wjpmr, 2020,6(6), 71-78

SJIF Impact Factor: 5.922

WORLD JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.wjpmr.com

Research Article

ISSN 2455-3301

WJPMR

# DRUG PRESCRIPTION PATTERN OF ANTI-MALARIALS AND THE USE OF LABORATORY DIAGNOSIS BY MEDICAL PRACTISIONERS FOR TREATMENT OF CHILDHOOD (<5YEARS) MALARIA IN IMO STATE, NIGERIA

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**Article Received on 08/04/2020** **Article Revised on 29/04/2020** **Article Accepted on 19/05/2020**

## ABSTRACT

A retrospective study on drug prescription pattern of anti-malarials and the use of laboratory diagnosis by medical practitioners was carried out in Owerri municipal and Orlu both in Imo State using medical records of both in-patients and out-patients between the March 2004 and June 2007. Overall, the result showed that out of 510 medical records of childhood malaria, 59.9% were sent for laboratory diagnosis by medical personnels before commencement of treatment. The prescription pattern by medical practitioners in the treatment of childhood malaria varied significantly ($P<0.05$) between the two local government areas. In Owerri municipal, montherapy was the most prescribed antimalarial drugs among in-patients (57.6%) while Artemisinin Combination therapy (42.8%) was prescribed most for out- patients. In Orlu, monotherapy was the common prescription for both in-patients (57.6%) and out- patients (74.3%). This study therefore can be used as a baseline to assess future trends in prescription patterns of medical personnels in Imo State.

## INTRODUCTION

Drug combination therapy is now increasingly recognized as a key response to the challenge of drug resistance (Bjorkman, 2002). The principles on which combination therapy rests are increased efficacy, prevention of drug resistance and possibly reduced doses and duration i.e. better tolerability and compliance. Optimally, two drugs with full or at least very high sensitivity should therefore be combined.

The result of this study therefore will add to the body of knowledge on the rate of combination therapy prescription by medical practisioners and drug utilization of care givers in the treatment of childhood malaria in the study area. It will also explore the possibility of prescription patterns and health seeking behavior of care givers as factors affecting control of malaria in the study area.

## 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 largest towns are Owerri, the State capital with a population in 2006 estimated at about 289,721, Okigwe, Orlu and Oguta with population estimates of 133,699, 177,343, and 87,415 respectively. The predominant occupation in the urban areas is civil service and trading. A lot of artisans are also found. Majority of the rural dwellers are farmers while others engage in trading, fishing, palm wine tapping and hunting activities.

The study was conducted in two Local Government Areas (LGAs) in Imo State namely Owerri Municipal and Orlu LGAs. The hospitals (Government and Private Hospitals) used in the study were chosen because of their easy access by the people, researcher and his team, high attendance by the patients and the availability of diagnostic facilities.

### Data Collection

Data used for this study are secondary obtained from medical records. Consent from the hospitals were obtained for the use of only the prescription notes which are sourced from the patient files by the medical record officer of the hospital without reference to name and health background of the patient.

The patient records were sourced by the medical record officer in each hospital and the information on the prescription pattern of children ≤5 years who presented with symptoms of malaria was obtained. Records used include both in-patient and out-patient records between March 2004 and June 2007. They were carried out in a general hospital and two private pediatric hospitals in Owerri Municipal LGA and two private hospitals in Orlu LGA. The study population were children ≤5 years. On the whole, data was generated from a total of 5140 records.

## RESULTS

**Assessment of the use of Laboratory Diagnosis in the Treatment of Malaria among the Study Population (children ≤ 5 yeas of age) by Medical Practitioners.**

Hospital records of 5140 patients (children ≤ 5 years of age) made up of 3740 patients from Owerri municipal LGA and 1400 patients from Orlu LGA, who had attended hospital facilities and had been clinically confirmed for malaria during period of the study, were involved in the assessment of the use of laboratory diagnosis of malaria by medical practitioners.

