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Prevalence of *Schistosoma* and other parasites among female residents of some communities in Oyo State, Nigeria

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Prevalence of Schistosoma and other parasitic infections in 507 females (5-78 years) was determined in a cross-sectional study undertaken in seven communities of Oyo State, Nigeria. Urine and stool samples were examined, and 25.2% overall parasite prevalence was recorded. *Schistosoma haematobium* and *Schistosoma mansoni* prevalence was 5.5 and 0.3% respectively. *Ascaris lumbricoides* (11.4%), Hookworm (9.3%), *Strongyloides stercoralis* (0.6%), *Trichuris trichiura* (0.3%), *Taenia saginata* (1.2%) and *Entamoeba histolytica* (0.8%) were also identified from stool and *Trichomonas vaginalis* (0.3%) from urine of participants. *Schistosoma haematobium* egg intensity ranged between 100-145 eggs / l0 ml urine. PCV was determined for all participants, values ≤ 32% was recorded for 67.1% of the parasite positive participants and 100% of *Schistosoma* infections. A correlation (0.75, p > 0.05) was established between PCV and parasite intensity. *Schistosoma* infection was highest (13.5%) amongst 11-20 year olds but absent in women 41-50 year old. There was a positive correlation (0.90, p > 0.05) between age and *S. haematobium* egg intensity. *A. lumbricoides* and hookworm infections were predominant in children (1-10yrs) while women (21-30 years) had infections of all the identified parasites. Concomitant infections (2.2%) of *S. haematobium* with other parasites were recorded. The high prevalence of infections amongst women of child bearing age and adolescent girls with the attending low PCV suggests the importance of parasitic infections in these groups. This emphasizes the need for intervention measures targeted at all members of these communities to interrupt transmission.

Key words: Schistosoma species, intestinal parasites, PCV, female residents, Oyo State.

INTRODUCTION

Over a billion people in Sub-Saharan African, Asia and the Americas are infected with one or more helminth parasites, and of these, soil-transmitted parasites are amongst the most common infections world-wide. More

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than 1.5 billion people (24% of world population) are infected with soil-transmitted helminthes (WHO, 2012). They affect the poorest and most deprived communities and represent more than 40% of the tropical disease burden, excluding malaria (WHO, 2003). The main species of helminth parasites transmitted through contaminated soil include *Ascaris lumbricoides, Trichuris trichiura* and the hookworms (*Ancylostoma duodenale and Necator americanus*). Hookworms are important parasites posing threats to the health of adolescent girls, women of reproductive age and to the outcome of pregnancy because the highest intensity of the infections occurs in this population (WHO, 2012).

Schistosomiasis, a fresh water borne disease caused by helminth parasites of the genus *Schistosoma*, is endemic in 74 countries in tropical and sub-tropical areas of the world with 50 million people at most risk in 52 countries (WHO, 2012). Schistosomiasis is widely distributed in Latin America, Middle East, Africa (Adenowo, 2014) It is also endemic in several parts of Nigeria (Ogbe, 1995). In Nigeria, schistosomiasis has a long history and is caused by two *Schistosoma* species: *S. haematobium* and *S mansoni*. *S haematobium* is more widespread (Banji *et al.,* 2012). Transmission of schistosomiasis is dependent on human-water contact and the extent and duration of contact in association with domestic and occupational activities (Ofulla et al., 2013). Infection appears to be correlated with frequency of water contact and women doing domestic chores in infected water are at greater risk. The amount of body surface exposed to water, enhancing cercarial contact during these activities is important in transmission (WHO, 2012). Age may also influence the extent and length of water contact. Morbidity and mortality are mostly associated with infections in school-age children, teenagers, young adults and women (Rollinson et al., 2013). Schistosomiasis has been known to have severe consequences for outcome of pregnancy in women. An observed difference in the prevalence of infection among sexes has been reported in previous studies (Mulugeta et al., 2013). Infections in women have been shown to be more easily transmitted to their sexual partners (Kjetland et al., 2006; Mbabazi et al., 2011). The health consequences of schistosomiasis may include anaemia and weight loss (WHO, 2012). Blood profiles help in the evaluation of the health condition of the individual to detect disease and it has been reported that mean haemoglobin level is affected by high parasitic load (Orji, 2015).

