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# INTERVENTIONAL STUDIES OF ANTI-MALARIAL DRUGS UTILIZATION IN PUBLIC HEALTH FACILITIES IN KANO, NIGERIA

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***ABSTRACT***
***The best way to analyze drug utilization and evaluate impact of an intervention in health care institutions is to study the universal indicators, which are not dependent either on investigator or time of measurement. The aim of this study was to characterize the prescription pattern of public health institutions in Kano, Nigeria and evaluate the rational use of anti-malarial drugs with a view to intervening where necessary. Values of drug utilization indicators were measured prospectively and areas that required intervention identified. Intervention; consisting of free pictorial handbills given to patients, discussions held with health care personnel and pieces of advice were given to health administrators. The impact of the intervention was assessed using pre and post comparison of appropriate indicators. The study revealed a significant decline (P < 0.01) in percentage of encounters with injections and increase utilization of oral chloroquine (P < 0.05). Significant increase (P < 0.05) in dispensing time was also observed in the study group. The results of this study suggest the need for further intervention.***

***Key words: Drug Utilization, Anti-malarial, Intervention, Public Health Institutions, Kano***

## INTRODUCTION

Over 400 million cases of malaria occur each year; in terms of socio-economic impact, it is the most important of the transmissible parasitic diseases (Mosanya, 2001). The disease, especially when caused by *Plasmodium falciparum,* kills three out of every ten children under the age of five, and one out of every ten women especially during their first pregnancies (Ebong and Adiele, 2001). Studies in some health care institutions in Africa showed that malaria constitutes 20-60% of all outpatients' consultations and 10% of hospital admissions (WHO, 1993). In addition, out of 96% of caregivers who treat malaria promptly within 24 hours, only 14.3% treat correctly (Mosanya, 2001).

Appropriate management of malaria could only be achieved by using the drugs rationally. This means, using the right drug in the right patient, for the right indication, in the right dose and dosage form, for the right duration of time. The assessment of rational drug use was made difficult due to lack of objective quantitative parameters. However, in 1992, the Drug Action Programme of the World Health Organization (DAP-WHO) in collaboration with the International Network for Rational Use of Drugs (INRUD) introduced a set of indicators related to drug use in health facilities. These enable comparison of drug use practices within and between facilities, regions and countries. They also provide useful tools for supervision and monitoring of drug use practice as well as allowing for the measurement of changes over time, they are also useful instruments for the evaluation of interventional efforts (Isah *et al*., 2001). The aim of this study was to characterize the prescription pattern of six public health institutions in Kano, Nigeria and evaluate the rational use of anti-malarial drugs with a view to intervening where necessary.

## MATERIALS AND METHODS

### Study Design

The study was a cross sectional prospective survey involving six public health care institutions selected from Kano metropolis by stratified random sampling using local government as a stratum. The hospitals selected were Aminu Kano Teaching Hospital (AKTH), Mohammed Abdullahi Wase Specialist Hospital (MAWSH), Sheik Jidda General Hospital (SJGH), Murtala Mohammed Specialist Hospital (MMSH), Sir Muhammadu Sanusi General Hospital (SMSGH) and Waziri Gidado General Hospital (WGGH). After sampling, the health institutions were paired into three clusters based on their General Outpatients Departments (GOPD) staff and locations. In each cluster, one institution was randomly selected to receive the intervention while the remaining acted as control.

### Data Collection

In each health institution, 175 general outpatient encounters were randomly collected during the period of July to December 2004 (pre-intervention period). The demographic data of each patient was recorded and the prescription analyzed. The values of the WHO Drug Utilization Indicators were calculated as follows:

### Prescribing Indicators

- Average number of drugs per encounter = total number of drugs prescribed ÷ total number of encounter

- Percentage of drugs prescribed by generic name/from National Essential Drug List (NEDL) = (total number of drugs prescribed by generic name/from NEDL ÷ total number of drugs) × 100
- Percentage of encounters with antibiotics/anti-malarial drugs/injection = (number of patient encounters during which antibiotics/anti-malarial drugs/injection was prescribed ÷ total number of encounters surveyed) × 100

**Patient Care Indicators**

- Average consultation/dispensing time = total time for a series of consultations/ ÷ number of consultations
- Average dispensing time = total time for dispensing drugs to series of patients ÷ number of patients encounter
- Percentage of drugs actually dispensed = (number of drugs actually dispensed ÷ total number of drugs prescribed) × 100
- Percentage of drugs adequately labeled = (number of drugs adequately labeled ÷ total number of drugs prescribed) × 100
- Percentage of patients who had adequate knowledge of correct dosage schedule = (number of patients who had adequate knowledge ÷ total number of patients interviewed) × 100

**Facility Indicator**

- Availability of NEDL or formulary: yes or no
- Availability of key drugs = (number of specified drugs actually stock ÷ total of drugs in NEDL) × 100

**Intervention**

Data collected during pre-intervention period was analyzed; areas that need intervention identified and appropriate interventions administered in July to August 2005. Free pictorial handbills were given to patients enlightening them about malaria and importance of adhering to recommended dosage regimens, guided focus group presentations and one to one discussions were held with 37 prescribers, 23 dispensers and other health care providers in the study group on rational use of anti-malarial drugs while the healthcare administrators were advised to established Drug and Therapeutic Committees (DTC).

