



Prevalence of malaria infection in children aged 0-5 years, received at the Moanda medical centre: A retrospective study from 2021, in South-Eastern Gabon

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Abstract

Introduction: With a high burden among pregnant women and children under five years of age, malaria infection remains a real health problem, for these vulnerable segments of the population. The objective of this study was to assess the prevalence of malaria infection in children aged 0-5 years attending the Moanda medical centre in south-eastern Gabon.

Methods: A retrospective, descriptive and cross-sectional survey was conducted among children aged 0-5 years who came to the Moanda medical centre in January to December 2021, using the results of microscopic examinations (thick drops) recorded in the laboratory registers of the centre.

Results: Out of 770 children aged 0 to 5 years registered for this study, 302 were positive for malaria infection, a total prevalence of 39.22%. With a mean age of 24.21 months, boys (415 cases, 53.90%) were more prevalent than girls (355 cases, 46.10%). While the 0-12 months age group was in the majority with 113 cases of malaria infection, i.e. 37.42%, the study showed no significant correlation between gender, age groups and malaria infection. The distribution of malaria infection by type of quarter showed that it was more prevalent in the under-integrated (disadvantaged) quarters with n=182, i.e. 60.26% cases, than in the integrated quarters. The seasonal evolution of malaria infection according to age groups revealed two peaks, which represented periods of higher prevalence. The periods between the months of February and March, which are included in the short rainy season, and the month of June, which had the highest peak, corresponding to the long dry season.

Conclusion: The prevalence of malaria infection in the study area showed seasonal variation during the study period. The results of this survey may be useful for a future update of the epidemiological profile of malaria infection in children aged 0-5 years. This may be essential to guide resource allocation, evaluation and prioritisation of malaria interventions at Moanda Medical Centre.

Keywords: Prevalence, Malaria infection, Children aged 0-5 years, Moanda, South-East, Gabon

1. Introduction

Malaria is a potentially fatal human disease, caused by parasites transmitted by the bites of infected female Anopheles mosquitoes, and is a preventable and curable disease ^[1]. According to the latest World Health Organization (WHO) reports, there were approximately 229 million cases of malaria and 409,000 deaths worldwide in 2019 ^[2].

Africa is the most affected continent with about 92% of malaria cases and 93% of deaths in 2017 [3]. Indeed, malaria is prevalent in tropical and subtropical regions, it can occur in two forms: simple and severe. Consequently, about 2% of malaria cases in African children progress to the severe form [4]. In Niger, 5.2 million cases and 10,000 deaths were recorded in 2015 [5]. Despite the many resources deployed, Gabon, a country located in equatorial Africa, does not escape the heavy burden of malaria infection. Malaria remains a real public health problem, as indicated since 2007, and is responsible for a morbidity ranging from 31% to 75% in this country [6]. As in all endemic countries, malaria infection in Gabon is one of the top three causes of death in the most vulnerable population groups, namely children under five years of age and pregnant women [4]. To this end, the activities of the national programme against this disease (PNLP) have long focused on this category of people [7]. A study carried out in Franceville revealed a prevalence of malaria of 55% among children and *Plasmodium falciparum* was the most widespread and fearsome parasite in this region, ahead of *Plasmodium malariae* (2.5%) [8]. As this study has initiated a contribution to fight and eliminate this malaria infection desired by the WHO [2], it is in this context that this study has set as its main objective, the determination of the prevalence of malaria infection in children from zero to five years old, who came to the Moanda Medical Centre (MMC) for consultation.

2. Materials and Methods

2.1 Type and period of study

This was a retrospective, cross-sectional and descriptive study, conducted from January to December 2021.

2.2 Study setting

The study was conducted at the Moanda Medical Centre. Indeed, Moanda is a town in Gabon located in the province of Haut Ogooué, 41 kilometers from Franceville. This mining town has about 70,000 inhabitants. It is characterised by the exploitation of manganese, the extraction of which is the main activity of the Lemboumbi-Leyou department. It is the second largest city in terms of population, after Franceville, the capital of Haut Ogooué province.

2.3. Study population

The study population consisted of all children aged 0 to 5 years who came to the emergency department of the Moanda medical centre during the study period.

