Protozoans that affect domestic animals with the skin as their predilection/migratory sites are majorly: toxoplasmosis, giardiasis, and leishmaniasis. Mostly, protozoans are vector-borne. In the course of the vectors of the protozoans feeding on the hosts, vectors such as Tsetse fly illicit localized painful reactions called chancre at points where they bite. (Naessens et al., 2003) These further precipitate itchings which many times, leave sores, damaging hides and skin. Also, skin lesions caused by protozoan organisms like *Leishmania* also cause huge deformities and damage to the skins of domestic animals. Eventually, costs are incurred to manage these wounds and if severe, patients may suffer social/ emotional neglect from their care owners.

5. VIRAL SKIN DISEASES OF DOMESTIC ANIMALS:

Viruses are not excluded from skin diseases causing agents. Varying with species and sometimes, one or more viruses affecting multiple species, eg. Papilloma Virus (causing Warts); viral skin infections have accounted for a global significant threat, reducing animal production and performance. Affecting Dogs (such as Viral Pigmented Plaques, Papilloma Virus), Cattle (most especially Lump Skin Disease Virus, Bovine Papular Stomatitis Virus and Vesicular Stomatitis Virus) and many viruses affecting many other animal species. Viruses cause tremendous damage to the skin and hides of infected animals and incite social neglects thereby socioeconomically impacting affected patients negatively.

6. NUTRITIONAL DEFICIENCIES CAUSING SKIN DISEASES IN DOMESTIC ANIMALS:

Although, not commonly encountered, Zinc, Vitamin A & C, Copper and Fatty acid deficiencies have been incriminated in many skin diseases. Vitamin A in particular has been discovered and documented to further increase the susceptibility to secondary pyoderma, *Malassezia* dermatitis, and poor wound healing in dogs, horses, caged birds, and reptiles. Clinical presentations in such disease conditions could be alopecia, hyperkeratosis, pruritus, seborrhea or appearance discoloration. Nordic breeds of dogs and goats have also been reported to be associated with hereditary nutritional deficiencies. (Patrick Hensel, 2010). The sight of some of these disease conditions by animal owners sometimes could be appalling, inciting neglect from them and so, inflicting social harms to such animals. Also, managing these conditions increase overall cost of production and in some cases, economic losses are made when production losses arising from the drastic drop in production quantity and when such patients become overwhelmed by secondary infections.

7. CONCLUSION

As discussed above, skin diseases, regardless of their causes, cause tremendous economic and social losses to domestic animals that suffer from them. Hence, precautionary measures should be implemented by Veterinarians, Animal Heath Technicians and Animal Handlers/ Owners in the forms of vaccinations, ectoparasite controls, optimum hygiene practices, and adequate nutritional supplementation to reduce the occurrences of these skin diseases. Thereby, eliminating or significantly reducing the possibility of economic and social losses from arising.

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Prevalence of Infection Aspects of Schistosomiasis Among Primary School Children in Nsugbe Town Anambra East of Anambra State South Eastern Nigeria.

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ABSTRACT

A study was undertaken in Nsugbe community in Anambra East Local Government Area of Anambra State Southern Nigeria to investigate the prevalence and intensity in three primary schools of urinary schistosomiasis in the area. An open-ended questionnaire was administered to the pupil to ascertain how often they visit the water bodies for domestic choirs. A total of 281 pupils were randomly selected from primary 1-6 aged 6 to 15years and their urine samples collected were examined using urine filtration technique after receiving consent from their parents through their teachers, of which 117 are males and 164 are females. Data was cross tabulations and Chi Square test was used to analyze the data and test for significance. Results show that out of 281 students examined, only one male (0.4%) in primary 1 pupil within the age group of 11-15 was infected with S. haematobium, showing a very low prevalence. In the study, statistical analysis showed that the prevalence of the disease is neither gender, class nor age dependent ($p>0.05$). This low prevalence could be attributed to improved water sources in the area but preventive measures should be put in place to prevent an outbreak of the disease in the community.

