Original Research Article

Prevalence of Schistosomiasis amongpupils of Umunya ~~central~~ CentralSchool, Oyi ~~local~~ LocalGovernment, Anambra State, Nigeria.

ABSTRACT

Background: Schistosomiasis is a disease of medical importance caused by the parasitic worm *Schistosoma haematobium.* It is responsible for morbidities such as blood and protein deficiency in those infected. The study on the prevalence of urogenital schistosomiasis and contributory risk factors was carried out among pupils of Umunya ~~central~~ CentralSchool, Oyi ~~local~~ LocalGovernment, Anambra State between November and December~~,~~ 2021. **Methods:** The children were between the ages of 4-15 years. One hundred and twenty respondents of children were selected and their urine samples were collected and examined for the presence of haematuria and p~~P~~roteinuria using a combi 9 strip before the filtration technique was used to detect the presence of the parasite. Pupils data were collected using Google ~~forms~~ Formsresearcher's questionnaire. **Results:** Out of the ~~one hundred and twenty~~120 (62 males and 58 females) children examined, a total prevalence of 0% was gotten. The pupils had a good source of water although a few of them (8%) still drank from the rivers in the community which could predispose them to the disease. Knowledge of the disease was very little among the children and many of them ~~visits~~ visitedthe rivers for different activities (78%). **Conclusion:** Health education of the children and residents for improved perception of the behavioural and socio-economic activities associated with the disease will help reduce the burden ~~in~~ ofthe disease transmission.

INTRODUCTION

Schistosomiasis also known as bilharzia or snail fever is an infectious disease caused by blood t~~T~~rematode of the genus *Schistosoma.* It is the most important and prevalent ~~water borne~~water-borne disease, the parasite was first observed in Cairo

in 1851 by a young pathologist, Theodor Bilharz in the blood of mesenteric veins of a young man on autopsy. There are three major species under the genus *Schistosoma*, that can infect humans, and these are; *Schistosoma haematobium*, *Schistosoma mansoni* and *Schistosoma japonicum* (Colley *et al.*, 2014) while other species include; *Schistosoma mekongi* and *Schistosoma intercalatum*.

Furthermore, schistosomiasis~~Schistosomiasis~~ is among the set of 17 neglected tropical infectious diseases and it majorly affects people who live in these areas (tropics). It is also the second leading endemic parasitic disease after malaria on the list of parasitic diseases in 76 countries worldwide (Mubyazi *et al.*, 2017) and the disease has been implicated to be the cause of over 280,000 deaths each year in Africa alone (Chala *et al.*, 2018). Nigeria, with 20 million people requiring schistosomiasis preventive chemotherapy, is ranked first ~~amongst~~ among the countries of the world endemic for s~~S~~chistosomiasis (WHO, 2019). The ~~federal ministry~~Federal Ministry of Health in 2015 recorded that Nigeria had the highest burden of s~~S~~chistosomiasis in the world. The overall prevalence was 9.5% and it was present in all 20 states surveyed but was higher in the northern part of Nigeria.

The aetiological agent of urogenital Schistosomiasis is the infective stage i.e. cercaria~~Cercaria~~, of ~~*Schistosoma* *S.*~~*hematobium*, a digenic trematode of the phylum Platyhelminthes, whose intermediate hosts are some species of Gastropod Snails in the genus *Bolinus*(Tolulope *et al.*, 2018). These snails are found in freshwater, therefore proximity of communities to freshwater sources and irrigated lands ~~predispose~~ predisposesthem to the infective stage of the parasite (Cercariae). Some human activities also play a huge role in predisposing humans to infection by this parasite**.** Schistosome eggs are excreted by humans in ~~feces~~ faecesand urine**.** After hatching, miracidia infects specific snails ~~in~~ which ~~it~~ develops into cercariae~~Cercariae~~. Schistosoma cercariae penetrates the skin of humans during

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Please standardize throughout the manuscript.

domestic (for example., washing clothes or food materials) Recreational activities (for example., bBathing and swimming in infected freshwater bodies). Other factors that facilitates facilitatethe transmission of schistosomiasis include; proximity to freshwater bodies, socio economicsocioeconomic factors which influence occupational activities (e.g., poor individuals without running water at home are likely to contact freshwater bodies) and cClimate change (McCreesh *et al.*, 2015). Lack of access to improved sanitation facilities contributes to open defecation into freshwater bodies which also enhances the transmission of Schistosomiasis. Human inducedHuman-induced ecological transformations like dam construction and irrigation scheme developments are becoming the major risk factors for the resurgence of the parasitic disease.

