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Clinical malaria: Aspects of demographic and health-seeking characteristics of inmates of New Bakassi Resettlement in Ekpiri-Ikang, Nigeria

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***Abstract*-** Nigerians in Bakassi were evacuated after International Court of Arbitration awarded Bakassi to Cameroon. This study, carried out after two years of resettlement, was aimed at determining the incidence, health-seeking occurrences and spatial clustering of clinical malaria among New Bakassi resettlees at Ekpiri-Ikang, Nigeria. Records from approved hospitals and structured questionnaires were employed. Overall, 25.4% of resettlees seeking medical assistance were diagnosed with clinical malaria. Prevalence was highest among the 0-9 years age group; higher among females of reproductive age than among their male counterparts (χ^2-test; $p < 0.05$); comparable between sexes in all other age brackets, (χ^2-test; $p > 0.05$). The risk of having malaria was six times as high among children (0 – 9 years) than among adults (OR 5.99; 95% CI 1.738 TO 1.842); twice as high among females than among males (OR 1.79; 95% CI 0.531 to 0.627); five times as high among females of reproductive age than among their male counterparts (OR 4.55; 95% CI 1.349 to 1.581). Malaria incidence was 2.4 episodes/person/year (2.2 for males; 2.6 for females). Generally, females had higher number of episodes than males. Overall, 6.5% of respondents had zero malaria episode per year, and were from 8.3% of the total households. From the latter, 15.4% had two residents each with zero malaria episode. The occurrence of clinical malaria was high among health-seeking resettlees generally, especially among children and women of reproductive age. Very few households (8.3%) had zero malaria episodes.

***Index Terms*-** Malaria, Incident rate, health-seeking, Resettlement, Nigeria

I. INTRODUCTION

Sub-Saharan Africa is the hotbed of clinical malaria, accounting for about 80% of 110 million global cases, and with up to 2 million mortality cases [1]. About 588 million people are at risk and there is endemicity in 45 African countries with Nigeria accounting for a quarter of all cases [2]. Malaria, is holoendemic in Nigeria especially in the rural areas [3], could be hyperendemic in urban areas [4], is perennially stable but transmission is most intense during the rainy season. It is the commonest cause of work and school absenteeism and outpatient attendance in the country [5]; a leading cause of hospital admissions and child mortality in Africa [6]; a serious impediment to economic and social development in Nigeria [7]. Furthermore, the vectors that transmit the malaria parasites, *Plasmodium*, especially *Anopheles gambiae* and *An. funestus* are quite abundant in the country [8]. With Nigeria located close to the equator, there are consequent hot and humid conditions which are favourable for malaria transmission. The combination of these ecological factors including preponderance of clear surface water bodies increases the vectorial capacity of the anopheline mosquitoes [9].

The total number of refugees worldwide is put at 9.2 million; an estimated 25 million people are displaced by conflicts worldwide, while the number of those uprooted for developmental projects is thought to be much higher [10]. About 30% of displaced persons in the world are found in Sub-Saharan Africa region, which has the worst overall access to clean drinking water. The displaced persons are considered to be among the most vulnerable group in the world. Forced movements of populations are precursory to health hazards [11], social stress, insecurity, and outbreak of relocation-related diseases [12-13], exacerbate malaria transmission leading to malaria epidemics [14].

The refugee and Internally Displaced Persons (IDP) camps in sub-Saharan Africa are characterized by overcrowding, poor accommodation, unsafe and inadequate water supply, poor sanitation, poor system of waste disposal, the amount and quality of food available, and poor sewerage systems, heighten vulnerability to epidemics, as these conditions predispose to parasitic and communicable diseases including malaria. The impact of malaria is greatest when the populations are most vulnerable [15]. Malaria infections were of particular concern among the refugee population because of the severe morbidity [16]. The weakest segments of the demographic spectrum such as infants, children and the elderly are the most strongly affected.