Keywords: Schistosoma, School Children, Prevalence, Nsugbe.

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1. INTRODUCTION

Schistosomiasis is an acute and chronic disease caused by parasitic worms of family Schistosomatidae (Dawaki et al., 2016). People are infected during routine agricultural, domestic, occupational, and recreational activities, which expose them to infested water. In terms of public health and renumeration importance, this disease is second only to malaria as the most devastating parasitic disease (Abdulkadir et al., 2017). It is the deadliest Neglected Tropical Disease (NTD), infecting an estimated 140 million people each year, with over 90% of cases occurring in sub-Saharan Africa and the most important water-borne disease (Chiamah et al., 2019).

The parasites that cause schistosomiasis live in certain types of freshwater snails. The infectious form of the parasite, known as cercariae, emerges from the snail into the water. You can become infected when your skin comes in contact with contaminated freshwater. Lack of hygiene and certain play habits of school-aged children such as swimming or fishing in infested water make them especially vulnerable to infection (Ezeh et al., 2019). Estimates show that at least 236.6 million people required preventive treatment for schistosomiasis in 2019, out of which more than 105.4 million people were reported to have been treated (WHO, 2021). An estimated 200million people are infected worldwide. Infection occurs when your skin comes in contact with contaminated freshwater in which certain types of snails that carry schistosomes are living (CDC,2020). More than 200,000 people die each year in Sub-Saharan Africa from this infection (Davis and Stoppler, 2020).

Many symptoms of schistosomiasis infection frequently include fever, blood in stools or urine, and abdominal discomfort. The immune response and Schistosoma egg migration through tissues and their deposition in body organs cause the disease (Davis and Stoppler, 2020). Health care professionals diagnose schistosomiasis by identifying characteristic eggs in feces, urine, or biopsy samples. Serologic (blood) tests may aid the diagnosis. Though, there is no vaccine for treatment of urinary schistosomiasis, antiparasitic drug praziquantel (Biltricide) often effectively treats schistosomiasis, especially in acute phase disease (WHO, 2021). Chronic urinary schistosomiasis often produces complications in various organ systems for example, urinary system, heart, and liver (Davis and Stoppler, 2020).

Between 1987 and 2021, many prevalence studies on urinary schistosomiasis were carried out in Nigeria, particularly in the northern States like Yola(Akogun and Akogun, 1996), Kebbi(Daniel et al., 2001), Katsina(Abdulhamid et al., 2021),Plateau (Dakul et al., 2007),Adamawa (Pukuma and Musa, 2007),(); in the Middle-Belt Region in Benue (Obisike et al., 2021), Cross River(Kenneth et al., 2021); south-western States including Oyo State (Nwabueze et al., 2009; Adeoye et al., 2008),Ogun State (Mafiana et al., 2003);South-southern states especially Delta State (Nwabueze and Opara, 2007), as well as south-eastern States such as Enugu (Njom, 2021), Imo (Uwaezuoke et al., 2007;), Anambra (Obiukwu et al., 2009; Ekwunife et al., 2004), Abia (Alozie and Anosike, 2004), Ebonyi(Uneke et al., 2007). From these studies, it appears that urinary schistosomiasis is widespread in Nigeria, and its endemicity in many communities has not yet been determined.

Schistosomiasis is more common in males because of their increased exposure to infected water through bathing, swimming, and agricultural activities. S. haematobium causes genital lesions in 30% of women who are infected. Vulval lesions may also occur, increasing the risk of HIV transmission (Ahmed and Bronze, 2020). The frequency and severity of Schistosoma infections vary with age. Children and adolescents are most often infected and are infested most heavily. Infection rates and severity may vary with gender-specific activity at all ages. Schistosomiasis has been detected in the placenta and newborns have been diagnosed with the disease, thus, confirming congenital infection. Globally, infections occur majorly in individuals aged 10-19 years. In many affected areas, schistosomiasis infects a large number of children under 14 years of age. In some endemic areas, the prevalence in this group may be up to 100% but in persons older than age 19 years, the prevalence of active infection and egg counts slowly reduces (Ahmed and Bronze, 2020).