Overall assessment of the use of laboratory for diagnosis of malaria prior to commencement / initiation of treatment by medical practitioners revealed that out of 5140 cases reviewed, 56.9% of the patients underwent laboratory test prior to treatment. In Owerri municipal, out of 3740 patients, 40.8% had laboratory result prior to treatment, while in Orlu LGA all patients were treated only after laboratory tests. The difference in use of laboratory facilities in Owerri municipal and Orlu LGA was statistically significant ($p \leq 0.05$). (Table 1)

**Table 1: Assessment of the use of Laboratory Diagnosis by Medical Practitioners in the Treatment of Malaria among the Study Population (Children ≤ 5 Years of Age) in Owerri Municipal and Orlu L.G.A, Imo State, Nigeria**

| Study Area | Total No. of Cases Reviewed. | No (%) Treated with Laboratory Results. | No (%) Treated without Laboratory Results. |
|---|---|---|---|
| Owerri | 3740 | 1526 (40.8) | 2214 (59.2) |
| Orlu | 1400 | 1400 (100.0) | 0 (0.0) |
| Total | 5140 | 2926 (56.9) | 2214 (46.1) |

**Assessment of Anti-Malaria Drugs Prescription Pattern By Medical Practitioners for the Treatment of childhood Malaria in the study Areas.**

Overall, out of 5140 prescriptions by Medical Practitioners, Coartem with prescription rate of 19.1% was highest followed by Chloroquine (18.0%), Fansider (17.4%), Quinine (14.7%) and Nivaquine (6.3%). Halfan, Artequine, Camoquine, Alaxin and Lonart were prescribed moderately with rates 5.1%, 4.1%, 3.2%, 2.2% and 1.9% respectively. Others had prescription rates below 2.0% with Larimal as the least (0.2%) prescribed.

In Orlu LGA, out of 1400 prescriptions, Chloroqine was the most (31.0%) prescribed drug whereas in Owerri municipal LGA, out of the 3740 prescriptions, Coartem was the most (24.8%) prescribed. Also, medical practitioners in Owerri municipal LGA prescribed a wide range of drugs unlike in Orlu LGA where they were limited to prescriptions of Chloroquine, Quinine, Halfan, Alaxin, Nivaquine, Laridox, Fansidar, Coartem and Larimal.

Moreso, in-patient and out-patient prescription patterns in Owerri municipal did not vary significantly ($P<0.05$) whereas in Orlu LGA, in-patient and out-patient prescription patterns varied significantly ($P>0.05$) with Chloroquine (42.2%) and Coartem (35.9%) prescribed most for out-patients and in-patients respectively. (Table 2).

**Assessment of the Prescription Rate of Anti-Malaria Drugs For Childhood Malaria by Government and Private Medical Practitioners in Owerri, Imo State.**

Assessment of the prescription rate of anti-malaria drugs by medical practitioners showed a significant difference ($P>0.05$) in prescription pattern between medical practitioners in government and private hospitals. Coartem was most prescribed in government hospitals while in private hospitals, Chloroquine was the drug most (38.4%) prescribed (Table 3).

