Original Article

The Malaria Burden: A Look at 3 Years Outpatient Malaria Clinic Visits in a University Community Town in Southeast of Nigeria

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Received: 19-Apr-2019;
Revision: 13-Dec-2019;
Accepted: 10-Feb-2020;
Published: 04-May-2020.

ABSTRACT

Background: One of the Nigerian vision 2020 National Malaria strategic plans is control and subsequent eradication of malaria. The present report looks at outpatient malaria clinic visits for a 3-year period with a view of ascertaining whether control measures put in place over decades are being reflected in the decline of the disease. **Methods:** A retrospective study was conducted at Nsukka in the southeast Nigeria using a cluster sampling method for the selection of health care facilities. Collected data included patient demography, number attendees, and the levels of parasitemia. The "Plus System Scale" was used for the grouping of detected levels of *Plasmodium* parasites in the blood samples and data were analyzed using SPSS (version 23). **Results:** A total of 9,531 outpatient malaria clinic visits which consisted of females (67.5%) and males (32.5%) were used for the report. The difference in the number of males and female malaria clinic attendees was statistically significant [$P < 0.05$]. Examined blood samples showed 87.25% were positive with *Plasmodium falciparum* parasites with various levels of parasitemia. There were also negative *Plasmodium* parasites blood samples with mean scores of 67 (±22.62), 92.63 (±9.97), and 353 (±179.6) for years 2013, 2014, and 2015, respectively. Most (43.47%) of the patients were in the age group of 21–30 and while parasitemia was seen to be higher in this group (21–30). **Conclusion:** The incidence of malaria in the region of this study is still high despite the effects made at reducing the scourge of the disease and would need timely intervention.

Keywords: *Age, burden, disease, gender, malaria, outpatient, parasitemia*

Introduction

Malaria remains the first most important parasitic disease of man despite intense efforts over the years to bring the disease under control. A WHO[1] report indicates that 216 million cases of malaria were reported in the year 2016 from 91 malaria-endemic countries and regions, with the global number of deaths placed at 445,000. This WHO[1] report also indicated that the global incidence of malaria had earlier fallen in the year 2010 but that this decline was stalled and in some cases reversed in various regions of the world by the year 2014. A similar trend was reported to have been seen in cases of mortality. This most important parasitic disease of man has received and continues to gain global attention all of which aims to control the disease and its subsequent eradication. It is estimated that about 2.7 billion US dollars were invested in the control and elimination of malaria in the year 2016.[1] The majority of this 2016 investment was spent in WHO African regions.

There have been various strategies put in place for the control and elimination of malaria in disease-endemic regions of the world. The WHO Global Technical Strategy[2] insists on the complete eradication of malaria from 35 more countries by the year 2030 but the question

Access this article online

Quick Response Code:

Website: www.njcponline.com

DOI: 10.4103/njcp.njcp_218_19

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How to cite this article: Badger-Emeka LI. The malaria burden: A look at 3 years outpatient malaria clinic visits in a university community town in Southeast of Nigeria. Niger J Clin Pract 2020;23:711-9.

of how obtainable this will be remains to be answered. Despite all the efforts at eradication, the burden of the disease remains a global problem. In Nigeria, according to Maduka,[3] the history of malaria control can be traced to the year 1948, while the 21st century has witnessed the establishment of various eradication/control programs. The National Malaria Strategic Plans (NMSP)[4] is one of such establishments serving as a blueprint for the eradication and control of malaria.

The NMSP has put in place goals with strategic objectives aimed for 2014–2020 to obtain these proposed goals. One of its objectives is to put in place a means by which more than 80% of the populace would practice appropriate malaria preventive measures as well as management through prompt treatment by the year 2020. To this effect, the distribution of long-lasting insecticide-treated mosquito nets (LLITNs) was initiated to help reduce the national burden of the disease. It is reported that between 2014 and 2016, insecticide-treated nets (ITNs) manufacturers had delivered about 582 million ITNs globally. 75% of these had been distributed through mass campaigns. The WHO[1,5] reported the success in the use of these nets in most sub-Saharan Africa inclusive of Nigeria. Also, between the years 2009 and 2015, more than 103.8 million LLITNs had been distributed in Nigeria.[6,7] The result of these efforts at control is yet to be ascertained.

