire Dawa Administration was estimated to have 37, 126 cattle, 64,370 sheep, 112,065 goats, 7,513camels, 10,779 equines, 1,225 Beehives and 25,301 chickens (RABDD, 2006).

Study population

Small ruminants in the study area are kept under traditional extensive system by households. Most householders maintain one to six sheep and goats. During this time, both sex and age group of sheep and goats were in selected 12 peasant associations and grazing in pasture fields. Those animals with the age of less than one year and above one year were grouped as young, and adult species of animals respectively was considered in the study according to the study of Tewdros (2007).

Study design, sampling technique and sample size determination

A cross-sectional study was carried out from November, 2011 to March, 2012 to determine the prevalence and to identify gastrointestinal tract helminthes from fecal samples collected from sheep and goats. Twelve peasant associations were selected purposively on easy of accessibility and simple random sampling method was employed to select 768 study units (25 samples from each PA for each specie was taken (total 600 samples), and the other 168 sample was taken from Dire Dawa veterinary clinic). The sample size required for the study was determined using the formula given by Thrusfield (2005), taking 50% expected prevalence, since

Table 1. Assessment of prevalence of parasitic infestation in relation to sheep and goats.

Species	No. of animals examined	No. of animals positive (%)	χ^2-Value	P-value
Sheep	384	351(91.41)		
Goat	384	331(86.2)	0.022	5.2377
Total	768	682 (88.67)		

there were no records to previous prevalence of gastrointestinal helminthes of sheep and goats in the study area, at 95% confidence level and 0.05 level of precision, therefore, a sample size of 768 (384 each for sheep and goat) was considered for the study.

Fecal sample collection

Fecal samples were obtained directly from the rectum of each animal. This was carried out by hands which were protected with glove. The samples were put into sampling bottles and labeled, and transported to laboratory for further coprological investigations.

Coproscopic examination

For coproscopic examination, a simple test tube flotation, sedimentation, fecal culture and Berman technique described by Hansen and Perry (1994) was employed, and the slides prepared were examined under microscope (x10). Eggs of different helminths were identified on the basis of morphological appearance and size of eggs (Foriet, 1999).

McMaster egg counting method was used to determine the number of eggs per gram of feces (EPG) in the positive fecal samples, and the degree of severity was categorized based on previously described methods (Soulsby, 1982; Urquhart et al., 1996). Furthermore, the EPG was classified as light, moderate and massive infestation for a count of 50 to 799, 800 to 1200 and over 1200, respectively.

Ovoculture and identification of larvae

Fecal samples were collected in slightly capped plastic bottles, and incubated at room temperature under suitable moisture contents for 14 to 21 days with continuous moistening at an interval of 3 days. The recovered larvae (L_3) were studied and identified. The presence of larvae was assessed by using stereomicroscope, when present; two drops of larval suspension were mixed with drop of lugols iodine on glass slide, and examined at low magnification power for identification. Identification keys used were: shape of larval head, number and shape of gut cells, presence or absence of retractile bodies, larval sheath coverage and length of sheath tail. The L_3 harvested using Berman apparatus after 14th day of incubation were differentiated to the generic level using the method as described by Annon, (1997).

Data analysis

The data collected was entered into a Microsoft Excel spreadsheet, edited and analyzed using Stata 11 intercooled statistical software (StataCorp, 2009). Descriptive statistics was employed to compute the prevalence of each parasite type. Pearson's chi square was utilized to assess the presence of association between prevalence of parasite, sex, age and species of animals. A statistically significant association was said to exist when the calculated P-Value is less than 0.05 ($P<0.05$) at 95% confidence level.

RESULTS

Overall prevalence

A total of 768 fecal samples from small ruminants (384 sheep and 384 goats) were examined. The overall prevalence of gastrointestinal helminth parasites infestation in sheep and goats was 88.67% (682/768). The prevalence of gastrointestinal helminth was 91.41% and 86.2% in sheep and goats respectively under 95% confidence interval (Table 1).