In Anambra state, there is evidence that there has not been any substantial study over the past decade especially in Nsugbe, Oyi Local Government Area which is a community in the riverine area of Anambra State. The present study of urinary schistosomiasis among children in primary schools in Nsugbe, Anambra State, Nigeria will highlight and provide the much-needed information on the current status of schistosomiasis in the community.

2. MATERIALS AND METHODS

The Study Area

The study was carried out among students of Nsugbe, Oyi Local Government Area of Anambra State. The study area with geographical coordinates 6º 12´51´ North and 6º 48´10´ East has a tropical rainforest vegetation and is bordered by Onitsha on the west, Nkwele-Ezunaka, Umunya to the southwest, River Anambra to the north across which lies such towns such as Anam and Asaba. On the east are towns such as Umuleri, Aguleri, EnugwuAguleri, Nando, Nteje, Awkuzu, Igbariam, and Achalla. It has a humid climate of 77% with a temperature of about 28°C (87°F) and a rainfall between 152 and 203 centimeters annually.

Community members are mainly traders, public servants, artisans etc. Sources of drinking water are taps, wells, water tankers, streams and rivers. Most inhabitants make use of herbal medicines as the health centres are lacking and most hospitals are owned by private individuals. Also, some community members resort to open defecation and urination.

Ethical Clearance and Informed Consent

Permission for study was obtained from the secretary for education in charge of primary schools in Oyi Local Government Area. Ethical clearance was gotten from Chukwuemeka Odumegwu Ojukwu University Teaching Hospital, Amaku, Awka. After successful advocacy visits to the study area, informed consent was obtained from parents and guardians to enlist their wards in the study.

Selection of children

The study population consisted of 281 pupils from primary classes 1-3 aged between 5-15 years from the selected public schools whose parents/guardians gave their consent were enrolled.
The design was a cross-sectional study which involved public primary school pupils.

Urine Sample Collection

Samples of urine from each subject were collected in a dry, labeled, sterile 70ml sample bottle for urinalysis, with emphasis on the last drop. On each sampling day, urine collections were done between 09.00 and 14.00 hours when Schistosome egg excretion is maximum.

Examination of urine sample for the presence of haematuria

A reagent strip (ACCU- ANSWER Uric 9V) was carefully dipped into the sterile bottle containing the urine for 5 seconds. The resulting change in colour of the strip after a while was compared with manufacturer's colour chart to estimate the amount of blood in the urine.

Examination for Schistosoma haematobium ova

Urine filtration technique was used for each urine sample to prepare two slides. To prepare a sample, a syringe with an O-ring rubber seal and 13 mm polycarbonate membrane filter to capture S. haematobium eggs is used. The transparent filter membrane paper was gently picked up with forceps, placing the shiny part up and was carefully installed into the filtration kit of the syringe which is cone-shaped after which it was covered properly.10ml of urine was taken up from the sample container using the syringe which was then fitted tightly into the filtration kit. Urine was manually filtered through a polycarbonate membrane filter using syringe by flushing the urine in the syringe out through the filter paper into a bowl after which it will be discharged. Any eggs present in the urine are caught by the filter.

Then, the syringe is removed and water is flushed out through it severally to avoid contaminating the next sample. The filter paper was gently placed on a well-labelled slide having the same information as the sample container to avoid misplacing the results. This process is repeated to make another slide, which are then mounted on a microscope slide for viewing S. haematobium eggs. The eggs were identified with their characteristic terminal spine on microscopic examination with ×10 and × 40 magnification.

Data Analysis

All data was entered into Microsoft Office Excel spread sheet 2010, where they were cleaned by checking for accuracy, errors and missing values. Cross tabulation and Chi square test analyses were carried out using SPSS for windows version 17 to test for significance and relationship.

3. RESULTS

281 urine samples, comprising 117 males and 164 females were examined for the presence of Schistosoma haematobium eggs from three schools in Nsugbe, Oyi Local Government Area. Only 1 (0.36%) was positive as shown in table 1.

