International Journal of TROPICAL DISEASE & Health
4(12): 1278-1286, 2014
ISSN: 2278–1005

SCIENCEDOMAIN *international*
www.sciencedomain.org

Urogenital Schistosomiasis among Fulani Pastoralists in Rivers State

N. Eze Chinwe[1*] and P. I. Agi[1]

[1]Department of Animal and Environmental Biology, Parasitology Unit, Faculty of Biological Science, College of Natural and Applied Science, University of Port Harcourt, Rivers State, Nigeria.

Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

Article Information

DOI: 10.9734/IJTDH/2014/8778
Editor(s):
(1) Thomas I. Nathaniel, Department of Biomedical Sciences, School of Medicine –Greenville University of South Carolina, Greenville, USA.
Reviewers:
(1) Toru Watanabe, Department of Pediatrics, Niigata City General Hospital, Japan.
(2) Anonymous, Nnamdi Azikiwe University Awka, Nigeria.
(3) Anonymous, Babcock University, Nigeria.
Complete Peer review History: http://www.sciencedomain.org/review-history.php?iid=673&id=19&aid=6464

Original Research Article

Received 30th December 2013
Accepted 17th April 2014
Published 10th October 2014

ABSTRACT

Aim: To determine the distribution and endemicity of Urogenital schistosomiasis infection among Fulani Pastoralists in their various bush encampments in Rivers State, Nigeria.
Study Design: Cross –sectional, descriptive study.
Place and Duration of Study: Rivers State, Nigeria, between November 2009 and January 2011.
Methodology: Urine samples were collected from 593 Fulani pastoralists from six bush encampments and examined for schistosome eggs using centrifugation method. The number of eggs obtained per 10ml of urine specimen was counted and quantified as

**Corresponding author: Email: ezenwadiuto@yahoo.com;*

intensity of infection. Egg counts were reported according to the following categories. Light infection ≤50eggs/10ml of urine, moderate infection- ≥50≤100 eggs/10ml of urine, heavy infection- ≥100 eggs/10ml of urine of urine. Urine samples were tested for proteinuria and haematuria using commercial reagent strips capable of detecting urinary blood, protein and other parameters.

Results: Of the 593 Fulani pastoralists who were investigated, 394(66.4%) were infected with a mean overall intensity of 83.3±2.0 eggs/10ml of urine. The herdsmen in Eleme and Oyigbo bush encampments had the highest prevalence of 91(81.3%) and 77(76.2%) respectively with a mean intensity of 96.1±4.0 and 93.1±5.1 eggs/10ml urine. There were significantly more infected males than the females ($p<0.05$). The subjects aged 21-30 years had the highest prevalence 92 (76.0%) with heavy intensity of infection (25.0%). About 169(42.9%) of infected Fulani's excreted ≥50≤100 eggs/10ml of urine while 132(33.5%) excreted ≥100 eggs/10ml of urine. Haematuria was recorded in 444(74.9%) with majority observed in 31-40 years age group while 427(72.0%) tested positive for proteinuria.

Conclusion: The results revealed high prevalence and intensity rates of *Schistosoma haematobium* among the Fulani herdsmen. Since such herdsmen are always on the move in search of greener pastures they would always pollute water bodies and thus serve as source of transmission to neighbouring communities. Health education campaigns by health workers as well as intensified integrated control measures are advocated.

Keywords: Urogenital schistosomiasis; proteinuria; prevalence; haematuria; herdsmen.

1. INTRODUCTION

Schistosomiasis is water borne parasitic disease; it is a disease of poverty that leads to chronic ill-health [1]. The disease is characterized by haematuria and transmitted by particular fresh water snails [2] Reports have established that both natural [3] and artificial water bodies [4] are transmission foci of the parasite. Schistosomiasis is considered by the World Health Organization as the second most socio-economically devastating parasitic disease, next only to malaria. More than 207 million people are infected worldwide; most live in poor communities without access to safe drinking water and adequate sanitation [1]. The number of people reported to have been treated for schistosomiasis in 2011 was 28.1 million [5]. People are at risk of infection due to agricultural, domestic and recreational activities which expose them to infested water [5]. Lack of hygiene and play habits make children especially vulnerable to infection. Of the 207 million people with schistosomiasis, 85% live in Africa. Extreme poverty, unawareness of the risk, inadequacy or total lack of public health facilities and the unsanitary conditions in which millions of people live are all factors contributing to the risk of infection particularly in developing tropical countries [6]. Urinary schistosomiasis is widespread in both rural and urban communities in Nigeria, with prevalence ranging between 2% and 90% and the vast majority of cases occurring among the poor and marginalized [7,8]. In Nigeria, schistosomiasis due to *Schistosoma haematobium* is widespread constituting a public health problem particularly in children [9,10,11]. The distribution of the disease is focal, aggregated and usually related to water resources and development schemes such as irrigation projects, rice/fish farming and dams. It is estimated that 11 million Nigerians are infected with schistosomiasis especially in the dry Northern areas where *S. haematobium* is focal and acquired in seasonal pools [12]. Several studies on urogenital schistosomiasis in Rivers State had tended to focus on school-age children and adults, with little or no emphasis on Fulani pastoralists in the State. The present

