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Full Length Research Paper

Antimalarial drug utilization pattern amongst staff of three health facilities in Rivers State, Nigeria

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The study assessed the level of antimalarial drug utilization amongst Staffers of three Health facilities in Rivers State. It was a cross sectional questionnaire based study. The study assessed the knowledge, attitude and malaria treatment and preventive practices of one hundred and five respondents gotten from amongst health workers at Terabor and Ahoada General Hospitals as well as College of Health Science and Management Technology, Health Centre in Port Harcourt. SPSS version 20 was used for the analysis. Chi squared test was used to assess relationships. The study revealed that majority of the Staff respondents were within 18 to 35 age bracket and have had tertiary education. Different frequencies of malaria treatment were also noted ranging from monthly to once a year. 86.6% of the staff reported having used Artemether-Lumefantrine as their drug of first choice for malaria treatment. Dihydroartemisinin/Piperaquine had 6.7% usage while 2.8% and 1.9% were for Artesunate/Amodiaquine and Artesunate/ Sulphadoxine-Pyrimethamine respectively. Non-ACT usage stood at 1.9%. Only 20% of the staff tests all the time before treatment. Most of the Staff also had good knowledge of symptoms of malaria and got their treatment recommendations from qualified personnels such as Doctors and Pharmacists. Six (5.7%) of the Staff still do not complete the treatment regimen either for reasons of feeling better half way or due to unpleasant odour/taste. The major malaria preventive practices prevalent among the staff are covering home windows with net (85.7%) and sleeping under Insecticide treated nets. Artemisinine-based Combination Therapies (ACTs) are the most predominantly used antimalarial amongst staffers of the three Health facilities.

Key words: Antimalarial, drug utilization pattern, Artemisinine-based Combination Therapies (ACTs).

INTRODUCTION

Malaria is still a major public health problem caused by plasmodium parasite species transmitted to human through the bite of infected female Anopheles mosquito. There are five parasite species that cause malaria in humans, namely *Plasmodium falciparum*, *P. vivax*, *P. ovale*, *P. malariae*, and *P. knowlesi*. Two of these species *P. falciparum* and *P. vivax* pose the greatest threat. Malaria is preventable and curable (World Health

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Organisation, 2019). Although all of the former species may cause significant illness, *P. falciparum* is responsible for the majority of serious complications and deaths. Drug resistance is an important therapeutic problem, most notably with *P. falciparum* (Borimas and Nicholas, 2016).

Irrational use of anti-malarial medication is one of the major challenges affecting the prevention, treatment and cure of malaria. This has led to the spread of parasite resistance to most commonly used anti-malarial drugs.

Assessment of drug use patterns with World Health Organization (WHO) drug use indicators is becoming increasingly necessary toward promoting rational drug use in developing countries. Inappropriate drug prescribing is still a global problem (Enwere et al., 2007). Misuse of drugs occurs in all countries and irrational practices are especially common and costly in developing countries (Ghimire et al., 2009). Some studies in Nigeria have revealed that appreciable gaps in knowledge exist with respect to rational drug use among health care professionals (Chukwuani et al., 2002; Okoh, 2012).

Aim of the study

The aim of the study is to assess the antimalarial drug utilization pattern amongst staff of three Health facilities in Rivers State.

Specific objectives

i) To assess the range of antimalarial drugs used by the staffers of the three Health facilities in the study.
ii) To identify the most frequently used anti-malarial drug(s) amongst staff of the three Health facilities.
iii) To find out their level of adherence to national guideline and policy on the diagnosis and treatment of malaria.
iv) To assess the preventive measures used by the study group for malaria control.

MATERIALS AND METHODS

Study design

The study adopted a cross sectional design with the use of questionnaire to obtain the desired information. The population for this study included health workers in the General Hospitals of Ahoada and Terabor and that of the Health Centre of Rivers State College of Health Science and Management Technology, Port Harcourt who consented to participating in the study. A total population of 105 respondents was drawn from the Staff of the Health facilities.