In October 2002, the International Court of Justice sitting in France, on a case brought by Cameroon against Nigeria, awarded the oil-rich Bakassi Peninsula to the former. This necessitated the resettlement of Nigerians in Bakassi to the New Bakassi camp at Ekpri- Ikang in Cross River State in October, 2009. This study is aimed at ascertaining the incidence rate, spatial clustering, and health-seeking epistemology of clinical malaria among New Bakassi resettlees in Ekpiri-Ikang, Nigeria.

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II. MATERIALS AND METHODS

A. *Description of Study population.* The New Bakassi Resettlement Camp is located in Ekpri- Ikang in Cross River State which lies between latitudes 4°49' 47'' N and longitudes 8°30' 49''E, on an altitude of 76 meters [17]. The population of the host community is 19,424. There are a total of 500 houses in the resettlees' camp. The houses could be described as modern as they are built with zinc roofing, painted, louvres-fitted windows, and with relatively good finishing. Only a few of these houses have mosquito nets. The houses were grossly inadequate for the resettlees hence a number of families were accommodated in one house. There were about 2,500 families housed in just 300 of the 500 houses in the camp.

The resettlees are Nigerians and are from five states of the federation namely, Cross River, Akwa Ibom, Bayelsa, Rivers, and Delta states. They were all professional fishermen living in the Bakassi Peninsula before their forced relocation to Ekpri-Ikang.

The resettlees have access to water through a bore-hole provided by the Cross River State Government. The bore-hole was however erratic, surrounded by bushes, and yet to be provided with reliable electricity.

B. *Field trips.*
Field trips to the New Bakassi Resettlement Camp, Ekpri –Ikang, Cross Rivers State were carried out between December 2009 and February 2010. Inventory of the available sanitary and recreational facilities, house types and settlement patterns was taken.

C. *Interactive sessions and questionnaire administration.* Interactive sessions were held with some of the resettlees in the local Efik dialect with an interpreter, and focused on explaining the aim of the study, their relationship with the host community, their general welfare including feeding and healthcare, and the need for them to give honest answers in the structured questionnaire. The questionnaire which bothered on the number of episodes of malaria per year, daily routines of the resettlees, their feeding and the general welfare, was randomly administered on a different day and setting, adjusting for age and sex. Every second person of the age and sex encountered was recruited for the questionnaire study. For children, their guardian helped with answers to the questions. Literate respondents were allowed to complete the questionnaire on their own, but their answers were revalidated by the study team to ensure accuracy.

D. *Collection of medical and laboratory records.*
Medical records of the resettles regarding clinical malaria were collected from the two approved medical facilities approved by the Government to oversee the health concerns of the resettlees. These are the Dispensary in the Camp and the General hospital, Calabar.
Information collected included clinical malaria diagnoses as reported by these two approved health institutions used by the resettlees since inception in relation to sex and age. These were collected, collated and analyzed.

E. *Data analysis.* SPSS 14.0 for Windows was used for data entry. Statistical analyses were carried out on differences between prevalences of infections using chi-square tests. P-values < 0.05 were considered statistically significant. Risk assessment was evaluated from Odds Ratio, while the Incidence of clinical episode was calculated as the number of episodes of malaria per person per year [18].

III. RESULTS

A. *Prevalence among health-seekers.*
The prevalence of malaria among health-seeking New Bakassi resettlees in relation to age and sex is presented in Figure 1. Overall, 25.4% of the resettlees who sought for medical assistance in the approved health institutions were diagnosed with clinical malaria. Among these, there were more females with clinical malaria than males (χ^2-test; $p < 0.05$). Prevalence was highest among the 0-9 years age group, and followed distantly by the 20-29 years age group. From the latter age group, prevalence decreased steadily until the last age group.