In many rural areas of Nigeria, little attention is paid to teenage girls and young adult members of communities during intervention programs because the majority of such schemes are directed at school children. The low level of the girl child's school enrollment in many such communities results in a low proportion of the female children benefitting from such intervention programs where available. Gender division of household tasks has been shown to predispose women and girls to schistosomiasis and other related parasitic infections as they are usually in charge of collecting water and washing clothes (WHO, 2008; McDonald, 2011). These girls/women remain sources of transmission in these communities. The non-participation of many girls from school-based intervention programs and the repeated exposure of girls and women to infection through domestic chores make them vital in the success of control programs. Therefore, this study determined the status of *Schistosoma* and other intestinal parasitic infections in the female members of some communities in Oyo State, South West Nigeria.

MATERIALS AND METHODS

Study site

A cross-sectional study was carried out in seven communities: Idikan, Basorun, Ajagba-Irepo, Olori, Omooba, Ajagba-Olaleye, and Akoda in Oyo State, South West Nigeria over a period of *5* months. Permission for the study was granted by the Oyo State Ministry of Health. Local health officials and the community leaders assisted in the mobilization of participants. The study was carried out according to the approved ethical procedures.

Participants' enrollment

Five hundred and seven (507) female members of the communities were recruited voluntarily into the study with the assistance of nurses and health workers at the primary health clinics in study areas after obtaining informed consent. Each participant was assigned a number, and given two 15 ml labeled screw-cap plastic bottles for urine and stool collection. Samples collected from participants were screened for presence of parasites. Pre-tested structured questionnaire was administered to the recruited participants to obtain socio-demographic information.

Sample collection and parasite detection

Urine (10 ml) was collected from each participant; each urine sample was centrifuged at 3,000 rpm for 5 min and then examined microscopically for presence of *Schistosoma haematobium* ova and other parasites. Egg count was carried out using the syringe filtration technique and expressed as eggs/10 ml of urine (WHO, 1993).

The initial screening of faecal matter for the presence of parasites was carried out by direct smear examination, followed by the examination of iodine stained smears and Formol-ether technique for concentrating and quantifying parasite ova (Cheesbrough, 2000). Ova, cyst, and larvae of parasites encountered in the samples examined were identified.

Blood (0.6ml) was collected from each participant into EDTA bottles, for the determination of the PCV, Hb count (Cheesbrough, 2000).

Statistical analysis

Results were subjected to simple percentages. Chi-square analysis was used to determine the relationship between the age and

Table 1. Prevalence of *S. heamatobium* infection in the age groups in the seven communities.

Age groups	Location							Total NE/ % Infected
	Basorun	Ajagba-Irepo	Olori	Akoda	Omooba	Ajagba-olaleye	Idikan	
	NE (% Infected)	NE (% Infected)	NE(% Infected)	NE (% Infected)	NE (% Infected)	NE (% Infected)	NE (% Infected)	
1-10	1(0)	9(0)	14(0)	3(0)	9(0)	0(0)	0(0)	**36(0)**
11-20	9(0)	10(0)	10(3)	11(0)	9(0)	24(3)	23(7)	**96(13.5)**
21-30	40(0)	14(0)	7(0)	18(1)	16(0)	12(0)	43(7)	**150(5.3)**
31-40	4(0)	23(0)	6(1)	9(1)	8(0)	12(0)	21(2)	**83(4.8)**
41-50	2(0)	18(0)	13(0)	5(0)	5(0)	12(0)	10(0)	**65(0)**
51-60	1(0)	23(0)	10(0)	3(0)	11(0)	10(2)	3(0)	**61(3.3)**
> 60	0(0)	0(0)	2(0)	4(0)	5(0)	0(0)	5(1)	**16(6.3)**
Total	57(0)	97(0)	62(4)	53(2)	63(0)	70(5)	105(17)	507 (5.5)

NE- Number examined.

prevalence. The multiple correlation co-efficient was used to find the relationship between egg counts and PCV.