Another goal of the NMSPs is that all health facilities should, by the year 2020, give routine reports on key malaria indicators. It is suggested that the effective surveillance of malaria cases, as well as reported deaths attributed to the disease, will be needed for the identification of populations that are most affected. The purpose is to target resources for maximum impact. Nigeria remains on the list of countries where the burden of malaria remains high and there is the presence of WHO support emergency response in the country. Regardless of this presence, the country is reported to suffer the most in cases of reported malaria.[3] It is estimated that 51 million cases with 207,000 deaths are reported annually.[7] While the literature is silent on positive results due to several control policies that have been put in place over years, a Federal Ministry of Health[8] Report indicates that about 60% of outpatient hospital visits were attributed to malaria. This percentage does not seem to have changed with time as the Nigerian National Malaria Survey[9] reports that 60% of outpatient visits are attributed to the disease. The report also pointed to the fact that 30% of hospitalized cases, low birth weights (10%), and about 11% of maternal mortality are as a result of malaria.

As the battle against malaria continues, Nigeria is not among the countries listed for the clinical trials of the more than 20 malaria vaccine candidates.[3] Reports[10] deemed malaria as not being only a public health problem but also a deterrent to the socioeconomic advancement of any country, Nigeria inclusive. Earlier reports by WHO[11] suggested the inclusion of awareness and subsequent control of malaria in the school health curriculum. This, in their opinion, would assist in measures aimed at not only prevention but also the subsequent control of the disease. The question as regards any reduction in the burden of malaria or the control in the transmission of the disease as a result of high awareness campaigns and health education needs are yet to be ascertained.

Nsukka is a University town with educated populace within the environment are satellite towns with a potentially educated populace. It is envisaged that health, as proposed by WHO and NMSPs 2020, will mitigate the scourge of malaria. Given the topography of the study area which provides a safe haven for malaria-carrying mosquitoes,[12] it will be important to know the prevalence of malaria in this area as the literature is silent on this. With the postulation[11] that malaria will have an effect on the socioeconomic activities of a community such as Nsukka, which is a part of the food basket of the entire region, it will be important to know if eradication measures being advocated have impacted the transmission of malaria in the study area. The present investigation, therefore, looks at outpatient malaria clinic visits at the Nsukka community for a 3-year period in order to ascertain if control measures put in place locally and internationally over decades are reflected in the decline of the disease.

Materials and Methods

Study setting

A retrospective study was conducted at Nsukka in southeast Nigeria. The town is a university town, located within the Nsukka LGA of Enugu state and is estimated to have a population of about 417,700 as of the year 2016. Nsukka is spread across three autonomous communities[13] with the weather of both rainy and dry seasons. The rainy season is from March to October while the dry season is from November to February. Annual rainfall is stipulated to be between 1680 mm and 1700 mm with temperatures ranging from 27°C to 28°C. In terms of the occupation of the populace, apart from Nsukka being a university town, farming constitutes a large part of the economic activity of the inhabitants.

The three autonomous communities are each made up of a number of villages with health care facilities constituting of both private and public equally located within them. For this study, health care facilities were selected based on cluster sampling. Therefore, three

health care providing facilities were selected in which all malaria clinic attendees in each cluster (hospital) were included in the study. Two of the selected health care providers offered free consultation services to patients but none of them offered free treatment to these patients.

Study population—Inclusion and exclusion criteria

Included in the study were diagnosed records of all age groups of Nsukka residents regardless of gender who presented at malaria clinics with symptoms of the disease for diagnosis. Also collected for the study were all results of patient visits to malaria clinics whether positive or negative blood parasite tests, as well as ascertaining the levels of recorded parasitemia. Non-Nsukka residents were excluded from the study.

Sample size

Reports[14] targeted malaria incidence of 72.8% at Nsukka local government area. Using the 72.8% of the population,[14] a confidence level of 95% within 2.5% error margin was calculated using OpenEpi online software version 3.01[15] to obtain a minimum of 609 sample size. With the 9,531 patient, malaria clinic data used for the study, the chances of error were grossly minimized.