study is an investigation on the prevalence of Urogenital schistosomiasis infection amongst the Fulani herdsmen in Rivers State

2. MATERIALS AND METHODS

2.1 Study Area and Study Population

A total of 593 herdsmen who voluntarily participated were randomly recruited from six bush encampments in Rivers State, Ahoada, Bori, Elele, Eleme, Elelenwo and Oyigbo where large population of Fulani herdsmen was located with their families. Rivers State lies at latitude 4º45'north and longitude 6º50'east and lies along Bonny River in the Niger Delta. Rivers State has tropical rainforests as well as mangrove and salt water swamps with an average rainfall of 2,500cm^3. Temperature range between 28ºC to 33ºC which supports the rainforest type of vegetation and humidity range of 72% to 83% is high in the State throughout the year and decreases slightly in the dry season [13].

Fulani's are the largest migratory ethnic group in the world. They are among 'super' ethnic groups of Africa with members numbering 15.3 million in Nigeria. Settled Fulani's live in villages, towns, cities permanently and have given up nomadic life completely, in favour of an urban one. Fulani's are primarily pastoralists and they spend long times alone on foot, they can be seen very frequently in Rivers State parading with their cattle. The study population consists of Fulani pastoralists who have migrated and encamped in bushes in Rivers State from 2009 to 2011. The Fulani herdsmen were selected randomly (simple random sampling). Fulani pastoralists live with their families in the bush camps from where they herd their animals in search of green pasture. Most bush encampments in the study areas depend on pond, water bodies, shallow wells, seasonal streams and domestic water supply for drinking.

2.2 Pre-survey Contact and Consent Mobilization

Before the commencement of the study, advocacy visits were made to the Fulani heads called Seriki in all the bush encampments chosen for the study. They were duly consulted and this was necessary to ensure maximum co-operation from the Fulani's. Considering the strict socio-cultural and religious observances peculiar to the Fulani's, this preceded actual data collection. Oral consent was given by each Fulani before commencing this study.

2.3 Data Collection

Each participant was given a clean dry screw capped 20ml universal bottle to provide terminal urine between 10.00am and 2.00pm. Personal data (i.e. age and sex in particular) were recorded and completed with the aid of an interpreter and labeled accordingly as recommended by Cheesbrough [14]. Urine samples were tested for proteinuria and haematuria using commercial reagent strips capable of detecting urinary blood, protein and other parameters (Medi-Test'Combi-9'reagent; Analyticon Biotechnologies, Lichtenfels, Germany) in accordance with the manufacturers' instructions.

2.4 Urine Examination and Analysis

The sedimentation method described by Cheesbrough [14] was used. Each urine sample was thoroughly mixed after which a 10ml aliquot was transferred into a centrifuge tube and

spun at 5000rpm for 5min. The supernatant was decanted while a drop of the sediment was placed on a clean grease free slide, stained with drops of Lugol's iodine solution and covered with a cover slip after which it was examined under the microscope using the x10 and x 40 objectives. A sample was recorded as positive where the presence of terminal spine eggs, characteristics of *S. haematobium* is established. The number of eggs obtained per 10ml of urine specimen was counted and quantified as intensity of infection. Egg counts were reported according to the following categories. Light infection - ≤50eggs/10ml of urine, moderate infection ≥50≤100 eggs/10ml of urine, heavy infection ≥100 eggs/10ml of urine.