**Table 2: Overall Prescription Rate of Anti-Malaria Drugs by Medical practitioners Among patients in the Study Area.**

| Anti-Malaria Drugs | | Owerri Municipal LGA | | | Orlu LGA | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Trade name | Generic name | | | | | | | | | |
| | | In-patient N = 1465 | Out-patient N = 2275 | Total N = 3740 | In-patient N = 781 | Out-patient N = 619 | Total N = 1400 | In-patient N = 2246 | Out-patient N = 2894 | Grand Total N = 5140 |
| Chloroquine | Chloroquine P | 311(21.2) | 182(8.0) | 493(13.2) | 154(19.7) | 280(45.2) | 434(31.0) | 465 (20.7) | 462 (16.0) | 927 (18.0) |
| Quinine | Quinine | 233(15.9) | 204(9.0) | 437(11.7) | 223(28.6) | 96(15.5) | 319(22.8) | 456 (20.3) | 300 (10.4) | 756 (14.7) |
| Halfan | Chlorhydrate Halofantrine | 30(2.0) | 130(5.7) | 160(4.3) | 73(9.3) | 28(4.5) | 101(7.2) | 103 (4.5) | 158 (5.5) | 261 (5.1) |
| Artesunate | Artesunate | 5(0.3) | 30(1.3) | 35(0.9) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 5 (0.2) | 30 (1.0) | 35 (0.7) |
| Alaxin | Dyhydroartemisinin | 0(0.0) | 100(4.4) | 100(2.7) | 5(0.6) | 6(1.0) | 11(0.8) | 5 (0.2) | 106 (3.7) | 111 (2.2) |
| Nivaquine | Chloroquine P | 140(9.6) | 124(5.5) | 264(7.1) | 9(1.2) | 50(8.1) | 59(4.2) | 149 (6.6) | 174 (6.0) | 323 (6.3) |
| Artequine | Artesunate + Mefloquine | 87(5.9) | 124(5.5) | 211(5.6) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 87 (3.9) | 124 (4.3) | 211 (4.1) |
| Camoquine | Amodiaquine | 112(7.6) | 50(2.2) | 162(4.3) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 112 (5.0) | 50 (1.7) | 162 (3.2) |
| Malareich | SP | 0(0.0) | 75(3.3) | 75(2.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 75 (2.6) | 75 (1.5) |
| Laridox | SP | 0(0.0) | 62(2.7) | 62(1.7) | 9(1.2) | 5(0.8) | 14(1) | 9 (0.4) | 67 (2.3) | 76 (1.5) |
| Fansidar | SP | 184(12.6) | 307(13.5) | 491(13.1) | 280(35.9) | 121(19.5) | 401(28.6) | 464 (20.7) | 428 (14.8) | 892 (17.4) |
| Coartem | Artemether + Lumefantrine | 263(18.0) | 663(29.1) | 926(24.8) | 26(3.3) | 27(4.4) | 53(3.8) | 289 (12.9) | 690 (23.8) | 979 (19.1) |
| Larimal | Artesunate + Amodiaquine | 0 (0.0) | 0 (0.0) | 0 (0.0) | 2(0.3) | 6(1.0) | 8(0.6) | 2 (0.09) | 6 (0.2) | 8 (0.2) |
| Lonart | Artemether + Lumefantrine | 50(3.4) | 50(2.2) | 100(2.7) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 50 (2.2) | 50 (1.7) | 100 (1.9) |
| Larimal / Quinine | Artesunate + Amodiaquine / Quinine | 12(0.8) | 50(2.2) | 62(1.7) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 12 (0.5) | 50 (1.7) | 62 (1.2) |
| Artesunate / Camoquine | Artesunate/ Amodiaquine | 0(0.0) | 50(2.2) | 50(1.3) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 50 (1.7) | 50 (1.0) |
| Artesunate / Amodoquine | Artesunate / Amodiaquine | 25(1.7) | 37(1.6) | 62(1.7) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 25 (1.1) | 37 (1.3) | 62 (1.2) |
| Alaxin / Artemether | Dihydroartemisinin /Artemether | 13(0.9) | 37(1.6) | 50(1.3) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 13 (0.6) | 37 (1.3) | 50 (1.0) |

Key: N = Number Examined; SP = SP = SULFADOXINE+PYRIMETHAMINE

**Table 3: Assessment of the Prescription Rate of Anti-Malaria Drugs for Childhood Malaria by Medical Practitioners working in Government and Private Hospitals in Owerri, Imo State.**