Sample size determination

The sample size of this research was calculated using the Taro Yamane (Yamane, 1973) formula with 95% confidence level.

The calculation formula of Taro Yamane is given as follows:

$$n = \frac{N}{1+N(e)^2}$$

Where: n = sample size required; N = number of people in the population; e = allowable error (%).

Substituting the numbers into the formula, we have; N = 44, 38 and 33 respectively; e = 5% (0.05). This translates to n = 40, 35 and 30 respectively for General Hospitals Ahoada and Terabor and College of Health Science and Management Technology Health Centre, Port Harcourt.

Data collection technique

The technique of data collection involves the administration of specially adapted and structured questionnaires adopted in the study. The questionnaire consists of three sections; the first section consists of demographic information of the respondents. The second part consists of knowledge based questions as regards signs and symptoms malaria and antimalarial drug utilization while the third section consists of questions on preventive measures and practices against malaria.

Statistical analysis

Data was compiled, presented and analyzed using Statistical Package for Social Sciences (SPSS) software version 20. Chi Square Test was used to determine correlation between variables, and p-value set at 0.05 significant levels.

RESULTS

A total of 130 questionnaires were distributed and 105 was completed correctly and returned. Of these, 35 was from Terabor, 40 from Ahoada and 30 from College of Health Science and Management Technology Health Centre. The results are presented in Tables 1 to 9.

Choice of malarial prophylaxis

About 32.4% (34) of the respondents reported to have been using malaria preventive medications of which 10 do use Proguanil, 7 do use Pyrimethamine , 14 for Sulphadoxine/Pyrimethamine while 3 reported the use of Chloroquine

Cross tabulation between health facility with preferred choice of antimalarial drug and level of adherence.

As shown in Table 10, there is no statistically significant relationship between the health facility and the preferred choice of antimalarial or the level of adherence to national guidelines on malaria treatment.

Table 1. Socio-demographics of study participants.

Variable	Frequency	Percentage
Sex		
Male	39	37.1
Female	66	62.9
Total	105	100.0
Age		
18-35	58	55.2
36-50	36	34.3
>50	11	10.5
Total	105	100.0
Marital status		
Married	50	47.6
Single	45	42.9
Separated	8	7.6
Divorced	2	1.9
Total	105	100.0
Educational status		
Primary	0	0.0
Secondary	14	13.3
Tertiary	91	86.7
Total	105	100.0
Educational qualification		
SSC/GCE	13	12.4
National/University Diploma	11	10.5
Professsional Diploma/Certificate	29	27.6
First Degree	36	34.3
Post Graduate Diploma	6	5.7
Second Degree	10	9.5
Total	105	100.0
Occupational status		
Pensionable	53	50.5
Contract	21	20.0
Casual	31	29.5
Total	105	100.0

SSC/GCE= Senior School Certificate/ General Certificate of Education.

Cross tabulation between health facility and choice of antimalarial drug switched to after first treatment

Table 11 reveals that there is no statistical significance between the health facilities and the choice of antimalarial drugs.

Cross tabulation between health facility and reasons for switching antimalarial and medication recommendation

In Table 12, there is no statistical significance between the health facilities and reasons for switching antimalarial

Table 2. Response on symptoms applicable to someone with malaria.

Variable	Frequency	Percentage
High temperature	73	69.5
Headache	52	49.5
Body pain	50	47.6
Joint pain	38	36.2
Chills	37	35.2
Fatigue	31	29.5
Shaking	26	24.8
Yellow colour urine	25	23.8
Nausea and vomiting	22	21.0
Extreme sweating	22	21.0
Red eyes	4	3.8
Bloody stools	2	1.9

Frequencies now arranged in a decreasing order.

Table 3. Malaria related symptoms felt by respondents.