2.5 Data Analysis

Urine specimens were stratified according to age, sex and various bush encampments. Statistical analysis of data obtained was processed using SPSS – version 15 software. Values were considered statistically significant at P<0.05

3. RESULTS

3.1 Prevalence and Intensity of *S. haematobium* Infection by Bush Encampments

Of the 593 Fulani pastoralists urine samples examined from six bush encampments for *S. haematobium* 394 (66.4%) were infected with mean intensity of 86. 6 eggs/10ml of urine. The Fulani's in Eleme bush encampment had the highest prevalence of infection 91(81.3%) with mean intensity of 96.1±4.0 eggs/10ml urine followed by Oyigbo bush encampment with prevalence of 77(76.2%) with mean intensity of 93.1±5.1eggs/10ml urine (Table 1). There was no significant difference (p>0.05) in the prevalence of *S. haematobium* between the six bush encampments. A total of 132(33.5%) had heavy infection with herdsmen in Eleme and Oyigbo bush encampments having the highest prevalence of 41(31.1%) prevalence and (25.0%) respectively. However, there was no significant difference in the intensity of infections (p>0.05).

3.2 Prevalence of *S. haematobium* Infection in Relation to Sex

Of the 394 Fulani pastoralists infected 68.0% and 63.8% were males and females respectively, the highest prevalence of infection was observed among the males in Eleme 56(83.6%) and the least 12 (45.5%) among the females in Bori (p<0.05). Of the infected female 36.6% had a low infection while 40.2%, 31.9% had moderate and heavy infection respectively. More so, 68.9% male had high infection (Table 2).

3.3 *S. haematobium* Infection in Relation to Age

There was a statistical significant difference in the rate of infection in the different age groups within the six bush encampments (p=0.007). The age group 21-30 years had the highest prevalence 92 (76.0%) followed by 82 (72.2%) while the least prevalence of 67.8% occurred within the age group 50 years and above (Table 3). The age group 11-20 years in Eleme bush encampment has the highest prevalence of 86.4% while the least 20.0% was recorded among 1-10 years age group in Bori bush encampment.

Table 1. Prevalence and Intensity of *S. haematobium* infection by bush encampment among Fulani Pastoralists in Rivers State

Bush encampment	NE	NI (%)	NNI (%)	Light (%)	Moderate (%)	Heavy (%)	Intensity (mean ova count/10ml ± S.E)
Ahoada	89	47(52.8)	42(47.2)	3(3.2)	24(14.2)	20(15.2)	86.1±4.1
Bori	71	33(46.5)	38(53.5)	12(12.9)	19(11.2)	2(1.5)	60.3±5.0
Elele	105	74(70.5)	31(29.5)	31(33.3)	37(21.9)	6(4.5)	58.1±3.6
Eleme	112	91(81.3)	21(18.7)	15(16.1)	35(20.7)	41(31.1)	96.1±4.0
Elelenwo	115	72(62.6)	43(37.4)	14(15.1)	28(16.6)	30(22.7)	91.1±4.6
Oyigbo	101	77(76.2)	24(23.8)	18(19.4)	26(15.4)	33(25.0)	93.1±5.1
Total	593	394(66.4)	199(33.6)	93(23.6)	169(42.9)	132(33.5)	83.3±2.0

NE= Number Examined; NI= Number Infected; NNI= Number not infected; ≤50eggs/10ml of urine=Light infection; ≥50≤100 eggs/10ml of urine= moderate infection ≥100 eggs/10ml of urine= heavy infection

Table 2. Sex- related egg count in *S. haematobium* in infection among Fulani herdsmen

Egg/10ml of urine	Males (%)	Females (%)	Total (%)
≤50eggs/10ml of urine	59 (63.4)	34 (36.6)	93 (23.6)
≥50≤100 eggs/10ml of urine	101 (59.8)	68 (40.2)	169 (42.9)
≥100 eggs/10ml of urine	91 (68.9)	41(31.1)	132 (33.5)
Total	251 (63.7)	143 (36.3)	394 (66.4)

≤50eggs/10ml of urine =Light infection; ≥50≤100 eggs/10ml of urine =moderate infection; ≥100 eggs/10ml of urine = heavy infection