| Anti-Malaria Drugs | | Total No. (%) of prescriptions | | No. (%) of prescription among in-patients | | No. (%) of prescriptions among out-patients | |
|---|---|---|---|---|---|---|---|
| Generic name | Trade name | Govt. | Private | Govt. | Private | Govt. | Private |
| Chloroquine P | Chloroquine | 261(8.4) | 232(38.4) | 211(16.8) | 100(47.8) | 50(2.7) | 132(31.4) |
| Quinine | Quinine | 236(7.6) | 201(33.6) | 149(11.9) | 84(40.2) | 87(4.7) | 117(27.8) |
| Dyhydroartemisinin | Alaxin | 100(3.2) | 0 (0.0) | 0(0.0) | 0 (0.0) | 100(5.4) | 0 (0.0) |
| Chloroquine P | Nivaquine | 249(8.0) | 15(2.4) | 137(10.9) | 3(1.4) | 112(6.0) | 12(2.9) |
| Artesunate + Mefloquine | Artequine | 211(6.8) | 0 (0.0) | 87(6.9) | 0 (0.0) | 124(6.7) | 0 (0.0) |
| Amodiaquine | Camoquine | 162(5.2) | 0 (0.0) | 112(8.9) | 0 (0.0) | 50(2.7) | 0 (0.0) |
| SP | Malariech | 75(2.4) | 0 (0.0) | 0(0.0) | 0 (0.0) | 75(4.0) | 0 (0.0) |
| SP | Laridox | 62(2.0) | 0 (0.0) | 0(0.0) | 0 (0.0) | 62(3.3) | 0 (0.0) |
| Chlorhydrate Halofantrine | Halfan | 112(3.6) | 48(7.6) | 25(2.0) | 5(2.4) | 87(4.7) | 43( ) |
| SP | Fansider | 398(12.8) | 93(14.8) | 174(13.9) | 10(4.8) | 224(12.1) | 83(19.7) |
| Artemether + Lumefantrine | Coartem | 920(29.6) | 6(0.9) | 261(20.8) | 2(1.0) | 659(35.5) | 4(1.0) |
| Artemether + Lumefantrine | Lonart | 100(3.2) | 0 (0.0) | 50(4.0) | 0 (0.0) | 50(2.7) | 0 (0.0) |
| Artesunate + Amodiaquine / Quinine | Larinal/ Quinine | 62(2.0) | 0 (0.0) | 12(1.0) | 0 (0.0) | 50(2.7) | 0 (0.0) |
| Artesunate/ Amodiaquine | Artesunate / Camoquine | 50(1.6) | 0 (0.0) | 0(0.0) | 0 (0.0) | 50(2.7) | 0 (0.0) |
| Artesunate/ Amodiaquine | Artesunate / Amodoquine | 62(2.0) | 0 (0.0) | 25(2.0) | 0 (0.0) | 37(2.0) | 0 (0.0) |
| Dihydroartemisinin /Artemether | Alaxin / Artemether | 50(1.6) | 0 (0.0) | 13(1.0) | 0 (0.0) | 37(2.0) | 0 (0.0) |
| Artesunate | Artesunate | 0 (0.0) | 35(5.6) | 0 (0.0) | 5(2.4) | 0 (0.0) | 30(7.1) |
| | Total | 3110 | 630 | 1256(40.4) | 209(33.2) | 1854(59.6) | **( )** |

Key: N = Number Examined; SP = SP = SULFADOXINE+PYRIMETHAMINE

**Assessment of Anti-Malaria Drugs Prescription Pattern by Medical Practitioners for the Treatment of Childhood Malaria based on Chemotherapy Pattern (Artemisinin Combination Therapy, Monotherapy and Non-Artemisinin Combination Therapy).**

Prescription forms of a total of 3740 patients in Owerri municipal LGA, (3110 forms from government hospitals and 630 forms from private pediatric hospitals) and a total of 1400 patients in Orlu LGA were reviewed to assess the prescription rate of anti-malarial drugs by medical practitioners for the treatment of malaria among in-patients and out-patients. Of the 5140 prescriptions, 51.1% showed monotherapy, 28.6% ACTs and 20.3% NACTs prescription patterns. Monotherapy was the highest prescription pattern among all LGAs, while ACT was the lowest in Orlu LGA (4.4%).

The highest percentage of prescription of NACT was observed in Orlu LGA (29.6%), while Owerri municipal LGA was the lowest (16.8%)(Table 4).

