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Original Article

Prevalence and risk factors of schistosomiasis infection among primary school pupils in Patigi Local Government Area, Kwara State, Nigeria

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إنتشار وعوامل الخطر لعدوى البلهارسيا بين تلاميذ المدارس الابتدائية في منطقة الحكم المحلي فى باتيجي، ولاية كوارا، نيجيريا

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الملخص:

الخلفية البلهارسيا البولية مرض استوائي طفيلي مهمل ناجم عن الاصابة بالطفيل شيستوسوماهيماتوبيم. تعتبر البلهارسيا مشكلة صحية عامة رئيسية في نيجيريا. حددت هذه الدراسة مدى إنتشار و عوامل الخطر الحالية لعدوى البلهارسيا البولية بين تلاميذ المدارس الابتدائية في منطقة الحكم المحلي فى باتيجي، ولاية كوارا، نيجيريا.

الطرق: أجريتهذه الدراسة المقطعيةفي المناطق المحلية الثلاث في منطقة الحكم المحلي في باتيجي. تم استخدام استبيان شبه منظم لاجراء مقابلات للحصول على معلومات اجتماعية وديموغرافية بالإضافة لأنماط الاتصال بالمياه وعوامل الخطر للتلاميذ الذين تتراوح أعمارهم بين 5-15 سنة. جمعت عينات البول من ألفي تلميذ للتحليل المجهري للكشف عنبيضطفيل شيستوسوماهيماتوبيم.

النتائج: بلغ معدل إنتشار عدوى البلهارسيا البولية 35٪ بين 2000 طفل تم فحصهم. سجلت منطقة باتيجي أعلى معدل انتشار بلغ 66.7٪. لم تتم ملاحظة أي فروق ذات دلالة إحصائية في مستوىإنتشار البلهارسيا البولية بين الذكور (36.2٪) والإناث (33.2٪) أوبين أى من الفئات العمرية المختلفة.عوامل الخطر الرئيسية التي ارتبطت بتوطن داء البلهارسيا البولية بين تلاميذ المدارس الابتدائية في منطقة الحكم المحلي في باتيجي تتلخص فى وجود مسطحات مائية موبؤة، إزدياد أنشطة الاتصال بالمسطحات المائية، إزدياد عدد مرات زيارة النهر الموبؤ، الزمن المستغرق عند زيارة المسطحات المائية ، انخفاض مستوى معرفة الوالدين بالقراءة و الكتابة، وإمتهانالوالدين للأنشطة الزراعية. علاوة على ذلك، وجدنا أن التبول أثناءالسباحة وقلة استخدام الأحذية الواقية عند زيارة النهر كانتا من الممارسات التي جعلت خطر إصابتهم بالطفيل أكبر.

الخلاصة: كان معدل الإنتشار الذي تم الحصول عليهمرتفعا في هذه الدراسة ، مما يدل على أن المرض متوطن بالمنطقة حسب تصنيف منظمة الصحة العالمية. هذا الأمر يدعو إلى برنامج عاجل و فعال لمكافحة البلهارسيا البولية في المنطقة.

الكلمات الرئيسية: الإنتشار،عوامل الخطر، البلهارسيا البولية، الحكومة المحلية باتيجي

Abstract ***Background:*** Urinary schistosomiasis is a neglected parasitic tropical disease caused by *Schistosoma haematobium* which has posed to be a major public health problem in Nigeria. This study determined the current prevalence and risk factors of urinary schistosomiasis infection among Primary school pupils in Patigi Local Government Area, Kwara State, Nigeria.

Materials and Methods: This was a cross-sectional study conducted in the three local district areas in Patigi Local Government Area. Semi-structured interviewer administered questionnaire was used to obtain information on socio-demography, water contact patterns and risk factors of the pupils aged between 5−15 years. Urine samples were

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collected from two thousand pupils for microscopic analysis for the detection of *S. haematobium* eggs.

***Results*:** The overall prevalence of schistosomiasis infection was 35% among the 2000 children examined. Patigi District recorded the highest prevalence of 66.7%. No statistical significant difference was observed in the prevalence of urinary schistosomiasis between males (36.2%) and females (33.2%) and among the different age groups. The major risk factors that were associated with the endemicity of urinary schistosomiasis among primary school pupils in Patigi Local Government were the presence of infested water bodies and increased water contact activities with the infested water bodies, increased frequency of visit to the infested river, prolonged duration of stay in the water bodies, low parental literacy, and farming occupational activities of the parents. Furthermore, urinating while swimming and poor utilization of protective shoes while visiting the river were some of the practices that placed them at yet a greater risk of being infected by the causative agent.

***Conclusion*:** The prevalence rate obtained in the study was high, an indication that the region is endemic by WHO classification. This calls for an urgent effective urinary schistosomiasis control programme in the zone.

