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ASSESMENT OF RISK FACTORS OF URINARY SCHISTOSOMIASIS IN KATSINA STATE, NIGERIA

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ABSTRACT

The research was conducted on risk factors associated to Urinary Schistosomiasis infection in some selected Primary schools in Katsina State. A researcher administered questionnaire was used to obtain the information from the respondents. Odds ratio analysis was employed to determine the interaction between exposure and occupational and water contact activities as risk factors of the disease. In Kaura primary school, the respondents admitted to engaged in both occupational and water contact activities, and was therefore exposed to the risk factors. The analysis on exposure with occupational and water contact activities produced an Odds ratio (OR) of 5.04 and 4.0(OR>1), indicating that the exposure associated high with the risk factors and

Introduction:

Schistosomiasis is a disease caused by parasites (genus Schistosoma) that enter humans by attaching to the skin, penetrating it, and then migrating through the venous system to the portal veins where the parasites produce eggs and eventually leads to symptoms of acute or chronic disease such as fever, abdominal discomfort (WHO, 1998). Schistosomiasis disease is among the neglected tropical diseases that cause chronic infections and ill health in endemic countries including Nigeria (FMoH and CIFF, 2015). The disease is usually related to water resources and development schemes such as

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produced Schistosomiasis at a higher rate of 26.55%. In Bardayya primary school, the respondents engaged in occupational and water contact activities. Odds ratio analysis on exposure with occupational and water contact activities produced OR of 0.32 and 0.33(OR<1), indicating that the exposure and risk factors associated less, and produced Schistosomiasis at a lower rate of 13.33%. In Iyatawa primary school, no subject was engaged in any occupational and water contact activities. In light of the above findings, it was observed that higher interaction between exposure and risk factors produced higher rate of Schistosomiasis, while low interaction produced low rate of Schistosomiasis.

Keywords: *Urinary Schistosomiasis, Occupations, Water contact activities, Odds ratio, Exposure, Risk Assessment*

Irrigation projects, rice/fish farming and dams (Tayo *et al*., 1989). It has been observed that the vast majority of current Schistosomiasis is found in sub-Saharan Africa. Like most parasitic disease, Schistosomiasis prevalence is related to poverty and poor living conditions. School aged children are mostly infected with this silent destructive disease because it is easily contracted while bathing or swimming in water contaminated with the parasite which is shed from snail and infect by penetrating human skin. Adult individuals are infected mostly during irrigation and other domestic activities that are water dependent (Engels *et al*., 2002). Because of children's play habits and poor hygienic conditions, children are particularly at risk for infection, with each passing year, a child's risk of infection increases, peaking between the ages of 10 and 20 (Kabatereine *et al*., 2004).

Over 20 million people residing in rural and agricultural areas have Schistosomiasis, exhibiting severe morbidity (WHO,1999). Poverty, ignorance, substandard hygienic practices and sanitary facilities contribute to infection (WHO, 1984).

Materials and Methods

Study Area

The study was conducted in Rimi Local Government Katsina State, Northern Nigeria. Rimi Local Government Area was located along Kano Road. It has an Area of 452 km^2 with an estimated population of 153,744 (National Population Census, 2006). The area has a point coordinates of 12°51'0"N 7°42'56"E.

Study Sites

The study sites was Faduma and Iyatawa communities, Rimi Local Government Area, Katsina State. In Faduma community, two primary schools namely: Kaura and Bardayya was the sampling sites while in Iyatawa community, Iyatawa primary school was considered.

Study Population

The target groups for this study was primary school pupils aged 6-15 years. The sample size was appropriately determined using Isixsigma, (2018) protocol. A total of 135 school pupils was randomly selected during the exercise. The sample size calculated was distributed equally to the three primary schools where 45 respondents was considered. Both male and female respondent was chosen from within the age brackets.

Ethical Consent

The study received an ethical consent approval of the Local Government Primary Health care and the Local Government Education Authority. Local village heads was also notified by the Local Government Authorities for their full cooperation.

