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CC-BY **Malaria chemoprophylaxis: The use and abuse by caregivers of children in South east Nigeria**

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Abstract: *Introduction:* Malaria still remains a major cause of morbidity and mortality in children despite concerted efforts to reverse this. Chemoprophylaxis involves the use of anti malarial drugs to prevent malaria infection in humans. However the increasing resistance of *plasmodium* to medications has limited the effectiveness of chemoprophylactic regimens used in the past. This study will explore the perception of caregivers about these practices and determine the proportion of caregivers who treat their children for malaria without meeting standard criteria.

Methodology: This cross-sectional descriptive study, was carried out over a 3-month period, from March 2017 to June 2017. Structured questionnaires accompanied by informed consent forms were sent to parents of selected pupils through their children. The first section of the questionnaire was about socio-demographic features of participants while the second

section, collected information on outcome variables which assessed respondents' level of practice of chemoprophylaxis.

Results: A total of 318 (77.2%) caregivers give antimalarial prophylaxis to their children. Mothers without tertiary education ($\chi^2 = 12.90, P = 0.00$) and those from middle and lower socioeconomic classes ($\chi^2 = 15.76, P = 0.00$) were significantly more likely to administer malaria chemoprophylaxis to their children.

Conclusion: The misconception on malarial chemotherapy could portend treatment failure if not controlled. Extensive public enlightenment programs on the guidelines for use of anti-malarial will go a long way in ensuring rational use of anti-malarial drugs in the fight against malaria particularly in high burden areas such as Nigeria.

Key words: Malaria, Chemoprophylaxis, Children, Nigeria

Introduction

Malaria still remains a major cause of morbidity and mortality in children despite concerted efforts to reverse this and over three billion people live in areas at risk of malaria transmission.¹In 2015 alone, 214 million new cases of malaria were reported and 438,000 deaths occurred.¹In Nigeria, there are an estimated 100 million malaria cases with over 300,000 deaths per year. Also, malaria accounts for about 60% of outpatient visits and 30% of hospitalizations among children under five years of age in Nigeria.²Malaria is however both preventable and treatable, and effective preventive and curative tools have been developed.³

According to the World Health organization (WHO) children with suspected malaria should have a parasitological confirmation of the diagnosis before treatment is given; as part of efforts to reduce resistance and use scarce resources appropriately.⁴ Current practices in our health institutions also uphold this decision. Methods of parasitological confirmation commonly used include microscopy and malaria rapid diagnostic test (RDT).⁵ The increasing resistance of *Plasmodium* to medications has limited the effectiveness of chemoprophylactic regimens used in the past and in areas of endemicity. Chemoprophylaxis involves the use of anti malarial drugs to suppress and prevent the establishment of infection in the humans. Chemoprophylactic efforts have also

been hindered by cost and programmatic difficulties.^{6,7} The National malaria treatment guideline for Nigeria stipulates that chemoprophylaxis should be limited for use in those with sickle cell anemia and non-immune visitors because of risk for severe disease.⁸ Intermittent preventive treatment of malaria is also recommended for all pregnant women and sometimes for children under five during seasonal outbreaks.⁸ Home treatment of malaria by mothers/caregivers without seeing a doctor or health worker, is a common practice.^{9,10} However, this practice is not in keeping with the "Test and treat"⁴ recommendation of the WHO and could lead to wastage of lean financial resources of the family as well as drug resistance. This study will explore the perception of mothers/caregivers about these practices and determine the proportion of caregivers who treat their children for malaria without meeting standard criteria. The findings in this study may positively influence the on-going fight against malaria.

Methods

Study design and area

This was a descriptive cross-sectional study carried out among parents of primary school children in Enugu metropolis of Nigeria from March to June 2017. The metropolis is made up of three local government areas – Enugu North, Enugu East and Enugu South.

Ethical consideration

Ethical clearance for the proposal was obtained from the Enugu State University Teaching Hospital Health Research and Ethics Committee (ESUTHP/C-MAC/RA/034/163). Furthermore, approval was obtained from the Enugu State Ministry of Education, school proprietor (s), Head teachers and class teachers as well as parents of the respondents. Informed consent – both verbal and written – were obtained from each child's parents/guardian. Confidentiality was maintained throughout and after the study.

Sampling technique

Multi-staged sampling involving stratified and simple random methods was used. The number as well as the ratio of public to private primary schools in the two randomly selected local government areas were used to determine the number of pupil's parents selected in the area. In each school selected, the participants were selected by simple random sampling using a statistical table of random numbers. Where the selected pupil's parents declined consent to participate, the pupil was excluded from the study and the pupil sitting next to him/her selected.

