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Research article

PREVALENCE OF SCHISTOSOMIASIS AMONG FEMALE ADOLESCENTS IN OTI SUB-DISTRICT OF KRACHI EAST IN THE VOLTA REGION, GHANA.

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Abstract

Schistosomiasis is the second most important parasitic disease after malaria. It is caused by different species of trematode parasites of the genus Schistosoma, which leads to chronic ill health with serious consequences on the socioeconomic development of tropical and sub-tropical countries. Schistosomiasis in females could have long term consequences. There is very little targeted with access the burden of schistosomiasis among young females in Ghana. This study sets out to investigate the prevalence of urinary and intestinal schistosomiasis among young female adolescents in the Oti sub-district of the Krachi East District. The study used the simple random sampling technique to draw 400 female pupils between the ages of 11 and 15 from Primary 6 to Junior High School 3. A Probability proportional to size sampling approach was used to select the number of pupils per class. A mixed approach which combined the use of semi-structured interview and a collection of urine and stool samples of respondents for laboratory investigations were used. It was revealed that young female adolescents possessed adequate knowledge about the disease. These help explain why the prevalence rate of urinary schistosomiasis among young female adolescents was found to be as low 7.58%. It was also found that the association between the urine strip and urine microscopic examinations is statistically significant. It was also found that 5.87% of young female adolescents who took praziquantel for the past three months tested positive of haematobium ova. Sanitary practices of households is not the best, 76.28% of the respondents do not have toilet facilities. Many therefore use public toilets and the bush if they want to defecate. It is concluded that, Schistosomiasis is still a public health problem in

Oti Sub-District (communities) in the Krachi East District of the Volta Region, despite respondents' knowledge about the disease was high. Mass Drug Administration, Community Mobilization and Health Education regarding the cause, transmission and prevention of the disease, education about good personal and sanitary hygiene practices could be considered in order to significantly reduce the prevalence of infection to the barest minimum within these communities.

Keywords: Schistosomiasis (Bilharzia); Haematuria; Schistosoma haematobium; Praziquantel; Bulinus species; Rural areas; Agrarian.

1.0 Introduction

In spite of the fast improving knowledge in the area of urinary schistosomiasis, which cuts across global burden, treatment, and associated morbidity [1] there are repeated cases of these parasites in humans, especially children. This causes untold hardship as a result of the associated morbidities and mortalities [2]. Schistosomiasis is a parasitic disease caused by different species of trematode parasites of the genus *Schistosoma,* which leads to chronic ill health with serious consequences on the socio-economic development of tropical and sub-tropical countries. Schistosomiasis or bilharziasis is a very ancient disease. It was Theodore Bilharza German pathologist, who first discovered *Schistosoma haematobium* worms while performing autopsy in Cairo, Egypt in 1852[3].

Bilharza reported both terminal and lateral spine eggs in the oviduct of the female worms, while others like Manson found only lateral spine eggs in a patient from the Caribbean islands[4]

The lateral spine species of *Schistosoma* is named after Sir Patrick Manson. With time the problem of schistosomiasis has been exacerbated by water and agricultural development projects, especially in the developing countries where the use of science and technology in agrarian practices is on the ascendancy. In endemic rural areas of many developing countries, the schistosomiasis is an important occupational hazard[5] The disease is endemic in 74 countries in Africa, South America, India, China, South East Asia, Sri Lanka, the Caribbean, Indonesia, Philippines, and Taiwan[6]

The World Health Organization (WHO) reports that when these countries are considered together, 600 million people are at risk of infection and 200 million more are actually infected in these areas. In 1990, the disease was responsible for the loss of 1.5 million Disability Adjusted Life Years (DALY's) worldwide; and mortality is estimated to exceed 100,000 per year. In Ghana, it is the second most prevalent parasitic disease after malaria [7]

The disease is endemic in the rural areas possibly due to the contamination of the source of water and the social and cultural practices of the inhabitants. Water is obtained from surface water for drinking and household chores. The water is fetched while standing in the water and laundry is sometimes done whilst standing in the water. When it is hot people swim in the water for considerable lengths of time. In most of these places there are no bridges and so people cross the river and streams to go from one bank to the other. These socio-cultural activities enhance skin-water contact, increasing risk of skin penetration by the cercariae[6]

In Ghana, prior to 1951, little precise information was available concerning schistosomiasis apart from brief references in the annual medical report[8]