Variable	Frequency	Percentage
High Temperature	63	60.0
Body Pain	61	58.1
Headache	40	38.1
Chills	39	37.1
Fatigue	25	23.8
Joint Pain	23	21.9
Shaking	15	14.3
Nausea and Vomiting	13	12.4
Extreme Sweating	7	6.7

Frequencies now arranged in a decreasing order.

Table 4. Response on frequency of malaria symptoms and treatment source.

Variable	Frequency	Percentage
How often do you develop symptoms of malaria?		
Every 2 weeks	2	1.9
Every month	18	17.1
Every 2 months	21	20.0
Every 3 months	34	32.4
Every 6 months	14	13.3
Once a year	15	14.3
Rarely	1	1.0
Total	105	100.0
Where do you normally go for malaria treatment?		
Hospital	55	52.4
Pharmacy	40	38.1
Chemist	10	9.5
Herbalist	0	0.0
Church/prayers	0	0.0
Total	105	100.0

Table 5. Response on choice of antimalarial therapy.

Variable	Frequency	Percentage
Which do you normally take for malaria?		
Artemether - Lumefantrine	91	86.6
Dihydroartemisinin/Piperaquine	7	6.7
Artesunate - Amodiaquine	3	2.8
Artesunate - Sulphadoxine/Pyrimethamine	2	1.9
Chloroquine	1	0.95
Sulphadoxine - Pyrimethamine	1	0.95
Total	105	100.0
Reasons for choice of antimalarial drugs.		
Recommended	46	43.8
Feel much better with it	28	26.7
Fewer tablets at once	16	15.2
Past use of drug	8	7.6
Affordable cost	7	6.7
Total	105	100.0
Who normally recommend the antimalarial for you?		
Doctor	52	49.5
Nurse	2	1.9
Pharmacist	32	30.5
Chemist	7	6.7
Self	12	11.4
Total	105	100.0
Do you always complete the recommended doses?		
Yes	99	94.3
No	6	5.7
Total	105	100.0
Reasons for not completing the recommended dose		
Felt better half way	5	83.3
Odour/taste more unpleasant	1	16.7
Total	6	100.0

drug. However, there is strong statistical evidence between health facilities and who recommends the medication, as the respondents are more likely to get prescriptions from a doctor or a pharmacist.

Cross tabulation between health facility and characteristics of antimalarial therapy

Table 13 shows that there is no statistical significance between the health facilities and testing before treatment, time duration between drug usage and reasons for second dose. Figure 1 describes the malaria preventive practices among respondents.

DISCUSSION

Antimalarial drug utilization pattern can serve as a means to identify causes/origins of drug resistance which increases malaria prevalence and also to evaluate the level of compliance to approved Malaria Treatment Guidelines. The respondents had good knowledge about the signs and symptoms of malaria in this study of which the most reported symptoms included high temperature (69.5%), body pain (47.6%), headache (49.5%), chills

Table 6. More responses on characteristics of malarial treatment.

Variable	Frequency	Percentage
How long before you need another malaria treatment?		
Less than a month	5	4.8
1 Month and above	26	24.8
>2 months - <6 months	45	42.9
6 Months and above	29	27.6
Total	105	100.0
What prompts you to take the second dose?		
I feel the same symptoms as before	80	76.2
I did not complete the first antimalarial treatment	3	2.9
I do take antimalarial at regular interval for prevention	22	21.0
Total	105	100.0
Do you test before treatment?		
All the time	21	20.0
Sometimes	65	61.9
No	19	18.1
Total	105	100.0

Table 7. Responses on antimalarial drug treatment switches.