**Evaluation of the Interventional Impact**

The impact of the intervention was assessed by collecting data of 58 outpatient encounters from each health institution in the September to October 2005 using the WHO Drug Utilization Indicators as in the pre-intervention study. Pre-intervention and post-intervention indicators of both control and study groups were express as mean ± SEM and compared using Student's t-test. The intervention was considered positive where statistically significant improvement on rational utilization of anti-malarial drugs was observed between the pre-intervention and post-intervention of the study group only.

**RESULTS**

A total of 1398 encounter; comprising 1050 and 348 pre- and post-interventions respectively were investigated. Values of the WHO core prescribing indicators are presented in table 1. The highest number of prescribed drugs found in a single encounter was 7 and 8 in the control and study groups respectively. Table 2 shows that chloroquine was the most prevalent anti-malarial drug prescribed in both groups and was administered in 47.0% of malarial encounter pre-intervention and 50.2% post-intervention while artemisinin derivatives accounted for 27.1% pre-intervention and 21.0% post-intervention malarial encounters. Halofantrine was the least prescribed anti-malarial drug in all the groups. Significant increase in the prescription of oral chloroquine ($P < 0.05$) and decrease in the injectable form ($P < 0.05$) post-intervention was observed in the study group, while no such difference was observed in the control (Table 2).

The average time, which a patient spends with a prescriber in the studied health institutions, was within the limits of 1.8 to 6.0 minutes with an average of 4.5 minutes in the control and 4.2 minutes in the study group (Table 3). Average dispensing time varies between pharmacies: the range was from 18 and 30 seconds. It is somewhat longer in the control (23.7, 25.7 sec) than in the study group (20.7, 25.0 sec). Percentages of drugs actually dispensed were similar among the pharmacies in both groups (90% to 96%). Although higher percentage was observed in the control as compared to the study groups, anti-malarial drugs were dispensed in same proportion. One major problem found was the drug-labeling practice. In the study area, names of the patients were not written on the labels with all the necessary details both pre- and post-intervention in all the groups.

Values of the patient's knowledge of correct dosage pre- and post-intervention in both groups were relatively high (between 80%and 95%), but this does not reflect reality since the response "I know the dose" was accepted as positive answer. The availability of key drugs in both groups was high, ranging from 85% to 96%; however only one out of the six healthcare institutions studied has a hospital formulary. The remaining five had neither a Hospital formulary nor NEDL.

**Table 1: World Health Organization Core Prescribing Indicators**

| Indicator | Control group | | Study group | |
|---|---|---|---|---|
| | Pre-intervention | Post-intervention | Pre-intervention | Post-intervention |
| Average number of drugs per encounter | 3.6 ± 0.14 | 3.6 ± 0.18 | 3.7 ± 0.17 | 3.5 ± 0.09 |
| Percentage of drugs prescribed by generics | 47.6 ± 0.67 | 48.3 ± 0.61 | 38.7 ± 5.35 | 39.7 ± 4.98 |
| Percentage of drugs prescribed from EDL | 79.6 ± 2.69 | 80.8 ± 3.12 | 78.2 ± 1.18 | 79.7 ± 1.13 |
| Percentage of encounter with antibiotics | 64.4 ± 4.14 | 62.6 ± 4.17 | 71.2 ± 5.71 | 70.1 ± 4.47 |
| Percentage of encounter with anti-malarial | 50.9 ± 2.81 | 50.0 ± 2.15 | 45.0 ± 4.59 | 45.4 ± 0.47 |
| Percentage encounter with of injections | 22.1 ± 1.48 | 19.5 ± 2.48 | 28.2 ± 1.62 | **19.0 ± 0.81 |

Data presented as mean ± SEM **P < 0.01 compared to pre-intervention study group
(n = 3 health care institutions for both groups)

