wjpmr, 2020,6(8), 47-57

SJIF Impact Factor: 5.922

WORLD JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.wjpmr.com

Research Article

ISSN 2455-3301

WJPMR

UTILIZATION PATTERN OF ANTI-MALARIA DRUGS BY CAREGIVERS FOR TREATMENT OF MALARIA IN CHILDREN UNDER FIVE YEARS IN IMO STATE, NIGERIA

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Article Received on 15/06/2020 **Article Revised on 05/07/2020** **Article Accepted on 26/07/2020**

ABSTRACT

The utilization pattern of anti malaria drugs in the treatment of childhood malaria was studied with the aim of investigating the influence of education and occupation on choice of malaria drugs. The study was carried out between September 2005 and January 2008 in two Local Government Areas (LGAs) of Imo State by administration of structured questionnaire through household surveys of caregivers. The result showed that out of the 4093 respondents, the most commonly used drugs during the period of survey were Chloroquine(13.6%), Malareich (11.4%), Fansidar(10.1%), Artesunate(8.3%), Amodiaquine(7.8%), Amalar(7.7%), Alaxin (7.6%)And Maloxine (7.6%). Overall, the highest number of respondents using monotherapy was among those with primary level education. The utilization of anti-malarials in relation to occupation of caregivers showed that Malareich was most used among Civil Servants (17.7%), Traders (14.9%) and Nurses (11.6%) while Fansider (15.7%) was used among Teachers. The Artemisinin combination therapy (ACT) was most used by Teachers while momotherapy was most preferred by Nurses (46.4%). There was variation in choice of drugs among respondents in the two LGAs however, choice of anti-malaria drug in relation to educational levels of respondents was not statistically significant (P=0.38) while it differed significantly (P< .05) in relation to occupational groups. In light of these findings, it is imperative to monitor and inform caregivers on the proper anti-malaria therapies through more targeted and strategic programs.

KEYWORDS: Utilization Pattern, Anti-Malaria Drug, Nigeria.

INTRODUCTION

Active malaria infection with *P. falciparum* is a medical emergency requiring hospitalization. Chemotherapy is the primary means of treating protozoan infections. Successful chemotherapy depends in a large part on the ability to exploit metabolic differences between the pathogen and the host. Infection with *P. vivax*, *P. ovale* or *P. malariae* can often be treated on an out-patient basis. Treatment of malaria involves supportive measures as well as specific anti-malaria drugs. When properly treated, someone with malaria can expect a complete cure (Redd, *et al.*, 2006).

Prompt treatment with antimalarial drug is considered the most important method of preventing deaths from malaria. Because the highest mortality is in young children in areas where laboratory facilities are limited, presumptive treatment of childhood fever has been adopted widely as a strategy in health care facilities in endemic areas (McCombe, 2002). The summit in Abuja recognized this problem and called upon member states to 'make diagnosis and treatment of malaria available as far peripherally as possible, including home treatment' (WHO, 2000).

To reduce the devastating effects of failing monotherapies (Snow, Trape and Marsh, 2001), ACT was recommended as first line of treatment for malaria (Olumere, 2006). In the light of these developments, some countries in Africa changed their treatment policy for uncomplicated malaria from Chloroquine to ACT: Artemether – Lumefantrine for children and non-pregnant adults weighing 10kg or more and Sulphadoxine-Pyrimethamine for children less than 10kg (Mudondo *et al.*, 2006). However, the effectiveness of the supply chain was complicated with international procurement of Artemether-Lumefantrine, single source of the product and potential shortages of the drug on the global market (Zurovac *et al.*, 2007). In October 2005, the Zambian Central Board of Health made an important

decision to recommend Artemether-Lumefantrine in patients with uncomplicated malaria weighing 5 to 9kg (Zurovac, 2006). This weight group recommendation is consistent with those specified as part of national guidelines developed during 2005 and 2006 in Kenya (Republic of Kenya National Guidelines for Diagnosis, 2006), Tanzania (United Republic of Tanzania National Guidelines for Diagnosis and treatment of malaria, 2006) and Uganda (Republic of Uganda Management of Uncomplicated Malaria, 2005).

In Nigeria, the policy change from Chloroquine to Artemisinin-based combined therapy (ACTs) was initiated in February 2005 while the combination of Artemether + Lumefantrin (Coartem®) was officially adopted as the first line antimalarial (FMOH,2005).A study in Northwest Nigeria reported that the pattern of treatment of uncomplicated malaria reflect high compliance with the policy change from Chloroquine to ACTs as first line anti-malarial drugs (Ishola *et al*., 2011).However, findings from a previous study in Nigeria showed that Chloroquine (CQ) remains the most frequent used drug for *falciparum* malaria for more than 40 years (Oreagba *et al*., 2008).This is most probably due to its easy availability and its affordability by patients which had been confirmed by studies carried out before the policy change (Aina,2005). Recent findings in Nigeria suggest vastly improved use of ACT in the retail sector after policy change (Ezenduka *et al*., 2014; Maryah *et al*., 2017). However, the use of monotherapy and improper use of ACT particularly through self medication remains significant with increasing risk of undermining treatment policy (Ezenduka *et al*., 2014; Uzochukwu et al., 2010). This study therefore aims to provide to the body of knowledge the prevailing picture of antimalaria utilization among caregivers in the study area during the period of study for purpose of analyzing trends and evaluation of intervention success.

METHODS

Study Area

Imo State is located in the South eastern region of Nigeria. It lies between latitude 5^0 10^1 and 5^0 51^1 North, Longitude 6^0 35^1 and 7^028^1 East. It is bordered, on the North by Anambra State, on the South and West by Rivers State and on the east by Abia State. The state comprises an area of about 6,346 square Kilometers, which is about 0.9% of the total land area of the Federation. The population is about 3.9 million inhabitants, which is about 2.8% of the total population of the Federation.