Table 3. Prevalence of *S. haematobium* infection in relation to age

Age	Ahoada		Bori		Elele		Eleme		Elelenwo		Oyigbo		Total	
group	NE	NI (%)	NE	NI (%)	NE	NI (%)	NE	NI (%)	NE	NI (%)	NE	NI (%)	NE	NI (%)
1-10	14	4(28.6)	10	2(20.0)	18	7(38.9)	21	15(74.4)	21	8(81.0)	22	14(81.8)	106	50(47.2)
11-20	20	8(40.0)	15	4(26.7)	21	16(77.0)	22	19(86.4)	21	11(85.7)	17	13(82.4)	116	71(61.2)
21-30	22	14(63.6)	14	9(64.3)	22	18(81.8)	21	18(85.7)	23	17(87.0)	19	16(84.2)	121	92(76.0)
31-40	16	11(68.8)	13	7(53.8)	20	16(80.9)	20	17(85.0)	22	16 (86.4)	18	15(83.3)	109	82(75.2)
41-50	10	6(60.0)	12	7(58.3)	14	10(71.4)	17	14(82.4)	16	12(81.3)	13	10(76.9)	82	59(71.9)
51 +	7	4(57.1)	7	4(57.1)	10	7(70.0)	11	8(72.7)	12	8(75.0)	12	9(75.0)	59	40(67.8)
Total	89	47(52.8)	71	33(46.5)	105	74(70.5)	112	91(81.3)	115	72(62.6)	101	77(76.2)	593	394(66.4)

NE=Number Examined; NI= Number Infected

3.4 Intensity of *S. haematobium* by Age

A total of three hundred and ninety four Fulani pastoralist were infected. Of these, ninety-two were with the age group 21-30 years, out of which 28(30.1%) had a light infection, 31 (18.3%) had moderate infection and 33(25.0%) had heavy infection (Table 4). However, fifty infected children were within the age group 1-10years and of these 13(13.9%), 20 (11.8%) and 17(12.9%) were presented with light, moderate and heavy infections respectively. Intensity of infection varies significantly across the age groups ($p<0.05$)

Table 4. Intensity of infection by age

Age group	Light (%)	Heavy (%)	Very heavy (%)	Total (%)
1-10	13(13.9)	20(11.8)	17(12.9)	50(7.2)
11-20	14(15.1)	33(19.5)	24(18.3)	71(61.2)
21-30	28(30.1)	31(18.3)	33(25.0)	92(76.0)
31-40	21(22.6)	39(23.1)	22(16.7)	82(72.2)
41-50	12(12.9)	24(14.2)	23(17.4)	59(72.0)
51-60	5(5.4)	22(13.0)	13(9.8)	40(67.8)
Total	93(23.6)	169(42.9)	132(33.5)	394(66.4)

≤50eggs/10ml of urine =Light infection; ≥50≤100 eggs/10ml of urine =moderate infection; ≥100 eggs/10ml of urine = heavy infection

3.5 Urinalysis by Age

A total of 444 (74.9%) and 427 (72.0%) urine samples were positive for haematuria and proteinuria (Table 5). The age 31-40 years had the highest prevalence of haematuria 96 (88.1%) and 69(59.5%) proteinuria while the least was the age group 1-10 years with 50.9% and 41.5% proteinuria and haematuria respectively. However, there was no significant difference between haematuria, proteinuria and age ($p>0.502$).

Table 5. Urinalysis showing number with proteinuria and haematuria by age

Age grade years	No. examined	Ova +ve (%)	No. positive for haematuria (%)	No. positive for proteinuria (%)
1-10	106	50(47.2)	54(50.9)	44(41.5)
11-20	116	71(61.2)	78(67.2)	69(59.5)
21-30	121	92(76.0)	101(85.5)	106(87.6)
31-40	109	82(75.2)	96(88.1)	98(89.9)
41-50	82	59(72.0)	67(81.7)	64(78.0)
50+	59	40(67.8)	48(81.4)	46(77.9)
Total	593	394(66.4)	444(74.9)	427(72.0)

4. DISCUSSION

The study assessed the prevalence of urogenital schistosomiasis infection among Fulani herdsmen in six bush encampments in Rivers State. In the current study urinary schistosomiasis infection had varied prevalence in the bush encampments. It was evident that, Fulani's in Eleme and Oyigbo bush encampments had the highest prevalence of infection. This has been observed in other Fulani settlements in Owerri, Eze [15] and Agi and Okafor [2] in epidemiology of *Schistosoma haematobium* in Odau Community in the