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Symptoms of schistosomiasis are caused by the body body'sreactions to the worm's eggs. Urogenital schistosomiasis can present as chronic, which is the most common or acute haematuria (blood in urine), and dysuria (painful urination) in the early symptoms of the disease and it is worthy worthto notenoting that the severity of the disease is dependent on the intensity of the infection (Carter care, 2015). In women, urogenital schistosomiasis may present with genital lesions, vaginal bleeding, pain during sexual intercourse and nodules in the vagina. It could also induce pathology of the seminal vesicles, prostrateprostate, and other organs in mMen. The disease could also have other long-term irreversible consequences, including infertility (WHO, 2021). In children, sSchistosomiasis can cause anaemia, stunting and a reduced ability to learn, although the effects are usually reversible with treatment (WHO, 2021). The best ways of preventing schistosomiasis include avoiding swimming in freshwater containing cercariae, drinking safe water, and swimming in treated pools. Control measures could include massive drug administration to communities and targeted treatment of

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~~school age~~school-age children (CDC, 2017). Diagnosis of infection is confirmed by the identification of eggs in stools or urine specimens. Antibodies and/or antigens detected in blood or urine samples are also indications of infection. For urogenital schistosomiasis, a filtration technique using nylon, paper or polycarbonate filters is the standard diagnostic ~~techniques~~technique. Children with *S. haematobium* almost always have microscopic blood in their urine which can be detected by chemical reagent strips.

Significance of Study

Previous studies have shown that s~~S~~chool children are highly susceptible to the infection. Although past studies indicate the prevalence of urogenital schistosomiasis in Anambra State (2.9% and 5.5% for microscopy and hematuria respectively) (Ndukwe *et al.*, 2019), but current information on the prevalence of urogenital schistosomiasis in Umunya is lacking. The school children, representing a greater percentage of the community and being the group more susceptible to the disease' morbidity, makes them an important group for carrying out this investigation. Carrying out this study would help determine if there would be an urgent need for the government to start an integrated, targeted and effective schistosomiasis control programme among these pupils to help improve their health.

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Aim and Objectives

Thus, this study was aimed at investigating the prevalence and contributory risk factors of urogenital schistosomiasis among pupils in Umunya Central S~~s~~chool in Oyi local Government area of Anambra state, Nigeria.

MATERIALS AND METHOD

Study Area

This study was carried out in the Umunya community in Oyi Local Government Area of Anambra State, Southeast Nigeria. Umunya is a town situated at the center of Anambra State and it lies within latitudes of 6^0 12 34" N and longitudes 6^0 54` 51" E. It is a town of ten villages namely Ezi U~~u~~munya, Okpu, Ojobi, Umuebo, Amaezike, Ajakpani, Odumodu-Ani, Isioye, Odumodu-Enu and Ukunu. These villages are sub-grouped into Ezi-Ifite and Ikenga sub-divisions, the tri-partite heritage of all Gadite H/Igbos commonly referred to in anthropological history as ERI-AWKA Igbo. The climate of the area is typically tropical with distinct wet and dry seasons with a temperature range of 23-35^{0}C between June and December but rises to 25-37^{0}C between January and April. Farming and trading over the years has become the major occupation of the people while some of them are transport workers and civil servants. They rely on ~~borehole water~~borehole water and well water as their source of water.

