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Prevalence of Malaria Parasitaemia among Pediatrics in Federal Teaching Hospital Abakaliki, Ebonyi State

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Abstract: This study investigated the seasonal prevalence of malaria parasitaemia among pediatrics in Federal Teaching Hospital, Abakaliki, Ebonyi State, South East, Nigeria using a retrospective study design. A total of 1, 235 pediatrics (between the age range 0-15 years, made up of 687(55.6%) males and 548 (44.4 %) females formed the study population. Blood samples were aseptically collected from each subject and analyzed for the presence of malaria parasite using standard parasitological technique (thick blood film stained with 10% giemsa staining technique).The overall malaria parasitaemia in this study was 298 (24.1 %). Parasitaemia was significantly higher in males (27.1%) than in females 112 (20.1 %) ($p<0.05$). Age distribution of parasitaemia revealed that those in the age range 11-15 years had the highest prevalence of 28.8%. Monthly variation of parasitaemia showed that the highest prevalence was recorded in the month of August (49.0%) while the least was recorded in the month of January (10.9%). Differences in monthly prevalence of parasitaemia was statistically significant ($p<0.05$). Investigation on seasonal prevalence revealed a higher prevalence during rainy season (24.7%) compared to dry season (23.6%). The results from these investigations may play useful role in the control and eradication of malaria amongst children in Ebonyi State and Nigeria at large.

Key words: Prevalence · Malaria Parasitaemia · Pediatrics · FETHA · Seasonal

INTRODUCTION

Malaria is a parasitic disease that frequently presents as an acute and sometimes chronic infection of the bloodstream. It is characterized clinically by pyretic illness, anemia and splenomegaly and is caused by apicomplexan parasites of the genus *Plasmodium* [1]. The four species of plasmodia causing human malaria are *Plasmodium vivax, P. falciparum, Plasmodium malariae* and *Plasmodium ovale*. Of these four species of *Plasmodium, P. falciparum* is the most prevalent in the sub-Saharan region of the world [2]. Malaria parasite is transmitted where reservoir of infection, appropriate mosquito vectors and susceptible hosts are available [1].

Many studies have investigated the prevalence of malaria across various study populations. A study carried out in Benin City, Nigeria on children aged between 6 months to 11 years recorded an overall prevalence of 36.4% of malaria parasitemia [3]. Additionally two separate studies [4], [5], reported the prevalence of 27% and 80% of parasitemia among school children in rural village in western Nigeria and malaria-endemic village of Erunmu in southwestern Nigeria respectively.

A study by Ani (2004) among school children in Ebonyi State, recorded a prevalence of 40.08% and a higher prevalence among males compared to their female counterparts.[6] Mbanugo and Ejims [7] in a study conducted in three hospitals and a Nursery School in Awka on prevalence of infections in children, reported that out of 400 children examined, 233 (58%) were positive and only *Plasmodium falciparum* were found. Among the positive cases, 85.5% were observed in age group of 2-3 while 33% was in 0-1 year indicating that the prevalence of *Plasmodium* infections amongst the study population was significantly affected by age.

Seasonal variation in the prevalence of malaria has been reported elsewhere [8] and record has it that malaria transmission in Nigeria is season dependent with a higher prevalence noted in rainy season as compared to dry season [3], [8], [9].

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Factors which influence malaria parasitaemia prevalence include environmental factors (e.g. rainfall), health status (i.e. immune state) and socio-economic characteristics of the study population involved [3].

Malaria generally occurs in areas where environmental conditions allow parasite multiplication in the vector, thus, its restriction to tropical and subtropical areas and altitudes below 1, 500 m. However, this distribution might be affected by climate change, especially global warming and population movements [9]. The infection has made a tremendous resurgence in many areas because of relaxed control efforts, paucity of information on its prevalence and the emergence of drug-resistant parasites and insecticide-resistant mosquitoes. Hence, the significance of the present study which was geared towards establishing the seasonal prevalence of malaria parasite infection amongst pediatrics in Federal Teaching Hospital, Abakaliki, South Eastern part of Nigeria. This will provide information on both prevalence and seasonality of the infection and may be useful in formulating policies and control programme for malaria eradication amongst the study population.

