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Level of Antimalarial Drug Utilization Amongst Teaching and Non-Teaching Staff of University of Port Harcourt, Rivers State, Nigeria

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Abstract: Malaria is still a threat to public health till date in all malaria endemic regions of the world. The World Health Organization (WHO) African Region continues to carry a disproportionately high share of the global malaria burden with malaria being the 2nd leading cause of death from infectious diseases in Africa, after HIV/AIDS. Assessment of drug use patterns is becoming increasingly necessary toward promoting rational use of drugs globally. Misuse of drugs occurs in all countries and irrational practices are especially common and costly in developing countries. The study investigated the level of antimalarial drug utilization amongst Teaching and non-Teaching staff of University of Port Harcourt, Rivers State. It was a cross sectional questionnaire based study. The study assessed the knowledge, attitude and malaria preventive practices of three hundred and sixty seven (367) respondents gotten from amongst the Teaching and Non-Teaching staff of the University. SPSS version 20 was used for the analysis. Chi squared test was used to assess relationships. The study revealed that three hundred and forty four (93.7%) of the Staff frequently treated malaria with Artemisinin-based Combination Therapy (ACT) while monotherapy stood at 3.6%. Most of the Staff also had a good knowledge of symptoms of malaria and got treatment from authorized sources such as hospitals and pharmacies. Eighty six (23.4%) of the Staff do not complete the treatment regimen. The major preventive practices prevalent among the study group are covering home windows with net (91%) and spraying of insecticides (86.7%). ACTs are the most predominantly used antimalarial amongst staffers of the University. If drug utilization pattern of anti-malarial drugs is however not monitored, there is the possibility of early emergence of resistance to the highly effective anti-malarial drugs presently in use.

Keywords: Antimalarial, Monotherapy, Drug Utilization Pattern

1. Introduction

Malaria is still a threat to public health till date especially in the sub Saharan African region. It is caused by parasites that are transmitted to people through the bites of infected female *Anopheles* mosquitoes. *Plasmodium falciparum* is the most prevalent malaria parasite in the World Health Organization (WHO) African Region, accounting for 99.7% of estimated malaria cases in 2017 and most malarial deaths globally [1, 2].

The WHO African Region continues to carry a disproportionately high share of the global malaria burden. In 2017, the region was home to 92% of malaria cases and 93% of malaria deaths. In 2017, 5 countries accounted for nearly half of all malaria cases worldwide: Nigeria (25%), the Democratic Republic of the Congo (11%), Mozambique (5%), India (4%) and Uganda (4%). Children under 5 years of age are the most vulnerable group affected by malaria; in 2017, they accounted for 61% (266 000) of all malaria deaths worldwide. (World malaria report 2018). Malaria is the 2nd leading cause of death from infectious diseases in Africa, after HIV/AIDS. Almost 20% deaths of children under 5 in

Africa are due to Malaria.

In Nigeria, malaria poses a major public health challenge as it accounts for more cases and deaths than any other country in the world. Malaria is a risk for 97% of Nigeria's population. There are an estimated 100 million malaria cases with over 300,000 deaths per year in Nigeria. This compares with 215,000 deaths per year in Nigeria from HIV/AIDS. Malaria contributes to an estimated 11% of maternal mortality in Nigeria (*Nigeria Malaria Fact Sheet*).

WHO recommends the use of Artemisinin-based combination therapy (ACT) in all cases of uncomplicated *Plasmodium falciparum* malaria [3] Nigeria adopted Artemether-Lumefantrine and Artesunate Amodiaquine as first and second line antimalarial therapy for uncomplicated malaria since 2005 [4]. And subsequent review of the Guideline in 2010 was concluded without inclusion of other ACTs like Artesunate-Mefloquine or Dihydroartemisinin-Piperaquine which are also been prescribed and used in the country.

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 a global problem [5] Misuse of drugs occur in all countries and irrational practices are especially common and costly in developing countries [6]. Some studies in Nigeria have revealed that appreciable gaps in knowledge exist with respect to rational drug use among health care professionals [7, 8].

AIM OF THE STUDY

The aim of the study is to assess the Antimalarial drug utilization pattern of Teaching and Non-Teaching Staff of the University of Port Harcourt.

Specific Objectives:

To assess the range of antimalarial drugs used by Teaching and Non-Teaching Staff of the University.

To identify the most frequently used anti-malarial drug (s) by the subjects.

To find out their level of adherence to national guideline and policy on the diagnosis and treatment of Malaria.

To assess the preventive measures used by the study group for malaria control.

2. Materials and Method

2.1. 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 Teaching and Non-Teaching Staff of the University of Port Harcourt, Choba in Obio Akpor Local Government Area of Rivers State. A total projected population of 367 respondents (244 Non-Teaching Staff and 123 Academic staff) was drawn from the Staff of the University.

2.2. 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=4346; e=5% (0.05); Therefore, $n=\frac{4346}{1+4346(0.05)^2}=367$

2.3. 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.

2.4. 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.

3. Results

After proper analysis using Statistical Package for Social Sciences (SPSS) software version 20 and chi square was used to determine correlation between variables where p-value was set at 0.05 significant level, the following results were obtained.