Questionnaire Administration and Analysis

Questionnaire was prepared to access information from the respondents with regards to Schistosomiais infection. The questionnaire focused on demographic variables, occupations and water contacts activities of the respondents. Other occupational activities of the respondents tested

include: fishing, farming, water fetching, business or un-employed. The questionnaire also tested variables in relation to water contact activities of the respondents, these include: source of contact with water such as: fishing, water fetching, swimming, bore hole or other domestic activities involving water. After preparation of the questionnaire, a pilot study was made through researcher administered questionnaire, the responded questionnaires was examined and corrected, the age groups of the subjects was adjusted to meet the required ages of the respondents (6-15yrs). The corrected questionnaire was administered to the subjects again.

Statistical Analysis/Odds Ratio Analysis for Risk Factors

Odd ratio analysis is a measure of association between a given disease exposure and an outcome. Odds ratio therefore determine whether a particular exposure is a risk factor for a particular outcome of interest (e.g. disease) to a variable of interest (e.g. health characteristics, aspect of medical history) (J Can, 2010). In this research, odd ratio analysis was conducted to determine whether a particular exposure (such as occupation or water contact activities) is a risk factor for a particular outcome of interest (Schistosomiasis). The occupational risk factor was farming, water fetching, business/employed and un-employed, the water contact activities include water fetching, swimming, domestic activities and borehole water use. In this research, the odds ratio as a measure of risk factor was determined using the variable identified from the questionnaire. The odds ratio was determined by considering the ratio between members within a population expressing a trait or not, relative to their exposure to a related risk i.e. those that has traits (exposed) divided by those that has traits (not exposed) x those that lack traits (exposed) divided by those that lack traits (not exposed) (J Can, 2010). For this analysis, the following table was used as a guide.

Guide Table for Determining Odds ratio

Risk factor / Exposure	Outcomes	Outcomes	Total
	Diseased	Not Diseased	
Exposed	(a)	(b)	(a) + (b)
Not exposed	(c)	(d)	(c) + (d)
Total	(a) + (c)	(b)+ (d)	(a)+(b) +(c) +(d)

Based on the above table, odd ratio can be defined mathematically as:
The odds of exposure to a risk factor for the group with a disease is = (a)/(c)
The odds of exposure to the risk factor for the group without the disease is = (b) / (d)
Therefore, the odds ratio for exposure is = a/c divided by (b)/(d).
Similarly, the odds ratio for disease is = a/b divided by (c)/ (d)
Where (a)/ (b) represents the odds for disease for those exposed to the risk and c/d represents the odds for disease for those not exposed to the risk factors.
Thus, we have the following relationship:

Exposure Odds Ratio:	Disease Odds Ratio:
(a)/ (c) ÷ (b) / (d)	(a)/ (c) ÷ (b)/(d)

Cross-Product Ratio = (a) × (d) / (b) × (c)

Since odds ratios are used to determine whether a particular exposure is a risk factor for a particular outcome of interest (e.g disease) to a variable of interest (e.g health characteristics, aspect of medical history), the general rule for assessing odds ratio are:
1. If odds ratio calculated (OR) =1 means that the exposure does not affect the odds of the outcome of interest.
2. If odds ratio calculated (OR) >1 means that the exposure associated with higher odds of the outcome of interest.
3. If odds ratio calculated (OR) < 1 means that the exposure associated with lower odds of the outcome (J Can, 2010).
All the occupational and water contact variables obtained in the research was properly arranged in the guide table, and the odds ratios was determined and assessed.

Results

An overviewed prevalence of urinary Schistosomiasis in the three selected primary schools namely: Iyatawa, Kaura and Bardayya was shown (Table

1). A total of 135 urine samples was collected among subjects at the age of 6-15 years. Forty five samples was collected and analyzed. In Iyatawa primary school, all the male and female subjects was completely uninfected having 0% prevalence of infection. In Kaura primary school, the total number of male subjects examined was 26 out of which 12 was infected with prevalence of infection of 26.26%, with mean intensity of the infection of 192.66 ±52.48 eggs per 10ml of urine. Out of the 19 female subjects examined, no subject was found to be infected. In Bardayya primary school, 25 male subjects was analyzed, where 6 was infected with prevalence of infection of 13.33% and mean intensity of 47±21.41 eggs/10ml urine. For all the 20 female subjects analyzed, no individual subject was infected. The overall prevalence of infection in the study area was 13.33%, while the overall mean intensity was 13.31±4.01 eggs/10ml of urine. Correlation analysis on overall prevalence and intensity of infection show strong positive correlation (r =+1.00), and the correlation were significant at the level of 0.01.