MATERIALS ANMD METHODS

Study Area: The study was undertaken in Abakaliki, the capital of Ebonyi State, South East Nigeria. Ebonyi State lies approximately within longitude 7°30' and 8°30'E and latitude 5°40' and 6°45'N. The vegetation of the state is predominately tropical rainforest with mean annual rainfall of 2100 mm [10], rainy and dry seasons are the two seasons in Nigeria. The rainy season starts from April to October while the dry season begins from November to March [10].

Study Population: A total of one thousand three hundred and five (1235) pediatrics formed the study population. Both males 687(55.6 %) and females 548 (44.4 %) of age range 0 day to 15 years were included in the study. The study was conducted from January to December, 2015.

Ethical Consideration: The ethical approval for this research was obtained from the ethical committee, Federal Teaching Hospital, Abakaliki. The consent of the parents of the children under study was also sought and obtained before the commencement of the study.

Thick Film Staining & Examination: Blood for examination was obtained by venipuncture into EDTA (tri Potassium Ethylene Diamine Tetra Acetic acid) anticoagulated container as described by [1].

Parasite identification was done according to [11]. Ring forms, chromatin dot, gametocytes (banana or crescent shaped) and schizonts were all features used in confirming the presence of malaria parasite.

Data Analysis: The data generated were analyzed using simple descriptive statistics and inferential statistics of Chi square and paired sample t test. The results were presented graphically using pie chart. Statistical analysis were done using Statistical Package for Social Sciences (SPSS) version 20.0.

RESULTS

A total of 1235 patients were sampled and 298 (24.1%) were positive for malaria parasitaemia (Figure 1).

Among the sexes, 55.6% of the study population were males while the remaining 44.4% were females. Parasitaemia among the males was significantly higher (27.1%) than that of their female counterparts (20.1%) ($p<0.05$) (Table 1).

Among the age groups investigated, those in the age group 11-15 years had the highest prevalence of 55 (28.8 %) followed by those in the age group 6-10 years 54 (28.6%) while the least prevalence was observed among those aged 5 years and below 189 (22.1 %). However, the difference was not statistically significant ($p>0.05$) (Table 2).

Monthly variation of parasitaemia showed that the highest infection was recorded in the month of August 24 (49.0 %) followed by July 11 (36.7 %), April 16 (30.8 %), January 6 (10.9 %), December 45 (25.9 %), November 25 (21.9 %), October 30 (22.4 %), March 41 (21.9 %), May 20 (21.7 %), February 6 (12.5 %) and June 41 (28.1%). Differences in monthly prevalence of parasitaemia was statistically significant ($p<0.05$) (Table 3). Seasonal variation showed that parasitaemia was higher in the rainy season (24.7 %) than in dry season (23.6 %) (Figure 2).

DISCUSSION

Prevalence of malaria parasite infection has been reported both globally and locally among different study populations and age groups. The present study recorded an overall prevalence of 24.1% which is lower than reports of some researchers both within and outside Nigeria within similar study group. In Ghana, prevalence of 30.5% and 30.1% were reported among children under 5 years in Volta and Upper West Region respectively [12]. A study by Nwaorgu and Orajiaka (2011) among children within 1-10 year old in south eastern Nigeria,

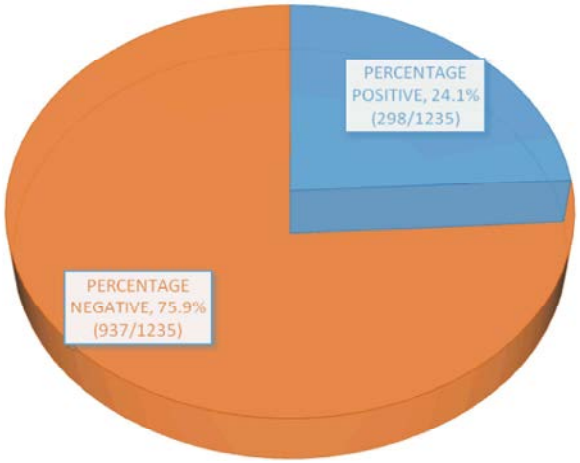


Fig. 1: Pie chart showing the overall malaria parasitaemia among the study population