Keywords: Prevalence, risk factors, urinary schistosomiasis, Patigi Local Government.

Introduction

Schistosomiasis (also known as bilharziasis, snail fever, or Katayama fever) is a neglected parasitic tropical disease caused by a trematode of the genus *Schistosoma*, and it is one of the major public health problems facing developing countries[1]. It is mostly found in Asia, Africa, and South America in areas where the water contains fresh-water snails Bulinus which carry the parasite.

Globally, over 600 million people are at risk with over 200 million infections in 76 countries annually. More than 20 million people come down with the disease following infection and it is estimated that about 20,000 deaths are attributable to the disease annually[2]. Sub-Saharan Africa accounts for 93% (192 million) of the world estimated 200 million cases of schistosomiasis. The highest prevalence of this infection in Africa is seen in Nigeria (29 million), which is closely followed by United Republic of Tanzania (19 million), Ghana, and Democratic Republic of Congo (15 million) and Mozambique (13 million) making up the top five countries in Africa with schistosomiasis infection[3].

Schistosoma haematobium infection is endemic in Nigeria with varying prevalence rates ranging between 2% and 90%[4]. Empirical data reveals that *S. haematobium* is the predominant species in the country, accounting for 79.8% of all reported cases, while the rate of *S. mansoni* reached 16.7% and that of *S. intercalatum* 3.7%. However, *S. haematobium* being the most prevalent of the three species among school-aged children often exceeds the high-endemicity threshold of 50% prevalence, according to the WHO (2002) classification of schistosomiasis rates of prevalence (i.e. 0.1-9.9%, low prevalence; 10.0−49.9%, moderate prevalence; and >50%, high prevalence[5]. It is endemic in Nigeria, especially in the poor and marginalized communities where it poses public health challenges to the inhabitants of those areas.

The endemicity of the disease in many rural areas has been attributed to ignorance, poverty, poor socio-economic status, inadequate sanitation, inadequate public infrastructure and water contact activity with snail infected rivers, streams and ponds[6]. School-age children are at the greatest risk of acquiring schistosomiasis basically because of their frequent water contact recreational activities. To date, concerted efforts to control schistosomiasis in Nigeria have failed, not only due to lack of political will or inadequate funding for the control programs, but basically, because reliable data regarding its geographical distribution are lacking.

Despite the existence of very favourable conditions for the transmission of urinary schistosomiasis in Patigi Local Government Area (LGA), no study of this magnitude had been conducted in recent time to determine the prevalence, and associated risk factors of the disease among primary school pupils who are majorly at risk of infection. However, due to the paucity of empirical schistosomiasis estimates of endemic foci within States and LGAs and the general concern that the disease may be increasing in prevalence, distribution and importance in Patigi LGA, efforts in this study were devoted to evaluate the current prevalence, and the associated risk factors of the disease among primary school pupils in Patigi LGA.

Materials and Methods

This research work was conducted in selected primary schools in Patigi LGA. Patigi is an ancient town in Kwara State, Nigeria, inhabited by the Nupe people. The Local Government was made up of three districts: Lade, Patigi and Kpada District (Fig. 1).

The districts were divided into wards comprising of different communities. There were 44, 34 and 39 primary schools including 3, 6 and 1 private schools in these districts respectively making a total of 117 primary schools in Patigi LGA. The estimated population of primary school pupils according to Patigi Local Government Education Authority 2014/2015 schools' enrolment list was 20,331 pupils; there were 7294, 7952 and 5085 primary school pupils in Lade, Patigi and Kpada districts respectively.