Table 1: A review on Prevalence and Intensity of Urinary Schistosomiasis in Iyatawa, Kaura and Bardayya Primary Schools.

Primary School	No. Exam	Age Range (Years)	No. Exam. Male	No. Exam. Female	Prevalence (%) Male	Prevalence (%) Female	Haematuria Analysis Male	Haematuria Analysis Female	Mean int/ 10ml of Urine
Iyatawa	45	6-15	25	20	0.00	0.00	0	0	0±0
Kaura	45	6-15	26	19	26.55	0.00	12	0	192.66± 52.48
Bardayya	45	6-15	25	20	13.33	0.00	6	0	47±21.41
Total	**135**	**-**	**76**	**59**	**13.3**	**0.00**	**18**	**0**	**13.31 ± 4.01**

Correlation analysis on overall prevalence and intensity of infection show strong positive correlation (r =+1.00). The analysis was significant at the level of 0.01.

Keys:

- Total Prevalence among the Subjects = **13.33%**
- Total mean intensity= **13.31 eggs/10ml of urine**
- Values placed after the signs ± are standard errors calculated

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Occupational and Water Contact Activities as Risk Factor of Urinary Schistosomiasis in Iyatawa, Kaura and Bardayya Primary Schools

Occupations and water contact activities of the respondents was shown according to schools (Table 2). In each primary school, 45 respondents was randomly chosen and the percentages of respondents from each variable was determined.

In Iyatawa primary school, the subjects respond according to their occupations and water contact activities. In this primary school, no subject was engaged in any occupation or water contact activities, hence zero number of subjects was recorded 0(0.00%).

In Kaura primary school, the respondents that engaged in farming occupation was 22(48.89%) while those that engaged in business was 1(2.22%) whereas 8(17.78%) of the respondents was un-employed, but 14(31.11%) was water fetchers. In terms of water contact activities, 10(22.22%) of the respondents visited the dam for water fetching, while no subject engaged in fishing 0(0.00%), 10(22.22%) swim in the water body, while 5(11.11%) was domestic water users whereas 20(44.45%) was borehole water users. Odd analysis was conducted among the variables. The analysis produced an odd ratio of 5.04. Since the odd ratio calculated was greater than one (OR>1), the exposure to risk factors therefore associated with the higher odds (5.04) of outcome (Schistosomiais) (Table 3). According to water contact activities, the odd ratio calculated was 4.00which was also greater than one (OR>1). The exposure to risk factors therefore associated with higher odds of outcome Schistosomiasis (Table 4).

Table 2: Occupations and Water Contact Activities of Respondents in Iyatawa, Kaura and Bardayya Primary Schools

		Occupations			Water Contact Activities					
Schools	No. of Resp. N =135	Farming	Business	Un-employed	Water Fetching	Water Fetching	Fishing	Swimming	Domestic Activities	Bore Hole Water
Iyatawa	45	0	0	0	0	0	0	0	0	0
Kaura	45	22(48.89)	1(2.22)	8(17.78)	14(31.11)	10(22.22)	0	10(22.22)	5(11.11)	20(44.45)
Bardayya	45	19(42.22)	10(22.22)	9(20.00)	7(15.56)	25(55.56)	0(0.00)	5(11.11)	15(33.33)	0(0.00)
Total	135	41(30.37)	11(8.14)	17(12.59)	21(15.56)	35(25.92)	0(0.00)	15(11.11)	20(14.81)	20(14.81)

Key:

Values in parenthesis ( ) are percentage calculated

Table 3: Odds Ratio Analysis for Exposure and Occupations in Kaura Primary School.

Outcomes Outcomes

Exposure	Diseased	Not diseased	Total
Exposed	Water Fetching (a)	Business (b)	(a) + (b)
Not exposed	Farmers (c)	Un-employed(d)	(c) + (d)
Total	(a) + (c)	(b) + (d)	(a)+ (b) + (c) + (d)

Where:

(a)=Water Fetching =14 (b) = Business=1 (c) =Farmers =22 (d) = Un-employed=8

The Odds ratio=

(a)/ (b) x (d) / (c) = (a) x (d) / (b) x (c)

=14 x 8/ 1 x 22 = 14 x 0.36

OR >1= 5.04

Exposure to risk factors associated with higher odds of our out outcome of interest (Schistosomiasis) **(OR>1)**.