Data collection and analysis

This study was a cross sectional survey carried out between September 2005 and January 2008. It was conducted in two Local Government Areas (LGAs) in Imo State namely Owerri Municipal and Orlu LGAs. Community level consents were obtained from the community leaders to carry out the survey. Individual consents were obtained from the caregivers. Structured questionnaires were administered randomly through household survey to caregivers domiciled in the communities. Respondents who reported seeking anti-malarial treatment from the health-care facilities or/and traditional healers were excluded from this survey. A total of 4093 caregivers were involved in the assessment of anti-malarial drugs utilization pattern, of which 2375 respondents were from Owerri municipal LGA and 1718 respondents were from Orlu LGA. The questionnaires were designed to obtain information on demographic characteristics and anti-malarial drugs used by caregivers for treatment of malaria in children. The data was analyzed using Statistical Package for Social Science (SPSS) version 9. The level of statistical significance was taken as $P<.05$. The results were also represented graphically in form of Bar Charts for easy interpretations of information.

RESULTS

Overall anti-malarial drugs utilization by Caregivers For the Treatment of Malaria in Children $\leq$ 5 years of age in the Study Area

Overall results of the anti-malarial drugs utilization by respondents revealed that out of the 4093 respondents, the most often used drugs were Chloroqunie (12.6%), Malareich (11.4%), Fansidar (10.1%), Artesunate (8.3%), Amodiaqunie (7.8%), Amalar (7.7%), Alaxin (7.6%), Maloxine (7.6%). In Owerri were Malareich (12.2%), Fansidar (12.1%), Artesunate (11.6%), Chloroquine (10.5%) and Amalar (9.0%). Most drugs used often in Orlu LGA by respondents were Chloroquine (15.6%), Amodiaquine (14.8%), Alaxin (13.0%), Malareich (10.2%), Maloxine (8.1%) and Fansidar (7.3%) (Fig. 1).

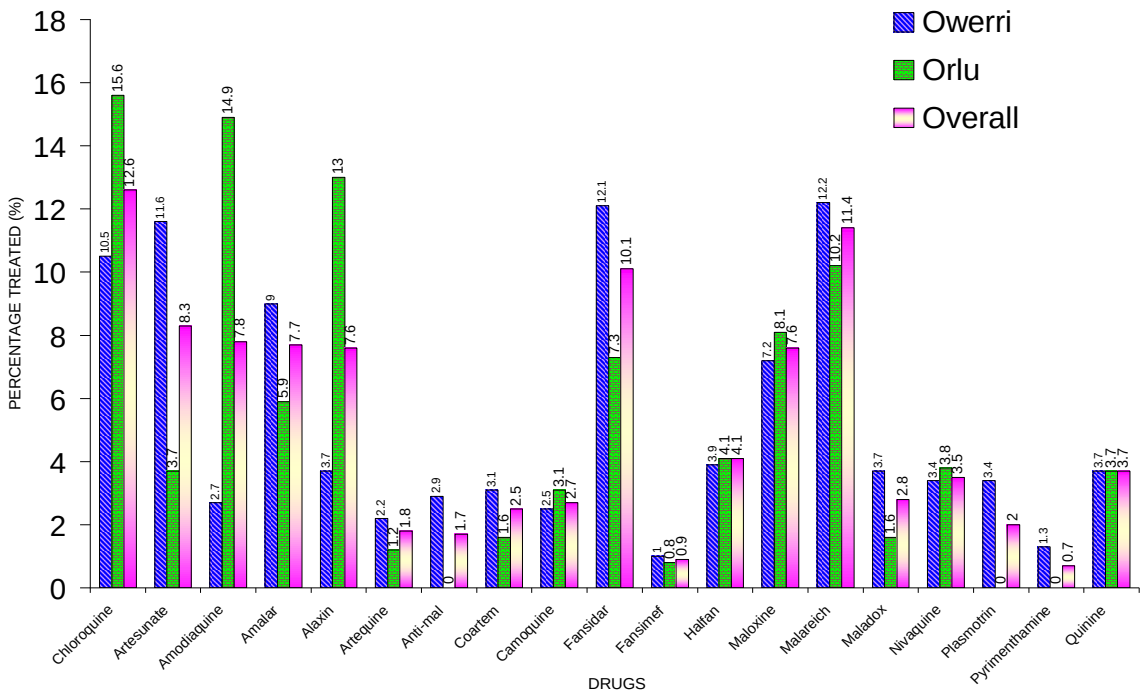

Fig. 1: Overall Anti-Malarial Drug Utilization Pattern by Caregivers for the Treatment of the Children ≤ 5 Years of Age in Owerri Municipal and Orlu LGA, Imo State.

Anti-Malarial Drugs Utilization in relation to Education by Respondents in Orlu and Owerri municipal LGA

The utilization of the anti-malarial drugs in relation to educational level of respondents in Owerri municipal LGA showed that Chloroquine was most often used among primary level educated respondents 65(15.5%). The highest number of respondents were among secondary and tertiary levels who used Fansidar and Malareich 123(15.1%) and 156(13.7%) respectively. In Orlu LGA, The highest number of secondary and tertiary levels of respondents used chloroquine 79(16.7%) and 105(15.7%) respectively, while primary level of respondents commonly used Amodiqunie 87(15.1%). (Table 1).