**Table 4: Overall Anti-malarial Drug Prescription Pattern by Medical Practitioners Based on Artemisinin Combination Therapy and Monotherapy in the Study Area.**

| Drug Prescription Pattern | | | | |
|---|---|---|---|---|
| Study Area | Total No. Cases Reviewed | Monotherapy No (%) | Artemisinin Combination Therapy (ACT) No (%) | Non Artemisinin Combination Therapy (NACT) No (%) |
| Owerri | 3740 | 1701 (45.5) | 1411 (37.7) | 628 (16.8) |
| Orlu | 1400 | 924 (66.0) | 61 (4.4) | 415 (29.6) |
| Total | 5140 | 2625 (51.1) | 1972 (28.6) | 1043 (20.3) |

**Assessment of Anti-Malaria Prescription Pattern Patttern Based on Monotherapy, Artemisinin Combination Therapy and Non Artemisinin Combination Therapy by Private and Government Medical Practitioners in Owerri Municipal LGA.**

Assessment of anti-malaria drugs prescription pattern among private and government medical practitioners revealed that government medical practitioners used more monotherapy among in-patients and artemisinin combination therapy among out-patients being 51.5% and 52.3% respectively. In contrast, private medical practitioners in Owerri municipal LGA used more of monotherapy for the treatment of malaria among both in-patients and out-patients with rates of 94.3% and 79.3% respectively, while the least was ACT 0.9% for both in-patients and out-patients. Statistical analysis revealed that the difference is significant ($p < 0.05$) (Fig 1)

**Assessment of Anti-Malaria Prescription Pattern Based on Monotherapy, Artemisinin Combination Therapy and Non Artemisinin Combination Therapy by Private Medical Practitioners in Orlu LGA.**

Fig 2 shows prescription patterns in Orlu LGA. Of 1400 cases reviewed, 66.0% were treated using monotherapy, 29.6% non-artemisinin combination therapy. Prescription pattern in Orlu LGA among in-patients and out-patients was based mainly on monotherapy being 59.4% and 74.3% respectively. ACT was the least used among in-patients and out-patients being 3.6% and 5.3% respectively. Prescription pattern significantly differed among in-patients and out-patients in Orlu LGA ($p < 0.05$).

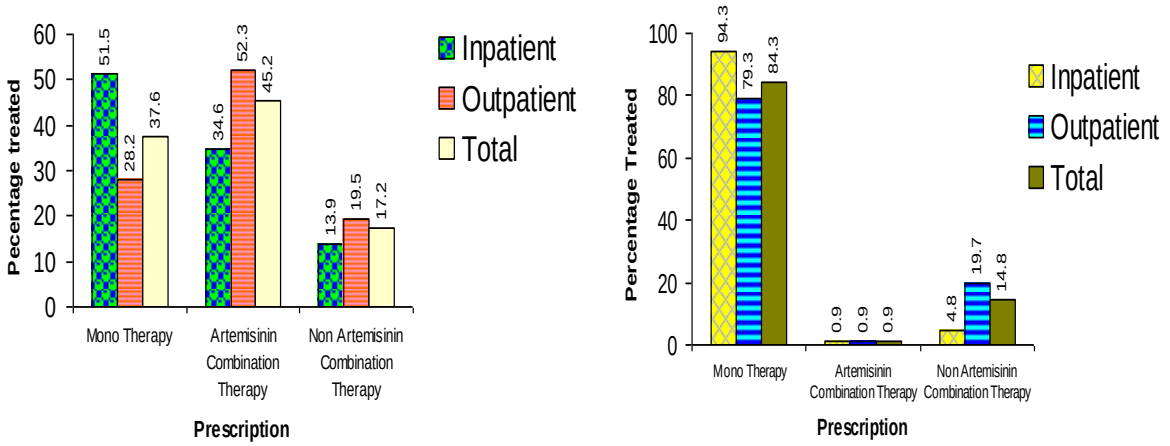


**Fig. 1: Anti-malaria Chemotherapy pattern by Government and Private Medical Practitioners in Owerri Municipal, Imo State.**