Interaction between host characteristics and prevalence

Species and prevalence

Species-wise analysis of prevalence has showed that sheep were more commonly affected than goats (Table 1). This variation in prevalence of gastrointestinal helminthes between sheep and goats was found to be statistically significant ($P<0.05$).

Sex and prevalence

During the study, sex-wise analysis of the prevalence of the gastrointestinal helminths of sheep and goats have indicated that female sheep (ewes) were slightly more infected than the male (rams) counter parts (Table 2). Opposing to this in goats, male animals were highly infected than females. However, this variation in susceptibility was statistically not significant ($P>0.05$).

Age and prevalence

Comparison of the frequency of infestation between young and adult age groups of animals showed that in sheep, young animals are more frequently affected than the adults (Table 3). This difference in the frequency of infestation between the two age groups of sheep is statistically significant ($P<0.05$). But in goats, both young and adult animals were equally susceptible to

Table 1. Assessment of prevalence of gastrointestinal helminths in sheep and goats by sex.

Species	Number of positive animals		χ^2-Value	P-Value
	Female (%)	Male (%)		
Sheep (n=384)	231(92.03)	120 (90.23)	0.3611	0.548
Goat (n=384)	217(84.11)	114 (90.48)	2.8852	0.089

Table 2. Analysis prevalence of gastrointestinal helminths in sheep and goat by age group.

Species	Number of positive animals		χ^2-Value	P-Value
	Young (%)	Adult (%)		
Sheep (n=384)	77(98.72)	274(95.06)	6.6617	0.010
Goat (n=384)	37(86.05)	294(86.22)	0.009	0.976

Table 3. The result of coproscopic examination of sheep and goats in Dire Dawa.

Helminth parasite		Sheep (n = 384)		Goat (n = 384)	
Class	Group or Genus	Number positive	Percentage (%)	Number positive	Percentage (%)
Nematoda	Strongyle	158	45.01	132	39.88
	Nematodirus	39	11.11	50	15.10
	Trichuris	45	12.80	54	16.31
	Strongyloides	48	13.67	40	12.08
Trematoda	*Fasciola*	24	6.84	20	6.04
Cestoda	*Moniezia*	37	10.54	35	10.57

gastrointestinal helminth infestation, but this is statistically not significant (*P*>0.05).

Parasite Identification

Coproscopyic examination

Based on eggs and larval studies, it was observed that nine genera of nematode parasites, one genus of cestode as well as one genus of trematode infected sheep and goats . Strongyle type eggs were encountered more frequently in the feces of sheep (45.01%) and goats (39.88%) than others. *Fasciola* was the least prevalent helminth parasite identified from 24 (6.84%) sheep and 20(6.04%) goats. The frequency of occurrence of the identified helminthes eggs in the feces of small ruminants examined is presented in Table 4.

Coproculture

Upon coproculture of those faecal samples found positive for strongyle type, six genera of parasites were recognized. Trichostrongylus was the most common type of strongyle encountered 40.33% of sheep and 40.1% goats, while *Bunostomum* was the least recovered from 20.29% sheep and 20.62% goats (Table 5). From 351 sheep and 331 goats infected with helminthes, 132 (37.60%) sheep and 183 (55.28%) goats harbored single infestations whereas only 219 (62.39%) sheep and 148 (44.71%) goats contained mixed infestations (Table 6). Based on mean egg per gram by any gastrointestinal helminthes in the study period, in both sheep and goat, the infestation of parasitic infestation was light (Table 7).