Prior to the formation of the Volta Lake, *Bulinus globosus* was the commonest and most widely distributed snail host in Ghana. It was found in all areas of the country but it was rare in the Volta Basin. *Bulinus truncatus,* on the other hand, was limited to the Savannah areas, that is, the south-east areas of the Volta Delta and parts of the Northern Ghana [9]

In Ghana, recent studies indicate that the disease is of great public health importance. A study by Aryeetey et al. (2000) revealed that prevalence of Schistosoma haematobium infection in some communities drained by the Densu river ranged between 54.8% and 60.0%.[10]

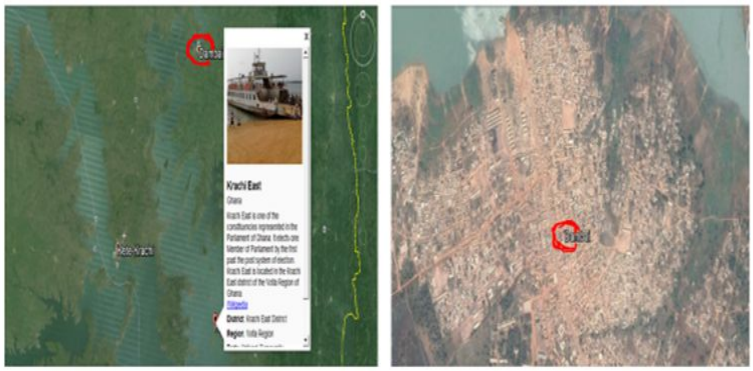
2.0 Materials and Methods

This was undertaken using a cross-sectional design that included questionnaire administration, urine and stool sample examination to determining knowledge, attitudes and practices (KAP) among female adolescents aged 11 to 15 living in the Oti Sub-District (**figure 1**) of the Krachi East District of the Volta Region.

Source: Krachi East District Assembly

THE MAP OF KRACHI EAST DISTRICT IN THE VOLTA REGION; SHOWING THE PROJECT AREA IN GREEN CIRCLE.

(Source: google earth)



THE SEARCHLIGHT LOCATION OF THE PROJECT AREA IN RED CIRCLE IN THE KRACHI EAST.

The study was conducted in 6 Primary Schools and 19 Junior High Schools in Dambai (the market and the administrative center of the district, which is the multi-ethical community).

The community is situated in the Northern part of the district, bound the lake on the main road to Krachi West District. Its geographical coordinates range between latitudes 7º 40'N and 8º 15'N and longitudes 0º 6'E and 0º20'E. Dambai community has economic activities such as farming, trading and few of the people are civil servants. The present of the lake in the community attracted different ethical groups because of its economic activities. Also, the lake serves as a great source of water supply various activities carried out by the people within the community and even some outers who come around, since the community do not have enough supply of mechanized bore-holes to feed all the inhabitants. Some of the residents of the Dambai community and majority of which are children, also

swim in this lake. Since children are most vulnerable and affected by the schistosomiasis infection, it became imperative Mass Drug Administration (MDA) should be carried out by Health professional in the community. The MDA was carried out in Dambai community three months before this study.

2.1 Ethical Approval

The study protocol was approved by the Ethical Review Committee of Ensign College of Public Health, Kpong in Eastern Region, Ghana.

2.3 Sample Collection

Before the collection of the specimens or samples, informative talks with head of schools, teachers and pupils was conducted on the purpose of the study. After obtaining informed con- sent from parents and teachers, a questionnaire was administered to pupils between the ages 11to 15 on demographic and epidemiologic information, such as age, class, tribe, place of residence, and proximity of place of residence to the water body and knowledge of respondents on Urinary Schistosomiasis infections. Urine samples were collected from the pupils by probability proportional to size sampling approach used to select the number of pupils per class. The number enrolled per class was done proportional to the number of female pupils in the class. The class list was used in systematic random sampling in each class.

The specimen containers were given to 409 instead of 400 consented subjects randomly from different classes, which were clean, dry, leak-proof, and wide-mouthed plastic, also with a zip mini-poly bag which the specimen would be put and well labeled to prevent contamination. They were given instructions on how to avoid contamination during collection of the urine samples.