Variable	Frequency	Percentage
Have you ever switched between antimalarial drugs?		
Yes	63	60.0
No	42	40.0
Total	105	100.0
If yes, Why?		
Treatment Failure	30	47.6
Cost	11	17.5
Side effects	9	14.3
Odour/Taste of medication	7	11.1
Others	5	7.9
Difficulty swallowing	1	1.6
Total	63	100.0
Which other antimalarial drug did you switch to?		
Artesunate - Amodiaquine	28	44.4
Dihydroartemisinin/Piperaquine	20	31.7
Artemether - Lumefantrine	5	8.0
Artesunate - Mefloquine	5	8.0
Artesunate - Sulfadoxine/Pyrimethamine	2	3.1
Mefloquine	1	1.6
Quinine	1	1.6
Chloroquine	1	1.6
Total	63	100.0

(35.2%), nausea and vomiting. These findings are consistent with studies from Ghana and Tanzania as well as that by Modupe et al. (2013) in which knowledge on symptoms of malaria was similar.

Table 8. Level of adherence to national guidelines and policies.

Variable	Frequency	Percentage
Strict adherence	20	19.0
Partial adherence	83	79.0
Do not adhere	2	1.9
Total	105	100.0

Table 9. Knowledge of blood group and genotype.

Variable	Frequency	Percentage
Do you know your blood group?		
Yes	100	95.2
No	5	4.8
Total	105	100.0
If yes, what is it?		
A+	18	18.0
A-	2	2.0
B+	21	21.0
AB+	9	9.0
O+	46	46.0
O-	4	4.0
Total	100	100.0
Do you know your genotype?		
Yes	101	96.2
No	4	3.8
Total	105	100.0
If yes, what is it?		
AA	71	70.3
AS	29	28.7
SS	1	1.0
Total	101	100.0

ACTs especially Artemeter-Lumefantrine (86.6%) was reported mostly as the drug of first choice for the treatment of malaria infections by the respondents. This is in line with National and WHO Guidelines for the treatment of uncomplicated malarial. From the study generally, 98% utilization was reported as antimalarial drug of first choice. This corresponds with a study carried out by Dodoo et al. (2009) where 90.8% of the respondents used artemisinin-based compound in their treatment regimen. And also that carried out by Ezenduka et al. (2014) where the ACTs recorded 72.7% usage.

On prevalence of malaria, 65.7% of the respondents reportedly develop malaria symptoms within 2 - 6 months. This is quite consistent with a study that revealed that 64.9% of respondents fall ill within 6 months also. 14.3% of the respondents developed symptoms once a year while only 1% rarely develops symptoms. This could be due to a number of reasons such as adequate self-preventive practices amongst others. This is in line with another study conducted in university of Ibadan that concluded that about a third of the volunteers suffered malaria attacks once a year, though a few claimed never to have malaria. This was attributed to the fact that they all had good knowledge of the disease and has developed individual methods of self-management of their malaria attacks (Anumudu et al., 2006). Mosquitoes breed more in the rainy season and hence the prevalence of malaria is always higher in the rainy season (Chigozie et al., 2018).

Health workers in the survey showed good knowledge about the malaria symptoms, demonstrated in their report

Table 10. Cross tabulation between Health facility with preferred choice of antimalarial drug and level of adherence.

Variable	Terabor		College of health		Ahoada		Total		X^2	df	P-value
	Freq	%	Freq	%	Freq	%	Freq	%			
Preferred Choice of antimalarial Drug											
Artemether - Lumefantrine	31	88.6	26	86.7	34	85.0	91	86.7			
Dihydroartemisinin	2	5.7	1	3.3	4	10.0	7	6.7			
Artesunate - Amodiaquine	1	2.9	2	6.7	0	0.0	3	2.9			
Artesunate - Sulfadoxine/Pyrimethamine	1	2.9	0	0.0	1	2.5	2	1.9	8.846	10	0.547
Chloroquine	0	0.0	0	0.0	1	2.5	1	1.0			
Sulfadoxine - Pyrimethamine	0	0.0	1	3.3	0	0.0	1	1.0			
Total	35	100.0	30	100.0	40	100.0	105	100.0			
Level of adherence to National Guidelines and Policies											
Strict adherence	8	22.9	5	16.7	7	17.5	20	19.0			
Partial Adherence	26	74.3	25	83.3	32	80.0	83	79.0	1.393	4	0.845
Do not adhere	1	2.9	0	0.0	1	2.5	2	1.9			
Total	35	100.0	30	100.0	40	100.0	105	100.0			

Table 11. Cross tabulation between Health facility and choice of antimalarial drug switched to after first treatment.