Anti-Malarial Drugs Utilization by Respondents in relation to Occupation in Orlu and Owerri municipal LGA

The utilization of the anti-malarial drugs in relation to the occupation of caregivers in Owerri showed that Malareich was the most often utilized drug among civil servants 86(17.5%), traders 113(14.9%) and nurses 68(11.6%), while Fansidar was used among teachers 45(15.7%) and Amalar among housewives 41(16.5%). Occupation-related anti-malarial drugs utilization among respondents for the treatment of children ≤ 5 years of age in Orlu LGA showed Alaxin was most preferred among 45(15.5%) of civil servants and 56(16.1%) of teachers, while Chloroquine was most often utilized drug among 101(16.2%) of traders, 47(19.1%) of house wives and 31(14.7%) of nurses. Coartem was used highest among 5(1.7%) of civil servants and teachers, while the lowest was among traders 5(0.8%). (Table 2)

Overall Assessment of Anti-malarial Utilization Pattern Based On Monotherapy, Artemisinin Combination Therapy and Non Artemisinin Combination by Respondents in Owerri Municipal and Orlu LGAs

Of the total 4093 caregivers who were involved in the assessment of anti-malarial drugs utilization pattern, 2375 respondents were from Owerri municipal LGA and 1718 respondents were from Orlu LGA. Of the total interviewed, 51.6% used monotherapy, 6.2% used Artemisinin combination therapy (ACT), and 42.1% used non-artemisinin combination therapy (NACT). Of the 2375 respondents interviewed in Owerri, 43.2% used monotherapy, 8.7% utilized ACT and 48.1% used NACT. Of the 1718 respondents interviewed in Orlu, 63.3% used monotherapy, 2.8% used ACT and 33.9% used NACT (Fig.2).

Education-Related Anti-Malarial Utilization Pattern Based On Monotherapy, Artemisinin Combination Therapy and Non Artemisinin Combination by Respondents in Orlu and Owerri Municipal LGAs.

The pattern of treatment among respondents based on their educational level in Owerri municipal LGA showed that of the 2375, the highest number of respondents using monotherapy was among the respondents with primary level of education (46.4%), while for NACT, the highest number was observed among secondary level (51.7%). The use of ACT was very low among all educational level of respondents, the highest percentage obtained being among those with secondary level of education (9.9%). The pattern of the treatment statistically varied among levels of education of the respondents/caregivers ($p < 0.05$).

Assessment in Orlu LGA revealed that of the 1718 respondents, the highest number who used monotherapy was among those with primary level of education (64.8%) and the least among secondary level of education (59.9%). ACT was more utilized by respondents among tertiary level (3.1%) and the least was by those with primary level of education (2.3%). From results obtained, all levels of education similarly used (NACT), the highest number being among secondary level of education (37.1%) the difference between educational levels of respondents and anti-malarial therapy pattern was not significant (P = 0.376) (Fig.4).

Occupation-Related Anti-Malarial Drug Utilization Pattern by Respondents in Owerri Municipal and Orlu LGAs

In Owerri, out of the 2375 of respondents, the highest number using monotherapy was observed among nurses, (46.4%) followed by house wives (45.2%) and the least among teachers (40.8%). ACT was used more by teachers 12.5% and the least by civil servants (6.5%). Majority of respondents used NACT for the treatment of malaria in children. The highest number was observed among civil servants (52.1%), and the least among housewives (43.5%).Anti-malaria drugs utilization pattern differs significantly among occupational groups ($p < 0.05$).

Utilization pattern by respondents in Orlu LGA based on their occupation showed that out of 1718 respondents, monotherapy was the most common pattern among all occupational groups, the highest being among the housewives (68.7%) and the least among civil servants (55.9%). Generally, number of respondents using ACT was very low among all occupational groups. The highest percentage was observed among teachers, house wives and nurses (4.3%) each. NACT was utilized most often by civil servants (41.4%) and least by teachers (28.5%). Statistical analysis revealed that the difference between the therapy pattern and occupational groups was statistically significant ($P<0.05$) in Orlu LGA.

Table 1: Education Specific Anti-Malarial Drug Utilization Pattern By Respondents For The Treatment Of The Children ≤ 5 Years Of Age In Owerri Municipal And Orlu L.G.As, Imo State.