About 15mls of (terminal) urine were collected per randomly selected child, per school into the specimen containers provided, and the samples were then transported to the Dambai health center and Dan-Moser Memorial Clinic laboratories in Dambai in the Krachi East District in the Volta Region for analysis.

2.3 Urine Strip Examination

5 mls volume of well mixed urine sample was poured into a 10 ml labelled centrifuge tube. Microscopic examinations were carried out on each specimen sample. Urinalysis Reagent Strip (from Rapid Laboratories Limited) were dipped into each urine specimen sample for a few seconds. It was then removed and an approximate time of 60 seconds was allowed per each sample to elapse for chemical reactions of the strip to the urine sample to occur. The outcome of the reaction was compared to a colour chart (on the container of the urine strip). The results were recorded with emphasis on blood and protein. Any colour change after the stipulated time was ignored.

2.4 Microscopy Examination

The urine samples were span at 3000 rpm for 4 to 5 minutes. The deposits examined with the aid of a light binocular microscope using the ×10, ×40 and ×100 objectives by basic recommended protocol.

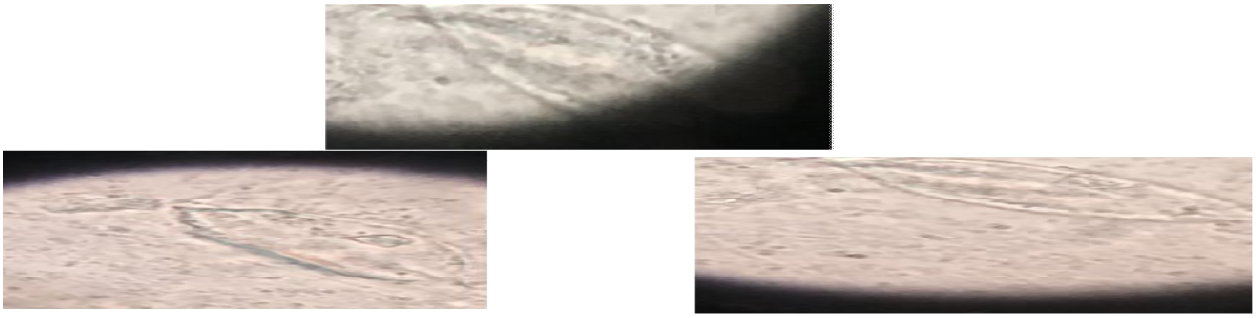
2.5 Data Analysis

Data was analyzed using a platform created in Epi Info (version 7.1.50) and SPSS (version 20). Entry, verification and cleaning were run concurrently with data collection. The entry, which was in SPSS format, was converted into Stata format for analysis. Stata software was used to generate frequency tables, bar charts, pie charts and cross-tabulations to describe and summarize field data, (reported in percentages and 95% confidence) and a P-Value less than 0.05 was considered statistically significant.

3.0 Results

3.1 Prevalence of Urinary Schistosomiasis

Figure 2Heamatobium Ova (eggs)



Some of the pictures of Schistosoma haematobium ova seen in the laboratory during the laboratory investigation.

3.2 Proximity to Water Body

The table below indicates that 280 respondents constituting 68.5% walked over 1000 meters to draw water for domestic purposes. Also, 4.5% of respondents walked between 600 and 1000 meters before they could access water for use. Those who cover 500 meters and below form 27% of respondents sampled for the study. On the average respondents walk 957.1 meters to draw water for domestic use.

Table 1Proximity to Water Body

Distance (m)	Frequency (f)	Percentage	Midpoint (x)	Fx
1 – 500m	111	27	250.5	27805.5
501 – 1000m	18	4.5	750.5	13509
1001-1500m	280	68.5	1250.5	350140
Total	**409**	**100**	**409**	**391454.5**

Source: Field data (2016)

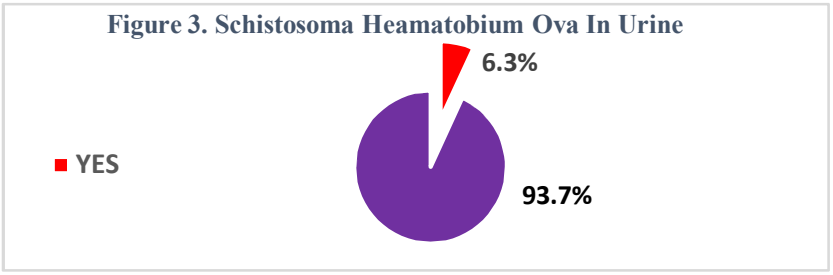
Mean (x) $= \Sigma fx / \Sigma x$

$= 391454.5 / 409$

= 957.1 meters

3.4 Urine Microscopic Examination

The chart represented below reveals that the ova of Schistosoma haematobium were not seen in 381 of the respondents, forming 92.4%. On the other hand 7.6% of the respondents tested positive of Schistosoma haematobium ova.