Data collection

A pretested, self-administered questionnaire containing due explanation and education on the content, purpose

and benefits of the study as well as informed consent forms was given to the selected parents. Some of the information required included sociodemographic data of the parents, number of children per parents, parameters that assessed respondents' level of general use of anti-malarial drugs by parents, the level of practice of chemoprophylaxis by parents and factors that influenced the use of chemoprophylaxis by caregivers. Parental social class was obtained using Oyedeji's method.¹¹

Data analysis

All the data obtained were analyzed using the IBM Statistical Package for Social Sciences version 21 (SPSS Inc., Chicago, IL). Continuous variables were reported as mean, median and standard deviation. While categorical variables were reported in percentages. Tables and figures were constructed as appropriate. Chi-square was used to test for significance between categorical variables. Statistical significance was set at $p < 0.05$.

Results

There were a total of 412 respondents, mostly females (77.9%) Their ages ranged from 17 years to 78 years with a mean age of 25.6 ± 17.4 years. Most (81.1%) of the respondents reside in the urban area giving an urban:rural ratio of 4.5:1. The number of children per caregiver were grouped with distribution as follows: 1 – 2 children (176, 42.7%), 3 – 4 (149, 36.2%), 5 – 6 (75, 18.2%), 7 and above (12, 2.9%).

A greater proportion of the caregivers (62.7%) had tertiary education, while only seven (1.7%) were without formal education. In terms of socioeconomic classification (SEC), 220 (53.5%) belong to upper SEC, while 98 (23.7%) and 94 (22.8%) belong to middle and lower SEC respectively.

Most of the caregivers (97.1%) used orthodox antimalarial to treat their children when malaria is suspected, while 2.9% used herbal medications. The antimalarials used are as shown in figure 1. The most commonly used antimalarial was Artemeter/Lumefantrine.

A total of 318 (77.2%) caregivers gave antimalarial prophylaxis to their children. The sources of the medications are as shown on table 1. About half (50.9%) of these caregivers give antimalarial to other siblings when one child is being treated for malaria. Mothers without tertiary education ($\chi^2 = 12.90$, $P = 0.00$) and those from middle and lower socioeconomic classes ($\chi^2 = 15.76$, $P = 0.00$) were significantly more likely to administer malaria chemoprophylaxis to their children, tables 2 and 3. The place of residence ($\chi^2 = 0.01$, $P = 0.93$) or number of children ($\chi^2 = 1.50$, $P = 0.22$) did not significantly influence the practice of malaria chemoprophylaxis, tables 4 and 5. Situations in which caregivers administer malaria chemoprophylaxis to their children are shown in table 6.

Source	Frequency (N=318)	Percentage
Doctors' prescription based on personal request	209	65.7
Based on Doctors' Previous prescription	53	16.7
Self-prescription	26	8.2
Patent Medicine Dealers/ Pharmacists	155	48.7

Level of education	Malaria chemoprophylaxis use		Total (%)
	Yes (%)	No (%)	
Tertiary	156 (71.2)	63 (28.8)	219 (100.0)
Below tertiary	91 (89.2)	11 (10.8)	102 (100.0)
Total	247 (76.9)	74 (23.1)	321 (100.0)

$$\chi^2 = 12.90, p = 0.00$$

SEC	Malaria chemoprophylaxis use		Total (%)
	Yes (%)	No (%)	
Upper	152 (69.1)	68 (30.9)	220 (100.0)
Middle	83 (84.7)	15 (15.3)	98 (100.0)
Lower	83 (88.3)	11 (11.7)	94 (100.0)
Total	318 (77.2)	94 (22.8)	412 (100.0)

$$\chi^2 = 15.76, p = 0.00$$

*SEC: Socioeconomic class

No of children	Malaria chemoprophylaxis use		Total (%)
	Yes (%)	No (%)	
Urban	257 (76.9)	77 (23.1)	334 (100.0)
Rural	59 (78.7)	16 (21.3)	75 (100.0)
Total	316 (77.3)	91 (22.7)	409 (100.0)

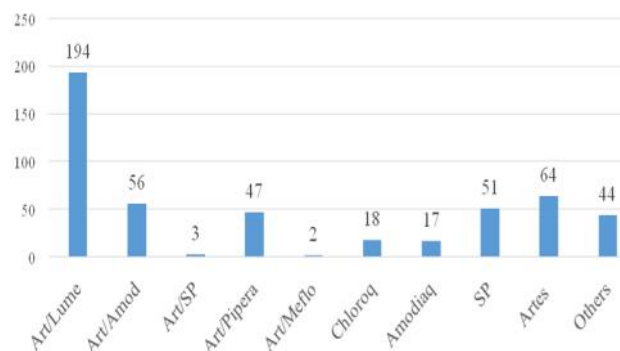
$$\chi^2 = 0.01, p = 0.93$$

No of children	Malaria chemoprophylaxis use		Total (%)
	Yes (%)	No (%)	
1-4	246 (75.7)	79 (24.3)	325 (100.0)
>4	72 (82.8)	15 (17.2)	87 (100.0)
Total	318 (77.2)	91 (22.8)	412 (100.0)

$$\chi^2 = 1.50, p = 0.22$$

Situation	Frequency (n=318)	Percentage
Return to school from holidays	76	24.0
Travel to the village	65	20.5
During holidays/ festivities	20	6.3
Long duration from last antimalarial therapy	116	36.6
Observation of mosquito bites on the skin	44	13.8