Anti-Malaria Drugs		PRIMARY			SECONDARY			TERTIARY			Total		Grand total
Generic Name	Trade Name	OW No = 420	OR No = 577	T NO = 997	OW No = 815	OR No = 474	T NO = 1289	OW No = 1140	OR No = 667	T NO = 1807	OW No = 2375	OR No = 1718	OW + OR = 4093
Chloroquine P	Chloroquine	65 (15.5)	84 (14.6)	169(14.9)	55 (6.8)	79 (16.7)	134(10.4)	129 (11.3)	105 (15.7)	234(12.9)	249(10.5)	268(15.6)	517(12.6)
Artesunate	Artesunate	58 (13.8)	24(4.2)	82(8.2)	71 (8.7)	17(3.6)	88(6.8)	147 (12.9)	23(3.5)	170(9.4)	276(11.6)	64(3.7)	340(8.3)
Amodiaquine	Amodiaquine	7 (1.7)	87(15.1)	94(9.4)	22 (2.7)	70(14.8)	92(7.1)	35 (3.1)	97 (14.5)	132(7.3)	64 (2.7)	254(14.8)	318(7.8)
Artesunate + SP	Amalar	37 (8.8)	28(4.9)	65(6.5)	78 (9.6)	33(7.0)	111(8.6)	99 (8.7)	40(6.0)	139(7.7)	214 (9.0)	101(5.9)	315(7.7)
Dihydro-artemisinin	Alaxin	14 (3.3)	77(13.3)	91(9.1)	28 (3.4)	55(11.6)	83(6.4)	46 (4.0)	91 (13.6)	137(7.6)	88 (3.7)	223(13.0)	311(7.6)
Artesunate + Mefloquine	Artequine	10 (2.4)	4(0.7)	14(1.4)	15 (1.8)	5(1.1)	20(1.6)	28 (2.5)	12(1.8)	40(2.2)	53 (2.2)	21(1.2)	74(1.8)
SP	Anti-mal	10 (2.4)	0(0.0)	10(1.0)	41 (5.0)	0(0.0)	41(3.2)	17 (1.5)	0(0.0)	17(0.9)	68 (2.9)	0(0.0)	68(1.7)
Artemether + Lumefantrine	Coartem	7 (1.7)	9(1.6)	16(1.6)	33 (4.0)	9(1.9)	42(3.3)	34 (3.0)	9(1.4)	43(2.4)	74 (3.1)	27 (1.6)	101(2.5)
Amodiaquine	Camoquine	3 (0.7)	14(2.4)	17(1.7)	11 (1.4)	23(4.8)	34(2.6)	45 (3.9)	16(2.7)	61(3.4)	59 (2.5)	53(3.1)	112(2.7)
SP	Fansidar	34 (8.1)	45(7.8)	76(7.9)	123(15.1)	35(7.4)	158(12.3)	130 (11.4)	46(6.9)	176(9.7)	287(12.1)	126(7.3)	413(10.1)
SP + Mefloquine	Fansimef	7 (1.7)	4(0.7)	11(1.1)	11 (1.4)	3(0.6)	14(1.1)	6 (0.5)	7(1.1)	13(0.7)	24 (1.0)	14(0.8)	38(0.9)
Chlorhydrate halofantrine	Halfan	10 (2.4)	29(5.0)	39(3.9)	37 (4.5)	10(2.1)	47(3.6)	45 (3.9)	31(4.7)	76(4.2)	92 (3.9)	70(4.1)	162(4.0)
SP	Maloxine	48 (11.4)	44(7.6)	92(9.2)	60 (7.4)	42(8.9)	102(7.9)	63 (5.5)	53(7.9)	116(6.4)	171 (7.2)	139(8.1)	310(7.6)
SP	Malareich	48 (11.4)	59(0.2)	107(10.7)	86 (10.6)	53(11.2)	139(10.8)	156 (13.7)	63(9.4)	219(12.1)	290(12.2)	175(10.2)	465(11.4)
SP	Maldox	21 (5.0)	10(1.7)	31(3.1)	22 (2.7)	10(2.1)	32(2.5)	45 (3.9)	7(1.0)	52(2.9)	88 (3.7)	27(1.6)	115(2.8)
Chloroquine P	Nivaquine	7 (1.7)	17(2.9)	24(2.4)	19 (2.3)	18(3.8)	37(2.9)	54 (4.7)	30(4.5)	84(4.6)	80 (3.4)	65(3.8)	145(3.5)
Artesunate	Plasmotrin	3 (0.7)	0(0.0)	3(0.3)	33 (4.0)	0(0.0)	33(2.6)	44 (3.9)	0(0.0)	44(2.4)	80 (3.4)	0(0.0)	80(2.0)
Pyrimenthamine	Pyrimenthamine	14 (3.3)	0(0.0)	14(1.4)	11 (1.4)	0(0.0)	11(0.9)	5 (0.4)	0(0.0)	5(0.3)	30(1.3)	0(0.0)	30(0.7)
Quinine	Quinine	17 (4.0)	25 (4.3)	42 (4.2)	59 (7.2)	9 (1.9)	68 (5.3)	12 (1.1)	30 (4.5)	42 (2.3)	88 (3.7)	64(3.7)	152(3.7)
Chloroquine P	Chemoquine	0(0.0)	17(3.0)	17(1.7)	0(0.0)	3(0.6)	3(0.2)	0(0.0)	7(1.1)	7(0.4)	0(0.0)	27(1.6)	27(0.7)

Key: OW = Owerri Municipal L.G.A; Or = Orlu L.G.A; T = Owerri + Orlu L.G.A; No = Number Interviewed ; Sp = Sulfadoxine+Pyrimethamine

Table 2: Occupation Specific Anti-Malarial Drug Utilization Pattern By Respondents For The Treatment Of The Children ≤ 5 Years Of Age In Owerri Municipal And Orlu L.G.As, Imo State.