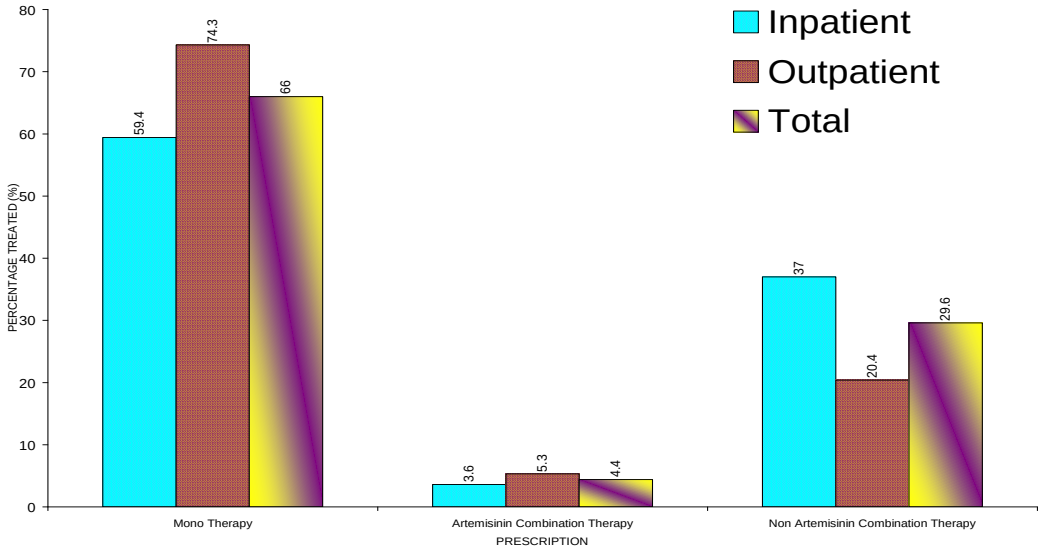


**Fig. 2: Anti-Malaria Prescription Patttern Based on Monotherapy,Artemisinin Combination Therapy and Non Artemisinin Combination Therapy by Private Medical Practitioners in Orlu LGA, Imo State**

## DISCUSSION

### Assessment of the use of Laboratory Diagnosis in the Treatment of Malaria

Rational therapy of malaria is essential to avoid non-target effects, to delay the advent of resistance and to save cost on alternative drugs. Diagnosis is the only way of effecting rational therapy. Confirmatory laboratory diagnosis before treatment initiation regained attention, partly influenced by the spread of drug resistance drugs unaffordable to resource-poor countries (Barnish *et al.*, 2004).

This study confirms the findings of others that a presumptive clinical diagnosis is often unconfirmed by laboratory tests (Reyburn *et al.* 2004). Result showed that only 56.9% of the overall study population (children $\leq$ 5 years of age) had a laboratory diagnosis out of which 48.7% had positive blood smear, resulting in 72.3% of the patients receiving unnecessary anti-malarial drugs. In Owerri municipal LGA, out of all cases reviewed, only 40.8% were referred to the laboratory, and only 56.6% were diagnosed with malaria based on positive blood smear, resulting in 76.9% of the patients over diagnosed with malaria. Similar observation was reported by Ndyomuguenyi *et al.*, (2007). Diagnostic rate of malaria in Owerri among in-patients was only 57.6% while among out-patients it was 31.0%, resulting in 59.2% of patients treated based on clinical presentation of signs and symptoms. Although, in Orlu LGA all presumptive clinical diagnoses were confirmed by laboratory tests, yet all patients were treated with anti-malarials, resulting in 59.9% of the patients over-diagnosed with malaria. The World Health Organization (WHO) advised presumptive diagnosis as the basis for first-line treatment of uncomplicated malaria in places where a parasitological test is not possible (Koram and Molyneux, 2007). The WHO recommendation was based on the balance of benefit over hazard. The benefits of basing treatment on presumptive diagnosis include promptness of therapy (and therefore hopefully reduced risk of progression to severe malaria); reduced cost in time and money for the caregivers. The drawbacks include over-exposure of the population to risks of drug toxicity; likelihood of inaccurate dosing, including the use of sub-therapeutic treatments that may favour the evolution or spread of drug resistance (Koram and Molyneux, 2007).