RESULTS

The 507 participants were made up of traders, farmers, artisans, civil servants, and students aged between 5 and 78 years. Parasites were identified from 128 (25.2%) of the participants in all seven communities. *S. haematobium* ova was identified in the urine of 28 (5.5%) participants from four of the seven communities (Olori, Akoda, Ajaba-Olaleye, and Idikan). Egg intensity ranged between 100-145 egg/10 ml urine and the mean egg intensity was 123 eggs/10 ml urine. *S. haematobium* infection was identified in participants in the different age groups; the group of 11-20 years old had the highest (13.5%) prevalence while no ova were identified in subjects 1-10 and 41-50 years old (Table 1). Two individuals (0.3%) only, from Idikan, a semi-urban community, had *S mansoni* ova identified in their faeces. Idikan also had the highest prevalence (16.2%) of both Schistosome infections.

Other parasites identified include; *Ascaris lumbricoides,* Hookworm*, Trichuris trichiura, Trichomonas vaginalis, Strongyloides stercoralis*, and *Entamoeba histolytica* (Figure 1). *A. lumbricoides* had the highest prevalence (11.4%) while *T. trichiura*, *T. vaginalis* and *S. mansoni* were least (0.3%) prevalent. Concomitant infections of *S. haematobium* and other infections were recorded in 11(2.2%) of the study participants. Idikan had the highest occurrence (44.8%) of concomitant infection. All the parasite species identified were recorded for participants from this community.

A. lumbricoides was prevalent in all the age groups with the highest in the 31-40 year group (Figure 2), while hookworm was most prevalent in the 1-10 year age group. Participants 21-30 years old had infection of all the nine species of parasites identified, while only three parasite species were identified in women above 60 years.

A large proportion (40.3%) of the female participants had no formal education and 37.5% had only primary school education (Figure 3). Parasite infection was highest in participants with primary education. There was no infection recorded in women with tertiary (post-secondary school) education. The level of the educational attainment of the participants had a significant effect ($p<0.05$) on the infection status of participants.

Infection with *Schistosoma haematobium* was highest amongst the traders, while hookworm infections were highest amongst farmers and they also had a high prevalence of *A. lumbricoides* (Figure 4). Students made up 18.7% of the study participants and 8.4% of them had *S. haematobium*, 9.4%, *A. lumbricoides*, and 13.7%, hookworm infections. Traders were the 27.8% of the study population and 8.4% of them had schistosome infection.

Low PCV (< 32) was recorded in 67.1% of study subjects with parasite infections. The mean PCV value of the 128 infected individuals was 28.8% compared with 34.5% for the 379 uninfected individuals, while mean Hb value for infected participants was 9.5 gm/dl compared to 11.5 gm/dl for uninfected individuals (Table 2). PCV value <32 was recorded in all *S.haematobium* infected subjects and there was also a correlation ($r = 0.75$, $p >0.05$)) between egg intensity and PCV counts of subjects with *S. haematobium* infection (Figure 5).

DISCUSSION

The results of the study showed the prevalence of parasitic infections amongst the female members of the study communities. The higher prevalence of *S. haematobium* compared to *S. mansoni* is in agreement