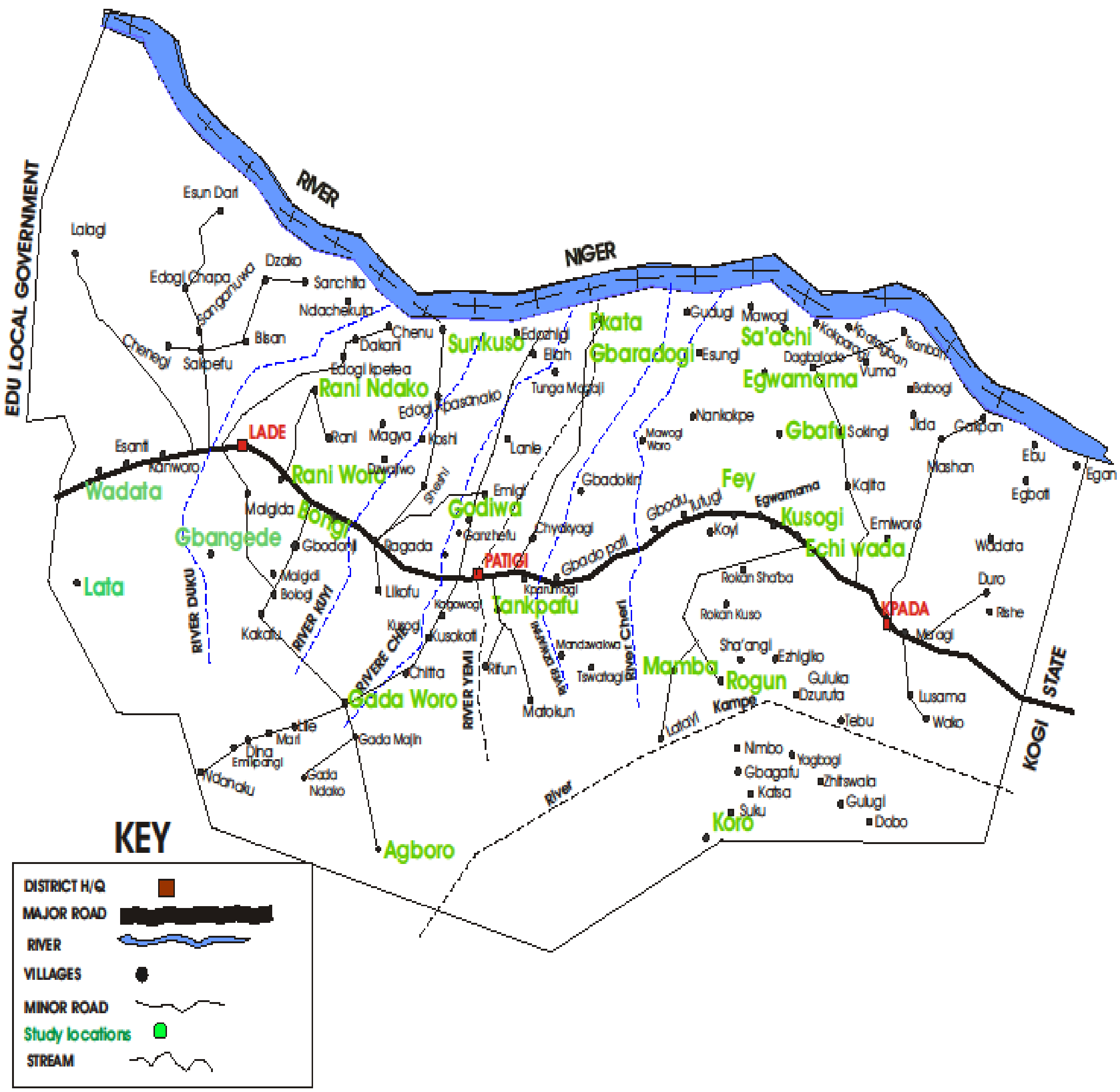

Figure 1: A sketch map of Patigi local government area showing the boundaries, some of the rivers, districts and the study locations.

The study was a cross-sectional survey carried out between March to July 2016 to assess the prevalence and risk factors associated with urinary schistosomiasis transmission among primary school pupils aged 5−15 years in Patigi LGA. Primary school pupils aged 5−15 years who were dully registered in the public and private schools and were present in school at the time of the study were included in the study for sampling. While those below the age of 5 years and above 15 years were excluded from the study. Also excluded were those not present in school at the time of sample collection and those that had taken praziquantel in the last six months.
A multi-stage sampling method was used to select 2000 respondents from the study population. The sample size of 2000 respondents was proportionately allocated to the three districts of Patigi LGA based on the population of primary school pupils in each district. One third of the public primary schools in each district were selected by simple random sampling while the private schools in each district were purposively added to the selected public schools and the sample size for each district was proportionately allocated to the selected schools based on the population of each school. The population of primary school children in each school was stratified by sex and the desired sample size selected by systematic random sampling based on the proportion of male and female pupils.
A standardized semi structured Interviewer administered questionnaire and sterile specimen bottle for urine sample collection for laboratory analysis were used for data collection. The questionnaire comprised of sections on demographic information, water contact patterns, socio-economic status and risk factors.
About 10−15ml of terminal urine sample was collected into sterile, plastic universal containers between the hours of 10:00 − 14:00 hours on each collection day. Each sample collected was labeled with the same identification numbers that appeared on the questionnaire form. Then urine samples were transported to the Laboratory Department of Patigi General Hospital for laboratory analyses.
Ten ml of the urine sample was centrifuged at 5000rpm for 5 minutes. The supernatant was discarded to leave the sediment which was transferred to the centre of a clean grease-free glass slide to which a cover slip was added. This was mounted on a light microscope and examined at x40 objective to identify *Schistosoma haematobium* ova which was characterised by a terminal spine. Urine samples containing egg(s) of *S. haematobium* and without eggs were recorded.
The Data from completed questionnaire was sorted and edited manually to detect omissions and error**.** The raw data obtained was analyzed, using computer base software Programme SPSS version 20.0 (Statistical Package for Social Sciences). Data were presented in tables, charts and percentages. The chi-square was used to compare differences and association between variables. Differences and associations were considered significant at a p value of < 0.05.
Ethical approval for this study was obtained from the Ethical Review Committee of University of Ilorin before the commencement of the study. Permission was also obtained from the health and education departments of Patigi LGAs where the study was carried out. Permission was obtained from the village head of each of the communities where the primary schools were located before the commencement of the study. Oral informed consent was obtained from parents through the Parents Teachers Associations of the respective schools. Informed consent was obtained verbally from the respondent before administering the questionnaire and participation by pupils was voluntary. Information collected from participants was maintained with utmost confidentiality as names were not used on the forms and samples but codes.