Table 4: Odds Ratio Analysis for Exposure and Water Contact Activities in Kaura, Primary School.

Outcomes Outcomes

Exposed	Diseased	Not diseased	Total
Exposed	Water Fetching (a)	Domestic Activities (b)	(a) + (b)
Not-exposed	Swimming(c)	Borehole users (d)	(c) + (d)
Total	(a) + (c)	(b) + (d)	(a)+ (b) + (c) + (d)

Where:

(a)= water fetching = 10 (b) =Domestic Activities = 5 (c) = Swimming = 10

(d) = Borehole users = 20

The odds ratio =

(a)/ (b) x (d) / (c) = (a) x (d) / (b) x (c)

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= 10 x 20 /5x10
= 2x2 = **4.00**

Exposure to risk factors associated with higher odds of outcome of interest (Schistosomiasis) **(OR) >1**.

In Bardayya primary school, the respondents that engaged in farming activities was 19(42.22%), while 10(22.22%) engaged in business, 9(20.00%) of the respondents was un-employed, but 7(15.56%) was water fetchers. According to water contact activities, 25(55.56%) fetch water from the dam, while no subject was engaged in fishing activities 0(0.00%), but 5(11.11%) swim in the water body, whereas15(33.33%) was domestic water users, no respondent was found to contact the water through boreholes 0(0.00%). Odd ratio analysis was conducted among the variables. Analysis on occupation produced an odd ratio of 0.32, while that of water contact activities produced and odd ratio of 0.33.

Since all the odds ratio produced was less than one (OR<1), the exposure to risk factors associated with less with lower odds of the outcome (Shistosomiasis) (Table 5 and 6).

Table 5: Odds Ratio Analysis for Exposure and Occupations in Bardayya Primary School.

	Outcomes	Outcomes	
Exposure	Diseased	Not diseased	Total
Exposed	Water Detection (a)	Business (b)	(a) + (b)
Not exposed	Farmers (c)	Un- employed (d)	(c) + (d)
Total	(a) +(c)	(b) + (d)	(a)+ (b) +(c) + (d)

Where:

(a) = Water Fetching =7 (b) = Business = 10 (c) = Farmers = 19
(d) = un-employed = 9

The odds ratio=

(a)/ (b) x (d) / (c) = (a) x (d) / (b) x (c)
= 7 x 9/10 x 19
= 0.70 x 0.47= **0.32**

Exposure to risk factors associated with lower odds of outcome of interest (Schistosomiasis) **(OR) <1**.

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Table 6: Odds Ratio Analysis for Exposure and Water Contact Activities in Bardayya n Primary School.

	Outcomes	Outcomes	
Exposure	Diseased	Not diseased	Total
Exposed	Water Fetching (a)	Domestic Activities (b)	(a) + (b)
Not-exposed	Swimming (c)	Borehole users (d)	(c) + (d)
Total	(a) + (c)	(b) + (d)	(a)+ (b) + (c) + (d)

Where:
(a)= water fetching = 25 (b) =Domestic Activities = 15 (c) = Swimming = 5
(d)= Borehole users = 1
The odds ratio
(a)/ (b) x (d) / (c) = (a) x (d) / (b) x (c)
= 25 x 1 / 15x5
= 1.66 x 0.2 = **0.33**
Exposure to risk factors associated with lower odds of outcome (schistosomiasis) since **(OR) <1.**

Discussion

Occupations and water contact activities was the risk factors the respondents was exposed in the study area. These factors play an important role in determining Schistosomiasis infection and the impact of the disease depending on the odds ratio obtained. In Iyatawa primary school, no subject was reported to be engaged in any occupation or water contact activity, hence the prevalence of the disease was zero, the possible reasons to this finding was that the subjects do not engaged and therefore not exposed to any of the risk factors that result to infection, simply by avoiding source of contact with infested water. Moreover, that the community was located far away from the reservoir, hence distance limit the frequency to visit the water body for activities such as water fetching, fishing, washing at washing points, farming and swimming.Swimming was particularly the habits of the school children; and because of children's play