Source: Field Data, 2016

3.5 Association between Urine Microscopic and Urine Strip Examination

Table 2. below is a cross tabulation for Urine Microscopic and Urine Strip examinations. From the table, 6.3% of respondents tested positive of blood in urine. Out of the 6.3% of respondents who tested positive of blood in urine, 6.0% of those tested positive by urine microscopic examination also tested positive by urine strip examination. Also, 93.8% of respondents who tested negative by urine microscopic examination also tested negative by urine strip examination. The relationship between these examinations by the using the Cramer's V is 90.0%. This shows that 90.0% of the times, people who test positive by urine microscopic examination will also test positive by urine strip examination and vice versa. The validity of the relationship between these two examinations was also found to be statistically significant at the 0.01, 0.05 and 0.10 level of significance.

Table 2Cross-Tabulation Urine Microscopic and Urine Strip Examinations

		Urine Microscopic Examination		Total
		Yes	No	
Urine Strip Examination	Yes	24 **6.0%**	4 **1.0%**	28 **7.0%**
	No	0.3 **0.2%**	371 **92.7%**	372 **93.0%**
Total		25 **6.3%**	375 **93.8%**	400 **100%**

Chi (2) = 324.5 **Source: Field data, 2016**
Cramer's V = 0.9006
Pr = 0.000

The cross tabulation therefore, brought about two main factors,

1. Urine strip examination strongly associated with urine microscopic results
2. Intake of praziquantel not associated with presence of Schistosoma haematobium ova

3.6 Praziquantel and Urinary Schistosomiasis Prevalence

Table 3below is a cross-tabulation of praziquantel intake and urinary schistosomiasis prevalence among respondents. Respondents are asked if they had taken praziquantel for the past three months. About 6.3% of respondents who took praziquantel for the past three months tested positive of haematobium. On the other hand, 93.8% of respondents who took the drug tested negative of the presence of haematobium ova in their urine. However, 0.8% of respondents did not take the drug but tested positive of the presence of haematobium ova. Also, 6.8% of young female adolescents who did take the drug tested negative of the presence of haematobium ova in their urine.

Table 3Praziquantel and Urinary Schistosomiasis

Praziquantel Intake	Presence of Schistosoma haematobium Ova		TOTAL
	Yes	No	
Yes	22 **5.5%**	348 **87.0%**	370 **92.5**
No	3 **0.8%**	27 **6.8%**	30 **7.5%**
Total	25 **6.3%**	375 **93.8%**	400 **100%**

Chi (2) = 1.9298 **Source: Field data, 2016**
Cramer's V = -0.0687
Pr = 0.165

4.0 Discussion

4.1 Characteristics of Young Female Adolescents

Data collected on the characteristics of respondents include age, proximity to water body, persons respondents are staying with, items possessed by respondents' parents and detection of blood in their urine for the past three months. The majority of young female adolescents are between 14-15 years of age on the average, respondents cover 957.1meters before they can access water for use, similarly a study indicated that, about two-thirds (68.9%) of the participants revealed that they live near a water body(< 250meter) [22] The study also reveals that respondents are not only living with their fathers and mothers but aunties, uncles, family friends and friends. This has implications for urinary schistosomiasis infection. Younger female adolescents not staying with their biological parents are more likely to be burdened with household chores such as fetching water[23]. The regularity with which younger females visit these water bodies may expose their skins to penetration by the Schistosoma other study also reported 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 [24].Respondents' parents also possess items such as bicycles, radio sets, mobile phones and other items such as television sets, motor bicycles, computers and others. It is also revealed that the majority (84.6%) of respondents has not detected blood in their urine for the past three months. Only 15.4% of respondents respond that they have seen blood in their urine for the past three months.