Samples and data collection

Secondary data of results on diagnostic report for the period of observation were collected and used for the research. The results on microscopic analysis of blood samples whether positive or negative for malaria parasites were collected and used for the report. They were part of routine hospital patient care needed for diagnosis. Routinely, blood samples had been collected through finger prick from patients presenting at the clinics. Routine basic parasitological methods of both thick and thin smears had been used for the detection of *Plasmodium falciparum* parasites. The thick blood smears were for detecting the presence of *Plasmodium* parasites in a larger sample of blood while the thin blood smear was for *Plasmodium* species identification as well as for quantification. All slides had been examined microscopically at × 100 magnification using oil immersion. The method of Kosack *et al*.[16] was used for the grading of parasitemia. Using the thick smear slides, positive findings had been graded according to the "Plus System Scale." The presence of 1–9 *Plasmodium* trophozoites in × 100 field was represented as +. Findings of 1–10 trophozoites in × 10 fields were represented as ++ while the detection of 1–10 trophozoites per field was recorded as +++ and detailed methodology is as described.[16] Samples negative for *Plasmodium* parasites were recorded as "None."

The data kept in the hospital database were collected and entered into an Excel sheet on a daily basis for a period of 3 years from January 2013 to December 2015. All collected data were later transferred to SPSS for statistical analysis and data cleaning. Consistency checks, missing data, and those that parasitemia levels that were not possible were methodologically discarded case wise.

Statistical analysis

Data were analyzed using Excel graphics and statistical package for the social sciences (SPSS) software version 23. Results were expressed as mean ± SD or as frequency and percentage for categorical variables. Comparison of independent groups was done using a two-tailed Chi-square test for the following: association between age groups and parasitemia, gender and levels of parasitemia, as well as the number of total hospital visits by both genders. *P* values were determined and considered statistically significant when $P < 0.05$.

Ethical consideration

Permission for data collection was obtained from the hospitals and health care centers selected for the study. No ethical approval was required as data were part of routine laboratory diagnosis for the care of patients. No written informed consent was required as no patient's personal information was used for the study.

Results

There were a total of 9,531 investigated malaria cases from all the selected clinics in the region of study

Table 1: Yearly and overall number (%) of patient attendees for three years

	2013	2014	2015	Total	
Females	2236 (65.61%)	2120 (68.3%)	2077 (68.8%)	6433	67.50%
Males	1172 (34.39%)	984 (31.70%)	942 (31.2%)	3098	32.50%
Total	3408 (100%)	3104 (100%)	3019 (100%)	9531	100%

The Chi-square statistic is 8.7671. The *P* value is 0.012481. The result is significant at $P<0.05$

Table 2: Yearly mean number of patients presenting at malaria clinics but with negative *Plasmodium* parasite in blood samples

	Year		
	2013	2014	2015
Females	51	122	226
Males	83	253	480
Total	134	375	706
Mean	67	187.5	353
SD	22.62742	92.63099	179.6051

P-value is less than 0.0001. The result is extremely statistically significant

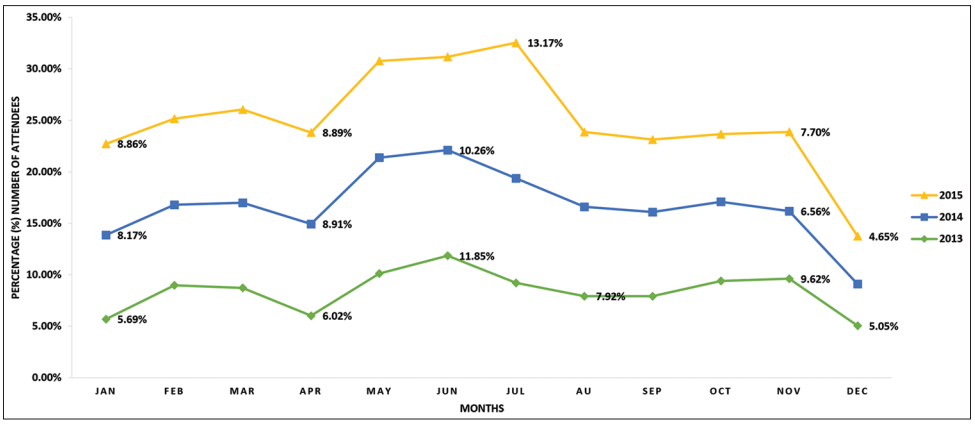

Figure 1: Percentage of overall monthly malaria clinic visits for a three year period