Variable	Terabor		College of Health		Ahoada		Total		X^2	df	P-value
	Freq	%	Freq	%	Freq	%	Freq	%			
Drug switched to after first choice											
Artesunate - Amodiaquine	13	52.0	2	28.6	13	42.0	28	44.4			
Dihydroartemisinin	7	28.0	1	14.3	12	38.7	20	31.7			
Artemether - Lumefantrine	1	4.0	2	28.6	2	6.4	5	8.0			
Artesunate - Mefloquine	2	8.0	1	14.3	2	6.4	5	8.0			
Artesunate-Sulfadoxine/Pyrimethamine	0	0.0	0	0.0	2	6.4	2	3.1	17.444	14	0.233
Mefloquine	1	4.0	0	0.0	0	0.0	1	1.6			
Quinine	0	0.0	1	14.3	0	0.0	1	1.6			
Chloroquine	1	4.0	0	0.0	0	0.0	1	1.6			
Total	25	100.0	7	100.0	31	100.0	63	100.0			

of high body temperature, headache, fatigue and chills amongst others as symptoms of malaria. This is consistent with other studies that demonstrated knowledge of malaria symptoms such as that carried out by Modupe et al. (2013). Although fever is a symptom of malaria, it is also a symptom of other non-malarial illnesses, hence the need for appropriate diagnosis before treatment as recommended by WHO.

Self-prescribing is still a problem as about 11.4% claim to prescribe drugs for themselves. This is in agreement with the study by Ezenduka et al. (2014) study, who stated that self-medication resulting in the use of monotherapy remains significant with increasing risk of undermining treatment policy, and suggested that additional measures be put in place to directly target consumers and providers in the sector for improved use of anti-malarial drugs in Nigeria. Self-prescribing could mitigate the effort aimed at ensuring rational antimalarial drug use, and as well may cause recrudescence and contribute to malaria resistance, therefore should be discouraged.

Treatment success does not only depend on the use of recommended treatment guidelines but encompasses the correct use of the drug by the patient. In this study, 94.3% of the respondents reported having always completed the recommended doses and their nature of

Table 12. Cross tabulation between Health facility and reasons for switching antimalarial and medication recommendation.

Variable	Terabor		College of health		Ahoada		Total		X^2	df	P-value
	Freq	%	Freq	%	Freq	%	Freq	%			
Reasons for switching to another anti-malarial drug											
Treatment failure	9	36.0	2	28.6	19	61.3	30	47.6			
Cost	5	20.0	3	42.9	3	9.7	11	17.5			
Side effects	5	20.0	2	28.6	2	6.5	9	14.3			
Odour/taste of medication	4	16.0	0	0.0	3	9.7	7	11.1	12.600	10	0.247
Others	2	8.0	0	0.0	3	9.7	5	7.9			
Difficulty swallowing	0	0.0	0	0.0	1	3.2	1	1.6			
Total	25	100.0	7	100.0	31	100.0	63	100.0			
Who normally recommends the antimalarial for you											
Doctor	13	37.1	21	70.0	18	58.1	52	49.5			
Nurse	0	0.0	1	3.3	1	3.2	2	1.9			
Pharmacist	18	51.4	1	3.3	13	41.9	32	30.5	21.413	8	0.006
Chemist	2	5.7	1	3.3	4	12.9	7	6.7			
Self	2	5.7	6	20.0	4	12.9	12	11.4			
Total	35	100.0	30	100.0	40	129.0	105	100.0			

Table 13. Cross tabulation between Health facility and characteristics of antimalarial therapy.