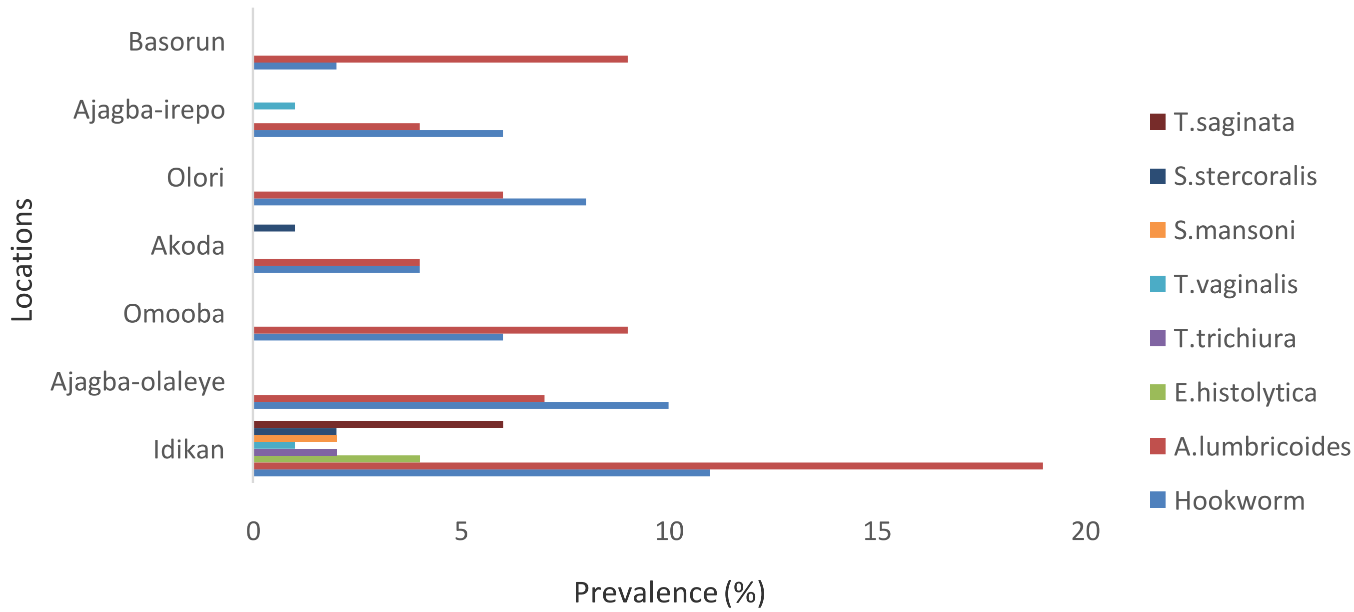

Figure 1. Prevalence of parasitic infections in the study communities.

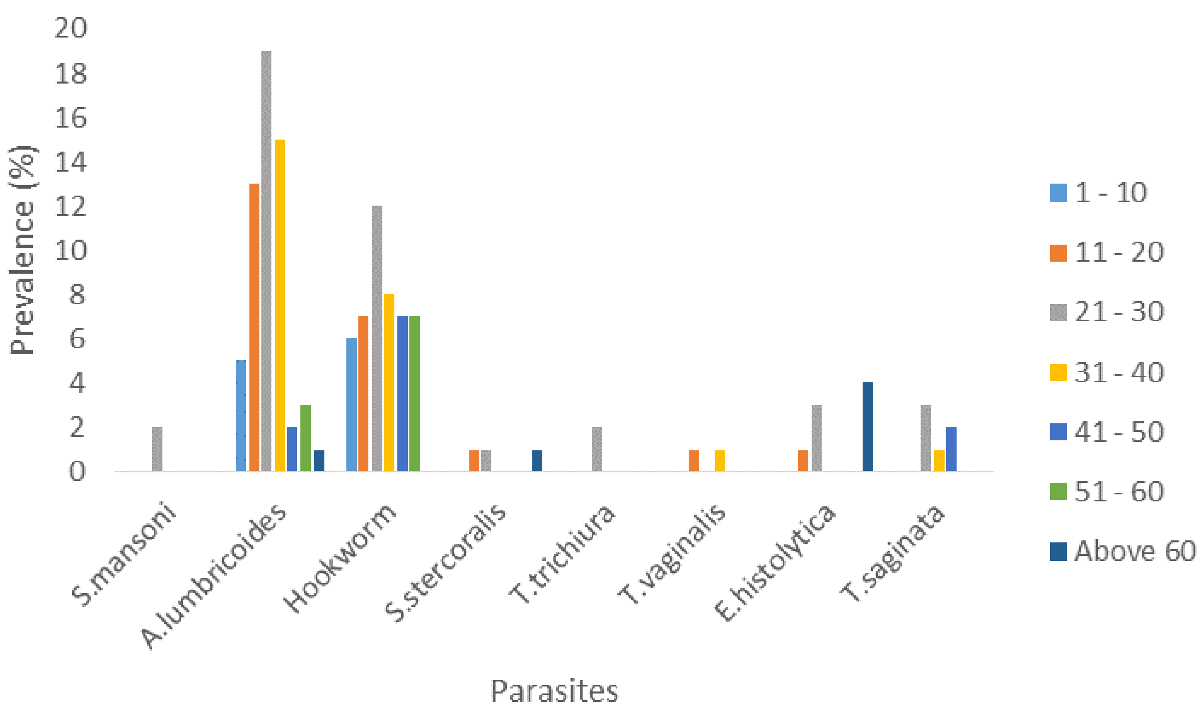

Figure 2. Distribution of infection in the different age groups.