Results

In this study, 2000 primary school pupils in Patigi LGA were involved, 578 from Lade District, 947 from Patigi District and 475 from Kpada District and all respondents took part and were eligible for final analysis giving a response rate of 100%. The majority of the respondents were male (55.8%), with male: female ratio of 1.3: 1. The age group of the respondents ranged from 5 to 15 years with a mean age of 9.22 ± 2.51. Majority of the respondents were in the 8-10 years age group (47.5%) while 14−15 years' age group has the least number of respondents (5.2%). The predominant occupation of the households examined was farming and greater proportions of the parents were uneducated (Table 1).

Table 1: Socio-demographic characteristics of respondents

Variable	Frequency	Percentage %
Districts		
Lade	578	28.9
Patigi	947	47.3
Kpada	475	23.8
Gender		
Female	883	44.2
Male	1117	55.8
Age Groups		
5-7	536	26.8
8-10	950	47.5
11-13	409	20.4
14-15	105	5.3
Mean ± SD	**9.22 ± 2.51**	
Fathers occupation		
Farmer	1028	51.4
Fishing	276	13.8
Trading	470	23.5
Civil Servant	206	10.3
Others	20	1.0
Mothers occupation		
Farmer	1028	51.4
Fishing	70	3.5
Trading	308	15.4
Civil Servant	114	5.7
Housewife	480	24.0
Fathers level of education		
Uneducated	896	44.8
Primary	406	20.3
Secondary	434	21.7
Tertiary	264	13.2
Mothers level of education		
Uneducated	1040	52.0
Primary	396	19.8
Secondary	323	16.2
Tertiary	241	12.0

Well served as the major source of domestic water supply and together with borehole accounted for 58.7% of domestic water supply among the study population. However, despite the availability of well and bore hole for domestic water supply, majority of the respondents 96.4% still visited the river for one purpose or the other (61% visited river on daily basis, while 35.4% occasionally). Washing of clothes is the major water contact activity engaged in by the respondents. Majority of the respondents had the river they frequently visit very close to their homes (33.9%) and their schools (32.4%). Greater proportions of the respondents (68.9%) spend an average duration of 35minutes in the river (Table 2).

Table 2: Information on water contact pattern

Variables	Frequency	Percentage%
Sources of water for domestic use		
Bore hole	477	23.9
River	640	32.0
Stream	186	9.3
Well	697	34.8
Frequency of visit to the river		
No visit	71	3.6
Occasionally	709	35.4
Everyday	1220	61.0
Activity in river		
No visit	71	3.6
Washing	983	49.1
Bathing	307	15.4
Fetching water	205	10.2
Swimming	434	21.7
Distance of river to house		
Don't know	17	0.9
Close	447	22.4
Very close	678	33.9
Far	317	15.8
Very far	541	27.0
Distance of river to school		
Don't know	17	0.9
Close	590	29.5
Very close	649	32.4
Far	243	12.1
Very far	501	25.1
Duration of stay in river (minutes)		
No visit	71	3.5
< 10	88	4.4
10 – 60	1375	68.8
> 60	466	23.3

According to the wealth index, the highest social class, among the respondents was the third social class since no respondent was found in the fourth social class. However, majority of the respondents 1277 (64%) belong to the second social class. The distribution of socioeconomic status according to private and public school showed a similar trend for both public and private schools with higher proportion of the respondents in second social class, followed by third social class and few in lowest social class. Majority of the respondents 847(42.4%) practiced open defecation, while only a few used flushed toilet 447(22.3%) (Table 3).

Table 3: Association between prevalence of S*chistosoma haematobium* and socio-demographic characteristics of respondents.