Comment [J3]: Haematuria (British) vs hematuria (American)

Defaecation (British) vs defecation (American)

Centre (British) vs center (American)

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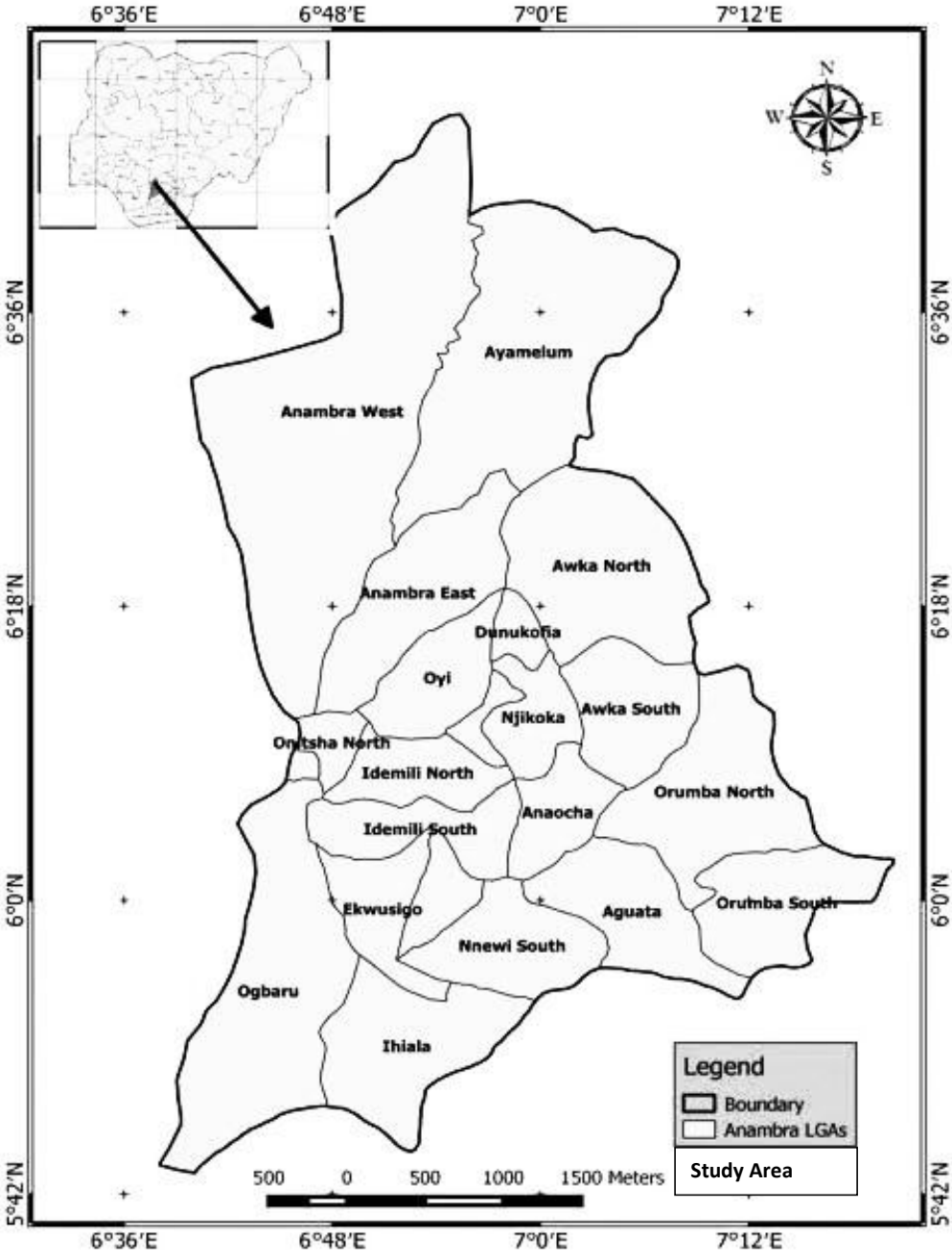

Fig 1: Map of Anambra state showing Umunya.

Study Design

The study design was a cross-sectional design to determine the prevalence and contributory risk factors of urogenital schistosomiasis among pupils in Umunya ~~central school~~Central School, Oyi local government area in Anambra State. The study countered both ~~survey~~ surveysof the pupils and laboratory studies of their urine specimens. One urine sample was collected from each pupil. ~~Study~~ The studywas carried out between October and December~~,~~ 2021.

Sample Population

The study population comprises ~~of~~ a total number of 120 pupils selected on a stratified random ~~base~~ basisfrom Umunya Central School in Oyi Local Government Area, Anambra State. The pupils were selected between the ages of 1-15 years from primary one to primary six.