4.2 Knowledge on schistosomiasis

Indicators that are used to assess respondents' knowledge of schistosomiasis include blood in urine being a disease, commonality of blood in urine in their communities, treatment of blood in urine in a health facility, mode of infection and control of blood in urine. It is noted that 4.9% and 6.6% of the respondents strongly disagree and disagree respectively that blood in urine is a disease. Approximately 32.3% agree that blood in urine is disease. Also, nearly half (49.6%) of the people interviewed strongly agree that blood in urine is a disease. Once the majority of respondents admit that blood in urine is a disease, it calls for celebration. This is because one it has been accepted as a disease in the community, the community will readily respond to health education on its treatment and prevention. In terms of the commonality of blood in urine in the Oti sub-district, an overwhelming 63.3% agree that blood in urine is common in their community, other study reported that knowledge of the participants regarding schistosomiasis transmission, signs and symptoms and prevention, it was found that a majority of 231 (92.4 %) of the respondents had heard about schistosomiasis (locally known as Bilharzia) [25]. This is indicative of the awareness of the prevalence of schistosomiasis in the Oti sub-district. About 14.9% of respondents are not aware of its prevalence or otherwise. However, 10.3% of respondents stated that blood in urine is not a common disease in

their communities. Knowledge of the spread of schistosomiasis is very crucial for prevention, similarly a study reported that concerning the knowledge about the prevention of schistosomiasis, 47.2 % (109/231) were able to give at least one measure of prevention, with 26.8 % mentioning avoiding swimming in ponds/ streams, 10.4 % avoiding washing clothes in ponds/streams, and 18.6 % mentioned taking anti-Schistosoma drugs [25]. It is evident that 85.8% of respondents know that schistosomiasis is gotten through swimming, fetching of water, bathing and fishing. Only 8.1% of respondents disagreed that urinary schistosomiasis could be gotten through swimming, fetching of water, bathing and fishing. Respondents' adequate knowledge on the mode of schistosomiasis transmission helps explain why the prevalence rate among respondents was found to be very low.
In terms of blood in urine prevention, revealed that, 88.5% strongly agreed and agreed that blood in urine can be prevented and controlled, meaning it is well noted that it is not normal to have blood in urine, so therefore it is a disease.

The foregoing discussion suggests that respondents' knowledge about schistosomiasis is adequate. This could be one of the reasons why its prevalence is low in the Oti sub-district.

4.3 Attitudes toward Schistosomiasis

The study also examined respondents' attitudes toward schistosomiasis. It is observed that, 60.2% of the respondents strongly agree that people who have blood in their urine should inform their parents immediately. The majority (62.1%) agree that they should get their parents informed if they detect blood in their urine. On the other hand, 28.6% of respondents do not see the need reporting to their parents if they detect blood in their urine. The study also reveals that more than half (62.1%) of respondents agree that people urinating blood should seek treatment in health facilities as against 7.3% of do not think so. In terms of seeking treatment for urinary schistosomiasis from traditional healers, an overwhelming 78.5% of respondents disagree. Only 15.4% of respondents think victims of schistosomiasis should resort to traditional healers for treatment. It was also found 58.2% of respondents do not buy the suggestion that victims of schistosomiasis should buy drugs and take. However, 35.7% are of the opinion that victims of schistosomiasis should buy drugs and use. The majority of respondents disagree that people urinate blood should do nothing about it. While 26.2% of younger female are of the view that public education on the spread of urinary schistosomiasis is not necessary, 67.0% see the need for public education on the spread of urinary schistosomiasis. Also, younger females think that the practice where those urinating blood are taken of the community as in the case of other diseases should not be encouraged. Only 12.0% of respondents encourage such a practice. The majority (81.7%) of respondents disapprove of the suggestion that victims of urinary schistosomiasis should not be allowed to go near the river. The study also reveals that majority of respondents approve that we can eat and drink with people affected by urinary schistosomiasis. Just as practices, respondents have very positive attitudes toward urinary schistosomiasis.

4.4 Practices

Because schistosomiasis is a water-related disease, an examination of water practices among respondents when conducting a study on the disease cannot be over emphasized. The study revealed that the majority of respondents occasionally swim the river. Apart from swimming in the river, the study revealed that the majority of respondents do not urinate in the river, fish on the river or stand in the river to wash. The main source of water in Oti sub-district is the river. As such, 61.1% and 54.3% depend on this water source for washing and bathing respectively. Though the river is the main source of water in the study area, more than half (52.1%) of respondents depend on pipe-borne water for drinking. All the same, 36.9% of respondents use river water for drinking. On the whole, water practices among respondents can be described as good and point to the low prevalence rate of urinary schistosomiasis among young female adolescents.