Anti-Malaria Drugs		Civil Servants			Teachers			Traders			House Wives			Nurses			Total		Grand total
Generic Name	Trade Name	OW No = 491	OR No = 290	T NO = 781	OW No = 287	OR No = 347	T NO = 634	OW No = 760	OR No = 624	T NO = 1384	OW No = 248	OR No = 246	T NO = 494	OW No = 589	OR No = 211	T NO = 800	OW No = 2375	OR No = 1718	OW + OR No = 4093
Chloroquine P	Chloroquine	56 (11.4)	37 (12.8)	93 (11.9)	32 (11.1)	52 (15.0)	84 (13.2)	81 (10.7)	101 (16.2)	182 (13.2)	30 (12.1)	47 (19.1)	77 (15.6)	50 (8.5)	31 (14.7)	81 (10.1)	249 (10.5)	268 (15.6)	517 (12.6)
Artesunate	Artesunate	59 (12.0)	13 (4.5)	72 (9.2)	45 (15.7)	11 (3.2)	56 (8.8)	89 (11.7)	21 (3.4)	110 (7.9)	24 (9.7)	0(0.0)	24 (4.9)	59 (10.0)	19 (9.0)	78 (9.8)	276 (11.6)	64 (3.7)	340 (8.3)
Amodiaquine	Amodiaquine	6 (1.2)	41 (14.4)	47 (6.0)	8 (2.8)	53 (15.3)	61 (9.6)	14 (1.8)	100 (16.0)	114 (8.2)	11 (4.4)	34 (13.8)	45 (9.1)	25 (4.2)	26 (12.3)	51 (6.4)	64 (2.7)	254 (14.8)	318 (7.8)
Artesunate + SP	Amalar	29 (5.9)	25 (8.6)	54 (6.9)	17 (5.9)	4 (1.2)	21 (3.3)	81 (10.7)	48 (7.7)	129 (9.3)	41 (16.5)	10 (4.1)	51 (10.3)	46 (7.8)	14 (6.6)	60 (7.5)	214 (9.0)	101 (5.9)	315 (7.7)
Dihydro-artemisinin	Alaxin	15 (3.1)	45 (15.5)	60 (7.7)	6 (2.1)	56 (16.1)	62 (9.8)	27 (3.6)	77 (12.3)	104 (7.5)	6 (2.4)	27 (11.0)	33 (6.7)	34 (5.8)	18(8.5)	52 (6.5)	88 (3.7)	223 (13.0)	311 (7.6)
Artesunate + Mefloquine	Artequine	9 (1.8)	3 (1.0)	12 (1.5)	4 (1.4)	9 (2.6)	13 (2.1)	22 (2.9)	5 (0.8)	27 (2.0)	2 (0.8)	2 (0.8)	4 (0.8)	16 (2.7)	2(0.9)	18 (2.3)	53 (2.2)	21 (1.2)	74 (1.8)
SP	Anti-mal	3 (0.6)	0 (0.0)	3 (0.4)	14 (4.9)	0 (0.0)	14 (2.2)	25 (3.3)	0 (0.0)	25 (1.8)	8(3.2)	0 (0.0)	8 (1.6)	18 (3.1)	0 (0.0)	18 (2.3)	68 (2.9)	0 (0.0)	68 (1.7)
Artemether + Lumefantrine	Coartem	8 (1.6)	5 (1.7)	13 (1.7)	15 (5.2)	6(1.7)	21 (3.3)	24 (3.2)	5 (0.8)	29 (2.1)	9 (3.6)	4 (1.6)	13 (2.6)	18 (3.1)	7(3.3)	25 (3.1)	74 (3.1)	27 (1.6)	101 (2.5)
Amodiaquine	Camoquine	10 (2.0)	6 (2.1)	16 (2.0)	6 (2.1)	8(2.3)	14 (2.2)	21 (2.8)	18 (2.9)	39 (2.8)	7 (2.8)	17 (6.9)	24 (4.9)	15 (2.6)	4(1.9)	19 (2.4)	59 (2.5)	53 (3.1)	112 (2.7)
SP	Fansidar	59 (12.0)	38 (13.1)	97 (12.4)	45 (15.7)	19(5.5)	64 (10.1)	89 (11.7)	35 (5.6)	124 (9.0)	29 (11.7)	11 (4.5)	40 (8.1)	65 (11.0)	23(10.9)	88 (11.0)	287 (12.1)	126 (7.3)	413 (10.1)
SP + Mefloquine	Fansimef	3 (0.6)	4 (1.4)	7 (0.9)	5 (1.7)	3(0.9)	8 (1.3)	6 (0.8)	2 (0.3)	8 (0.6)	3 (1.2)	3 (1.2)	6 (1.2)	7 (1.2)	2(0.9)	9 (1.1)	24 (1.0)	14 (0.8)	38 (0.9)
Chlorhydrate halofantrine	Halfan	24 (4.9)	1 (0.3)	25 (3.2)	9 (3.1)	26(7.5)	35 (5.5)	31 (4.1)	25 (4.0)	56 (4.0)	9 (3.6)	8 (3.3)	17 (3.4)	19 (3.2)	10(4.7)	21 (2.6)	92 (3.9)	70 (4.1)	162 (4.0)
SP	Maloxine	59 (12.0)	27 (9.3)	86 (11.0)	16 (5.6)	35(10.1)	51 (8.0)	44 (5.8)	52 (8.3)	96 (6.9)	13 (5.2)	16 (6.5)	29 (5.9)	39 (6.6)	9(4.3)	48 (6.0)	171 (7.2)	139 (8.1)	310 (7.6)
SP	Malareich	86 (17.5)	24 (8.3)	110 (14.1)	14 (4.9)	33(9.5)	47 (7.4)	113 (14.9)	66 (10.6)	179 (12.9)	9 (3.6)	31 (12.6)	40 (8.1)	68 (11.6)	21(10.0)	89 (11.1)	290 (12.2)	175 (10.2)	465 (11.4)
SP	Maldox	17 (3.5)	2 (0.7)	19 (2.4)	23 (8.0)	5(1.4)	28 (4.4)	20 (2.6)	16 (2.6)	36 (2.6)	5 (2.0)	0 (0.0)	5 (1.0)	23 (3.9)	4(1.9)	27 (3.4)	88 (3.7)	27 (1.6)	115 (2.8)
Chloroquine P	Nivaquine	9 (1.8)	8 (2.8)	17 (2.2)	7 (2.4)	5(1.4)	12 (1.9)	14 (1.8)	25 (4.0)	39 (2.8)	15 (6.1)	15 (6.1)	30 (6.1)	35 (5.9)	12(5.7)	47 (5.9)	80 (3.4)	65 (3.8)	145 (3.5)
Artesunate	Plasmotrin	15 (3.1)	0 (0.0)	15 (1.9)	17 (5.9)	0 (0.0)	17 (2.7)	15 (2.0)	0 (0.0)	15 (1.1)	17 (6.9)	0 (0.0)	17 (3.4)	16 (2.7)	0 (0.0)	16 (2.0)	80 (3.4)	0 (0.0)	80 (2.0)
Pyrimenthamine	Pyrimenthamine	5 (1.0)	0 (0.0)	5 (0.6)	0 (0.0)	0 (0.0)	0 (0.0)	14 (1.8)	0 (0.0)	14 (1.0)	0 (0.0)	0 (0.0)	0 (0.0)	11 (1.9)	0 (0.0)	11 (1.4)	30 (1.3)	0 (0.0)	30 (0.7)
Quinine	Quinine	19 (3.9)	8 (2.8)	27 (3.5)	4 (1.4)	10 (2.9)	14 (2.2)	30 (3.9)	20 (3.2)	50 (3.6)	10 (4.0)	21 (8.5)	31 (6.3)	25 (4.2)	5 (2.4)	30 (3.8)	88 (3.7)	64 (3.7)	152 (3.7)
Chloroquine P	Chemoquine	0 (0.0)	3 (1.0)	3 (0.4)	0 (0.0)	12 (3.5)	12 (1.9)	0 (0.0)	8 (1.3)	8 (0.6)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	4 (1.9)	4 (0.5)	0 (0.0)	27 (1.6)	27 (0.7)