Table 1: Gender distribution of malaria parasitaemia among the study population

Sex	No. examined (%)	No. positive (%)	No. negative (%)
Male	687 (55.6)	186 (27.1)	501 (72.9)
Female	548 (44.4)	112 (20.4)	436 (79.6)
Total	1235 (100)	298 (24.1)	937 (75.9)

(x^2 = 7.33; p-value = 0.007)

Table 2: Age distribution of malaria parasitaemia among the study population

Age group (years)	No. examined (%)	No. positive (%)	No. negative (%)
0-5	855 (69.2)	189 (22.1)	666 (77.9)
6-10	189 (15.3)	54 (28.6)	135 (71.4)
11-15	191 (15.5)	55 (28.8)	136 (71.2)
Total	1235 (100)	298 (24.1)	937 (75.9)

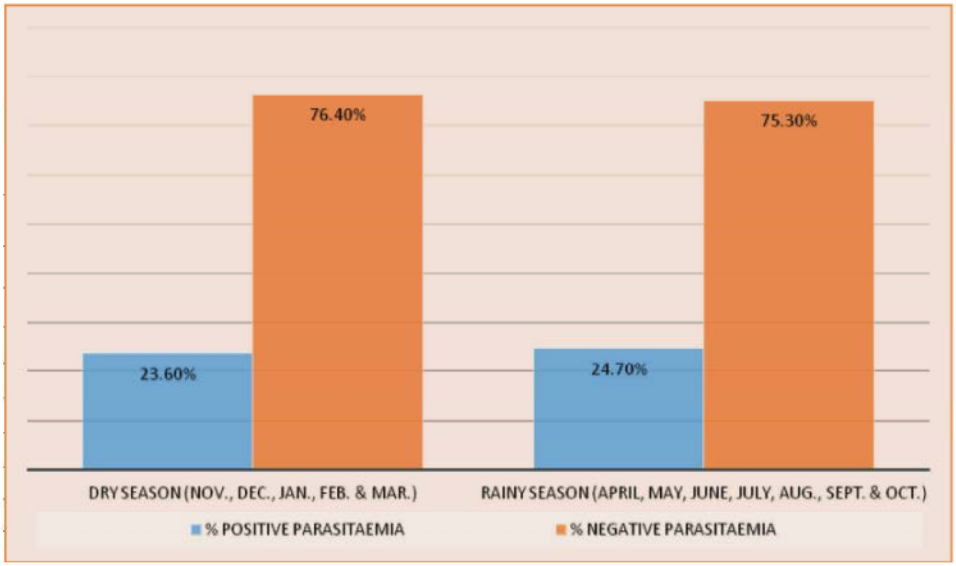
(x^2 = 6.222; p-value = 0.045)

Table 3: Monthly Prevalence of malaria parasitaemia among the study population.

Month	No. examined (%)	No. positive (%)	No. negative (%)
January	49 (4.0)	6 (10.9)	49 (89.1)
February	48 (3.9)	6 (12.5)	42 (87.5)
March	187 (15.1)	41 (21.9)	146 (78.1)
April	52 (4.2)	16 (30.8)	36 (69.2)
May	92 (7.4)	20 (21.7)	72 (78.3)
June	146 (11.8)	41 (28.1)	105 (71.9)
July	55 (4.5)	11 (36.7)	19 (63.3)
August	30 (2.4)	24 (49.0)	25 (51.0)
September	154 (12.5)	33 (21.4)	121 (78.6)
October	134 (10.9)	30 (22.4)	104 (77.6)
November	114 (9.2)	25 (21.9)	89 (78.1)
December	174 (14.1)	45 (25.9)	129 (74.1)
Total	1235 (100)	298 (24.1)	937 (75.9)

(Paired sample t-test = 5.637; p-value (2-tailed) = 0.001)

reported a prevalence of 58.2%. Okafor and Oko-Ose [I3] also reported a prevalence of 36.4% amongst children aged 6months to 11 years in South Southern part of Nigeria. A prevalence of 80.5% was also reported in south western Nigeria byOlasehinde *et al*., (2010) among infants and children aged 0-12 years. Ani [14] reported a prevalence of 40.08% among primary school children (5-10 years) in Ebonyi State. The variations in prevalence among the above reported studies could be attributed to many possibilities such as differences in social and ecological context of the study areas and their overall health and development plans [3], [6], [15].