with earlier studies which reported a higher *S. haematobium* infection in Nigeria (Ekpo et al., 2010; Adesola et al., 2012). Prevalence of infections had been linked to sanitary conditions in communities, proximity and frequency of contact with polluted water (Banji et al., 2012). Most of the communities in this study depend on river/stream as their main source of water, the frequent water contact by the female population increase the rate and length of exposure to the infective cercarial stage of schistosomes. Though Idikan a semi urban community

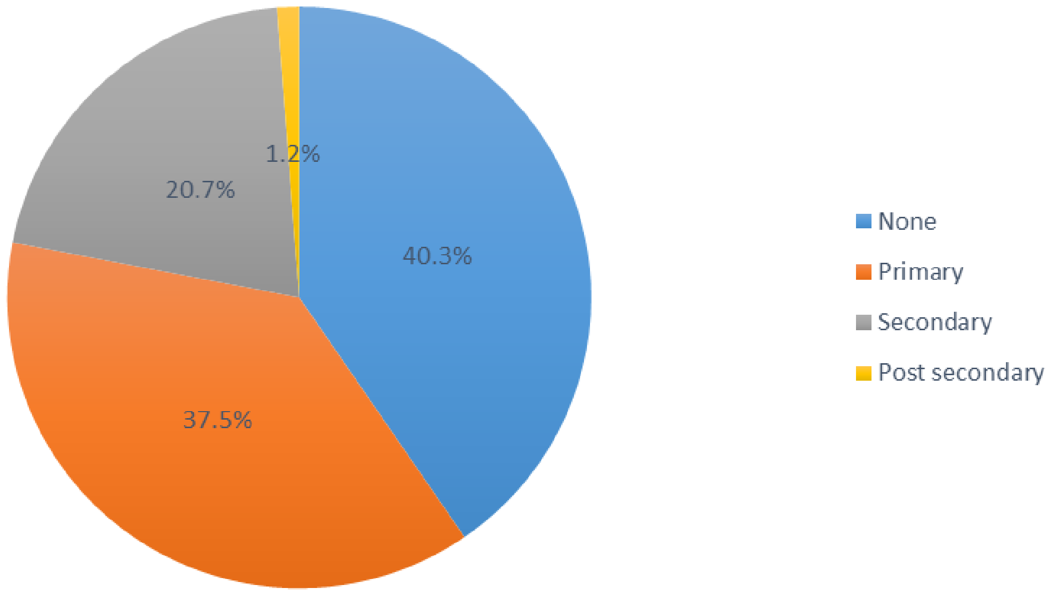

Figure 3. Proportion of study populations at various educational levels.