Key: OW = Owerri Municipal L.G.A; Or = Orlu L.G.A; T = Owerri + Orlu L.G.A; No = Number Interviewed; Sp = Sulfadoxine+P yrimethamine.

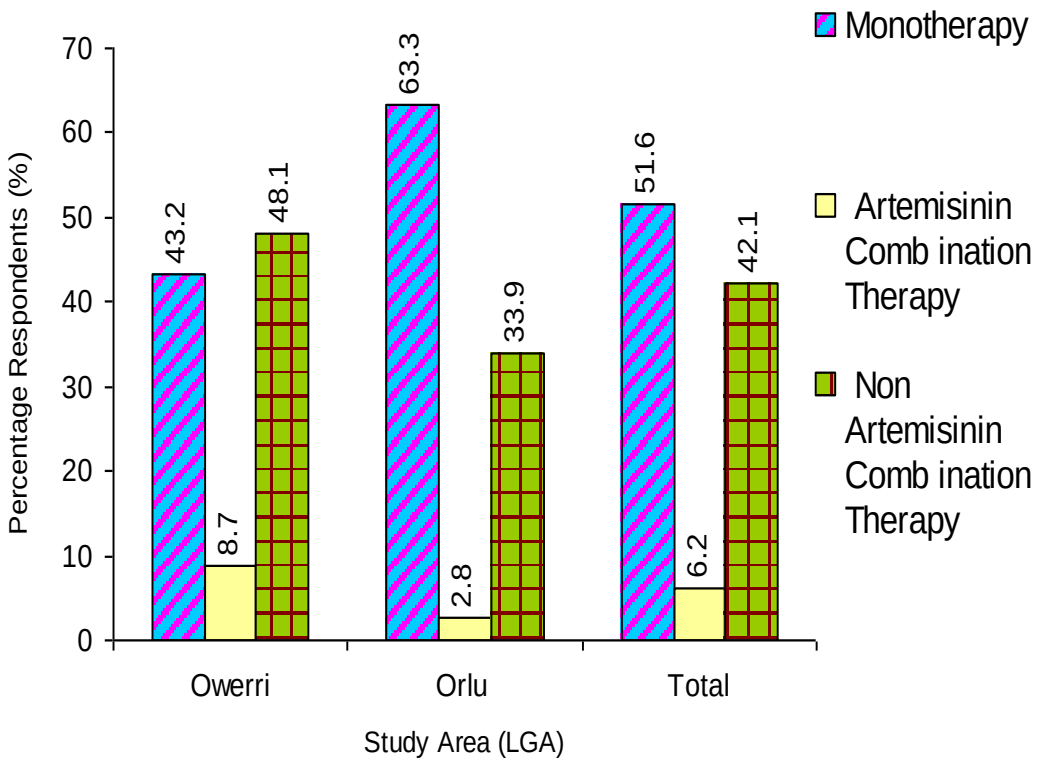

Fig. 2: Overall assessment of anti-malarial drug utilization pattern by respondents (child care-giver) for the treatment of the children ≤ 5 years of age based on monotherapy, artemisinin combination therapy and non artemisinin combination therapy in the study area, Imo State.