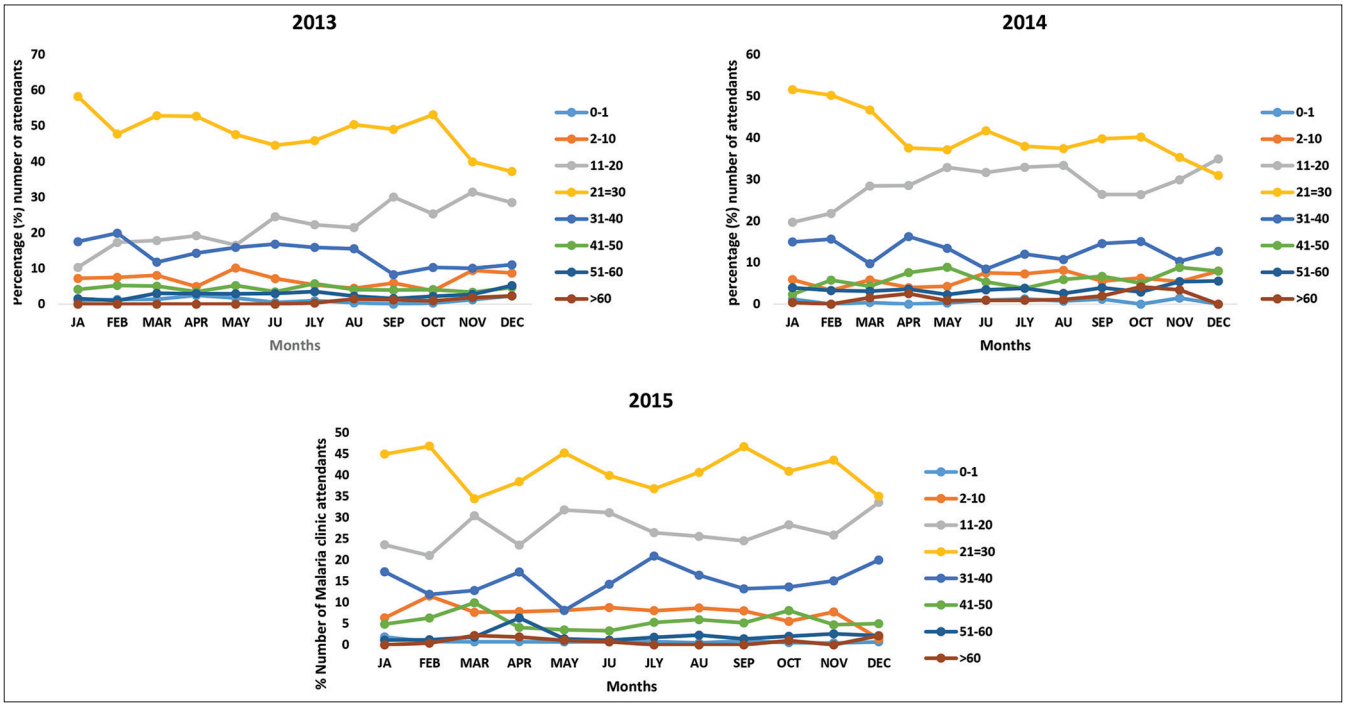

Figure: 2 Monthly malaria clinic attendance of the different age groups for three years