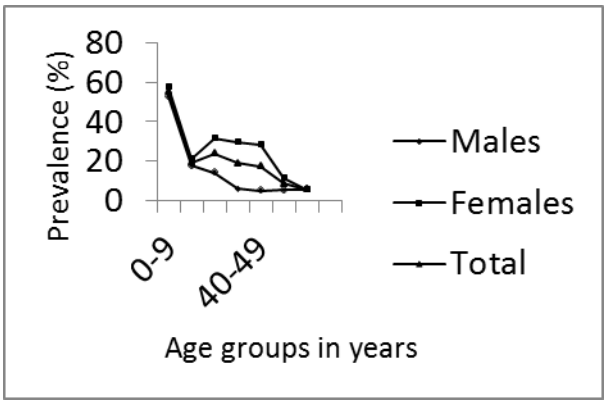

Figure 1. Prevalence of malaria among health-seeking New Bakassi resettlees in relation to age and sex

Prevalence was significantly higher among females of reproductive age than among their male counterparts (χ2-test; $p < 0.05$). In all other age brackets, prevalence was comparable between sexes (χ2-test; $p > 0.05$). Further analysis of the differences between the reproductive and non-reproductive categories showed a significantly higher prevalence of clinical malaria among non-reproductive females (inclusive of the 0-9 years age group) than among their reproductive counterparts (see Figure 2). When the 0-9 years were excluded from the non-reproductive females, the reverse was obtained. However, a comparison between the non-reproductive males and their reproductive counterparts showed that prevalence was significantly higher among the non-reproductive cluster than among their reproductive counterpart regardless of whether the 0-9 years age group was included or excluded from the study.

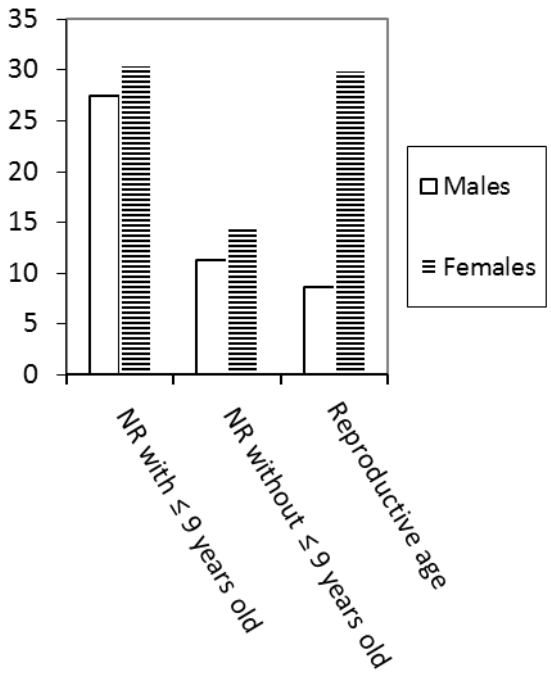

Figure 2. Sex-related differentials in prevalence of clinical malaria between reproductive and non-reproductive ages of health-seeking Bakassi resettles

(NR: Non-reproductive age groups; Reproductive age: represents age groups between 20 to 49 years. All others fall within the NR).

B. Risk assessments of health-seeking occurrence due to malaria.

The risk of clinical malaria was six times as high among children than among adults (0 – 9 years; OR 5.99; 95% CI 1.738 TO 1.842).

Overall, the risk of health-seeking occurrence due to malaria was twice as high among females (OR 1.79; 95% CI 0.531 to 0.627), than among males; five times as high among females of reproductive age than among their male counterparts (OR 4.55; 95% CI 1.349 to 1.581). However, among the non-reproductive age categories (1-19, 50 - ≥ 60 years age categories) there was no association between the risk of health-seeking occurrence due to malaria among females (OR 1.08; 95% CI 0.111 to 0.007) and the males.

Among males resettlees, the risk of health-seeking occurrence due to malaria was six times as high among the non-reproductive age cluster as among the reproductive counterparts (OR 5.68; CI 95% 1.570 to 1.904). Among the females, there was no association between the risk of health-seeking occurrence due to malaria among non-reproductive cluster and their reproductive counterparts (OR 1.01; CI 95% -0.060 to 0.078).