Comment [J4]: Are the school children attending starting at age 1? Please check this.

Ethical Consideration

A letter of introduction was obtained from the ~~department~~ Departmentof Parasitology and Entomology, Nnamdi Azikiwe University, Awka. ~~Advocacy~~ An advocacyvisit was made to first inform parents, teachers and students ~~on~~ aboutthe research project and informed consent and informed accent ~~was~~ wereobtained from parents and pupils respectively prior to the commencement of the research.The volunteers (participants) were also made aware of the aim of the research, additionally, volunteers were assured that the results ~~will~~ would~~be solely use~~be solely used for research purposes.

Sample size

About 20 urine samples were taken from each class (Primary 1 to Primary 6) making a total of 120 samples which were used for the study.

Comment [J5]: Please explain further how the stratified random sampling was performed resulting in "about 20 urine samples" being sampled.

Administration of Questionnaires

Structured, Ggoogle-form researcher's questionnaire was used for data collection. Data on ~~pupils~~ pupils'age, gender, activities carried out in water bodies, parent's occupation as well as their view and knowledge of schistosomiasis, which was referred to as "Okpo mammiri" in their local parlance, was obtained using ~~Google forms~~Google forms. Data obtained was analyzed subsequently.

Collection of Urine Sample

The urine was collected between ~~10am~~10 am ~~2pm~~ 2 pmto coincide with the peak of excretion of ~~*Schistosoma*~~ *S.haematobium* eggs. Sterile 20ml plastic universal specimen bottle with screw-caps ~~were~~ wasused to collect terminal urine samples from the selected pupils. The samples were appropriately labelled with identification numbers and were transported to the lab where the analysis was done.

Determination of Biochemical Parameters

Reagent strips (Medi-Test Combi 9) were dipped into the Urine inside the universal containers. Various parameters such as g~~G~~lucose, p~~P~~rotein, b~~B~~lood, u~~U~~robilinogen, n~~N~~itrite, b~~B~~ilirubin and pH were evaluated according to the manufacturer's instructions.

Parasitological Examination using the Filtration Technique

The filtration technique was used in other to recover ova from the urine samples (Obisike *et al*., 2019).

Apparatus

~~Packet~~ A packetof polycarbonate membrane filters, forceps, 10ml syringes, 13mm filter holder, cotton wool, beaker, L~~l~~ugol's iodine, slide, cover slip and a m~~M~~icroscope.

Procedure

- Using the blunt-ended (untoothed) forceps, a polycarbonate membrane filter was picked and placed carefully on the filter support of the filter holder (13mm diameter).
- The filter holder was then attached to the end of a 10ml Luer syringe.
- The plunger was removed from the syringe before the syringe was filled to the 10ml mark with well-mixed urine after which the plunger was replaced.
- The syringe was then held over a beaker and the urine sample was gently passed through the filter.
- The filter holder was removed and unscrewed before the blunt-ended forceps ~~was~~ wereused to carefully remove the membrane filter which was then transferred in such a way as to leave the eggs intact on the filter paper. The filter paper was faced upwards while being placed on the slide.
- A drop of Lugol's iodine was added to the slide and covered with a cover slip.
- Using the x10 objective with the condense and the iris closed sufficiently to give good contrast, the entire filter was examined systematically by adjusting the microscope until a clear image ~~is~~ wasgotten.

Determination of intensity of infection

The number of eggs was counted and reported as egg per 10ml of urine. 1-10 eggs/10ml urine signifies light infection, 11-49 eggs/10ml of urine as mild infection and >50eggs/10ml of urine as heavy infection.

Microscopic examination of the samples was performed at the Laboratory of Parasitology and Entomology, Nnamdi Azikiwe University Awka, Anambra state.

Data analysis

The data obtained from the sample examination and questionnaires were represented on tables with respect to age, sex, prevalence and other risk factors. Analysis was done using the Cehi-square statistical method.

Comment [J6]: Please change to "age group". Age is continuous data and can't be tested using the Chi-square test.

Comment [J7]: Please indicate all of the risk factors assessed.