Niger Delta area of Nigeria but, higher than those of Anosike [16]) who in a similar study in Eastern Nigeria reported a very low prevalence rate. Factors predisposing to infection include poor sanitation, unhealthy cultural practice and lack of education. It could also be attributed to closeness to open water sources and the bush encampment being at the outskirt of the cities where some residents still disposed their stool indiscriminately. However, the high prevalence in the study could have been acquired in the waterlogged areas or infested ponds during herding. The unprecedented level of schistosomiasis recorded among this population in Rivers State could be connected with migratory habit of the individuals and probably not to the presence of intermediate snail hosts, since no snail intermediate hosts of the parasite were found in the available natural water sources in the bush encampments. Majority of the infected population of the present study harboured heavy infection with a mean egg output of 83.3/10ml urine. This seem to be far lower than the 309.06 eggs/10ml urine reported by Ladan [17] as well as the 114.2eggs/10ml urine reported by Ugbomoiko [18] in two communities of Osogbo, Osun, Nigeria. However, similar trends have been observed by Kanwai [19] in sedentary Fulani settlements of Dumbi Igabi L.G.A, Kaduna State, Nigeria, and Bala [20] in prevalence and intensity of urinary schistosomiasis in Abarma village, Gusan, Nigeria. Higher male prevalence may have resulted from their exposure to the infection sites and from the water logged areas or infected ponds during herding. The higher prevalence and intensity observed among males compared with females could be also attributed to their high involvement to man contact activities engaged which exposed them to cercariae infected water. All the ages studied had infection, showing that infection with urinary schistosomiasis among the Fulani's occurs very early in life through exposure to contaminated water bodies. The young children are often involved in more activities that bring them to infested ponds, such as watering of the cattle, washing and bathing. However, it could be the result of early exposure to infested water bodies when they are taken along with their mothers. The decrease of infection with increase in age could also be due to increased immunity with increase in age as reported by Chigozi [21,16]. The age group 21-30 years had the highest prevalence and was more heavily infected probably because of their high levels of water contact and exposure to cercariae for various reasons. They are also the active working force while the decreased among the elderly subjects who probably have reduced schistosome worms and less eggs [2,22]. Reduced worm burden in patients of 50 years and above may have resulted from the development of concomitant immunity known to occur in the infection [23] or too old to be actively involved in water contact activities. The high excretion of schistosomes egg among 21-30 years old could be attributed to increased worm burden and the high fecundity rate of schistosome parasites. Findings in this study suggest that most infected of the population excreted ≥50≤100 eggs/10ml of urine and a small proportion excreted <50 eggs/10ml. This could be due to the differences in the degree of water contact among the Fulani. Haematuria and proteinuria are important indicators that are often used for assessment of the level of schistosomiasis in epidemiological studies. Higher rate of haematuria occurrence among the herdsmen in this study indicates that majority of infected individuals might suffer severe complications of the bladder and ureter due to immunological reactions [24].

5. CONCLUSION

This study reveals that urinary schistosomiasis is highly prevalent among the Fulani Pastoralists in Rivers State. This findings support an urgent need to start an effective schistosomiasis control programme among this group. Provision of clean and safe drinking water, periodic drug distribution, health education and introduction of proper sanitation are important in order to curb this among the Fulani's. However, the government and health

officials should ensure thorough check up and treatment of the Fulani's whenever they migrate to the State.

CONSENT

All authors have declared that written informed consent was obtained from the patients for publication of this case report and accompanying images

ETHICAL APPROVAL

All authors hereby declare that all experiments have been examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down in the 1964.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. World Health Organisation Fact sheet February, 2010 Schistosomiasis. Retrieved on October, 28, 2011. Available: http://www.goggle.com.ng
2. Agi PI, Okafor EJ. The Epidemiology of *Schistosoma haematobium* in Odau community in the Niger Delta Area of Nigeria. J Appl Sci Environ Mgt. 2005;9(3):37-43.
3. Mcmanus DP, Eray DJ, Ross AG, Williams GM, He HB. Schistosomiasis research in the donting lake region and its impact on local and natural treatment and control in China. Journal of tropical Diseases. 2011;(5)1053.
4. Duwa M, Oyeyi JI. The role of Jakara dam in the transmission of schistosomiasis. Bayero Journal of Pure and Applied Science. 2009;2:58-63.
5. World Health Organisation Fact sheet No 115 update March 2013 Schistosomiasis. Retrieved on November, 19, 2013. Available: http://www.goggle.com.ng
6. World Health Organisation: Schistosomiasis World Health Organisation division of control of Tropical diseases. Genera Switzerland. 2007; Retrieved on May 15, 2010. Available: http://www.goggle.com.ng
7. Oladejo SO, Ofoezie IE. Unabated Schistosomiasis transmission in Erinle River Dam, Osun State, Nigerian: Evidence of neglect of environmental effects of development projects. Tropical Medicine and International Health. 2006;11:843-850.
8. Opara KN, Udoidung NI, Ukpong IG. Gentourinary Schistosomiasis among pre-primary school children in rural community within the Cross River Basin, Nigerian. Journal of Helminthology. 2007;81:393-394.
9. Sulyman MA, Fagbenro- Beyioku AF, Mafe MA, Omotola BD, Adedoyin JA, Akande DO. *Schistosoma haematobium* and concurrent parasitic infections in school aged children. Nigerian Journal of parasitology. 2009;30(3):79-85.
10. Fana SE, Ekejindu IM, Nnamah AK. Urinary Schistosomiasis among School Children in Argungu, Kebbi State. Nigerian Journal of Parasitology. 2009;30(2):152-155.
11. Akinboye DO, Ayisebutu JU, Fawole O, Agholade OM, Akinboye OM, Amosu AM, Atulomh NOS, Awodele O, Oduola O, Owodnni BM, Rebecca SN, Falade M, Emem O. Urinary Schistosomiasis: Water Contact Frequency and Infectivity among Secondary School Students in Ibadan, Nigeria. Nigerian Journal of Parasitology. 2011;32(1):129-134.