C. Incidence rates.

Malaria incidence, calculated from data provided by the respondents, decreased with increasing age among females, while among males the age groups 20 -29 years and 30 – 39 years recorded the lowest (See Table 1). Overall incidence was 2.4 episodes/person/year (2.2 for males; 2.6 for females). For the more vulnerable groups, that is, children under 10 years of age and reproductive females, it was 3.1 and 2.4 respectively.

There were a total of 1,087 malaria episodes in the year 2009 between January and December recalled by 460 respondents. The number of episodes per person per year ranged from 0 to 5 episodes with a median and mode of 2 and 3 episodes respectively. In relation to age and sex, the range of number of episodes per person per year (see Table 2) showed considerable variation, narrowing more among the older age groups especially females of the 50 – 59 age group. The greatest percentage of the youngest two age groups (56.0 % for 0 – 9 years and 51.1 % for 10 – 19 years) had 3 episodes/person/year; for the oldest age groups it was 2 episodes/person/year (57.1% for 50 – 59 years and 57.6% for ≥ 60 years).

Generally, females had higher number of malaria episodes than males (see Figure 3). The odd of not having malaria episode was high among males (OR 11.37; 95% CI 1.67 to 3.17); this translates to reduction in risk of having malaria episode by 92%.

D. *Spatial clustering of clinical episodes*

Overall, 6.5% (30/460) of respondents had no malaria episodes within a year duration, and they were from 8.3% (25/300) of the total households. From households of respondents without malaria episodes, 15.4% had two respondents each with no malaria episode. On the other hand, 5.1% (16/300) of households had two respondents each with malaria episodes with an average incidence of 4.3 episodes/person/year.

IV. DISCUSSION

Malaria was highly prevalent among the New Bakassi resettlees at Ekpiri-Ikang. **T**he risk for malaria is high among IDPs and refugees [19], especially in sub-Saharan Africa where it is the most common health problem [20]. Actually, prevalence could be much higher if asymptomatic malaria cases are factored in [21]. *Plasmodium* infection without overt malaria disease [22], is common in sub-Saharan Africa, with some areas experiencing parasitaemia prevalence as high as 90% [20-21]. In a refugee camp in Kenya, malaria was the most common diagnosis among health-seeking Barawan refugees who presented themselves to the clinic at the refugee camp [23].

Prevalence among children of 0-9 years was the highest of all the age groups in this study, and is congruent with reports across Africa [18]. Similarly, the average number of clinical malaria episodes per child less than ten years of age in this study was 3.3 episodes per year. Malaria incidence in sub-Saharan Africa is between 1.6 and 5.4, and various studies have recorded the incidence to be between 3 and 5 episodes per year [18,24-28]. In the West African sub-region, children followed up for five years in Senegal were found to experience between 0–40 episodes of clinical malaria [29]. There was an unexplained high susceptibility to clinical malaria for a proportion of children with

some children suffering a malaria attack every 4 to 6 weeks over many years [30]. Such exceptional cases of high susceptibility to clinical malaria were not encountered at Ekpiri-Ikang Camp.

Table 1. Incidence of malaria among respondents in New Bakassi Resettlees Camp at Ekpiri-Ikang, Nigeria in relation to age and sex.

Age	Males			Females			Total		
	NResp[a]	TNE[b]	AvEpis[c]	NExam	TNE	AvEpis	NExam	TNE	AvEpis
0 – 9	48	145	3.0	52	163	3.1	100	308	3.1
10 – 19	43	101	2.3	49	130	2.7	92	231	2.5
20 – 29	36	41	1.1	38	87	2.3	74	128	1.7
30 – 39	32	23	0.7	36	85	2.4	68	108	1.6
40 – 49	24	59	2.5	27	66	2.4	51	125	2.5
50 – 59	19	55	2.9	23	51	2.2	42	106	2.5
≥ 60	15	43	2.9	18	38	2.1	33	81	2.5
Total	217	467	2.2	243	620	2.6	460	1087	2.4

[a] NResp: Number of respondents; [b]TNE: Total number of episodes; [c] AvEpis: Average number of episodes.