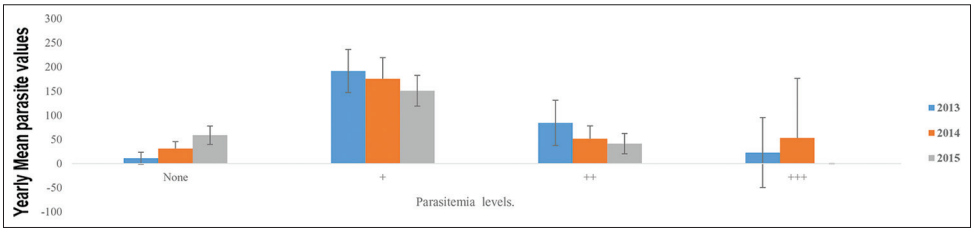

Figure 3: Overall encountered yearly mean parasitaemia levels amongst patients

for a period of 3 years. Of these, 67.5% (6,433) were females while 32.50% (3,098) were males as shown in Table 1. From these results, comparing the female and male malaria clinic visits on a yearly basis, it showed more females attendees than males and the difference in attendance was statistically significant ($P < 0.05$). This trend was also observed over the 3-year period of study with a P value of 0.012.

Of the total of 9,531 patients who visited the malaria clinics in the 3-year period, 87.25% of the examined blood samples were positive with trophozoites of *Plasmodium* while the remaining 12.75% (1,215)

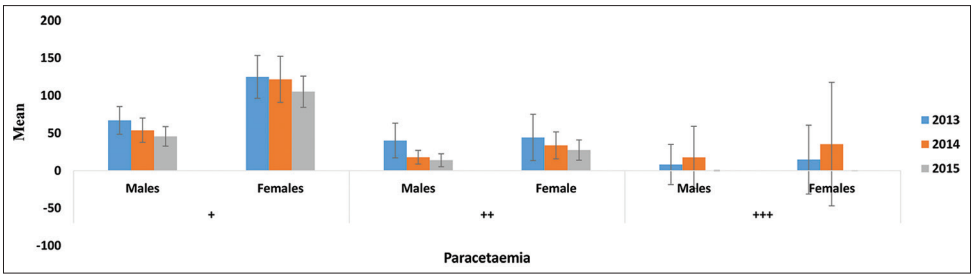

Figure 4: Showing the relationship between gender and the mean levels of Plasmodium parasitaemia

