



Survey of Haemoparasitic Infections among Fulani pastoralists in Rivers State

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ABSTRACT: This investigation was conducted between March 2010 and November 2011, to determine the prevalence and transmission of haemoparasites amongst Fulani pastoralists in six communities of Rivers State, Niger Delta, Nigeria- Ahoada – East, Elele, Eleme, Elemenwo, Oyigbo and Bori. 2mls of intravenous blood samples were collected from 593 Fulani pastoralists. Thick and thin blood smear techniques were utilized and thin film was stained with Delafield's haematoxylin. Of the entire pastoralists sampled, 538(90.7%) were positive for different haemoparasites, showing 564 (78.2%) for *Plasmodium falciparum*, while 74(2.5%) were positive for microfilariae of human filariasis. The microfilariae recovered, showed prevalence of 27 (4.6) for *Loa loa*; 38(6.4%) for *Mansonella perstans* and 9(1.5%) for *Wuchereria bancrofti*. No *Onchocerca volvulus* was recovered during the study. Differences in the prevalence of haemoparasitic infections varied significantly in the six communities ($\chi^2=14.6$, $df = 3$, $p>0.05$). The prevalence of haemoparasites was higher in Elemenwo community, with 114(99.1%). Sex-related prevalence showed, 326(88.3%) in males and 172(76.8%) in females. The haemoparasitic infections among male and female Fulani pastoralists were statistically significant, males: ($\chi^2=145.1$, $df 4$, $P>0.05$), females : ($\chi^2=92.9$, $df = 4$ $p>0.05$). Infections of haemoparasites within age groups varied significantly ($\chi^2=26.9$, $df =3$, $p>0.05$) with 21-30 years having the highest prevalence of 119(98.3%). A decline in prevalence was observed among 50 years and above age group. Multiple infections in males were 32(8.7%), while females were 8(3.6%). Thus, multiple infections were higher in males than females. No *W. bancrofti* was recorded in the females. Occupation-related prevalence was significant within the study populations ($\chi^2=26.9$, $df =3$, $p>0.05$), and the highest prevalence recorded among the nomads, with 336(96.8%). This study examined the interacting factors enhancing the high prevalence of haemoparasitic infections and further suggests, the provision of social amenities by government and other medical agencies to reduce haemoparasitic burden among pastoralists. ©JASEM

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Haemoparasites constitute a major public health problem globally, with negative impacts on the socio-economic development of their victims. The epidemiology of haemoparasitic infections in Nigeria is complicated, because of the diversity of environmental conditions in different regions of the country. Road constructions, demolition of buildings, and deteriorating drainage systems, have created suitable breeding sites for haemoparasitic vectors in many parts of Nigeria, including Rivers State. Of all haemoparasitic infections, malaria parasite, *P. falciparum* is the most prevalent and common, filarial parasites are *Wuchereria bancrofti*, *Loa loa*, and *Mansonella perstans*. Female *Anopheles* mosquito is the main vector of malaria parasite, *W. Bancrofti* is vectored mainly by *Culex* and female *Anopheles*

mosquito species, *Loa loa* is vectored by *Chrysops dimidiata*, while *Culicoides* species is the vector of *mansonella perstans*. Many studies have been conducted on haemoparasites and their vectors in tropical and sub-tropical regions of the world (Amadi, 2007, Anosike *et al.*, 2004). Fulani Pastoralists in search of pastures for their herds in Rivers State, settle in areas with high mosquito densities, which expose them to intense haemoparasitic infections. The present study is aimed at providing information on the current prevalence of haemoparasitic infections among the Fulani pastoralists in their various bush encampments, in addition to providing baseline data, necessary for implementation of control programmes for these haemoparasitic infections in the study area.

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MATERIALS AND METHODS

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 populations of Fulani herdsmen were located with their families. Rivers State lies at latitude 4°45' north and longitude 6°50' 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 2,500cm³. Temperature ranges between 28°C to 33°C which supports the rainforest type of vegetation and humidity ranges of 72% to 83% is high in the State throughout the year and decreases slightly in the dry season.

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 time 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 2010 to 2011. The Fulani herdsmen were selected randomly (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.

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.

Specimen collection: Only day time blood specimens were collected between 10.00am-2pm on each occasion from Fulani pastoralists. Day provocative test (DPT) for *Wuchereria* was adopted using diethyl carbamazone citrate (DEC) marketed as Banocide. One hundred milligram (100mg) of DEC was administered to individuals above 15 years and 75mg to those below 15 years (Udonsi, 2003). Pregnant

women did not receive the drug for medical reasons. Day provocative samples (DPS) were collected after 50-55 minutes of DEC administration. 2mls of blood samples were collected intravenously from the cubital vein of the arm, from each male and female volunteer, using sterile syringe. The blood samples collected were dispensed into labelled sterile specimen bottles containing anti-coagulant. The age and sex of each Fulani was noted.