Table 2. Number of malaria episodes in 2009 as recalled by respondents in the New Bakassi Resettlees Camp at Ekpiri-ikang, Nigeria in relation to age and sex

Age	No. exam	No. of episodes					
		0	1	2	3	4	≥ 5
Males							
0 - 9	48	3	2	3	27	9	4
10 – 19	43	5	3	10	22	3	0
20 – 29	36	6	20	9	1	0	0
30 – 39	32	10	21	1	0	0	0
40 -49	24	3	2	4	11	4	0
50 – 59	19	0	0	6	9	4	0
≥ 60	15	0	0	5	7	3	0
Females							
0 - 9	52	1	3	4	29	10	5
10 – 19	49	2	3	13	25	4	2
20 – 29	38	0	6	19	9	4	0
30 – 39	36	0	4	16	15	1	0
40 -49	27	0	2	13	10	2	0
50 – 59	23	0	0	18	5	0	0
≥ 60	18	0	1	14	3	0	0
Total							
0 - 9	100	4	5	7	56	19	9
10 – 19	92	7	6	23	47	7	2
20 – 29	74	6	26	28	10	4	0
30 – 39	68	10	25	17	15	1	0
40 -49	51	3	4	17	21	6	0
50 – 59	42	0	0	24	14	4	0
≥ 60	33	0	1	19	10	3	0

Indeed, malaria incidence varies substantially between areas [28]. High incidence rate is responsible for high child mortality in Sub-Saharan Africa.

The risk of having malaria was six times as high among children than among adults. Among the Barawan refugees the risk of having malaria parasitemia was twice as high among children than adults [23]. This age-related disparity is probably due to acquired immunity to malaria infection among adults [31]. In malaria endemic areas, immunity to malaria varies with age [25], with maternally acquired immunity in infants waning within

three months before they slowly develop theirs [32]. This results in a progressive and homogenous decrease in malaria attacks with increasing age in children [33-36]; with incidence rates peaking towards the end of infancy and then decrease [28,32].

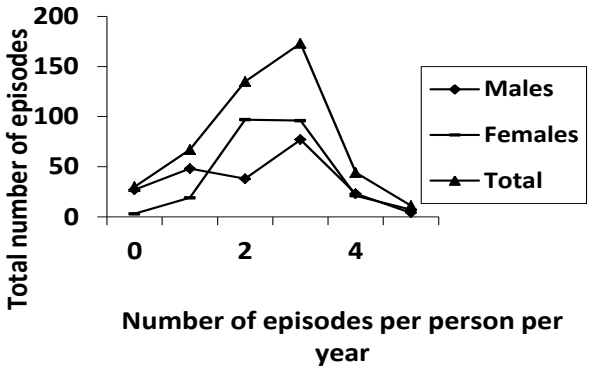

Figure 3. Distribution of number of episodes per person per year in relation to sex among respondents in New Bakassi Resettlees in Ekpiri-Ikang, Nigeria.

Prevalence of malaria was significantly higher among women of reproductive age than among their male counterparts, and is corroborated by other findings elsewhere [3,37,38]. The risk of health-seeking occurrence due to malaria was twice as high among females as among males in this study, and females were eleven times more likely to have malaria episode than males. Findings among Barawan refugees in Kenya were contrary, as males were twice as likely to be parasitemic as were females; and this was attributed to sex differences in behaviour during the evening hours (that is, males tend to be outside more) and their mode of dressing [39]. Among the Resettlees at Ekpiri-Ikang, men were better covered than women. Some have argued that females are expected to have better immunity to malaria and a variety of other parasitic diseases [40-42], while others have attributed this sex-related differences to genetic or hormonal factors [43]. However, there is consensus that pregnant women constitute a malaria-high-risk group. Malaria could cause fetal loss and maternal deaths. Furthermore, resistance of women of reproductive age is relatively weaker than those of their male counterparts. Generally, symptoms of malaria are far more severe in persons without resistance to the disease [44].