Fig 1: Bar Chart showing the drugs used by caregivers for home treatment of malaria in their children



Discussion

This study illustrated practical realities concerning malaria chemoprophylaxis in children by their caregivers in Enugu, which has implications for the implementation of national malaria treatment guidelines of Nigeria. The predominance of female respondents supports the prevailing socio-cultural conditions in this part of the world where mothers/ female caregivers are more closely involved in the health needs of children/wards and are seen more in health facilities seeking healthcare for their children.¹²⁻¹⁵

The study shows that the use of herbal medication to treat children with malaria is not a common practice in Enugu. This may be a reflection of their level of education and socio-economic class, as a greater proportion of the caregivers had tertiary education and were from the higher socio-economic class. Similarly, an earlier study in Enugu had shown a low rate of herbal medication use for malaria treatment.¹⁶

Despite the high level of education and socio-economic status of the caregivers in this study, majority of them gave malaria chemoprophylaxis to their children against the provisions of the national malaria treatment guideline. Unfortunately, there's paucity of studies on the use of malaria chemoprophylaxis in children living in malaria endemic areas. Our study revealed that the use of malaria chemoprophylaxis was more common among mothers without tertiary education and those from middle and lower socio-economic classes. This attitude is worsened by the belief on the part of caregivers that most if not all bouts of fever in our environment are due to malaria.¹⁷ In addition there is the low utilization of malaria diagnostic tests and over-reliance on clinical signs and symptoms for the diagnosis by health care workers^{13,18-21}

The practice of giving anti-malarial to other siblings when one child is being treated for malaria was observed in more than half of the caregivers. This may be due to the belief that since the children share same home, there's likelihood of other siblings being bitten by the same mosquitoes and hence maybe incubating malaria. Falciparum malaria has been reported to present in family members simultaneously.²² However, the

occurrence of malaria in one member should not be an indication to treat other family members in an endemic area except the individual is symptomatic and is confirmed by a laboratory test. Long duration from last anti-malarial therapy, a child's return to school after holidays and trips to the village should not be indications for antimalarial chemoprophylaxis. This practice amounts to abuse of anti-malarial drugs and shows obvious knowledge gaps on the part of caregivers and healthcare providers regarding the provisions of the policy guidelines on use of malaria chemoprophylaxis in children. This shows a clear need for extensive public enlightenment campaign on the provisions of the national malaria policy.

The pattern of prescription of anti-malarials in this study is similar to those of many studies from both Nigeria and other African countries,^{4,16,23,24} and shows a clear preference for artemisinin-based combination therapy (ACT), particularly the Artemisinin-Lumefantrine (AL) combination, which is the policy first line drug and indicates providers' confidence on the efficacy of the regimen. A large number of the prescriptions for chemoprophylaxis were written by doctors on personal request by the caregivers of children. This finding could partly explain why AL was the most commonly used drug for malaria. However, the use of anti-malarial drugs are neither in line with "test and treat" policy or the recommendations for malaria prophylaxis in children as contained in the national malarial guideline of Nigeria and therefore should be of concern. Studies have shown limited use of laboratory diagnosis prior to malaria treatment, even with the availability of rapid diagnostic tools.^{13,18-20} This is worrisome as a good number of doctors still rely on their clinical skill in making a diagnosis of malaria and prescribe anti-malarial drugs

for children on request by care givers as found in this study.

Conclusion

This study has demonstrated the misuse of antimalarial chemotherapy by caregivers and the indiscriminate use of anti-malarial drugs as prophylaxis outside the provisions of the national malarial guidelines. This could lead to treatment failure and development of drug resistance if not controlled.

Recommendation

There needs to be an extensive public enlightenment programs on the guidelines for use of anti-malarials. Also, regulation of access to anti-malarial drugs and instituting ways to ensure and enforce adherence to the National Malarial Policy guidelines by health workers will go a long way in ensuring rational use of anti-malarial drugs, ensure drug efficacy and improved outcome in the fight against malaria particularly in high burden areas such as Nigeria.

Authors contribution

NIK: Conception, questionnaire design, directed data analysis, and manuscript writing. UND, UE, NOC, EBO, AIN, AAC, BOA and ODIC: Questionnaire design, data collection, literature review, manuscript writing. EBO: data analysis

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