Variable	**Urinary schistosomiasis**				
	Positive (%)	**Negative (%)**	**Total**	**X²**	**P**
Age Groups					
5 – 7	187 (34.9%)	349 (65.1%)	536 (26.8%)		
8 – 10	312 (32.8%)	638 (67.2%)	950(47.5%)		
11 – 13	159 (38.9%)	250 (61.1%)	409(20.4%)		
14 – 15	39 (37.1%)	66 (62.9%)	105(5.3%)	4.849	0.183
Total	**n= 697(35%)**	**1303**	**2000**(100%)		
Mean ± SD	**9.22 ± 2.51**				
Gender					
Male	404 (36.2%)	713 (63.8%)	1117(55.8%)		
Female	293 (33.2%)	590 (66.8%)	883(44.2%)	1.937	0.164
Districts					
Lade	33(5.7%)	545(94.3%)	578(28.9%)		
Patigi	632(66.7%)	315(33.3%)	947(47.3%)		
Kpada	32(6.7%)	443(93.3%)	475(23.8%)	805.62	**< 0.001**
Fathers education					
Uneducated	312(34.8%)	584(65.2%)	896(44.8%)		
Primary education	144(35.5%)	262(64.5%)	406(20.3%)		
Secondaryeducation	177(40.8%)	257(59.2%)	434(21.7%)		
Tertiary education	64(24.2%)	200(75.8%)	264(13.2%)	19.881	**< 0.001**
Mothers education					
Uneducated	366(35.1%)	674(64.9%)	1040(52.0%)		
Primary education	144(36.4%)	252(63.6%)	396(19.8%)		
Secondaryeducation	137(42.4%)	186(57.6%)	323(16.2%)		
Tertiary education	50(20.7%)	191(79.3%)	241(12.0%)	29.706	< 0.001
Fathers occupation					
Farmer	413 (40.2%)	615 (59.8%)	1028(51.4%)		
Fishing	65 (23.6%)	211 (76.4%)	276(13.8%)		
Trading	160 (34.0%)	310 (66%)	470(23.5%)		
Civil servant	49 (23.8%)	157 (76.2%)	206(10.3%)		
Others	10 (0.5%)	10 (99.5%)	20(1.0%)	41.621	< 0.001
Mothers occupation					
Farmer	475(46.2%)	553(53.8%)	1028(51.4%)		
Fishing	25(35.7%)	45(64.3%)	70(3.5%)		
Trading	14(4.5%)	294(95.5%)	308(15.40%)		
Civil servant	32(4.6%)	82(6.3%)	114(5.7%)		
House wife	151(28.1%)	329(71.9%)	480(24.0%)	187.7	<0.001
Total	**697**	**1303**	**2000**		
Social class					
Lowest(4-9)	28 (32.6%)	58 (67.4%)	86(4.3%)		
Second (10-14)	473 (37.0%)	804 (63.0%)	1277(63.8%)		
Third (15-19)	196 (30.8%)	441 (69.2%)	637(31.9%)	7.568	0.023
Total	697	1303	2000(1000%)		
Sanitary facility					
Open defecation	277 (32.7%)	570 (67.3%)	847(42.4%)		
Pit toilet	168 (23.8%)	538 (76.2%)	706(35.3%)		
Flush toilet	252 (56.4%)	195(43.6%)	447(22.4%)	130.9	< 0. 001
Type of school					
Public	512(32.6%)	1059(67.4%)	1571(78.6%)		
Private	185(35%)	244(65%)	429(21.4%)		
Total	697	1303	2000	16.466	< 0.001

Urinating into the water body during water contact activities is a common practice among the respondents, as 1678 (83.8%) engage in such while 322 (16.2%) do not (Table 4).

Table 4: Association between prevalence of *Schistosoma haematobium* and risk factors (water contact pattern).

Variable	Urinary schistosomiasis Positive (%)	Negative (%)	Total	X²	P
WATER CONTACT ACTIVITES					
Domestic source of water					
Bore hole	161(33.8%)	316(66.2%)	477(23.9%)		
River	133(20.8%)	507(79.2%)	640(32.0%)		
Stream	21(11.3%)	165(88.7%)	186(9.3%)	223.8	< 0.001
Well	382(54.8%)	315(45.2%)	697(34.8%)		
Total	697	1303	2000(100%)		
Frequency of visit to river					
no visit	3(4.2%)	68(95.8%)	71(3.6%)		
Occasionally	273(38.5%)	436(61.5%)	709(35.4%)	33.562	< 0.001
Everyday	421(34.5%)	799(65.5%)	1220(61.0%)		
Total	697	1303	2000(100%)		
Activities in river					
no visit	3(4.2%)	68(95.8%)	71(3.6%)		
Washing	350(35.6%)	633(64.4%)	983(49.1%)		
Bathing	143(46.6%)	164(53.4%)	307(15.4%)	114.0	< 0.001
Fetching	20(9.8%)	185(90.2%)	205(10.2%)		
swimming	181(41.7%)	253(58.3%)	434(21.7%)		
Total	697	1303	2000(100%)		
Duration of stay in river					
no visit	3(4.2%)	68(95.8%)	71(3.5%)		
<10 min	28(31.8%)	60(68.2%)	88(4.4%)		
10-60 min	438(31.9%)	937(68.1%)	1375(68.8%)	74.477	< 0.001
>60min	228(48.9%)	238(51.1%)	466(23.3%)		
Total	697	1303	2000(100%)		
Distance of river to house					
don't know	2(.11.8%)	15(88.2%)	17(0.9%)		
Close	168(37.6%)	279(62.4%)	447(22.4%)		
v close	212(31.3%)	466(68.7%)	678(33.9%)		
Far	115(36.3%)	202(63.7%)	317(15.8%)	10.646	0.031
very far	200(37%)	341(63%)	541(27.0%)		
Total	697	1303	2000(100%)		
Distance of river to school					
don't know	1(5.9%)	16(94.1%)	17(0.9%)		
Close	192(32.5%)	398(67.5%)	590(29.65%)		
v close	257(39.5%)	393(60.5%)	650(32.4%)	15.420	0.004
Far	76(31.3%)	167(68.7%)	243(12.1%)		
very far	171(34.2%)	329(65.8%)	500(25.1%)		
Total	697	1303	2000(100%)		
Urinating while swimming					
Yes	582(34.7%)	1096(65.3%)	1678(83.9%)		
No	115(35.7%)	207(64.3%)	322(16.1%)	0.722	0.750
Use of protective shoe					
Yes	31(27.0%)	84(73.0%)	115(5.8%)		
No	666(35.3%)	1219(64.7%)	1885(94.2%)	3.348	0.067