DISSCUSION

The coprological examination revealed that the overall prevalence of gastrointestinal parasite was 88.67% of which sheep and goat showed 91.41 and 86.20%, respectively. This result agrees with the result of Getchew (1998) who reported 88.1 and 84.32% in sheep and goat in and around Mekele; Mulugeta et al. (2011) reported 91.32 and 93.29% in and around Bedelle (south western), Bayou (1992) reported 90.23 and 88.13% in Buno province (illubabor), Tesfalem (1989) reported 92.33 and 93.33% in Bale, Gebreyesus (1986) reported 90.41 and 82.13% in Gonder and Genene (1994).

Table 5. Result of coproculture from sheep and goat in the study area**.**

Strongyle	Sheep (n=138)		Goat (n=97)	
	Number positive	Percentage (%)	Number positive	Percentage (%)
Trichostrongylus	55	40.33	38	40.1
Haemoncus	40	28.99	32	32.99
Oesophagostomum	35	25.64	24	24.99
Chabertia	32	23.19	23	23.71
Bunostomum	28	20.29	20	20.62
Cooperia	34	24.64	25	25.77

Table 6. Prevalence of GI helminthes of sheep and goat.

Species	Positive animals		Single Infestation		Mixed Infestation	
	Number	Percentage	Number	Percentage	Number	Percentage
Sheep (n=384)	351	91.41	132	37.60	219	62.39
Goats (n=384)	331	86.20	183	55.28	148	44.71
Total	682	88.67	315	46.44	367	53.55

Table 7. Intensity of different helminthes in sheep and goat.

Helminth parasite	Sheep		Goat	
	Number of animals	Mean EPG	Number of animals	Mean EPG
Strongyle	50	738	50	742
Trichuris	4	133.33	6	375
Moniezia	5	140	6	455
Nematodirus	4	300	16	400
Strongyloides	10	400	13	375
Fasciola	6	408.33	6	408

However, this finding is comparatively lower than Amenu (2005) who reported a prevalence of 97% in sheep in three different agro ecological areas of southern Ethiopia. Mulugeta et al. (2011) reported a prevalence of 93.8% in goat. This difference in prevalence could be related with variation like season of study, age and stage of infestation and treatment of animals (Donald and Waller, 1982). This difference in prevalence in different ecological region could be explained by the existence of favorable climatic conditions (Rossanigo and Grunder, 1995) that support prolonged survival of infective larvae stage. Additional factors like sample size, management system (that is, overstocking of the animals, grazing of young and adult animals together with poorly drained land) could also contribute to the different prevalence. The overall prevalence of this finding is greater than the overall prevalence. Tesfaheywet (2012) reported 61.4% in sheep and in goats in and around Haramaya. The difference may be due to climate and environmental variation which could determine the prevalence.

This study showed statistically significant difference ($p<0.05$) between species. This findings are contrary to the report of Tony (2007) who described that goats appeared to be more susceptible to helminthes than sheep as they appear to develop less immunity but sheep picked more parasites because they predominantly grazed on grass which harbor infective larvae while goat mostly consume browse which is uncontaminated with parasite larvae. A significant differences ($p<0.05$) in infestation level among age groups (adult and young) showed only in sheep. According to Asnaji and Williams (1987), young animals are highly susceptible due to immunological immaturity and unresponsiveness.

No statistical difference ($p>0.05$) was observed between sex groups on the basis of breed and origin. The study findings are similar with the report of Assefa and Sissay (1998), gastrointestinal parasite affects both sexes equally. In similar agro ecological area, there is equal exposure of both sex to parasite (Armour, 1980)

In addition to direct coproscopic examination carried out, the level of each genera of nematodes was prevalent for those animals positive for strongyle egg type 138 (sheep) and 97 (goat) sample cultured. Based on facal culture, six genera of nematode were identified including

Bunostomum 20.29 and 20.62%; *Oesophogostomum* 25.64 and 24.74%; *Chabertia* 23.19 and 23.71%; *Haemonchus* 28.99 and 32.99%; *Cooperia* 24.64 and25.77% and *Trichostrongylus* 40.33 and 40.1% in sheep and goat, respectively. The most prevalent nematode was *Trichostrongylus* and *Haemonchus* followed by *Oesophagostomum* and others.