2.4. Exclusion and inclusion criteria

We included the data of all children aged 0-5 years who presented for a thick drop (GD) examination for malaria infection at the medical analysis laboratory of the said centre. Those with suspected malaria infection or not, but with missing laboratory data, were excluded.

2.5. Sampling method

After authorization from the Chief Medical Officer of the centre, purposive sampling was used to target and focus only on socio-demographic characteristics of children such as age, sex, area of residence, and malaria test results recorded in the laboratory records during the study period. To ensure the representativeness of the study, the sample size depended on the number of cases recorded in the registers of the Moanda medical centre.

2.6. Statistical analysis of the data

The data were entered in Microsoft Excel 2016 format and then analysed using R software version 3.6.1, including the measurement of rates and correlations. An exact binomial test was used to determine the factors associated with the prevalence of malaria infection. A 95% confidence interval was estimated and a $p \leq 0.05$ was considered statistically significant.

2.7. Ethical considerations

The data received did not include the identity of the patients or personal information.

3. Results

3.1. Sociodemographic characteristics of the children in the study

The synthesis of the data collected allowed us to identify a total of 770 children aged 0 to 5 years between January and December 2021. With an average age of 24.21 months and a sex ratio of 1.17, boys (415 cases, 53.90%) were more represented than girls (355 cases, 46.10%). It was noted that the 0-12 month age group was the most represented, with 320 children (53.87%) coming for consultation. During the study period, the children came from two different types of quarter, namely integrated and under-integrated (disadvantaged) quarters. The under-integrated quarters were predominantly represented with 432 children (56.10%) compared to children from integrated quarters (338 or 43.90%). Table 1

Table 1: Socio-demographic parameters of the children in the study

Variables	Numbers	Percentages %
Sex		
Boys	415	53.90
Girls	355	46.10
Age groups		
[0-12 months]	320	41.55
[13-24 months]	189	24.55
[25-36 months]	113	14.68
[37-48 months]	81	10.52
[49-60 months]	67	8.7
Integrated quarters		
Fumier	94	27.81
Montagne Sainte	42	12.43
Oasis	90	26.63
Douane	24	7.1
Alliance	88	26.03
Total	338	43.90
Underintegrated quarters		
Sotrao	42	9.72
Belle vue	45	10.42
Commercial	40	9.26
Moukaba	78	18.05
Moanda III	32	7.41
Leyima	92	21.3
Onkoula	38	8.8
Lekolo	65	15.04
Total	432	56.10

3.2. Distribution of malaria infection according to sex, among the children in the study

Out of 770 children aged 0 to 5 years, registered during the study period, 302 were positive for malaria infection, i.e. a total prevalence of 39.22%. Male (164 cases or 54.3%) were more likely to be infected than Female (138 cases or 45.7%) Figure 1.

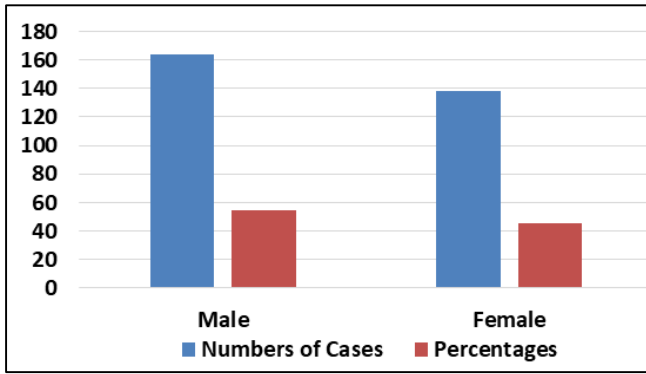


Fig 1: Distribution of malaria infection by sex among the children in the study.

3.3 Distribution of malaria infection by age group, among the children in the study

The 0-12 months age group was in the majority with 113 cases of malaria infection (37.42%), followed by the 13-24 months age group with 76 cases (25.17%). The age groups with the lowest representation were 49-60 months, followed by 37-48 months and 25-36 months. Figure 3

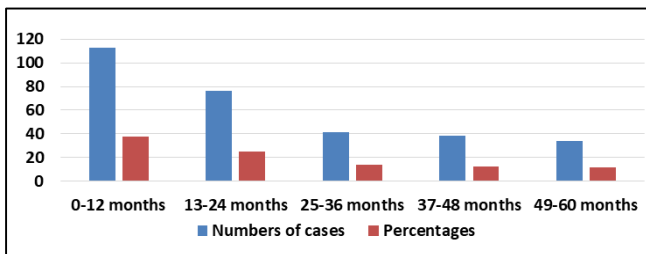


Fig 3: Distribution of malaria infection by age group in the study population.