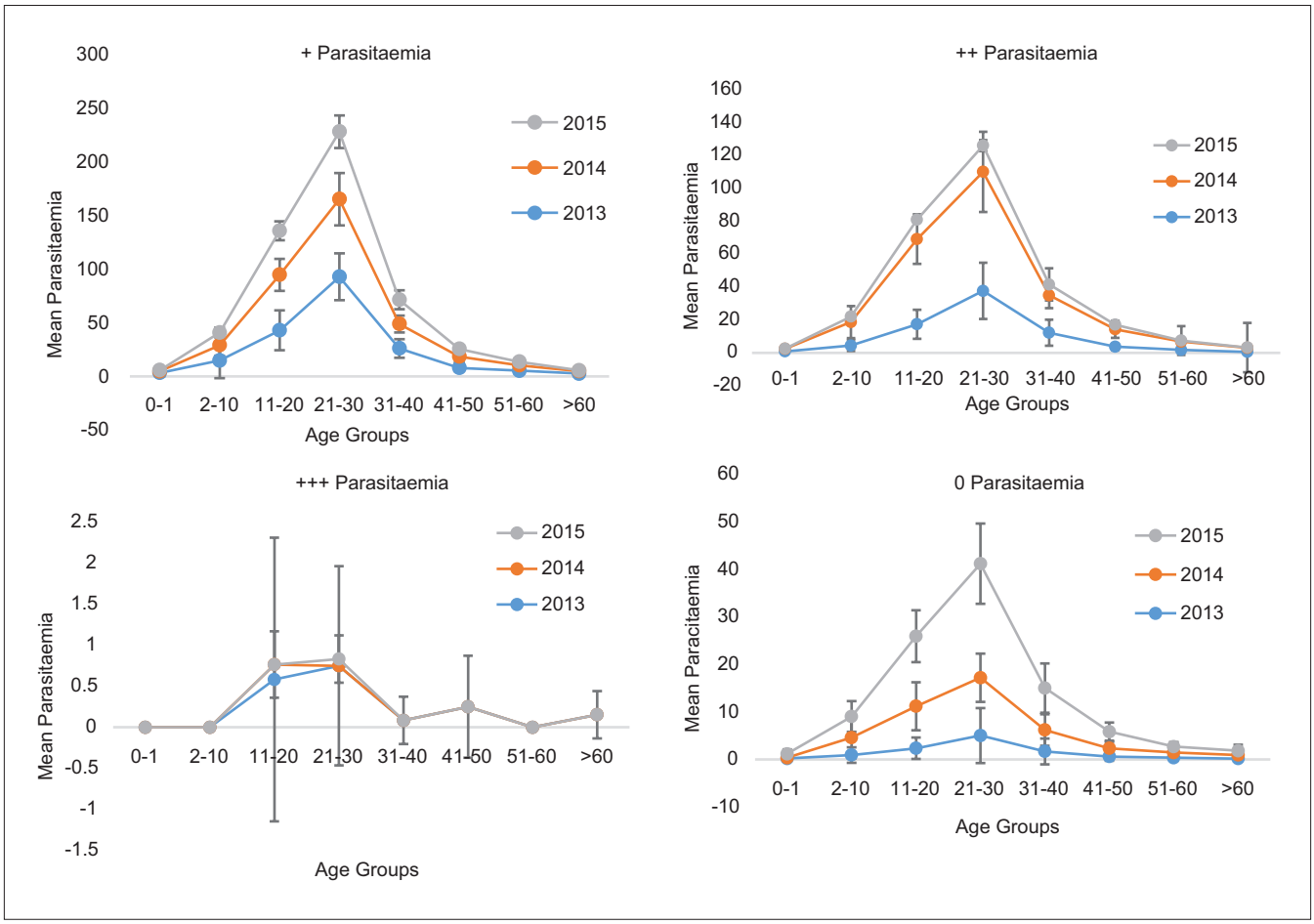

Figure 5: Mean ± SD Parasitaemia with age distribution over 3 year observation

Table 3: Ages groups of patients presenting at the malaria clinics

Age group	Total number	Percentage (%)
0-1	80	0.84
2-10	654	6.86
11-20	2471	25.93
21-30	4142	43.47
31-40	1333	13.99
41-50	499	5.24
51-60	261	2.74
>60	89	0.93
Total	9529	100

of the examined blood samples were negative for *Plasmodium* parasites. For the negative blood samples, (that is, patients presenting at malaria clinics with symptoms of malaria but negative parasitemia) the comparison between the mean numbers of negative blood samples for years 2013, 2014, and 2015 were 67, 187.5, and 353 respectively. Results are extremely significant (P value = 0.00) as shown in Table 2.

The ages of attending patients were grouped into eight groups. The result of the various age groups presenting at the clinics with malaria cases for the period under

consideration is shown in Table 3. The highest percentage number of visits were from patients between the ages of 21–30 (43.47%), followed by those in the age group of 11–20 and 31–40 constituting 25.93% and 13.99%, respectively. The least malaria clinic attendance was by children of one year and below as well as adults above the ages of 60 years [Table 3].

The results on the comparison in a number of percentage number monthly visits by patients to the malaria clinics for the 3-year period is shown in Figure 1. The figure shows that for the 3-year period, there were more hospital visits during the months of May, June, and July and these were at the peak of the raining season. The least malaria clinic attendance was in the months of December while there were no specific patterns for the other months during the year. Worthy of note in the month of July 2015 in which there was the highest percentage number of visits as compared to previous years. Also, based on the age groups, the results presented in Figure 2 shows the percentage number of monthly patient visits according to the age groups. The group 21–30 years of age had the highest number of monthly malaria clinic attendance for 2013, 2014, and 2015. This as followed by 11-20 and 31-40 age groups. The least number of visits were in the 0–1 year of age as well as the elderly who were 60 of age and above.