Out of the 2000 urine sample collected for microscopic examination 697(35%) had ova of *Schistosomal haematobium*. The highest burden of the disease was in Patigi District (66.7%) (*p*<0.001**)** while Lade and Kpada Districts with prevalence rates of 5.7% and 6.7% respectively. The respondents were divided into four age groups **(5-7, 8-10, 11-13, 14-15)** and the` result showed that the infection cut across all the age bracket with the age group 11-13 years recording the highest prevalence rate of 38.9%, while the least prevalence rate

(37.0%) was observed in the 8−10 years' age group. However, there was no significant difference in prevalence rate between age groups ($\chi 2$= 4.849, *p=0.183*). Males recorded slightly higher prevalence rate of 36.2% than females (33.2%). This observation is however not statistically significant. ($\chi 2$=1.937, *p*=0.164).

It was observed that children whose fathers did not have post-secondary education recorded high prevalence of infection; while the least prevalence was observed among children whose father had post-secondary education. Similar trend was also observed with regard to maternal education. A statistically significant difference was also observed in prevalence between the different level of education of the parents of the children (*p*<0.001). With regard to parental occupation, children whose fathers' occupation were farming had the highest prevalence rate of infection 40.2%, while a lower prevalence rate was observed among children whose father's occupation were civil servants. Similar trend was also observed with regards to maternal occupation. However, a statistically significant difference was observed in the prevalence between the various parental occupations (*p*<0.001) (Table 3). The respondents in the highest social class had the least prevalence (30.8%) while those in the lower social class had a comparatively higher prevalence with a statistically significant difference. *p*=0.023. Respondents that are using flush toilet recorded the highest prevalence of infection compared to those using pit toilet and open defecation, with a statistically significant difference *p*<0.001. The prevalence of urinary schistosomiasis was higher in private school (35%) than public school (33%).This differences is statistically significant showing that primary school pupils in private schools are greatly affected than there counterpart in public schools (*p*<0.001) (Table 3).

The respondents that had well and bore hole water as their domestic source of water recorded the highest prevalence rate of infection with *Schistosomal haematobium* (54.8%) and (33.8%) respectively. Those making use of river and stream had the least prevalence (20.8%) and (11.3%) respectively. However there is a significant difference in the prevalence according to the various sources of water for domestic use (*p*<0. 001).

This present study has shown that contact with infected river is significant in the transmission of urinary schistosomiasis as respondents that had visited river showed higher prevalence (73%) than those than those that never visited river (4.2%). Although, prevalence is higher among those that visit river occasionally (38.5%) than those that visit on daily basis (34.5%) (*p*<0.001). The children that went bathing, swimming and did the laundry in water bodies recorded higher prevalence of 143(46.6%), 181(41.7%) and 350(35.6%) respectively, while those that visit river to fetch water and those that do not visit river at all have the lowest prevalence of 20(9.8%) and 3(4.2%) respectively. A statistically significant difference was observed in prevalence between the different water contact activities of the respondents. p<0.001 Those that stayed longer than 60 minutes in water had the highest prevalence 48.1% compared to those that stayed less than10 minutes who recorded the lowest prevalence of 31.8% with a statistically significant difference p<0.001. Although, not statistically significant, respondents that have river close to their house had a slightly higher (37.6%) prevalence compared to those that had the river very far from their house. Similarly those that had the river very close to their school had the highest prevalence (39.5%) than those that had the river far from their school (31.3%). Although, not statistically significant, prevalence was found to be high among the respondents that don't wear protective shoes while going to river (35.3%), than those do wear (27.0%) (Table 4).