Variable	Terabor		College of Health		Ahoada		Total		X^2	df	P-value
	Freq	%	Freq	%	Freq	%	Freq	%			
Do you test before treatment											
All the time	8	24.2	5	16.7	8	20.0	21	20.4			
Sometimes	19	57.6	20	66.7	26	65.0	65	63.1	0.802	4	0.938
No	6	18.2	5	16.7	6	15.0	17	16.5			
Total	33	100.0	30	100.0	40	100.0	103	100.0			
How long before you need a second dose											
Less than a month	3	8.6	1	3.3	1	2.5	5	4.8			
1 Month and above	9	25.7	9	30.0	8	20.0	26	25.0			
>2 months - <6 months	17	48.6	9	30.0	19	47.5	45	43.3	5.811	6	0..445
6 Months and above	6	17.1	10	33.3	12	30.0	28	26.9			
Total	35	100.0	29	96.7	40	100.0	104	100.0			
What prompts you to take the second dose?											
I feel the same symptoms as before	25	78.1	18	66.7	31	77.5	74	74.7			
I didn't complete the first antimalarial treatment	1	3.1	1	3.7	1	2.5	3	3.0	1.333	4	0.856
I do take antimalarial at regular interval for prevention	6	18.8	8	29.6	8	20.0	22	22.2			
Total	32	100.0	27	100.0	40	100.0	99	100.0			

work and work environment may be contributory to this. Switching of medication was also reported among the study group with reasons ranging mostly from treatment failure to cost and side effects of medication. However, it would be interesting to note that artesunate-amodiaquine was the drug about 44% of persons switched to, followed by Dihydroartemisinine/ Piperaquine (31.7%) which are all within WHO antimalarial recommendations. Only about 4.7% still switched to non-ACT monotherapies like Mefloquine, Quinine and Chloroquine which should not be expected from such a study group again.