Three levels of parasitemia were encountered during the period of investigation and the frequency of their yearly mean and standard deviation of parasitemia levels as recorded in blood samples of patients presenting at the malaria clinic is shown in Figure 3. The figure shows that through the plus-scale system, the + (1–9 trophozoites in 100) were the most encountered parasitemia levels over the 3-year period. The least was the +++ parasitemia levels which were not encountered in the 3rd year. All levels of parasitemia were encountered in all patients irrespective of gender. However, these levels were seen to be more in females than in males through the period of study and the results of the mean levels of parasitemia with the standard deviations are shown in Figure 4.

As regarding age and levels of parasitemia, a similar pattern was seen for the period being considered. All levels of parasitemia, +, ++, +++, and none, were highest in the age group of 21–30. This was followed by patients who were between 11 and 20 years of age as shown in Figure 5. The least parasite levels were encountered in babies (0–1) and the elderly who were 50 years of age and above. Also, the highest age group presenting to clinics with malaria symptoms but with negative parasites blood samples were patients in the 21–30 years group. The observations on a presentation at clinics with negative parasite blood samples are similar to those of positive blood samples as regards age and the results are shown in Figure 5. The figure also shows the mean numbers were lowest during the 1st year (2013) increased through the 2nd year and highest in the 3rd year.

Discussion

The burden of malaria seems not to be abating as the findings in the present report have further highlighted the proportion of encountered positive cases of the disease in this small community university town. The study revealed that the number of patients who tested positive to malaria parasite for the 3-year period of study was high at 87.2%. Similar findings in southeastern Nigeria had also been reported by some researchers.[17] They[17] reported an overall proportion of encountered cases of 80.4% in other parts of southeastern Nigeria. Their findings, however, varied with the two urban areas in their comparative study with reported 86.4% malaria-infected individuals in Aba and 74.4% in Umuahia. These reports point to a high number of malaria cases still being reported in the southeast of Nigeria. Thus, 87.2% of encountered malaria cases for the 3 years period of observation as seen in the present study further highlight the fact that despite decades of efforts at controlling the disease, malaria still remains uncontrolled in the region of this investigation. These findings do not seem to reflect any positive results from efforts that have been put in place over the years to bring malaria under control. However, other findings from southwestern Nigeria differ slightly. Sam-Wobo *et al*.[18] reported a proportion of 71% of malaria cases from their study and this they said was higher than what they had encountered from an earlier investigation with a 53.5% in the year 2010[18] again signifying an increase in the percentage of encountered cases over a period of 4 years. They[18] considered a 71% rate to be high as it represents a substantial level of illness. It can, therefore, be said that 87.2% as encountered from the study in this community points to a higher level of malaria burden in this community. Differences in percentages could be attributed to the different geographical regions where the studies had been carried out. However, the results do not seem to point to positive results after years of adequate control measures that had been put in place by various organizations globally aimed at lasting control of malaria. A number of reasons could be attributed to this. Nigerians are generally known to practice indoor residual spraying (IRS). This measure of IRS and the use of LLITNs are procedures that target the mosquito vectors under the integral vector management (IVM) for the control of malaria. There is the view that[19] financial reasons are responsible for the lack of adoption of LLITNs and the IRS by various states and communities

in Nigeria. While other researchers[3] explain this to be a result of socioeconomic and sociocultural barriers all of which act to hinder the use of LLITNs by Nigerians. Also, the cost for IRS has not led to the rapid reduction in malaria transmission attention should therefore be put on improving the socioeconomic improvement in order to enhance implementation of the National Malaria policy.[3] In the case of Nsukka, the community of the present study, it might be expected that socioeconomic and sociocultural barriers factors are contributory to the high proportion of encountered cases of malaria. This is coupled with the fact that there are also hazardous environmental factors such as the problem of solid waste management in Nsukka town as had been reported.[20] Being a malaria-endemic area, the home to the first indigenous Nigerian University, a number of Federal parastatals, colleges, secondary, and primary schools yearly results do not reflect any positive effects that might have evolved as a result of any form of education. While it[13] was of the view that the level of education played a role in susceptibility to preventable diseases, there might; however, be an urgent need to look at issues related to social status rather than education as earlier reported.[21]