3.4. Correlation between malaria infection, age groups and sex, among the children in the study

The analysis of the level of significance of the differences observed in the percentages of malaria infection of boys versus girls according to age groups was carried out using the exact binomial test, with a 95% confidence interval. The test was considered significant when p-value ≤ 0.05. Table 1 shows that there was no significant correlation between gender, age groups and malaria infection.

Table 2: Correlation between malaria infection, age groups and sex among study children

Age groups	Male	Female	Total	Binomial test		
				p(G)	IC95%	p-value
0-12 months	64	49	113	0.56	[0.4-0.6]	0.1876
13-24 months	36	40	76	0.47	[0.35-0.59]	0.731
25-36 months	23	18	41	0.56	[0.39-0.71]	0.5327
37-48 months	23	15	38	0.60	[0.43-0.76]	0.2559
49-60 months	18	16	34	0.52	[0.35-0.70]	0.8642
Total	164	138	302	0.54	[0.48-0.60]	0.1501

3.5. Distribution of malaria infection by type of quarter among the children in the study

Figure 3 shows that malaria infection was more prevalent in the under-integrated (disadvantaged) quarters with n=182, i.e. 60.26% of cases, than in the integrated quarters, which had n=120, i.e. 39.74% of cases of malaria infection among children.

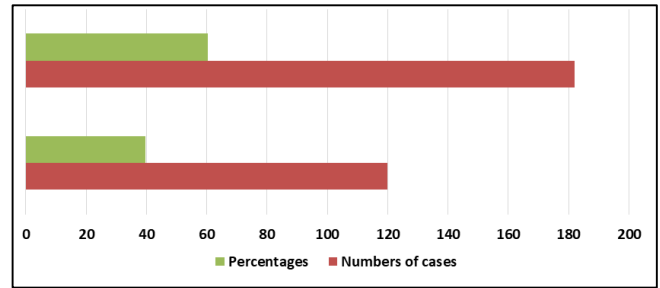


Fig 3: Distribution of malaria infection by type of quarter among the children in the study.

3.6. Seasonal evolution of malaria infection according to age group among the children in the study

The prevalence of malaria infection among children aged 0 to 5 years in the city of Moanda was also unevenly distributed from month to month over a period of one year. Figure 4 shows us two spikes, which represent periods of higher prevalence. The periods between February and March, which are included in the main rainy season, and the month of June, which has a higher peak, correspond to the main dry season.

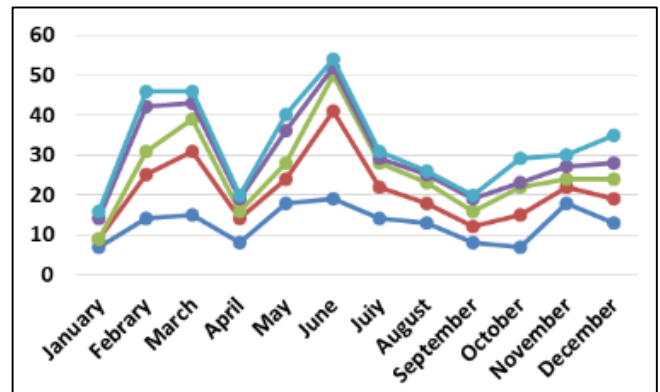


Fig 4: Seasonal evolution of malaria infection according to age group among the children in the study.