Discussion

The present study examined the prevalence, and risk factors of *Schistosoma haematobium* infection among primary school pupils in Patigi LGA of Kwara State, Nigeria. The overall prevalence rate of infection recorded is 35% which showed that Patigi LGA falls within the WHO classification of moderate prevalence[(5)]. The prevalence rate in this present study is similar to various reports across Nigeria where *S. haematobium* had been found to be moderately endemic, 34.1% in rural community in Enugu State,[7] and 37.9% in Sankwala, Cross-River State, Nigeria[(8)]. In contrast, the result obtained in this study is lower than the reports of Nmorsi et al who recorded 65.0% in Edo State[(9)] and Bolaji et al who recorded 58.7%, in Ajese Ipo community of Ifelodu LGA of Kwara State[(10)]. However, the prevalence rate recorded in this present study is higher than findings of Okoli et al[(11)] and Ejima etal[(12)] who reported prevalence of 11.3% and 18.7% in Ohaji/Egbema LGA, Imo State and the Niger-Benue basin of Kogi State respectively. The differences could be explained by differences in ecological factors that could in turn lead to differences in transmission intensity.

The prevalence of urinary schistosomiasis when distributed across the three districts of Patigi LGA with similar geographical and socio demographic characteristics revealed an alarming high prevalence rate of 66.7% in Patigi District when compared to a low prevalence rate of 5.7% and 6.7% recorded in Lade and Kpada Districts respectively. These differences in prevalence rates among the three districts were statistically significant (p<0.001) and could be due to the presence of intermediate snail hosts in some of the local River in Patigi District, in addition to availability of factors that aid the transmission of the disease with some peculiar ecological characteristics which may need further scientific study. The four water bodies of Nyami river 457 (65.6%), Zduafini river 110 (15.8%), Ndaduma 44 (6.3%), Water works 21 (3.0%) that were highly associated with the direct transmission of the disease among the respondents were all located in Patigi District. These water bodies were distributed throughout the district and serves as the natural sources of water for domestic use for the community members. Also lack of health education and intervention programme in the community could have contributed immensely to the prevalence of the disease in the area. The predominantly high prevalence of *S. haematobium* in Patigi District placed the area in category 1 (>50% prevalence) and qualifies the district for universal treatment according to WHO guidelines which recommends treatment of all, irrespective of age, sex, infection status, or other social characteristics, and treatment campaigns must be conducted once a year[(13)].

The prevalence of urinary schistosomiasis was not associated with gender or age group. This may be an indication that both genders and all the age groups were being equally exposed to infection through similar water contacts activities as there were no cultural barriers against any gender or age group. However, the fact that both genders had similar prevalence agrees with previous reports that *Schistosoma haematobium* infection was not gender-specific in many parts of Nigeria[(7)] and contrast with the study by Okwori et al[(14)] and Ugbomoiko et al[(15)] who reported a significantly high prevalence of *S. haematobium* in male than female and that of Ekpo et al[(16)] who separately reported insignificantly higher prevalence in female than male.

The finding concerning age disagrees with that of Morenikei et al in Ogun State south western Nigeria in 2011 where the peak of infection was within ages 8-10 years[(17)] , that of Augusto etal[(18)], Ugbomoiko et al[(15)] and Okechukwu et al[(7)] who recorded a significantly age related increase in prevalence with the age group 13−15 years recording highest prevalence.

With regards to parental education, children whose parents do not have post-secondary education recorded high prevalence, while the least prevalence was observed among children whose parents had post-secondary education with a statistically significant difference (p<0.001). These findings showed that Educational background of parents of the children do significantly affect the prevalence of urinary schistosomiasis. This could be due to lack of proper knowledge of the disease which leads to inability to properly educate their children about the preventive measures against the disease. These findings were in consonance with the reports of Geleta et al who reported that educational backwardness has a great impact on the distribution of schistosomiasis in rural communities[19] .

Occupational activities such as farming was also identified as a significant risk factor in transmission of infection among the respondents as shown by the increase the prevalence of the disease among children whose parents are farmers. The reason is that these children often participate in farming activities with their parents and most of their farms are irrigated by water from the *Schistosomal haematobium* infested rivers. This could account for the 4.2% prevalence rate recorded among the respondents who do not visit river for any form of recreational activities (Table 3).