The interview with medical practitioners in the study area brought to light the factors and reasons for common use of presumptive diagnosis in treatment of malaria. Similar reports made by others, such as microscopy or other tests to confirm parasitemia were commonly unavailable or unreliable (Petti *et al.*, 2006).

Poor microscopy has long been recognized in practice and is a function of multiple factors, including training and skills maintenance, slide preparation techniques, workload, condition of the microscope, and quality of essential laboratory supplies (Maguire *et al.*, 2006). Laboratory facilities do not provide results within 48 hours when most deaths occur (Berkley *et al.*, 2003).The lack of confidence in laboratory services, and consequent 'invisibility' of other etiologies lead clinicians to treat for malaria even when the slide result is negative for malaria (Barat *et al.*, 1999; Zurovac *et al.*, 2006).

Medical practitioners also reported that in many cases, children were brought to the health facilities after failure of self medication by their caregivers, and thus patients had been rendered aparasitemic by an antimalarial drug, resulting in negative-slide. Moreover, the condition of the children was usually very critical and required promptness of therapy based on presumptive diagnosis.

The introduction of artemisinin-based combination therapy (ACT) in Sub-Saharan Africa had prompted calls for increased use of parasitological diagnosis for malaria to reduce over-diagnosis of malaria, cost of treatment and misuse of more expensive ACTs drugs (Barnish et al., 2004). WHO recommended testing before treatment of patients over the age of 5 years, and WHO guidelines extended this recommendation to younger children in low transmission settings (WHO, 2006b).

### 4.3 Prescription Pattern of Anti Malarial Drugs by Medical Practitioners Based on Monotherapy and Combination Therapies

The overall assessment of prescription, which included in-patients and out-patients in the study areas revealed that a greater number of (51.1%) of the patients were treated with monotherapy, 28.6% with artemisinin-based combination therapy (ACT). While Non artemisinin-based combination therapy was the least (20.3%) prescribed. Similarly, Harrison *et al.*, (2005) reported that only 40% of the doctors in Enugu urban utilized the National guidelines for treatment of malaria. Overall, Coartem (19.1%) was the drug most prescribed by medical practitioners in the study area. Chloroquine was the second most (18.0%) prescribed anti-malaria drug. Unfortunately, the resistance of malaria parasite to chloroquine was growing and several countries had already abandoned chloroquine in favour of sulfadoxine/pyrimethamine (SP). In this study, SP usually prescribed include Malareich (1.5%), Laridox (1.5%) and Coartem (17.4%). However, the resistance of malaria parasite to SP was also growing (Winstanley, 2000). Similar reports were also received from medical officers in Owerri during interview and that explained fewer prescriptions of these drugs among patients in the study area.

The prescription pattern varied significantly between in-patients and out-patients in Owerri municipal LGA ($p<0.05$). Monotherapy was commonly used in the treatment of in-patients (57.6%), while Artemisinin Combination Therapy (ACT) was more prescribed for out-patients (42.8%). Based on the overall prescription pattern of antimalarial drugs in Owerri municipal LGA it was observed, that Chloroquine was the most often

prescribed drug among in-patients, while Coartem was often prescribed among out-patients. These results showed that medical practitioners in Owerri municipal LGA utilized the National guideline and WHO (2006b) recommendation for treating severe malaria patients in high transmission areas which is the use of either quinine or an artemisinin derivative.