4. Discussion

In Gabon, the health of children aged 0 to 5 years is greatly affected by malaria infection. It is endemic and therefore a major public health problem in the country. With the objective of determining the prevalence of malaria infection in children aged 0-5 years attending the Moanda medical centre, this study was based on the results of microscopic examinations (thick blood smears and blood tests) recorded in the registers of the emergency department of the said centre, and recorded 770 children aged 0-5 years who had come for consultation during our study period. Of these children, 302 were positive for malaria infection, giving an overall prevalence of 39.22%. This result is highly superior to those of many previous studies such as the one reported in 2010 in the paediatric department of the reference health centre of commune I of the district of Bamako in Mali which indicated that, out of 7760 cases of children under 5 years of age who came for consultation, there were 476 cases of malaria, i.e. 6.1% [9], or the one carried out in 2013 at the Panda Hospital in Likasi of the Democratic Republic of Congo. They found that out of 1653 children under 5 years of age hospitalised, 221 had malaria, i.e. 13.4% of prevalence [4]. On the other hand, our prevalence is lower than that found at the University Hospital of Brazzaville in Congo [10], and that found at the hospital of Sikasso in Mali, which indicated

that out of 2565 children aged 0-5 years hospitalised, 1432 children had malaria infection, i.e. 55.82% of prevalence^[11]. This variability of results can be explained by aspects such as sample size, degree of endemicity, types of studies, quality of personnel and technical platform of laboratories in the countries where the studies were conducted. In this study, we found that male children were more infected, with 164 cases, or 54.3%. Similar to other authors who also indicated a male predominance in their study^[9], our result is contrary to that found in the paediatric department in Bamako where they obtained a female predominance of 56.5% during their survey^[12]. This result can be justified by the fact that the majority of children who consulted the emergency department of the Moanda medical centre at the time of our study were male. This study indicated a higher prevalence of malaria infection in the 0-12 month age group. This result, similar to that of Chaka Coulibaly, is contrary to a similar study conducted elsewhere, which noted that the 12-36 month age group was the most infected with 52.3%^[9, 13]. Our result can be justified by the fact that this age group includes children who are still fragile and therefore more susceptible to malaria infection. Especially if the mother had suffered from malaria during her pregnancy. According to the type of quarter of residence, our study indicated that children from under-integrated (disadvantaged) neighbourhoods of the city of Moanda were more infected with malaria than those from integrated neighbourhoods. As indicated in a previous study, the under-integrated (disadvantaged) neighbourhoods have serious sanitation problems exposing the inhabitants to significant health risks. They face the double burden of disease and economic poverty on a daily basis.^[14] Relative humidity and temperature therefore play an important role in the survival and longevity of the mosquito vector responsible for the transmission of malaria infection^[15]. The seasonal evolution of malaria infection was observed throughout the year of the study. A high incidence of malaria was recorded between the months of February and March, corresponding to the long rainy season, which runs from February to May in Gabon. This is the case for studies elsewhere, which have shown a seasonality of malaria infection between the months of February and April^[16]. Also, it has been indicated that high rainfall would contribute to the establishment of adequate wet conditions in which mosquito larvae could survive in pools of water^[17]. On the other hand, the study observed a peak during the month of June that is of greater concern. This period corresponds to the long dry season (mid-May to mid-September), which indicates the summer holidays. This is often characterised by cold and wet winds, coupled with a total or partial absence of rain, but is particularly conducive to increased dust on unpaved roads, leading to a high rate of malaria infections, influenza, coughs and allergies of all kinds, and even more often other viral infections that are prevalent at this time in Gabon^[18]. This state of affairs can be justified by the existence of several aggravating factors such as long-lasting poverty, a poor medical culture and insufficient basic hygiene among the population, a precarious sanitary system and climatic conditions that are conducive to the permanent multiplication of pathogens and vectors^[19].

5. Conclusion

This study showed that there was no significant difference between male and female children with malaria infection in the study area. Therefore, parents of these children should be sensitized and encouraged by the health authorities in Gabon

to avoid malaria infection by ensuring that children are adequately protected from mosquito vectors of the disease by sleeping under an insecticide-treated net (ITN), as recommended by the World Health Organization (WHO), in order to reduce morbidity and mortality associated with malaria among children aged 0-5 years in the city of Moanda.

6. Acknowledgements

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7. Availability of data and materials

This study used data contained in the laboratory results registers of the Moanda Medical Centre. All data used and/or analysed in this study are included in this published article and available from the corresponding author upon reasonable request.

8. Competing interests

All authors had no potential conflicts of interest regarding the publication of this article.

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