RESULTS

Six classes were selected for the study (Primary 1 to 6) and 20 samples were taken each from the selected classes summing 120 samples which were examined from Umunya ~~central school~~Central School. Out of the 120 samples examined 0 (0%) tested positive for urogenital schistosomiasis.

Prevalence according to sex

Out of the 120-sample collected and examined, 62 were males and 58 were females and there were no positive samples. This shows that there was no significant association between males and females in the prevalence of schistosomiasis.

Comment [J8]: What was the statistical test used to assess the association between gender and the negativity of the result?

Also, if no statistical test is used to assess the gender and the negativity of the result, the term 'no significant association' can't be used.

If statistical analysis was conducted for this, please indicate the p-value.

TABLE 1. Prevalence of Urogenital schistosomiasis by sex.

Sex	**No. Examined**	**No. Infected (%)**
Male	62 (51.7%)	0
Female	58 (48.3%)	0
Total	120 (100%)	0

Prevalence according to age.

The pupils were between the ages of 4 to 15 and of these age groups, no positive samples were observed.

TABLE 2. Prevalence of urogenital schistosomiasis by age group.

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Age interval	**No. Examined**	**No. Infected (%)**
4 – 6	15	0
7 – 9	54	0
10 – 12	50	0
13 – 15	1	0
Total	120	0

Risk factors of schistosomiasis Observed Among the Selected Children

From the questionnaire given to assess the risk factors promoting the spread of schistosomiasis, the following risk factors were observed. A greater number of children indicated that they make use of ~~Bore hole~~Borehole water (48%). Most of them make use of ~~pipe borne~~pipe-borne water (45%), w~~W~~hile a few of them still make use of water from rivers. 78% of them indicated that they still visit the rivers around them to carry out different activities, while 22% indicated that they don't go to the rivers for any activity. 81% of them were ignorant of what schistosomiasis was all about, its causes and transmission while the remaining 19% admitted to ~~have~~ havingheard of schistosomiasis or "Okpo mammiri" as they called it in their local Parlance. 77% representing a greater percentage of the pupils indicated to have recently ~~taking~~ takenworm medicines, while 23% of the pupils ~~haven't~~have not been dewormed.

Comment [J9]: Please indicate the percentage of pupil using the river water.

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Table 3.Risk factors of Schistosomiasis as observed among the pupils.

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Risk Factors	**Observation**	**Percentage**
Activities carried out in Natural water body	Bathing: 50	42%
	Washing clothes: 29	24%
	Defecation/Urination: 6	5%
	Fishing: 3	2%
	Washing food materials:6	5%
	No contact with river: 26	22%

Knowledge of the Disease (Urogenital Schistosomiasis)	Know about it: 23 Ignorant: 97	19% 81%
Source of drinking water	Shallow wells: 11 Tankers: 11 Streams: 10 Borehole: 48 Pipe borne water: 45	9% 9% 8% 38% 36%
Number of Dewormed	Dewormed: 92 Not Dewormed: 28	77% 23%

CHART 1. Showing the pupil's source of drinking water

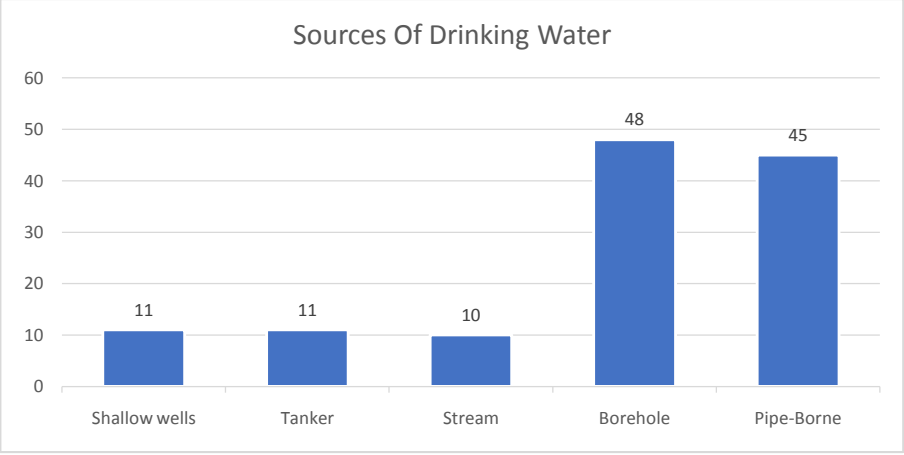

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CHART 2. Showing Number of Dewormed pupils