Prescription pattern among government and private practitioners in Owerri differed significantly. The use of first generation antimalarial drugs was most common among private practitioners. Pediatricians in government hospitals in Owerri municipal had adopted the WHO (2006b) recommendations and the National guideline to use ACT as first-line treatment for uncomplicated malaria in cases experiencing resistance to first generation anti malarials, while private doctors had poor compliance. For instance, in government hospitals in Owerri municipal, 53.3% of the patients (children $\leq$ 5 years of age) with uncomplicated malaria were treated with ACTs, while in private hospitals only 0.9% of the patients received ACT and majority of the patients were treated using monotherapy (79.3%). The preference for monotherapy by private practitioners maybe militated by cost which remained a major barrier to ACT implementation. ACTs remained costly compared with other anti-malarial drugs and thus private health officers were likely to use cheaper and older drugs that were still effective in the study area in order to reduce the overall treatment cost. Other factors that may have also contributed to the choice for monotherapy among private medical practitioners include clinical history and condition of the patients on arrival to the health facilities, presence of severe malaria, history of previous allergy to the ACTs, socio-economic status of caregivers and cost of other adjunct drugs and procedures that may be necessary in contribution to the success of treatment. Furthermore, ACTs were neither subsidized nor distributed free to private hospitals/clinics at the time of this study while, Federal and State hospitals had been receiving free supplies of ACTs to treat children $\leq$ 5 years of age free of charge. Most likely, as a result of this, ACTs compliance was observed higher among government doctors.

Overall prescription pattern of antimalarial drug based on monotherapy and combination therapy in Orlu LGA revealed that 66.0% of all patients (in-patients and out-patients) were treated using monotherapy and only less than 5% of the patients treated with ACTs, indicating poor compliance with WHO and National guideline recommendation among practitioners. Prescription pattern of antimalarial drugs among in-patients and out-patients differed significantly ($p<0.05$).Monotherapy was more often prescribed among out-patients, than in-patients, whereas non-artemisinin combination therapy (NACT), was administered more to in-patients with severe malaria.

Chloroquine and Fansider ® were the most often prescribed drugs in treating malaria among out-patients in Orlu LGA. Parenteral administration of Fansider ®, Quinine and Chloroquine were most preferred in treating malaria among in-patients in Orlu LGA. This is good evidence supporting existing treatment policy in Nigeria of using SP as second line therapy in the event of Chloroquine (CQ) failure against parasites. Findings of Ikeh and Nwaorgu (2004) had demonstrated 37.9% of parasitological failure with Fansider® and 56.0% with Maloxine ® , indicating that the resistance to SP was spreading rapidly in Nigeria and to other parts of the world including parts of South America and East Africa after being first noted in Thailand, in the late 1970's. WHO (1998) also reported 10 – 20% treatment failures with SP. Clearly, therefore, chloroquine and SP were not very useful in reducing malaria morbidity and mortality in some parts of Nigeria. However, investigation had not been carried out on the performance of antimalaria drugs in Orlu LGA, but from the prescription rate of CQ and SP among private medical practitioners, it can be assumed that, they were still effective in the treatment of uncomplicated malaria.

In addition, Halofantrine (Halfan) was also used in the treatment of malaria among 9.3% of in-patients and 4.5% out-patients in the study areas. The findings of the assessment of clinical effectiveness of Halofantrine (Halfan) in southeast Nigeria by Eneanya and Nwazelu (2004) indicated that the parasites were fully (100%) sensitive to the drug.

The cost of antimalarial drugs is one of the complex arrays of factors determining the market for malaria therapy locally, nationally and internationally (Foster, 1991). Furthermore, facilitating the appropriate use of combination therapy in the private sector and ensuring equitable access to treatment would require a substantial reduction in the cost presented to the consumer implying a need for subsidies (Bloland *et al.,* 2000).

In the course of this study, it was also observed that medical practitioners in both government and private sector followed the current WHO (2005) referral care guidelines to prevent child's mortality (Berkley *et al.,* 2005; WHO 2005) where WHO recommends antibiotics, micronutrients and nutritional support for children with severe malnutrition, even if treatments for malaria or other conditions are being given.

## CONCLUSION

The overall assessments of the prescription pattern of anti-malaria drugs by medical practitioners revealed that majority of patients in the study area were treated with monotherapy and it differed between government and private medical practitioners. The government medical practitioners adhered to the WHO and National guidelines Policy for malaria treatment. Coartem and Chloroquine were most often prescribed drugs however; prescription rate differed among in and out patients.

Drug resistance has been a health concern over the years, especially as it relates to malaria treatment in endemic areas. Analysis of trends in prescriptions and laboratory diagnosis can help monitor future resistance. Therefore, this study provides useful baseline on which success of treatment policies can be built.

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