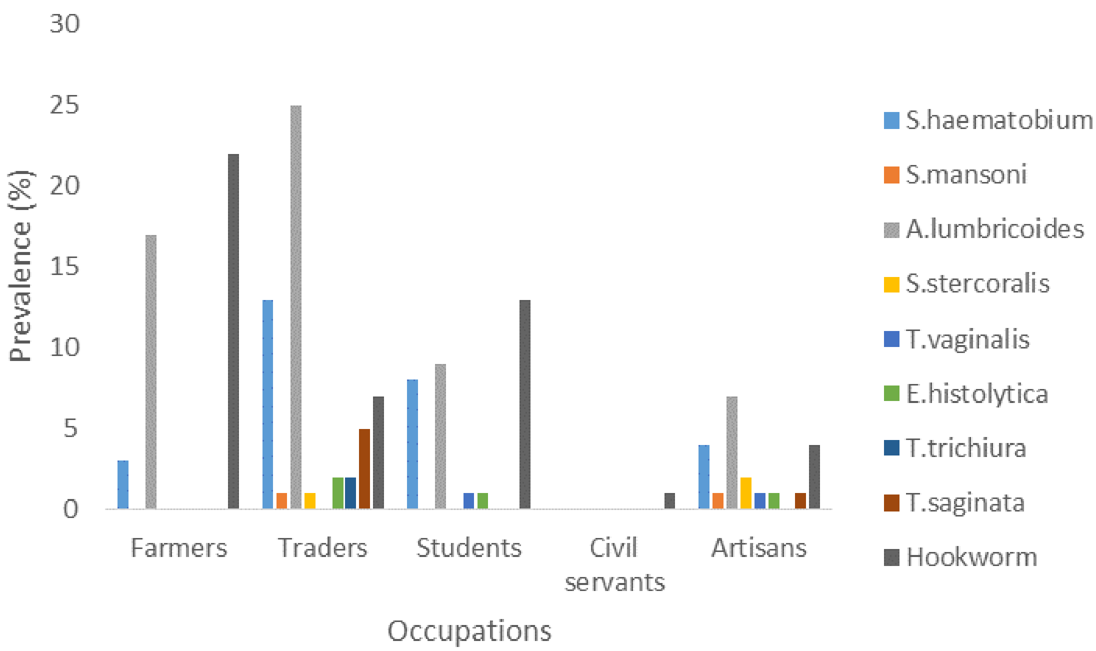

Figure 4. Distribution of Infection in the occupational groups.

had occasional access to pipe borne water, the prevalence of *S. haematobium* was high. This suggests that the river which serves as the main/alternate source of water is a viable transmission site. The variation in the prevalence of schistosome infections recorded in the different communities may be due to differences in exposure and duration of contact with cercaria infested water. Continuous contact with contaminated water source may result in multiple infections of the same subject over time. This could explain the positive correlation between age and egg burden.

The high prevalence of *Ascaris lumbricoides* and Hookworm in this study is in consonance with the report of Banji et al. (2012) in Niger State, Nigeria. A.

Table 2. Haematological parameters (Mean) with different parasites.

Parasites	Haematological parameters	
	Hb (gm/dl) Mean ± SE	PCV (%) Mean ± SE
S.haematobium	8.6 ± 0.9	25.9 ± 2.7
S.mansoni	10.1 ± 0.2	30.5 ± 0.7
Hookworm	9.4 ± 1.5	28.1 ± 4.5
A.lumbricoides	9.5 ± 1.6	28.6 ± 4.7
E.histolytica	8.7 ± 1.1	26.2 ± 3.3
T.trichiura	9.1 ± 1.2	27.5 ± 3.5
T.vaginalis	9.2 ± 0.7	27.5 ± 2.1
S.strongyloides	10.1 ± 1.0	30 ± 3.0
T.saginata	9.1 ± 1.2	27.2 ± 3.5
Uninfected	11.5 ± 0.1	34.5 ± 0.4
Infected	9.5 ± 1.6	28.8 ± 4.7