habits and poor hygienic conditions, children are particularly at risk for infection, that with each passing year, a child's risk of infection increases, peaking between the ages of 10 and 20 (Kabatereine *et al.*, 2004). The finding in Iyatawa Primary School (0.00%) was found to be different from that of A keh *et al.,* (2010) who carried out a research on Urinary Schistosomiasis, Perception and Treatment Seeking Behavior in Sankwala Area, Cross Rivers, Nigeria, added that a prevalence of 37.0% was obtained in the study area. According to Akeh, 91% of the respondents was observed to visit the stream, while no caution was taken before entering the water, but in Iyatawa Primary School, no subject was observed to visit the water body. The high prevalence obtained Sankwala area was attributed to the high level of ignorance among the children, this high prevalence was higher compared to that of Iyatawa Primary.

The findings obtained in Kaura primary school was compared to a research conducted by Akeh, *et al.,* (2010), where a prevalence of 37.0% was obtained in Sankwala area. The prevalence obtained in Sankwala was higher than that of Kaura primary school, where a prevalence of 26.55% was obtained. Among the reasons for high prevalence rate in Sankwala area was that the subjects constantly visited the stream water as area was recently upgraded to a semi-urban area. In addition, high level of ignorance among the subjects contributed to infection in the area. The reason for low prevalence of infection in Kaura primary school was the presence of some boreholes in the area which supplement water demand, this limits the frequency of water visit and exposure to the risk factors of Schistosomiasis; The odds ratio analysis on occupations and water contact activities as risk factors the subjects was exposed showed higher Odds (OR =5.04 and 4.04) respectively. The exposure to the risk factors determined was therefore higher (OR>1). The higher value of the odd ratio(OR>1) and indicated that the exposure associated with higher outcome of the disease (Schistosomiasis infection) and the high odds ratio agree with the high prevalence of the disease (26.55%). In Bardayya Primary School, a prevalence of infection of 13.33% was obtained. The prevalence recorded was compared with the findings of Bala *et al.,* (2012) who carried a

research in Abarma village, Gusau, Nigeria. The prevalence obtained in Abarma Village was 74.0%. This prevalence was much higher than that of Bardayya Primary school. The possible reason was that the large number of subject frequently visited the reservoir for water fetching (52.7%), whereas majority (81.8%) engaged in swimming, thus, high exposure to these two important risk factors contributed to the general rise in the prevalence of the Schistosomiasis in the area. In Bardayya primary school, the reason for low prevalence was attributed to that fact that the subjects visited the water body less frequently for water fetching 7(15.56%) as occupation and more importantly swimming as part of water contact activities 5(11.11%). The duration of the exposure largely determine infection, since children spend more time swimming than fetching water. Odds ratio analysis on occupations and water contact activities as risk factors showed a lower odds ratio OR = 0.32 and 0.33 respectively. The exposure to the risk factors determined was therefore lower, given the value OR<1. The value of the outcome indicated that low exposure to risk factors associated less with each other, and therefore, low outcome of the disease (Schistosomiasis) was the result, which agrees with low prevalence of 13.33% obtained in the primary school, and hence, the lower the exposure to the risk factors, the lower the prevalence of the disease.

Conclusion

Higher odds ratio of 5.04 and 4.0 (OR>1) was obtained in Kaura primary, these indicated that the occupational and water contact activities associated high with exposure, and produced higher odds ratio OR>1, with an outcome of Schistosomiasis at a higher rate of 26.55%. In Bardayya primary school, odds ratio of 0.32 and 0.33(OR<1) was obtained, this indicated that the occupational and water contact activities associated less with the exposure and produced an outcome of Schistosomiasis at a lower rate of 13.33%. In Iyatawa primary school, no subject was engaged in any occupational or water contact activities, and therefore no respondent was exposed to any risk factor. The results indicated that, high exposure to risk

factors produced high rate of Schistosomiasis, while low exposure produced low rate of Schistosomiasis.

Recommendations

For successful control of Schistosomiasis in the study area, the following recommendations should be observed:

- Public enlightenment campaign should be encouraged. The life cycle of the disease, early symptoms and prompt treatment of infected ones should be emphasized.
- The population should also observe personal hygiene
- The government and other stakeholders should assist the rural communities for good roads and free medications to the infected individuals.

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