The prevalence of infection was noticed to decrease with increasing social class. A finding in support of the reports that urinary schistosomiasis is typically a disease of the poor who live in conditions that favour transmission and is endemic in Nigeria, especially among the poor and marginalized individuals in most communities[20]. It is also in consonance with the findings of Ugbomoiko and co-workers who established the link between schistosomiasis and poverty in their cross-sectional study in two peri-urban communities in Osun State[15]. The prevalence of urinary schistosomiasis was found to be high among the respondents that used flush toilet than those that used pit toilet and open defecation with a statistically significant difference $p<0.001$. Hence it could be deduced that the predominant practice of open defecation, a poor sanitary system among the respondents has little or no influence on the prevalence of urinary schistosomiasis in the community. This is contrary to the reports of Pinot de Moira et al who reported that poor toilet facility contributes to the spread of *S. haematobium* among primary school children when a high prevalence of the disease was discovered among children that practice open defecation[21]. The significantly higher prevalence recorded in private schools compared to public schools could be due to the fact that respondents from both private and public school showed no difference in their water contact pattern and social class according to the wealth index.

Despite the availability of well and borehole that serves as the major source of water for domestic use in the community, water contact recreational activities among the respondents were on the increase. Out of the 2000 respondents, only 71 (3.6%) don't visit river for any recreational activity while 94.6% do. This difference was found statistically significant $p<0.001$. Statistical analysis showed that respondents that had well and borehole water as their domestic source of water (54.8% and 33.8% respectively.) recorded the highest prevalence of infection with statistically significant difference when compared to those that had river and stream as their domestic source of water. This had shown that the water contact activities of children which predispose them to increased risk of infestation by *Schistosoma haematobium* might not really be prevented by provision of adequate water supply for domestic use. This is contrary to the findings of Esrey et al[22] and Nworie et al[23] who separately concluded that availability of safe water is necessary for reducing the incidence and prevalence of schistosomiasis and some other water related diseases.

Various forms of water contact activities such as swimming, washing clothes, bathing and fetching of water were all found to enhance the transmission of this disease and the pattern in which they predispose the pupils to *S. haematobium* infection follows an order of increasing prevalence with bathing in rivers (46.6%) > swimming contaminated water (41.7%) > washing of clothes in river (35.6%) > fetching water from river (9.8%).This agrees with the findings of Ekpo etal[16] and could be explained by the duration of contact with the river during these activities since those activities associated with prolonged duration of stay (bathing, swimming, washing) in the river had higher prevalence than those with short duration of contact (fetching). This is in agreement with the findings that the duration of stay in a river infested with *Schistosoma haematobium* affects the prevalence of urinary schistosomiasis as shown by the higher prevalence among the respondents that stayed more than 60 minutes in the river (48.9%) when compared to those that stayed less than 60minutes (31.9%) with a statistical significant difference **(**$p < 0.001$).

Although, not statistically significant, respondents that had the river very close to their school had the highest prevalence (39.5%) compared to those that had the river far from their school (31.3%). This finding is in consonance with the report of Kapito-Tembo et al in the study carried out in Blantyre district in Malawi, which showed that children whose school were closer to open water bodies had increased risk of infection[(24)]. Similarly, in this study, those that had river close to their house had a slightly higher (38%) prevalence compared to those that had the river very far from their house (37%) a finding similar to that of Clenon etal[(25)]. However, the proximity of Rivers to households was greatly associated with increased water contact activities among children despite the availability of pipe borne water in the community. This increased water contact activities among children in turn could be responsible for the increased prevalence of *Schistosoma* haematobium infection among primary school pupil in Patigi LGA. This could be due to the frequent exposure to the causative agent causing infestation and re infestation of the individual. Besides increased water contact activities among children could also be associated with increased and persistent transmission of the disease through increased egg excretion into the water bodies and subsequent infestation of other healthy individuals.

The major risk factors associated with endemicity of urinary schistosomiasis in this study were, the presence of infested water bodies and increased water contact activities with the infested water bodies, increased frequency of visit to the infested river, prolonged duration of stay in the water bodies, low parental literacy, and farming occupational activities of the parents. Also, urinating while swimming and poor utilization of protective shoes while visiting the river are some of the practises that could place them at yet a greater risk of being infected by the causative agent.

Furthermore, the presence of water bodies infested with *Schistosoma haematobium* has been associated with the transmission and spread of the disease among the respondents. Nyami, Ndaduma, Zduafini, Water works, Eche and Nnakolyi rivers had been linked with about 94.5% of the prevalence of the disease in the local government with Nyami and Zuafini rivers contributing the most, 65.6% and 15.8% respectively. However, a control approach directed to these rivers will reduce the disease prevalence by similar proportion.

In conclusion, this study found *S. haematobium* infection to be moderately endemic in Patigi LGA and specifically highly endemic in Patigi District of the LGA. The endemicity of the disease in the Area was attributed to the presence of water bodies infested with *Schistosoma haematobium* and increased water contact activities to the water bodies, in addition to low socioeconomic status, low parental literacy and farming occupational activities of parents. This is a significant milestone in updating and broadening the epidemiological picture of *S. haematobium* infections in Nigeria which is necessary in planning strategies for control programmes in accordance with WHO recommendations. Therefore the attention of the state, National and International health authorities for the prevention and control measures is urgently needed.

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