(X^2 = 0.209; p-value = 0.647)

Interestingly, the above reported prevalence especially in Nigeria showed a trend towards decline in malaria prevalence over the years. A prevalence of 80.5% [14], 58.2% [13], 36.4% [3], 24.1% (the present study) were reported respectively in 2010, 2011, 2012 and 2015. This shows that malaria prevalence is on the decline in Nigeria perhaps due to malaria control and eradication programmes e.g. Roll Back Malaria Partnership and National Malaria Elimination Programme which exist in the country.

Monthly variation of parasitaemia showed that the highest prevalence was recorded in the month of August 24 (49.0%) while the least occurred in January 6 (10.9 %). The difference was statistically significant (p = 0.001) and this was similar to a t value of 0.0053 reported between rainy and dry seasons by[16]. Frequent rainfall which is usually recorded in the months of July and August coupled with long periods of sunshine during the August break could be responsible for the increase in mosquito breeding during this period. Hence, the high rates of parasitaemia in these months.

Seasonal variation showed that parasitaemia was slightly higher in the rainy season (24.7%) than in dry season (23.6%) but the difference was not statistically significant though higher occurrence of malaria parasites was recorded in the months of August and July which coincided with the rainy season. This is consistent with the result of [17] in wet forest area of Nigeria. This can be explained by the fact that malaria transmission occurs all year round. Parasitaemia therefore fluctuates throughout the year without any clear pattern and devoid of seasonality. This may be due to lack of certain social amenities such as portable water and poor drainage in most communities in developing tropical zones. During dry seasons, storage of water in containers in and around homes of the residents may constitute breeding places for mosquitoes. Vegetable farmers occasionally turn gutters into ponds for irrigation of their farms during dry season thereby providing ready ecological habitats for *Anopheles* mosquitoes. Again, the availability of economic trees close to the houses of the residents also constitute favourable breeding habitats for mosquitoes as earlier reported by [18]. All these factors and more contribute to perennial transmission of malaria in Ebonyi State and Nigeria at large.

However, there is no marked difference in parasitaemia between the seasons in the present study when compared to previous reports of marked differences in seasonality in malaria parasitaemia [18], [19]. These studies revealed that clear seasonal pattern in climate of Sahel savanna enhanced seasonality in malaria transmission and invariably led to unstable malaria transmission.Other studies, [20], [21], [16], all reported higher prevalence of malaria during rainy than dry season.

Parasitaemia among the males was significantly higher (27.1%) than that of their female counterparts (20.1%) ($p<0.05$). Similar findings have also been reported by [22], [7], [23], [6], [13]. Among the age groups studied, those in the age group 11-15 years had the highest prevalence of 28.8% followed by those in the age group 6-10 years (28.6%) while the least prevalence (22.1%) was observed among the study population aged 5 years and

below. The differences in the age distribution of malaria parasitaemia was statistically significant ($p<0.05$). This is consistent with [7], who reported a low prevalence of *Plasmodium* among 0-1 year old but is contrary to the reports of [7], [4] who stated that increase in age leads to decrease in malaria parasite prevalence.[7], attributed the low prevalence in 0-5 years old to passive immunity acquired from the mother by the baby. The reason for the difference in age-wise prevalence of malaria parasitaemia between the present study and the reports above could be the fact that the present study was conducted within the urban region where children are less susceptible to mosquito bite, younger generations (0-5 years) are usually under close watch by their parents, majority of them sleep under mosquito nets and older children (6-15 years) are prone to infection due to staying out late at night and playing with their body exposed in most occasions.

CONCLUSION

The present study revealed high prevalence of malaria parasitaemia in the study area among the study population. Infection rate was higher during the rainy season than dry season while the females recorded higher parasitaemia than the males. Information from these findings will enable policy makers and stakeholders in malaria control programmes to target the high risk groups at the peak of transmission.

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