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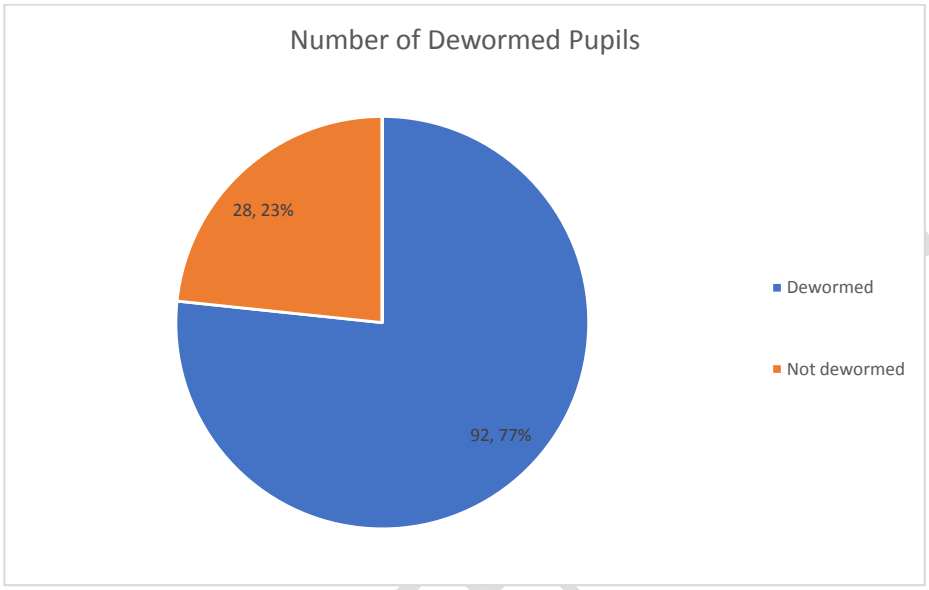

CHART 3. Showing Pupils Knowledge of the disease

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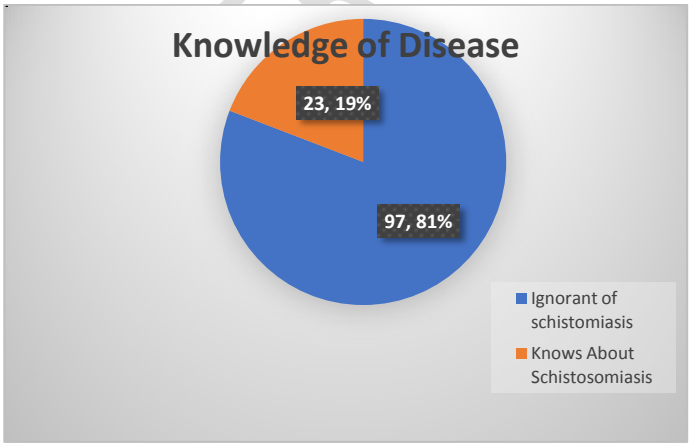
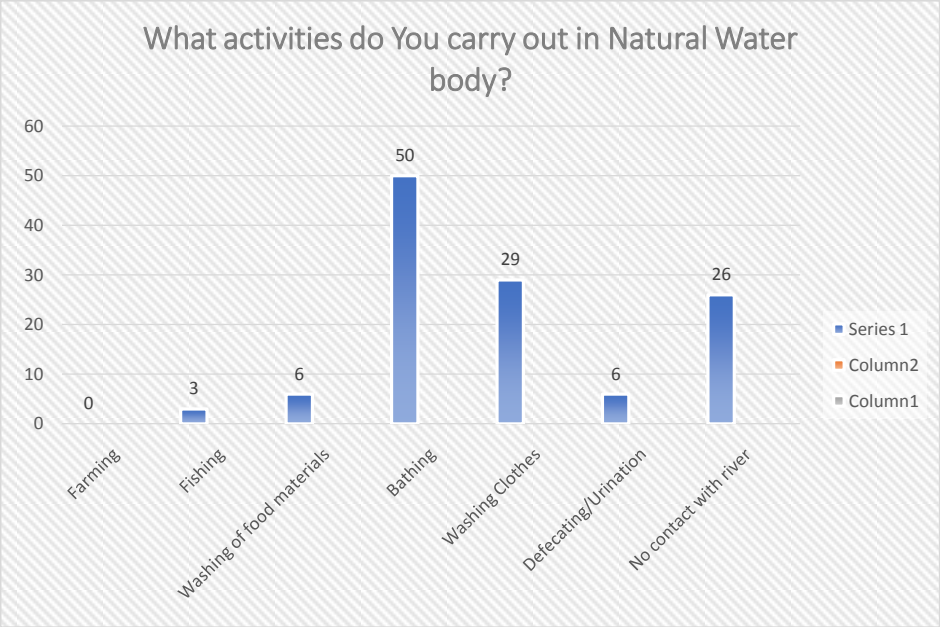