12. Anyanwu GI, Okoro OC. Observation on Urinary Schistosomiasis in School Children in J.S, Plateau Stale Nigerian. International journal, Environmental Health and Human Development. 2002;3(1):31-34.
13. Nigeria Physical Setting: Web 6 Feb.2003.
Available: www.onlinenigeria.com/links/Riversstateadv.asp
14. Cheesbrough M. Examination of blood for malaria parasite. District Laboratory Practice in Tropical Countries Part 1. Cambridge Low-Price Edition. 2005;239-258.
15. Eze NC, Nzeako SO, Amadi EC. Current Status of Malaria and Urban Schistosomiasis Infections in Mammy Market Free Zone of the 34 Field Artillary Brigdage in Obinze, Owerri. Nigeria Journal of Parasitology. 2010;31(2):61-68.
16. Anosike JC, Bertram E. B. Nwoke, Celestine O. E. Onwuliri, Charles E. Obiukwu, Akuchinyere F. Duru, Micheal I. Nwachukwu, Chinyere N. Ukaga. Prevalence of parasitic diseases among Nomadic Fulani's of South-Eastern Nigeria. Ann Agric Environ Med. 2004;11:221-225.
17. Ladan MU, Abubakar U, Abdullahi K, Bunza MDA, Nasiru M, Ladan MJ. Gender and age-specific prevalence of urinary schistosomiasis in selected villages near a Dam site in Gusau Local Government Area, Zamfara State. Nigerian Journal of Parasitology. 2011;32(1):55-60.
18. Ugbomoiko US, Ofoezie IE, Okoye IC, Heukelbach J. Factors associated with urinary schistosomiasis in two peri- urban communities in south–western Nigeria. Annals of Tropical Medicine & Parasitology. 2010;104(5):409-419.
19. Kanwai SA, Ndams IS, Kogi E1, Abdulkadir JS, Gyam ZG, Bechemagbor A. Cofactors Influencing Prevalence and Intensity of *Schistosoma haematobium* Infection in Sedentary Fulani Settlements of Dumbi Dutse, Igabi LGA, Kaduna State, Nigeria. Science World Journal. 2011;6(2):15-19. Available: www.scienceworldjournal.org ISSN 1597-6343.
20. Bala AY, Ladan MU, Mainasara M. Prevalence and Intensity of Urinary Schistosomiasis in Abarma Village, Gusau, Nigeria: A preliminary Investigation Science. World Journal. 2012;7(2). Available: www.scienceworldjournal.org1597-6343
21. Chigozie JU, Patrick GO, Cletus DCU, Azinzechukwu PN, Reuben OI. Urinary Schistosomiasis Among School Age Children In Ebonyi State, Nigeria. The Internet Journal of Laboratory Medicine. 2007;2:1.
22. Ogbe MG. *Schistosoma haematobium* in human population: A review of the relationship between prevalence, intensity and age. Nig J Parasit. 1995;16:39-46.
23. Woolhouse MEJ, Taylor P, Mattanhire D, Chandiwana SK. Acquired immunity and Epidemiology of *Schistosoma haematobium.* Nature. 1991;351(6329):757-759.
24. Vennervald BJ, Kohama AL, Reimert CM. Assessment of morbidity in *S. haematobium* infection. Current methods and future tools. Acta Tropica. 2000;77(1):81-89.

Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sciencedomain.org/review-history.php?iid=673&id=19&aid=6464