Examination and Identification of haemoparasites: Thick blood films were stained with Giemsa for the examination of common blood parasites while the Thin smears were air-dried, fixed in methanol and stained with Delafield's rapid haematoxylin staining technique as described by (Cheesbrough, 2005). The methanol fixed preparation was covered with 1ml of diluted field stain B and A. This was washed with clean water and covered with diluted Delafield haematoxylin stained for 5 minutes with buffered water and air dried. Microfilariae were identified and counted under the microscope, using nature of their sheath and position of nuclei while malaria parasite was identified by the presence of chromatin dot at the middle or margin of infected red blood cells.

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. ANOVA and chi-square analyses were used to assess significant differences in intensity and prevalence of infection. Values were considered statistically significant at $P > 0.05$.

RESULTS AND DISCUSSION

Four different haemoparasites namely, *Plasmodium falciparum*, *Loa loa*, *M. perstans* and *W. bancrofti* were recovered during the investigation. Of the 593 Fulani's examined for various haemoparasites, 538 (90.7%) were infected by *plasmodium falciparum* and filarial parasites. 464 (78.2%) of the haemoparasites were *plasmodium falciparum*, while 74 (12.5%) were positive for filarial parasites. Statistical analysis indicated that distribution of the different haemoparasites varied significantly in the bush encampments (χ^2 cal = 14.6; df=3, $p > 0.05$). The highest prevalence was recorded in Elelenwo 114 (99.1%), while Oyigbo, Eleme and Elele bush encampments had prevalence of 97 (96.0%), 101 (90.2%), 92 (87.6%) respectively. The highest prevalence of *P. falciparum* was recorded in Elelenwo with 96 (83.5%) followed by Oyigbo 82 (81.2%) and Elele with 82 (78.1%). Only 38 (6.4%) had *M. perstans*, while prevalence of 27 (4.6%) and 9 (1.5%) were recorded for *L. loa* and *W. bancrofti*

(Table 1). In the study, males had 326(88.6%), while 172 (76.8%) females had haemoparasitic infections. The prevalence of the different haemoparasites for males were 295(79.7%) for *P. falciparum*, 23(6.2%) for *L. loa*, 31(8.4%) for *M. perstans* and 9(2.4%) for *W. bancrofti*, while the females had 169 (75.4%) for *P. falciparum*, 4(1.8%) for *L. loa*, 7(3.1%) for *M. perstans* respectively. The difference between female and male infections was statistically significant (males χ^2 cal = 145.1, df=4, $p>0.05$, females χ^2 cal= 92.9, df = 4, $p>0.05$). Multiple infections in males were 32 (8.7%) and females 8(3.6%) and no *W. bancrofti* was recorded among females (Tables 2 and 3). Peak infections of 119 (98.3%) occurred within age bracket of 21-30 years while lowest infection of 49(83.0%) occurred in 51 years and above age

bracket. The highest prevalence of *P. falciparum* was observed among 21-30years with 99(81.8%), followed by 11-20years, 93 (80.2%) and the least occurred among 51 years and above 41(69.5%). High prevalence of filarial worms were observed among 21-30years (16.5%), and the lowest observation among 1-10years with (4.7%) and no *W. bancrofti* in the same age bracket (Table: 4). However, multiple infections of *P. falciparum* and *Mansonella perstans* were among males but does not show any statistical significance(Table:5), (χ^2 cal = 7.20, df =1, $P<0.05$). The occupation-related prevalence of haemoparasitic infections in the study showed that nomads had 336(96.8%) and cattle dealers had 44(91.7%), (Table 6).

Table 1: Prevalence and distribution of haemoparasites amongst Fulani pastoralists in the bush encampments

Bush encampments	No. Examined	No. (%) infection	MP No. (%) infection	<i>L. loa</i> No. (%) infection	<i>M. perstans</i> No. (%) infection	<i>W. bancrofti</i> No. (%) infection
Ahoda –East	89	74(83.1)	69(77.5)	2(2.2)	3(3.4)	-
Elele	105	92(87.6)	82(78.1)	4(3.8)	5(6.1)	1(0.9)
Elelenwo	115	114(99.1)	96(83.5)	7(6.1)	9(7.8)	2(1.7)
Eleme	112	101(90.2)	81(72.3)	6(6.3)	11(9.8)	3(2.7)
Oyigbo	101	97(96.0)	82(81.2)	6(5.9)	7(6.9)	2(1.9)
Bori	71	60(84.5)	54(76.1)	2(2.8)	3(4.2)	1(1.4)
Total	593	538(90.7)	464(78.2)	27(4.6)	38(6.4)	9(1.5)