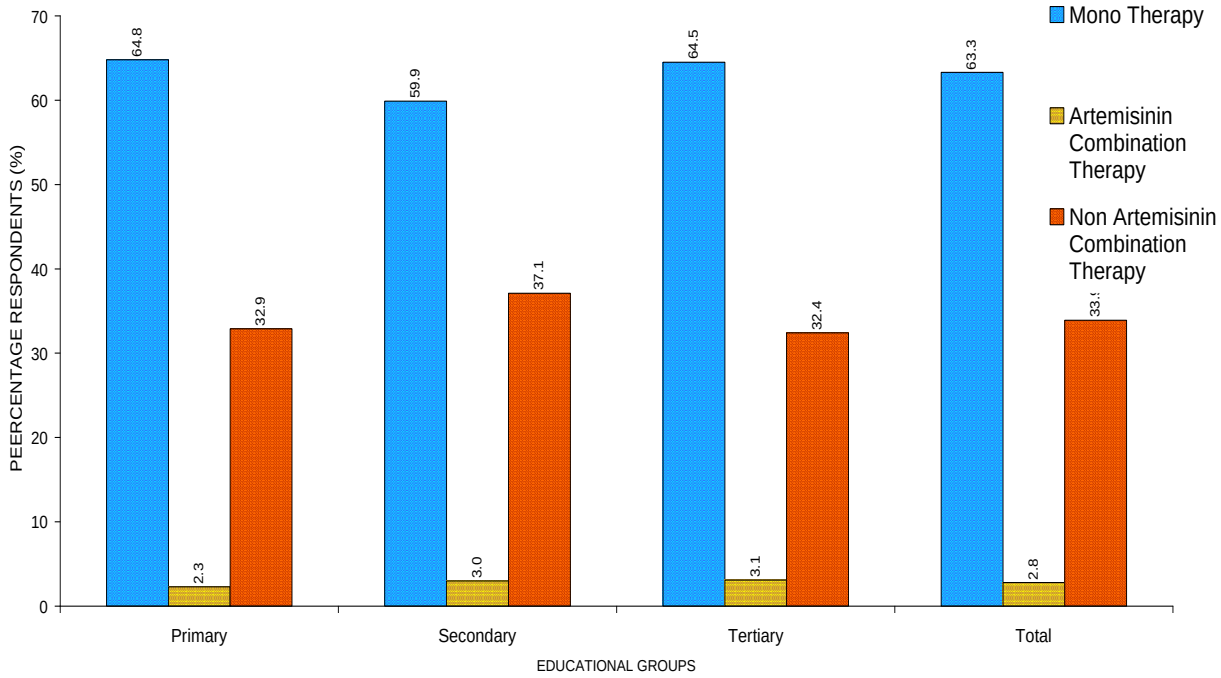

Fig. 3: Arthemisinin Combination Therapy and Monotherapy Utilization Pattern by Respondents in Orlu LGA based on Educational Status

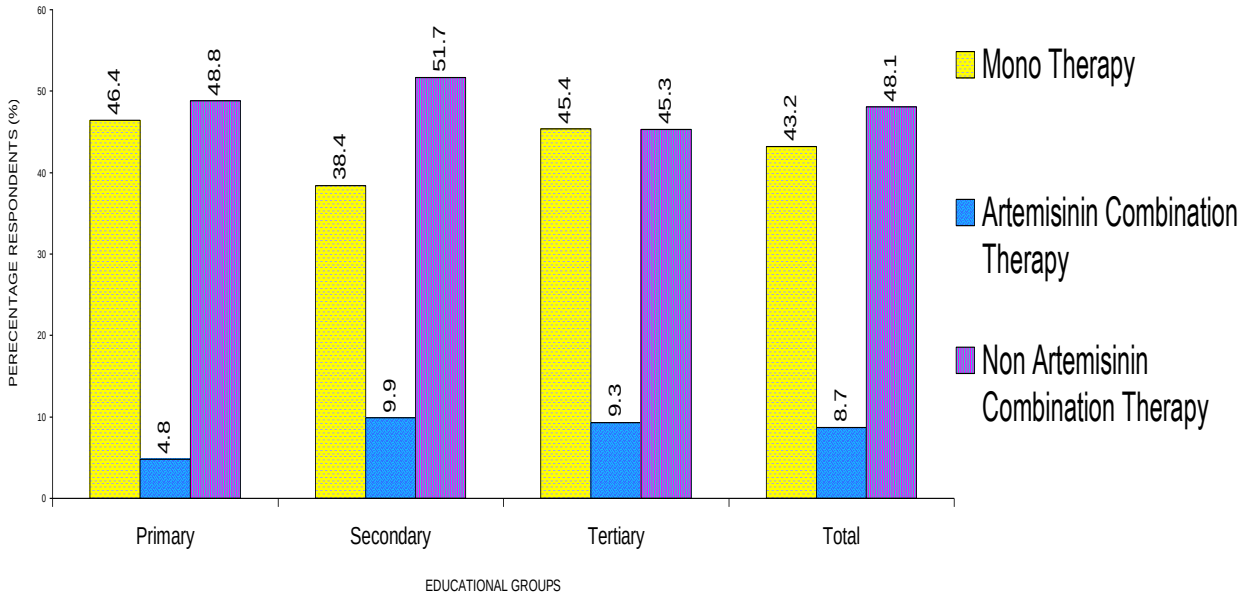

Fig. 4: Combination Therapy and Monotherapy Utilization Pattern by Respondents in Owerri Municipal based on Educational Status.

DISCUSSION

Prompt treatment of malaria with effective anti-malarials is one of the key strategies for malaria control in Africa. Since the Abuja summit, efforts to increase access to effective control and treatment measures have been made throughout Africa. However, barriers to full implementation of treatment measures exist, including cost and availability of new anti-malarial drugs and awareness and acceptability of new drug policies. In addition, defining appropriate treatment has become increasingly complex in the face of rising drug resistance and changes in anti-malarial drug policy in Africa (Kemble *et al.*, 2006).

In Africa, treatment of malaria at home is common, before seeking care from a health facility, frequently using drugs purchased from private vendors (Muller *et al.*, 2003; Nshakira *et al.*, 2002). Chloroquine was the most commonly used drug for fever, with monotherapy accounting for 51.6% of treatments, followed by non artemisinin combination therapies (NACTs) (42.1%). Artemisinin combination regimens were used rarely by respondents in the study area. These findings were in agreement with observations by Kemble *et al.*, (2006). Mboera *et al.*, (2004) also reported that in some parts of Tanzania, only 10% of respondents were using SP (Metakelfin) in the treatment of malaria, Chloroquine and Quinine were the most common drugs used in the area. Similarly, in Orlu LGA, despite changes in drug policy in Nigeria and the availability of a variety of anti-malarial drugs, Chloroquine remained the most popular for the treatment of childhood malaria during the period of the survey.

In contrast, caregivers in Owerri municipal LGA were commonly using sulfadoxine-pyrimethamine-based NACTs, accounting 48.1% of all treatments. Several countries and some parts of Nigeria have already abandoned chloroquine (CQ) in favour of sulfadoxine-pyrimethamine (SP) because of worsening CQ resistance. This process has improved malaria treatment and in some settings has resulted in noticeable declines in rates of severe illness and malaria-related mortality (Winstanley, 2000). In addition, in some cases the reasons for the preferred use of SP brands over Chloroquine were due to the itching reaction reportedly experienced after taking Chloroquine.