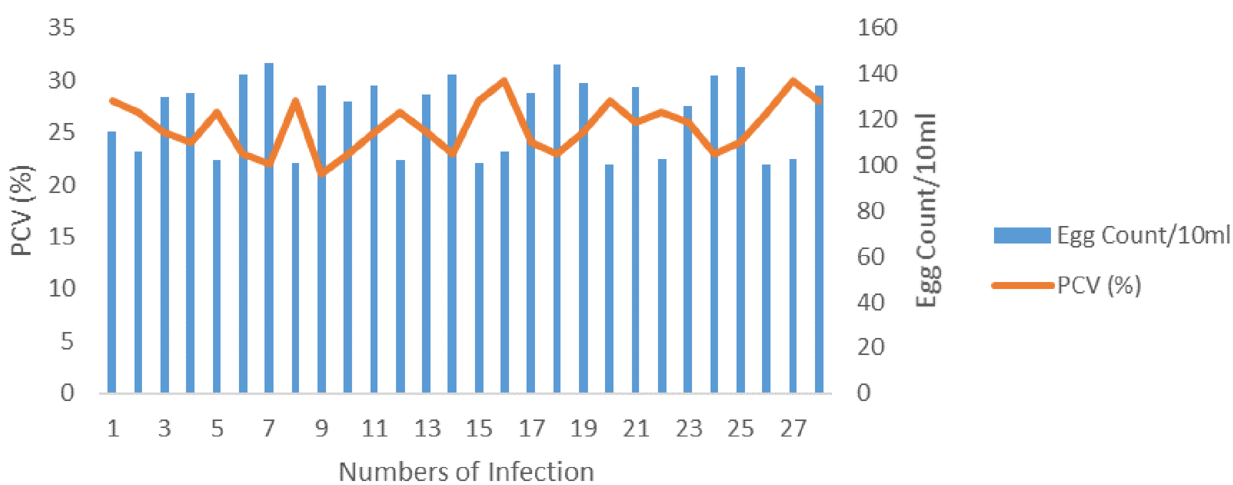

Figure 5. Relationship between *S.haematobium* infection and PCV.

lumbricoides and hookworms are some of the main parasite species transmitted through contaminated soils and are predominant in poor deprived communities with low sanitary conditions. Being in constant contact with soil is an occupational hazard for farmers and this explains the high rate of infection with these soil transmitted parasite in these female farmers. The contamination of water and soil by these parasites resulting from indiscriminate defecation and urination in the communities emphasizes the lack of basic social amenities and the low hygiene levels which make active parasite transmission possible.

The high prevalence of schistosome infection and relatively high levels of *A. lumbricoides* infections in girls (11-20 yrs) in the study were probably due to the social responsibility of carrying out household chores which brings them into close and constant contact with the infectious agents, also suggesting that these young girls contribute significantly to the pollution of the water sources. Schistosomiasis poses high risk particularly to female members of some African societies because of their multiple water-related activities. This was reiterated by Uyanga (1990). The lower prevalence of schistosome infection in the older women might be due to acquired immunity and decreasing exposure to infection because of fewer domestic chores. The low level of information or education amongst the study participants about the cause and symptoms of parasitic infections observed in this study maybe due to the low level of formal education of the study population. Also, as a result of this low level of education, it was observed that a high proportion of the women were engaged in low paying jobs or trade limiting their economic capabilities. Low socio-economic status has been known to play a major role in the epidemiology of parasitic diseases. Infections cause morbidity and this helps to maintain the vicious cycle of poverty, decreased productivity and inadequate socio-economic development as reported by WHO (2012). Anaemia (low haemoglobin count) was recorded in the study to increase with egg counts; this may have a deleterious effect on the haemopoetic status of infected participants. An association between *S haematobium* infection and high morbidity was also reported by Kjetland et al. (2006), King et al. (2010), and Mbabazi et al. (2011). Banji et al. (2012) also reported a correlation between prevalence of *S. haematobium* and haematuria. It is however important to note that in some communities in Nigeria, haematuria is well known but interpreted and explained in a traditional way and by culturally determined concepts (Akogun and Obadiah, 1996). Constant blood loss due to S. *haematobium* infection increases deficiency in iron and other minerals in women from menarche to menopause. This must have a considerable impact on their physical well-being, working capacity, and resistance to infection. Poor dietary habits, nutritional deficiencies, socio-cultural factors, and concomitant infections may interactively exacerbate the degree of anaemia in the subjects. The lack of information about the causes of parasitic diseases and ways to prevent transmission/infection may contribute immensely to the disease state in these communities.

Conclusion

It is highly conceivable that urinary schistosomiasis and presumably other intestinal parasites play a significant role in anaemia in women and girls. The resulting effect of these infections on the individual, households, and the entire communities could be severe. Consequences of parasitic infections on communities are multi-faceted and may be difficult to assess. It is therefore important that intervention programmes (surveillance and treatment) should be designed to include all members of the community. Also, basic social amenities especially potable water and toilet facilities should be provided for these communities.

Conflict of interests

The authors have not declare any conflict of interests

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