**Table 2: Percentages of anti-malarial drugs prescribed per encounter**

| Drug | Control group | | Study group | |
|---|---|---|---|---|
| | Pre-intervention | Post-intervention | Pre-Intervention | Post-Intervention |
| Chloroquine Oral | 27.9 ± 0.68 | 28.7 ± 1.24 | 23.3 ± 1.35 | *36.7 ± 0.94 |
| Chloroquine Injection | 11.3 ± 0.54 | 9.2 ± 0.47 | 29.2 ± 1.64 | *13.9 ± 0.94 |
| Chloroquine Oral plus Injection | 9.4 ± 1.22 | 6.9 ± 0.81 | 3.0 ± 1.09 | 5.1 ± 0.47 |
| Sulphadoxine-Pyrimethamine | 28.7 ± 0.87 | 23.0 ± 0.94 | 20.5 ± 1.79 | 21.5 ± 2.05 |
| Halofantrine | 0.8 ± 0.31 | 0 | 0 | 0 |
| Artemisinin derivatives | 22.0 ± 4.12 | 32.2 ± 3.29 | 23.7 ± 4.43 | 22.8 ± 1.41 |

Data are means ± SEM * P < 0.05 compared to pre-intervention study group
(n = 3 health care institutions for both groups)

**Table 3: Patient Care Indicators**

| Indicator | Control group | | Study group | |
|---|---|---|---|---|
| | Pre-intervention | Post-intervention | Pre-intervention | Post-intervention |
| Average Consultation Time (min) | 4.3 ± 0.27 | 4.7 ± 0.27 | 4.0 ± 0.47 | 4.3 ± 0.27 |
| Average Dispensing Time (sec) | 23.7 ± 0.98 | 25.7 ± 0.54 | 20.7 ± 1.19 | *25.0 ± 0.47 |
| Percentage of drugs actually dispensed | 96.0 ± 0.81 | 95.8 ± 0.47 | 90.1 ± 3.18 | 93.5 ± 2.01 |
| Percentage of drugs adequately labeled | 0 | 0 | 0 | 0 |
| Patients' knowledge of correct dosage | 87.3 ± 0.70 | 90.4 ± 0.21 | 86.4 ± 1.3 | 89.7± 0.8 |

Data are means ± SEM * P < 0.05 compared to pre-intervention study group

## DISCUSSION

Although increasing efforts are being made to improve drug-use practices in developing countries, this study shows an average number of drugs per encounter (pre- and post-intervention) of 3.6 and 3.7 in the control and study group respectively. This is higher than figures (1.3-2.2) obtained in most developing countries (Hogerzeil *et al.*, 1993) but slightly lower than those obtained earlier in similar studies in sourthern part of Nigeria (Isah *et al*, 2001) and Ghana (Owusu-Daaku and Sablah, 2004). Though the WHO guidelines on rational use of drugs expects minimal number of drugs (1.6-1.8) prescribed per encounter (Isah *et al.*, 2004), it should be noted that some patients visit hospitals with other diseases such as anaemia, malnutrition and a times some other infections; thereby making poly pharmacy inevitable.

Percentages of drugs prescribed by generic name in this study were considerably low (26.1% to 50.0%) compared to the suggested 100% by WHO. The values for anti-malarial drugs were within this range, being 37.6% and 42.7% for the control and study groups respectively. Similar findings were obtained in Ghana (Owusu-Daaku and Sablah, 2004) and other parts of Nigeria (Isah *et al.,* 2001). This might be as a result of pharmaceutical promotion by some drug companies and the convenience of the prescribers. Although, some of the drugs especially the artemisinin derivatives are available only in proprietary names, it was expected that prescription should be by the acceptable generic or non-proprietary name. Voluntary methods to regulate the impact of promotional activities by drug companies on prescribers have been shown to be ineffective (Anonymous, 2004). It is therefore suggested that hospital managements (or DTC where available), should regulate and monitor drug advertising and promotional activities in their settings to improve compliance with rational prescription practices.

Percentages of drugs prescribed from NEDL (79.6-80.8) were lower than the values (96-98%) obtained by Isah *et. al.* (2001), in Delta and Edo states in southern part of Nigeria. No ready explanation for this difference could be advanced by the investigator. When the prescribers were asked concerning their low prescription from NEDL, some of the arguments forwarded by them were that; (i) not all the drugs for various diseases are available in the NEDL, (ii) resistance had developed to some of the drugs on the list. However, further investigation revealed that the list was not even available to most prescribers and therefore their argument might not be substantive.

This study showed that percentages of encounters leading to prescription of anti-malarial drugs ranged from 45.4 to 50.9. This is also higher than 23% recorded in Ghana (Owusu-Daaku and Sablah, 2004). Table 2 shows that chloroquine was the most frequently prescribed anti-malarial drug in both groups and was administered in 48.6% and 55.5% of malarial encounter pre-intervention and 44.8% and 55.7% post-intervention in the control and study groups respectively, while artemisinin derivatives accounted for an average of 23.0% pre-intervention and 27.5% post intervention malarial encounters. Overall, halofantrine was the least prescribed anti-malarial in all the health institutions. Insignificant decrease of SP and increase in the artemisinin derivatives prescriptions were observed post-interventionally while no halofantrine prescription was recorded. These could be as a result of increasing awareness of the halofantrine cardio-toxicity effect, National Agency for Food & Drugs, Administration and Control (NAFDAC) alert and introduction of ACT.