CHART. 4. Showing activities carried out by Pupils in Natural water bodies.



DISCUSSION

Schistosomiasis is a disease of medical importance. It is prevalent in Nigeria where it is responsible for grave economic losses (Chikwendu *et al.*, 2019). These resuls showed a total 120 school aged pupils, aged 4-15 years old were investigated in Umunya.

The findings of this study reveal the prevalence of urinary schistosomiasis among pupils in Umunya Central School, Oyi Local Government Area, Anambra State was 0% out of the 120 examined pupils. The prevalence in this work was relatively

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low compared to other studies reporting schistosomiasis ~~at~~ in~~other~~ places for instance Yvonne *et al.* (2019) reported that the prevalence of urogenital schistosomiasis in Anambra North ~~which~~ was 6.0%, Which may be due to the fact that the rivers and streams are not close to the schools which limits students' activities in them. Aribodor *et al*. (2019) also recorded a prevalence of 2.1% among school pupils in Nsugbe community, Anambra state. In Ebonyi state, prevalence was up to 49.7% in Ohaukwu Local Government Area of the state (Obionu *et al.,* 2014). Studies in other parts of Anambra and Maidugri reported a lower prevalence from a 2013 survey reported a prevalence of 9.5% (Federal Ministry of ~~health~~Health, 2015).

The 0% prevalence could be ~~as~~ a result of some factors which were observed during the research. From the study, it was observed that 45(36%) and 48(38%) of the study population used pipe-borne water and ~~borehole~~ boreholesas their major source of drinking water. This could be a contributory factor to the low prevalence of schistosomiasis, as this generally ~~reduce~~ reducestheir contact with ~~fresh water~~freshwater bodies and its use as a source of drinking water thereby reducing the possibility of infection (Amuta *et al.,* 2020).

Deworming using Praziquantel Preventive Chemotherapy (PC) has proven to be very effective and schistosomiasis can be easily controlled and treated with a single annual dose of praziquantel, which can also reverse up to 90% of the damage done by the parasite (Carter care 2015). From the collected data, a greater percentage (77%) of the pupils indicated to have always partaken in the annual deworming programme in the school which is pioneered by the government.

CONCLUSION AND RECOMMENDATION

Transmission of schistosomiasis in communities is enhanced by the resident's use of unsafe water sources of water for both personal and domestic activities as well as ~~behavioral~~ behaviouraland socio-economic tendencies that promote risky contacts with potentially ~~parasite infested~~parasite-infested bodies. It has also been observed that constant use of bore-holes, pipe borne and participation in annual praziquantel chemotherapy has actually reduced the prevalence of urogenital schistosomiasis to zero. Nevertheless, as was observed, ignorance of the disease was high among the children, therefore, to maintain the zero level of prevalence; health education and awareness should be created among the pupils and ~~residence~~ residentsof the communities for improved perception of the ~~behavioral~~behaviouraland socio-economic activities associated with the disease. ~~Children~~ Children's activities should also be regulated as they stand a higher chance of infection.

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