The use of insecticide treated nets constitutes one of

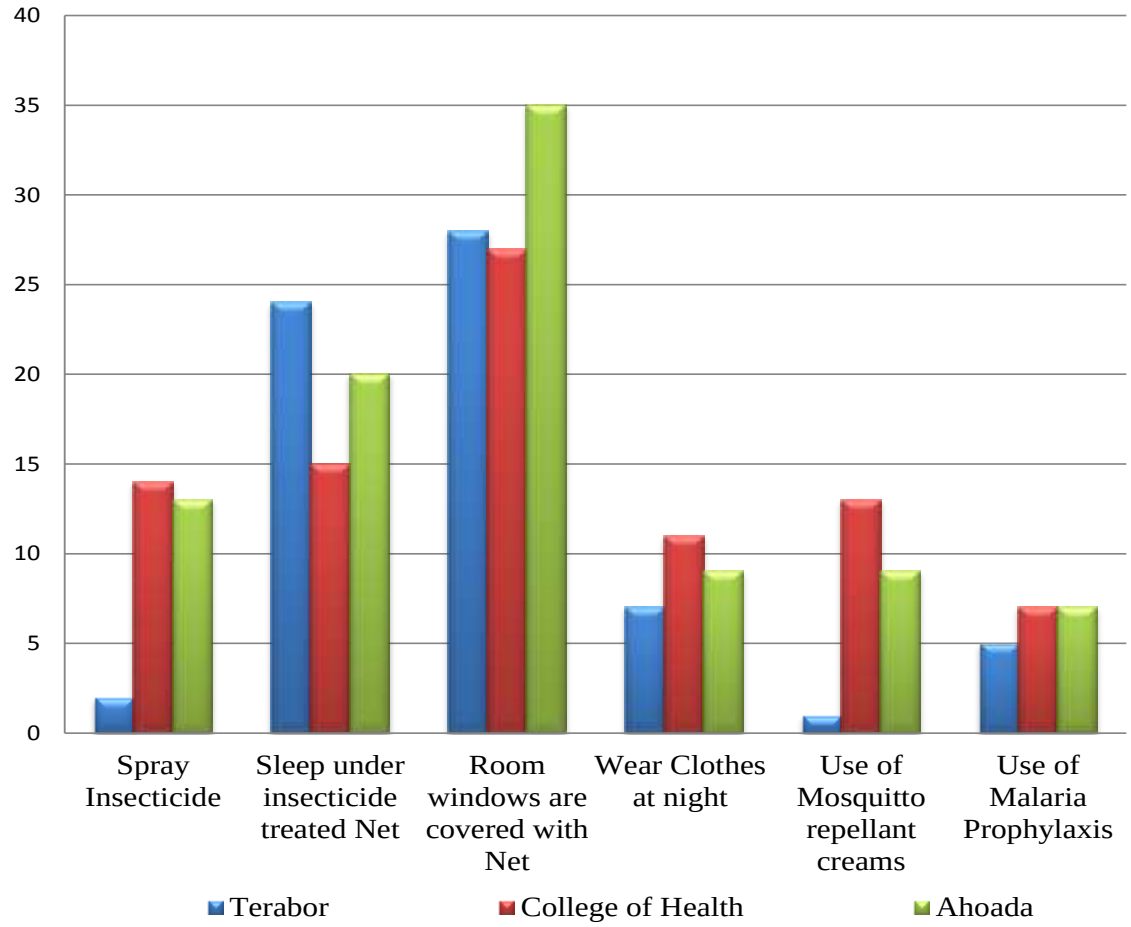

Figure 1. Malaria preventive practices among respondents.

insecticide treated nets while 27.6% agreed to spraying insecticides. This is closely related to a study carried out in the University of Lagos which showed that more than half of the students possessed long lasting insecticide treated nets (LLIN), but not up to half of the students regularly sleep under the treated nets (Olusegun-Joseph et al., 2016). This also agrees with a study that revealed that more than three-quarter of the students (78.1%) knew that LLIN was an effective form of malaria control; however only 55.3% actually reportedly use LLIN in their homes (Chigozie et al., 2018). Few respondents reported their use of malaria prophylaxis. This may not have been necessary if other preventive measures were adopted; however, it agrees with a study carried out in the University of Ibadan which reported that the most used form of preventive measure were the use of Metakelfin (quinine + sulphalene-pyrimethamine), Daraprim (pyrimethamine) and Fansidar (sulphadoxin-pyrimethamine) in addition to bed nests and insecticides (Anumudu et al., 2006). It should be noted that malaria prophylaxis is generally not necessary in persons living in a malarious area because of the risk of lowering one's resistance to the disease; however, it is required in sickle-cell anaemia patients and non-immune visitors (Federal Ministry of Health, 2005). 95.2% and 96.2% of the respondents reported knowledge of their blood group and genotype respectively. However, of the 101 respondents who reported knowledge of their genotype, 70.3 and 28.7% were respectively AA and AS. Only 1% was SS. Blood group and genotype may be important as it is also related to individual's malaria susceptibility.

Conclusion

The antimalarial most frequently used among staff of the three health facilities were the ACTs with Artemether-Lumefantrine having the highest frequency. They also had adequate knowledge of malaria symptoms and adherence to WHO recommendations was good. However, strict adherence to National guidelines for the treatment of uncomplicated malaria was poor. Not all the preventive strategies for malaria were thoroughly in practice; however, having their home windows covered with nets, sleeping under insecticide treated nets and wearing clothes at night with insecticide spraying were

the most utilized methods of malaria prevention among the study group.

Recommendations

1) Concerted efforts should be made towards ensuring strict adherence to National Treatment Guidelines, as well as putting a stop to self-prescribing.
2) Health workers need to take up more responsibilities regarding proper choice of antimalarial medication so that their patients also, can have appropriate recommendations.
3) More campaigns should be channelled towards the adoption of good preventive practices against malaria as this could reduce the incidence rate and consequent drug pressure.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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