Absence of occurrence of health-seeking activity to approved health facilities does not necessary imply absence of malaria whether symptomatic or asymptomatic. Personal differences in response to malaria outcome could be the main reason for the differences in health-seeking occurrences between males and females at Ekpiri-Ikang camp. On the average, females of reproductive age may be more compelled to seek the services of a clinician than their male counterparts, especially when they are pregnant. The predominant local tradition is such that men are men when they "subdue" their ailments; the same ailments that women are encouraged to seek the services of clinicians. At best such men predominantly embarked on self medication.

Any of the resettlees could be asymptomatic even though they have the malaria parasite in their blood [45-49]. The prevalence of asymptomatic malaria could be as high as 98.5% in a Nigerian population [50]. Factors that play important roles in asymptomatic malaria include parasite and host genetics as well as socioeconomics [51], nutritional status [52].

The IDPs are vulnerable for this disease due to a wide variety of reasons. Firstly and perhaps one of the most obvious is the mere population makeup, with 45% of the 33 million displaced persons in the Sub-Saharan region comprised of children. Although adults are also at risk for contracting malaria, children are far more likely to develop severe malaria and die of the disease. Another clear reason for high malaria risk in IDP camps, especially at the early stage of setting up the camp is the lack of health services and control programs which would have been long established in a permanent setting [53]. This is true of the study population where there is total lack of health facilities. The nearest approved hospital for the resettlees being two hours drive away. To reduce malaria mortality and morbidity there must be effective case management and access to prompt effective treatment [54]. Secondly, only very few houses in the study area had window and door screens against mosquitoes and no household had treated mosquito bednets either. A similar situation which resulted in high malaria prevalence in Uganda has been reported [55]. Thirdly, the environmental presence of open water collections catalyzed by anthropogenic activities provides mosquitoes with breeding grounds. This is perhaps, one of the most important risk factors propagating malaria. With the paucity of water in the Ekpiri-Ikang camp, the storage of water by the resettlees in open containers creates increased risk for malaria as water storage containers provide additional breeding ground for the anopheline mosquitoes. Fourthly, the high population density shown by the high number of persons per room creates lots of biting options for the biting mosquito vectors to transmit diseases [56]. Vectors bite more persons in areas of higher population density and concentration increasing vulnerability to malaria [57].

Moderate spatial clustering of clinical malaria was observed from the questionnaire study. Spatial clustering of clinical malaria attacks was reported in Kenya and Pemba Island in Tanzania [28,58]. There are evidence of heterogeneity in malaria infections with 20% of the population carrying 80% of all infections [59], and the existence of a group of children with more clinical malaria disease than others [60-62]. Reasons adduced for these included behavioural differences between households, genetic factors including genetic polymorphism represented by sickle cell trait, as well as continuous exposure which genuinely reduces susceptibility [58].

V. CONCLUSION AND RECOMMENDATIONS

In conclusion, there is high prevalence of malaria in the New Bakassi Resettlement Camp at Ekpri-ikang. The preponderance of vector breeding sites helped by uninformed human activities, poor sanitary and poor social amenities, overcrowding,

malnutrition, lack of house screens against in-door biting vectors, poor personal hygiene and poor personal protective measures among others, have helped make the camp a malaria-paradise. This ugly situation must be promptly arrested as neglect or breakdown in control activities may give previously controlled malaria the opportunity to re-emerge, leading to a subsequent increase in transmission and endemicity lasting for several transmission seasons [63].

It is recommended that adequate sanitary and social facilities be put in place at New Bakassi resettlee camp at Ekpiri-Ikang that would discourage disease transmission. Provision of good pipe-borne water should be made a certainty in all future resettlement projects. Resettlees should be given health education on personal hygiene and preventive measures against acquiring infections. Treated mosquito nets should be made available to every individual and houses in the camp. Provision of a good health facility accessible to the resettlees in as minimum time as possible, while clearing of surrounding bushes and fumigation of entire camp site from time to time should the norm. Finally, targeting children with higher susceptibility may lead to more successful control interventions but this should be augmented with intermittent preventative treatment to children presenting higher episodes of clinical malaria and those who are regular callers at health facilities [58-59, 64-65].

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