Moreover, in general, the study sites were likely to differ from each other as Owerri municipal LGA is located within Imo State's largest and most developed city. Comparing the study population in Orlu LGA to Owerri municipal LGA population, there were notable differences based on number of factors (including employment, access to internet facilities and electricity, quality of housing materials). Owerri municipal LGA caregivers somewhat appear to be more wealthy than Orlu LGA respondents and it was somehow reflected by increased utilization of more expensive anti-malarial drugs such as Coartem and SP by Owerri respondents. In addition, Owerri municipal LGA respondents had much greater access to health-related education, to anti-malaria drug promotion programmes and other amenities than the majority of the Nigerian population living in rural areas, including in Orlu LGA, and as such might have contributed to the reasons for the preferred use of SP brands. Economic status of the respondents was not investigated in this study and therefore some predictors associated with use of malaria treatment measures could not be evaluated. Although, according to Kemble et.al. (2006), wealth is not associated with adequate treatment,

suggesting that cost may not deter caregivers from obtaining appropriate treatment.

Assessment of occupation and education-related utilization pattern of anti-malarials revealed that pattern differed significantly among occupation and educational levels of respondents ($p < 0.05$) in both study areas. In Owerri municipal LGA, monotherapies were more used by nurses and primary school level respondents, Artesunate and Chloroquine were most common drugs used for the treatment. NACTs were more utilized by civil servants and secondary school level respondents. In Orlu LGA, similar trend was observed in utilization of ACTs and NACTs among educational and occupation groups, with exception of monotherapy regiments. Housewives used more of monotherapy with common drugs for the treatment of malaria in children $\leq$ 5 years of age, than other occupation groups.

Treatment of malaria with ACT which is the current and recommended treatment option for uncomplicated malaria (Nosten and White, 2007; Maryah *et al*., 2017) was not well utilized among the study population in both LGAs. Very few people who used ACT are health personal or enlightened people or traders. Furthermore, at the time of this study, Coartem (Artemeter lumefantrine) was the only fixed-combination ACT widely available costing 20-40 times more than monotherapy with Chloroquine and SP (Bloland *et al.*, 2000, Bosman and Mendus, 2007).

Children aged less than 5 years may experience five to six febrile episodes a year. Febrile illnesses are nearly always treated presumptively as malaria. Use of ACTs for malaria treatment at home would greatly exceed the household's resources available for health (Bloland *et al.*, 2000). Thus, financial barriers are one of the impediments to accessing ACTs not only among respondents, but drug sellers as well (Forster, 1991). Like any business, they maintain their existence in response to consumer demand, in this case for accessible, convenient reliable and affordable antimalarial supplies (Goodman *et al.*, 2007).

Rates of utilization of anti-malarial drugs varied in the study areas and among occupation and educational levels of caregivers. Chloroquine was the most popular drug for the treatment of malaria among housewives and all educational levels of respondents in both study areas, followed by Malareich ® and Fansidar ®, which were utilized commonly by all occupational groups in both study areas. Artesunate and Amalar were also often used by respondents in Owerri municipal LGA, while Amodiaquine and Alaxin were used in Orlu LGA. Other researchers working in Nigeria, Tanzania, Uganda and other African countries have also reported frequent use of Chloroquine for childhood malaria (Anosike *et al., 2004*; Mboera *et al.*, 2005; Kemble *et al.*, 2006). In addition, Mboera *et al.*, 2005 also observed that sulfadoxine-pyrimethamine-based antimalarials (eg. Fansidar, Malareich, Amalar) and Amodiaquine were the most common anti-malarial drugs kept at home by the majority of the respondents in Tanzania. In contrast to the health facilities in the study area, Quinine was one of the least utilized drugs among respondents.

It was observed that medicine vendors were widely patronized for the treatment of malaria in children. However, concerns surround the appropriateness of drugs and information that medicine endors provide. Moreover, drugs may be of sub-standard quality because of poor manufacture and storage (Geissler *et al.*, 2000; Basco, 2004; Taylor *et al.*, 2001). Studies show that the medicine vendors' knowledge of drugs and doses is often poor (Alilio *et al.*, 1997). In Nigeria, a previous study showed that only 1 of 49 percent medicine vendor owners know the correct dose of Chloroquine for a three-year old child (Oshiname and Brieger, 1992), and 95% of medicine sellers incorrectly considered artesunate monotherapy to be an ACT (Gilpin *et al.*, 2006). Failure to promote ACTs through medicine vendors may lead to widespread use of artemisinin monotherapies (Gilpin *et al.*, 2006), perpetuating drug resistance. The successful implementation and use of combination therapy will probably require strict and effective guidance of private sector markets, to ensure that they have the capacity to provide safe and appropriate medicine in correct amounts and to contribute to the achievement of the Roll Back Malaria targets.

CONCLUSION

Overall assessment of anti-malarial drug utilization pattern differed among occupation and educational level of caregivers showed Majority used monotherapy for treatment of their children during the period of study. Moreover, Chloroquine (12.6%) Malareich (11.4%) and Fansidar (10.1%) were the most preferred drugs used by caregivers in the study area. Utilization of the drugs differed among occupation and educational levels of respondents. The study also established low utilization rate of artemisinin combination therapy for the treatment of childhood malaria among caregivers. There should be therefore intensive and sustained public health education aimed at improving the antimalarial drug utilization of caregivers to suit recent policies for the timely treatment of childhood malaria. In addition, the practices of drug vendors must be improved through retail regulation, training and effective guidance. A very effective monitoring system should be established to ensure that intervention strategies, reach the target population and in equitable manner.

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