This finding was similar to the report of Bayou (1992) and Gebrekirose (1990), who identified *Trichostrongylus* to be the most predominant parasite isolated from larvae cultured. The abundance of these parasites was associated with difference in the study method or technique used. However, this study finding is contrary with the report of Sisay (2007), and Haileleul (2002) were *Haemonchus* dominates. *Haemonchus* was observed to be the most prevalent internal parasitic pathogen of GIT in this study. This could be related partly to breed susceptibility, biological and high environmental adaptability (Baiser and Dunsmore, 1993).

The current study has shown the existence of poly parasitism as observed in coproscopic and coproculture examination. Most of the animals had more than one type of parasite eggs. The prevailing poly-parasitism agrees with the result of Haileleul (2002), Gennene (1994) and Gebreyesus (1986). This prevalence of poly parasitism observed in current studies showed that gastro intestinal helminthosis is an important cause of morbidity and loss of production in sheep and goat in the study area. This can be supported by the fact that most of animal included in this study were in some selected PA, and the ones brought to the veterinary clinic of Dire Dawa town for various health problem. The presence of interactions and compromization of the immune system of the host by polyparasitism to increase their susceptibility of other disease or parasite has been a documented phenomenon (Wang et al., 2006).

Larvae of *Haemonchus* were the second abundant in sheep and goat. However, it's pathogenecity *Haemonchus* is known to be more important parasite than other nematode. The importance of this genus has also been reported in other region of the countries as by Tesfalem (1989), Bayou (1992), Yoseph (1992) and Haileleul (2002).

Oesophagostomum and *Bunostomum* were helminthes genera encountered in this study. The occurrence of these genera has been variably reported in different parts of Ethiopia. For instance the study of Bergeon (1968) and Grabber (1973) have showed that they are widely distributed throughout the countries at relatively high prevalence. Similarly, Gebreysus (1986), Tesfalem (1989), Genene (1994) and Haileleul (2002) have reported high prevalence of this genera of parasite in sheep and goat reared in different agro ecological of Ethiopia those may be due to the difference in study methodology. Most of the previous studies were based on postmortem examination that allows the recovery of arrested parasite which cannot release eggs. But during ova culture, we can obviously miss this arrested parasite as they do not release egg.

During the study period, the prevalence based on mean EPG of each genus of the gastrointestinal helminth by species of animal was conducted, and the result showed light infestation by all the genera of helminth that were encountered in sheep and goats. But there was no moderate and heavy infestation observed based on mean EPG by any gastrointestinal helminth in the study period. The classification of intensity of parasitic infestation was made based on fecal egg counts as light (50 to 800), moderate (801 to 1200) and heavy (>1200) as described for mixed infestation in grazing small ruminants (Jorgan and Brain, 1994).

CONCLUSION AND RECOMMENDATIONS

In general, the overall prevalence of gastrointestinal helminth parasites in the study area indicates gastrointestinal helminthosis to be an important heath problem due to its high prevalence and occurrence of polyparasitism. The result also shown that sheep carries more parasitic type than goat. This is because, they predominantly graze in grass which harbors infective larvae while goats mostly consume browse which is uncontaminated with parasite larvae. The majority of sheep and goats were infected by two and more parasite types with some animals showing pure infestation. Strategic deworming of animals, when conditions are most favorable for larval development on the pasture, using broad spectrum anti-helminthics since poly-parasitism is a common problem. Moreover, proper pasture and animal management is required since this is a key component in managing gastrointestinal helminths in sheep and goat operations. In addition, rotation grazing is used in interval, and this avoids communal grazing with other animals to avoid cross parasite contamination. The professional input of veterinarians is needed especially in the preventive and control measures against gastro-intestinal helminths.

Conflict of Interests

The authors have not declared any conflict of interests.

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