4.5 Prevalence of Urinary Schistosomiasis

Urine samples of respondents were subjected to different examinations in the laboratory. About 91.9% of respondents tested negative of blood in urine by urine strip examinations. Only 8.1% tested positive of blood in urine. As stated above, the low prevalence rate of urinary schistosomiasis could be due to the adequate knowledge that respondents have about the disease or females are not more working in and around contaminated areas like

males to contract the disease as a similar studies have reported, higher prevalence of the infection was recorded among males than females. This is probably due to increase contact with infected water bodies by males than female as result of engagement in swimming and or agriculture activities. Nsowah-Nuamah et al., also reported high rates of the infection among males (55.9%) than the female counterparts (3.7%). Chimbari and Chirundu, conducted a similar study in Zimbabwe which also revealed higher infection rates among males than the females. These observations are expected considering the fact that some socio-cultural practices such as farming, fishing and recreational activities expose males to infected water bodies than the female counterparts [18]. Also positive attitudes that respondents have toward urinary schistosomiasis explains this low prevalence rate of the disease.

As the survey was done in the last four months for 50 samples and 10 were positive [26], as a result of that drugs of choice was distributed in the last three months before this study hence contributed to low prevalence

Another cause of the low prevalence rates of schistosomiasis is the good water-related practices that respondents engage in. The urine microscopic examination reveals that 92.4% of respondents did not test positive of Schistosoma haematobium ova. Only 7.6% tested positive of Schistosoma haematobium ova.

Further examination of the association between these two examinations using the chi-square statistic reveals that the use of the urine strip is as valid as the use of the urine microscopic. The test reveals that 88.0% of the times, a person who tests positive of urinary schistosomiasis will test positive by the use of the urine microscopic and vice versa. And this association between the two tests is found to be highly statistically significant.

Praziquantel is one of the commonest and cheapest drugs used for treating urinary schistosomiasis with success[27]. Pupils took this drug three months before this study was conducted. The efficacy of the medicine translated into the low prevalence rate of urinary schistosomiasis among young female adolescents in the study area. It is however worthy of note that a few respondents who did not take this drug for the past three months tested negative of the presence of haematobium ova in their urine. Interestingly, 5.9% of respondents who took this drug for the past three months tested positive of the presence of haematobium ova in the urine. It must be pointed out that though praziquantel is efficacious in treating urinary schistosomiasis, it is not supreme. Other factors may be responsible for the presence of haematobium ova in the urine of young female adolescents who took the praziquantel three months before the conduct of this research. Phamarco -tolerance, improper administration of the drug, among others could result in the situation where people who took the drug test positive of urinary schistosomiasis.

5.0 Conclusion

The ultimate goal in the control of the second parasitic infections after malaria, such as schistosomiasis is to break the chain of its transmission by bringing about a change in the environment and negative habits of the people making them acquired the infection. Many of those changes are needed in areas where these infections are endemic and resources limited in supply. This study, undertaken through knowledge, attitude and practice (KAP) on bilharzia with a view to finding reasons for differing prevalence in Oti Sub-District has provided some insight into essential activities, which must take place to ensure the success of any programme on schistosomiasis.

The adequate knowledge of respondents on schistosomiasis coupled with positive attitudes and good water-related practices is a major reason why the prevalence rate on schistosomiasis among young female adolescents is very low.

The chi-square statistic reveals that the use of the urine strip is as valid as the use of the urine microscopic; 88.0% of the time, a person who tests positive of urinary schistosomiasis will also test positive by the use of the urine microscopic and vice versa. And this association between the two tests is found to be highly statistically significant.

Interestingly, 5.9% of respondents who took praziquantel for the past three months tested positive of the presence of haematobium ova in their urine. The implication of this is that though praziquantel is common, efficacious and cheap, its administration needs properly monitoring to achieve desired results.

The study also reveals that the majority (76.3%) of respondents do not possess toilet facilities in their homes. This indicates that the ways of disposing fecal matter in the homes of respondents is not good for the prevention of

Schistosoma mansoni, soil transmitted helminth, cholera, typhoid fever and others, in the Oti Sub-District in the Krachi East District.

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