Table 1: Prevalence of Schistosoma haematobium infection

Schistosoma haematobium infection			
Number Examined	Number Infected	Percentage Infected (%)	Number Uninfected	Percentage Uninfected (%)
281	1	0.36	280	99.64

Sex-related Prevalence of Schistosoma haematobium Infections in the Three Primary Schools Examined in Nsugbe

The prevalence of Schistosoma haematobium varies among both sexes and shows no statistical significance ($p>0.05$). In relation to sex, prevalence of Schistosoma haematobium shows that females have a higher prevalence than males.

Table 2: Prevalence of Schistosoma haematobium among the pupils by sex

Gender	Number Examined	Number Infected	Number Uninfected
Male	117	1 (0.4%)	116(99.6%)
Female	164	0	164
Total	281	1	280
		Ns	Ns

X^2=1.407, P >0.05 (Not significant)

Age-related Prevalence of Schistosoma haematobium Infections in the Three Primary Schools Examined in Nsugbe

The prevalence of Schistosoma haematobium varies among age-groups and shows no statistical significance (p>0.05). Result on prevalence based on age indicates that the Schistosoma haematobium egg was prevalent among children within the age of 11-15 (14.59%) years than in other age groups.

Table 3: Prevalence of Schistosoma haematobium infection based on age

Age group(years)	Number examined	Number infected	Number uninfected
< 6	19 (6.76%)	0	19 (100%)
7 - 10	221(78.65%)	0	221 (100%)
11-15	41(14.59%)	1 (2.44%)	40 (97.56%)
Total	281	1	280
		Ns	Ns

X^2=5.875, P>0.05 (Not Significant)

4. DISCUSSION

Studies have indicated that urinary schistosomiasis is a major health problem in the rural areas of Middle East and most African countries. It remains one of the major health problems facing developing children. The endemicity of the diseases in many rural areas were attributed to ignorance, poor living condition, inadequate sanitation, water supply, personal and environmental hygiene as well as water contact activity with snail infected rivers, streams and Pond (WHO, 2021).

This present study shows that urinary Schistosomiasis is present among primary school children in Nsugbe but at a very low rate. Of 281 pupils examined, only one person (0.4%) was positive. Hence, a very low prevalence rate was recorded. This could be as a result of provision of various sources of water in the community such as boreholes, tap, harvested rain water, making them less exposed to infected water bodies. The prevalence of urinary schistosomiasis in Nsugbe is low compared to Safana, Katsina state (21.3%) as reported by Auta et al., (2020).

The prevalence of the infection was higher in males than in females. This is similar to the studies done by Umoh et al., (2020) where more males (10.3%) were reported to be infected than females (4.3%). Also, the sex specific prevalence of a study carried out by Bala et al., (2012) showed that males had the highest infection rate of 81.7% while females had 68.6% prevalence.

This study recorded the prevalent age group as 11-15years. A similar result can be seen in the work done by Biu et al., (2009) where prevalence was higher among age groups between >13 and 15 years (50.0%) compared to age groups of 7-10 years (12.5%) and >10-13 years (37. 5%) ($p<0.05$). This is in contrast to reports by Abdulhamid et al., (2021) where 7-9 age group had the highest prevalence (33.7%), followed by age groups 10-12 (28.5%) and 13-15 (25.9%).

5. CONCLUSION

The study has demonstrated that urinary schistosomiasis is not prevalent among primary school pupils in Nsugbe. Because there is a tendency that the disease might epidemiologically spring up and get a higher prevalence especially during dry season where frequency of water body contact activities is higher, preventive measures should be adopted such as educating people about the causes and transmission of urinary schistosomiasis as well as the control. Also, improved agricultural activities and irrigation may be practiced.

Authors' Contributions

OVO—conceived the idea and wrote the manuscript. IIB, and NIC—collected the data and participated in writing the manuscript; All authors read and approved the final manuscript.

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Competing interests

The authors declare that they have no competing interests.

Availability of data and materials

The study data is available on personal request to the corresponding author.

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