Table 2 also showed that the intervention resulted in significant ($P < 0.05$) improvement in the use of oral chloroquine and reduction ($P < 0.05$) in utilization of the injectable ones. Although the Nigerian Federal Ministry of Health pronounced the use of ACT as a mainstay in the treatment of malaria, there was an insignificant increase in their utilization in both groups. The reason given by most prescribers were that; the drugs are expensive due to the lack of generic forms and are beyond the affordability of most of their patients. The course of therapy with the ACT also does not encourage compliance and above all, most patients still responded well to the previous conventional therapy with chloroquine.

Percentages of encounters with injections in this study (19-28%) were similar to figures observed in other developing countries except extreme high values of 36-48% in Sudan and Uganda (Horgerzeil *et. al*., 1993) and 34-77 % in Edo and Delta states of Nigeria (Isah *et al*., 2001). The present data are close to the optimal theoretical value of 17.2% proposed in Yemen study (Hogerzeil, *et al.,* 1989). Although tendency towards overuse of injections especially chloroquine, dipyrone and promethazine (used for the treatment of malaria and other febrile conditions) were observed in the study group pre-interventionally, there was significant decline post-intervention (28.2% to 19.0%). This was evidenced from the changes by most prescribers in that group to oral anti-malarial drugs in place of injectable ones except when necessary. This improvement was most marked in the hospital that was worst performing at the beginning of the study.

The average time, which a patient spent with a prescriber in the studied health institutions, ranged between 1.8 and 6.0 minutes with an average of 4.5 minutes in the control and 4.2 minutes in the study group (Table 2). Such short time corresponded well with values measured in other developing countries (from 3 to 6.5 minutes) (Hogerzeil *et al*., 1989). Although it is difficult to estimate optimal time period for a patient encounter, such time is too short to conduct complete patient evaluation and prescribe the therapy for all cases but especially malaria. Thus, the intervention made no impact on this indicator.

In the study area, the average dispensing time was similar among the pharmacies (between 18 to 30 seconds). It is somewhat longer in the control (23.7, 25.7 sec) than in the study group (20.7, 25.0 sec). These figures are slightly higher than the average value obtained (12.5 seconds) from other studies in twelve developing countries (Horgerzeil *et al.,* 1993) but far shorter than 86.1seconds recorded in Nepal pharmacies (Kafle *et al.,* 1992). Although there was significant increase ($P < 0.05$) in the study group post-intervention, still such time is far from enough to explain dosage regimen, adverse effects of the drug(s), all precautions and to actually label and dispense the drug(s). Since patient compliance directly depends on sufficient understanding of the drugs prescribed, pharmacists and all dispensers need to be further enlightened on the necessity of patient counseling as a necessary step towards improvement of malarial treatment and patient care.

One notable characteristic of pharmacies in public health institutions in Kano was their consistency in stocking anti-malarial and other essential drugs. This could be as a result of the active Drug Revolving Scheme operating in the state and the appropriate policy about the priorities in supplying drugs by its managers.

Because of this, the availability of key drugs in the NEDL in all the health institutions studied was high (85-89%). In spite of the high availability of key drugs in all the healthcare institutions, only one has a hospital formulary. The remaining had neither an official formulary nor copies of NEDL. Percentage of drugs actually dispensed was similar among the pharmacies in both groups (90% to 96%), however higher percentages were observed in the control as compared to the study group. This indicates appropriate supply of drugs in both groups and such policy guarantees a minimum level of healthcare to the citizens.

Although the WHO recommends that each drug label should contain dose regimen, drug name and patient's name (WHO 1995), in the study area, names of the patients (or mark) were not written on the labels and dose regimens were also not written with all the necessary details both pre- and post-intervention in all the groups despite the interventional effort. This is important especially in childhood malaria where more than one child may be sick in a particular home, because considerable confusion might arise when administering the drugs. The arguments forwarded by most dispensers were: inadequate manpower and the patients' attitudes (most patients being in a hurry). Further educational/behavioural intervention and use of prepackaged drugs would probably improve the dispensing practice and patient adherence to malarial treatment regimens.

Results that came up after investigation of the patients' knowledge of correct dosage indicate relatively very high values (between 70%and 85%), but this does not necessarily reflect reality since the some patients were not willing to repeat the whole dose regimen in front of the investigator. Their response "I know the dose" was accepted as positive answer, but it remains doubtful whether they really knew the dose regimens.

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