In terms of gender, this study shows more females than males attended malaria clinics yearly, throughout the period of investigation with the difference being statistically significant (*P*-value = 0.01). Parasitaemia was seen to be higher in females than in males for the 3 years period. These findings are contrary to reports[18] that found malaria prevalence to be higher in males than females and suggested the possibility of better immunity to malaria by females. Also, it is stipulated[18] that female immunity to malaria and other parasitic diseases was due to factors such as hormonal and genetics. However, according to a WHO[22] report on gender and malaria, the pattern of exposure is seen to coincide with "gender norms and behavior." That report pointed to the fact that in societies where men were in occupation of high exposure such as working in fields and forests at high mosquito biting time, there would be high endemicity among men. Also, the report pointed out that there would be high malaria endemicity for females who were up before dawn to perform household duties. It can, therefore, be suggested that gender played a significant part in being exposed to malaria. Thus, the results as seen in the present investigation which remained consistent for the period of 3 years simply point to the possibility of either reduce immunity in women or that they were more exposed at mosquito biting peaks periods than the men from the same region. Also, earlier findings[23] established that the prevalence of malaria parasite remained high in a survey in Kenya with women being reported to be more likely to have malaria than men. Results would, therefore, be expected to vary depending on regions as well as on gender occupational roles. On the other hand, the quality of health care services could be an attributing factor with the suggestion[13] that gender plays a role in the utilization of health care facilities as those with friendly workers, affordable drugs, and a friendly work environment can create a more responsive atmosphere.

Outpatient malaria visits were by all ages as shown in this study and this was inclusive of babies less than 1 year of age as well as those within the ages of 2–10 years. Also, the study shows the least parasite levels were seen in these 0–1-year-old babies as well as in the elderly who were 60 years of age and above. Contrary to these findings are those of other researchers[24] who reported a higher parasitemia among children and teenagers. The prevalence of childhood parasitemia has been on a regular survey[25] as most deaths as a result of malaria occur in children. However, through a comparison of various surveys,[26] it was found that malaria declined in children 2–10 years of age for over a period of 20 years of monitoring. The presence of malaria parasites in babies of less than 1 year has been explained[18] to be the low transfer of maternal immunity or as a result of infection acquired through mothers. However, WHO[27] report attributes malaria in infants born in disease-endemic area to the waning in immunity acquired from the mother starting from about 3 months after birth. There were 2 months old babies seen in the present investigation leading to the question of the general health status of the mothers with a possibility of other factors. Generally, age is a risk factor for most diseases including severe *P. falciparum* malaria. Eli *et al*.[28] associated the clinical outcome of *P. falciparum* malaria was high at 62% of patients who were less than 40 years old. Results from the present investigation showed parasitemia was highest in the 21–30 years group throughout the period of 3 years of the study. This was followed by the 11–20 and 31–40 years of age. The levels of parasitemia for both groups showed a consistent pattern over the 3 years. These age groups are the most outdoor active years of the populace in this community and could explain the reason for the encountered results. The results are different from earlier findings[18] who encountered a higher prevalence in older age groups and explained this to be due to sleeping outside at nights during hot weather. As WHO[22] suggests, the pattern of the exposure often coincides with other factors as well as behavioral ones. Thus, high levels seen in the 21–30 years group can be due to behavior and similar findings had been reported.[22] Differences can also be reflecting the difference in geographical regions.

A report by the USA Embassy in Nigeria Malaria Fact Sheet[29] attributed the incidence of malaria in children between the ages of 6 and 59 months in the southwest, northcentral, and northwest of Nigeria to be close to 50%. However, the report placed the incidence for the same age group at 27.6% in southeastern Nigeria.

Conclusion

Results from the present study have shown that for the 3-year period of investigation, the incidences of malaria in the community of study did not reduce. Therefore, strategies aimed at controlling and eradication of malaria appear not to be working. Implications of this will definitely be reflected in the socioeconomic activities of the Nsukka populace and will further stretch the already overburdened health care facilities. As the population increases without any visible change in disease dynamics, it is suggested that working control measures be put in place if Nigeria is to join the nations of the world who have successfully reduced the cases of malaria.

Competing interests

There are none. The research was not funded.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient (s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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