χ^2 cal = 146.4, df =3, $p>0.05$

MP = Malaria Parasite

Table 2: Prevalence of haemoparasites and mixed infections amongst male Fulani pastoralists in the bush encampments

Bush encampments	No.Examined	No. (%) infection	MP No. (%) infection	<i>L. loa</i> No. (%) infection	<i>M. perstans</i> No. (%) infection	<i>W. bancrofti</i> No. (%) infection	Mixed Infection No. (%) infection
Ahoda –East	57	46(80.7)	45(78.9)	2(3.5)	2(3.5)	0	3(6.5)
Elele	69	61(88.4)	55(79.7)	4(5.8)	4(5.8)	1(1.4)	3(4.9)
Elelenwo	67	63(94.0)	57(85.1)	6(8.9)	7(10.4)	2(3.0)	9(13.4)
Eleme	67	59(88.1)	50(74.6)	4(6.0)	9(13.4)	3(4.5)	7(10.4)
Oyigbo	64	58(90.6)	53(82.8)	5(9.4)	6(9.4)	2(3.1)	8(12.5)
Bori	45	39(86.7)	35(77.8)	4(4.4)	3(6.7)	1(2.2)	2(4.4)
Total	369	326(88.3)	295(79.9)	23(6.2)	31(8.4)	9(2.4)	2(9.8)

χ^2 cal = 145.1, df =4, $p>0.05$

Table 3: Prevalence of haemoparasites infections amongst female Fulani pastoralists in the bush encampments

Bush encampments	No. Examined	No. (%) infection	MP No. (%) infection	<i>L. loa</i> No. (%) infection	<i>M. perstans</i> No. (%) infection	<i>W. bancrofti</i> No. (%) infection	Mixed Infection No. (%) infection
Ahoda –East	32	24(75.0)	24(75.0)	0	1(3.1)	0	1(4.2)
Elele	36	28(77.8)	27(72.2)	0	1(2.8)	0	0
Elelenwo	48	40(83.3)	39(81.3)	1(2.1)	1(4.2)	0	2(5.0)
Eleme	45	32(71.1)	31(68.9)	2(4.4)	2(4.4)	0	3(9.4)
Oyigbo	37	29(78.4)	29(78.4)	1(2.7)	1(2.7)	0	2(5.4)
Bori	26	19(73.1)	19(73.1)	0	0	0	0
Total	224	172(76.8)	169(75.4)	4(1.8)	4(1.8)	0	8(4.6)

χ^2 cal = 92.9, df =4, $p>0.05$

*MP = Malaria Parasite

Table 4: Age-related distribution of haemoparasitic infections in the bush encampments

Age group (years)	No. Examined	No. (%) infection	MP No. (%) infection	<i>L. loa</i> No. (%) infection	<i>M. perstans</i> No. (%) infection	<i>W. bancrofti</i> No. (%) infection
1-10	106	89(84.0)	84(79.2)	2(1.9)	3(2.8)	-
11-20	116	108(93.1)	93(80.2)	6(5.2)	8(6.9)	1(0.9)
21-30	121	119(98.3)	99(81.8)	6(5.0)	11(9.1)	3(2.5)
31-40	109	102(93.6)	87(79.2)	4(3.7)	8(7.3)	3(2.8)
4-50	82	71(86.5)	60(73.2)	5(6.1)	4(4.9)	2(2.4)
51& above	59	49(83.1)	41(69.5)	4(6.8)	4(6.8)	-
Total	593	538(90.7)	464(78.2)	27(4.6)	38(6.4)	9(1.5)

$X^2_{cal} = 26.9$, $df = 3$, $p > 0.05$

Table 5: Multiple infections of haemoparasites in the bush encampments

Haemparasites	MALES	FEMALES
	No. (%) infection	No. (%) infection
<i>Malaria + Loa loa</i>	11(3.4)	3(1.7)
<i>Malaria + M. perstans</i>	15(4.6)	5(2.9)
<i>Malaria + W. bancrofti</i>	6(1.8)	0(0)
Total	32(9.8)	8(4.7)

$X^2_{cal} = 7.2$, $df = 1$, $p < 0.05$

Table 6: Occupation-related prevalence of haemoparasites in the bush encampments

Occupation	No. Examined	No. (%) infection	MP No. (%) infection	<i>L. loa</i> No. (%) infection	<i>M. perstans</i> No. (%) infection	<i>W. bancrofti</i> No. (%) infection
Nomads	347	336(96.8)	279(80.4)	21(6.0)	29(8.4)	7(2.0)
Cattle dealers	48	44(91.7)	37(77.1)	2(4.2)	4(8.3)	1(2.0)
Artisans	21	16(76.2)	15(71.4)	1(4.8)	-	-
House wives	128	86(67.2)	81(63.3)	2(1.6)	3(2.3)	-
Total	544	422(88.6)	412(75.7)	26(4.8)	36(6.6)	8(1.5)

$X^2_{cal} = 3.5$, $df = 3$, $p < 0.05$

*MP= Malaria parasite

This study revealed high prevalence of haemoparasites among Fulani pastoralists in six bush encampments in Rivers State. The four major species encountered were *Plasmodium falciparum*, *L. loa*, *Mansonella perstans* and *Wuchereria bancrofti*. This is similar to other reports from different parts of the country (Amajuoyi *et al.*, 2006); Anosike *et al.*, 2005). The prevalence of these haemoparasitic infections among nomadic Fulani's is related to peculiar ecological nature of the areas, which favour the breeding of arthropod vectors of haemoparasites and transmission of these parasites to the pastoralists. Further, the Fulani's may acquire the infections in other areas during herding and seasonal movements. Fulani's in their normal attire expose most parts of their body and therefore, this behavioural pattern predisposes them easily to vector bites. This is consistent with WHO, (1976) which reported, the general prevalence of haemoparasitic infections was dependent upon vectors biting habit and frequency of transmission to which a population was exposed. *Plasmodium falciparum* predominated in the investigation with 464 (78.2%) prevalence, contrary to the prevalence reported for the infection among the

nomadic Fulani's elsewhere (Abdikarim and Johan, 1999, Anosike *et al.*, 2004, Ekpo *et al.*, 2006). This high prevalence of *P. falciparum* in the study is not surprising, because of the epidemiological factors noticed during the investigation like suitable ecological conditions, humid atmospheric conditions, prevailing in the study areas which favour biological development of the parasite and insect vectors of the haemoparasites, thereby enhancing their transmission to the human population.

Nomads prefer to camp near water bodies, usually at river banks and stagnant ponds, where mosquitoes breed, ensuring that malaria transmission is intense. The bush encampments lack basic amenities; huts are made of straw or thatch, without windows and good doors, therefore, no protection against mosquito bites. In addition, there is overcrowding and fewer mosquito bednets were given mainly to the children by Ministry of Health, Rivers State in some encampments. Also, majority of the population were using old, black thorn and untreated bednets. Filarial parasites among the study population, revealed a moderately low prevalence rate of 74(12.5%). This is

consistent with (Anosike *et al.*, 2004, Amajuoyi *et al.*, 2007). The variation of haemoparasitic infections in the encampments could be related to local environmental factors of the different study areas or behavioural practices of the nomads concerned. The overall prevalence of the haemoparasites was higher in Elelenwo community. This is a community, where cattle's were sold mainly in Rivers State. The cattle hoofs, feeding troughs and large bathroom baths used as drinking troughs were noted to be close to residential houses inhabited by the Fulani's. Again, the ongoing road construction and building demolitions, which allow accumulation of stagnant water at different spots, could be a contributory factor to the high prevalence of haemoparasites especially malaria parasites.

It was observed that males had more haemoparasitic infections than females. This is in line with most reports in Africa Abdikarim and Johan, (1999), Anosike *et al.*, (2004), Gundiri *et al.*, (2007), This could be attributed to the more active involvement and exposure to disease vectors by males during herding. Higher prevalence were observed among individuals of 21-30 years which had 119(98.3%) and 31-40 years with 109(93.6%). This high prevalence in these age groups may be attributed to active working and involvement in herding and other outdoor activities, which predispose them to day and night vector bites. This is contrary to reports of Gundiri *et al.*, (2007) and Ekpo *et al.*, (2008), who observed higher haemoparasitic infections only in the age groups below twenty years and females are generally known to be more susceptible to malaria infection due to their immunity level, social and economic challenges. The least haemoparasitic infection was recorded among fifty (50⁺years) and above individuals. This agrees with Udonsi, (1986) and Gundiri *et al.*, (2007), who reported, that there may be immunological tolerance of human host, as a result of long exposure to *plasmodium* and filarial parasites. Occupation-related prevalence was observed to be statistically significant. Nomads have the highest prevalence of 336(96.8%). Since they are poor and cannot afford health-care services in their various bush camps, this resulted in continuous and increasing transmission of haemoparasitic infections without interference. During the investigation, no *Onchocerca volvulus* was recovered from the study population. This may be attributed to the absence of fast-flowing water bodies in the various bush encampments that support reproductive biology of *Simulium damnosum* – vector of *onchocerciasis*. This investigation suggests an urgent need for the provision of basic amenities, healthcare services with chemotherapy and introduction of health education in

the various bush encampments to control or reduce morbidity from the transmission of haemoparasitic infections in the study area.

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