3.1. Biodata of Respondents

Table 1. *Showing the Socio-demographics of respondents.*

Variable	Frequency	Percentage %
Sex		
Male	181	49.3
Female	186	50.7
Total	367	100.0
Age		
18-35yrs	97	26.4
36-50yrs	152	41.4
>50yrs	118	32.2
Total	367	100.0
Marital Status		
Married	321	87.5
Single	36	9.8
Divorced	10	2.7
Total	367	100.0
Educational Qualification		
Primary	20	5.4

Variable	Frequency	Percentage %
Secondary	70	19.1
First Degree	130	35.4
Second Degree	69	18.8
Third Degree and Above	78	21.3
Total	367	100.0
Occupational Status		
Teaching Staff	123	33.5
Non-Teaching Staff	244	66.5
Total	367	100.0

The result obtained from the study and as represented in the table above shows that 181 (49.3%) respondents are males while 186 (50.7%) are females. The modal age group that participated in the study was 36-50, 152 (41.4%). Others include 18-35, 97 (26.4%) and >50, 118 (32.2%). Most of the respondents are married 321 (87.5%) and a greater percentage has at least a first degree 130 (35.4%). The respondents are made up of 123 (33.5%) Teaching Staff and 244 (66.5%) Non-Teaching Staff.

Knowledge of malaria symptoms and treatment

Table 2. *Showing symptoms of malaria that the respondents know.*

Variable	Frequency	Percentage %
High Temperature	241	65.7
Body Pain	256	69.8
Headache	237	64.6
Chills	118	32.2
Joint Pain	144	39.2
Nausea and Vomiting	121	33.0
Extreme Sweating	108	29.4
Fatigue	124	33.8
Shaking	113	30.8
Red eyes	20	5.4
Bloody stools	2	0.5

The most common symptom of malaria that the respondents know includes body pain (69.8%), high temperature (65.7%), and headache (64.6%). While some of the rare symptoms the respondents reported include nausea/vomiting (33%), red eyes (5.4%) and bloody stools (0.5%).

Table 3. *Showing symptoms of malaria that the respondents feel.*

Variable	Frequency	Percentage %
High Temperature	194	52.9
Body Pain	207	56.4
Headache	210	57.2
Chills	81	22.1
Joint Pain	151	41.1
Nausea and Vomiting	47	12.8
Extreme Sweating	40	10.9
Fatigue	116	31.6
Shaking	42	11.4

The most common symptom of malaria felt by the respondents include headache (57.2%), body pain (56.4%), high temperature (52.9%). Some of the symptoms rarely felt by the respondents include chills (22.1%), joint pains (41.1%), nausea and vomiting (12.8%), extreme sweating (10.9%), fatigue (31.6%) and shaking (11.4%).

Table 4. *Showing malaria symptoms frequency and point of treatment.*

Variable	Frequency	Percentage %
How often do you develop symptoms of malaria		
Every 2 Weeks	6	1.6
Every Month	87	23.7
Every 2 Months	22	6.0
Every 3 Months	67	18.3
Every 6 Months	50	13.6
Once a year	96	26.2
Rarely	39	10.6
Total	367	100.0
Where do you normally go for treatment		
Hospital	160	43.6
Pharmacy	136	37.1
Chemist	44	12.0
Herbalist	10	2.7
Church/Prayers	17	4.6
Total	367	100.0

The respondents mostly fall ill with malaria at least once a year (26.2%), every month (23.7%) or every 3 months (18.3%). A few respondents (10.6%) stated that they rarely fall ill with malaria. During these episodes of malaria, the common places for seeking medical attention include hospital (43.6%) and pharmacy (37.1%) but a few of the respondents (2.7%) claim to get their treatment from herbalists.

Table 5. *Showing response on anti-malarial treatments.*

Variable	Frequency	%
Which antimalaria do you normally take for malaria?		
Artemether – Lumefantrine	261	71.1
Dihydroartemisinin-Piperaquine	21	5.7
Artesunate – Amodiaquine	44	12.0
Artesunate – Mefloquine	15	4.1
Mefloquine	0	0.0
Halofantrine	0	0.0
Amodiaquine	4	1.1
Sulfadoxine – Pyrimethamine	6	1.6
Quinine	9	2.5
Chloroquine	0	0.0
Artesunate - Sulfadoxine/Pyrimethamine	3	0.8
Others	4	1.1
Total	367	100.0
Reasons for choice of antimalarial drugs.		
Fewer Tablets at once	88	24.0
Feel much better with it	136	37.1
Recommended	124	33.8
Past use of drug	3	.8
Affordable cost	16	4.4
Total	367	100.0
Who normally recommend the antimalarial for you		
Doctor	181	49.3
Nurse	11	3.0
Pharmacist	123	33.5
Chemist	28	7.6
Self	24	6.5
Total	367	100.0

The most frequently used antimalarial drug is Artemether – Lumefantrine (71.1%), and the least used is Artesunate - Sulfadoxine/Pyrimethamine (0.8%), while mefloquine, halofantrine and chloroquine recorded 0% use. The choice of drugs is mostly affected by the therapeutic effects the

respondents felt after its use (37.1%) and least affected by affordable cost (4.4%). The drug recommendation is mostly done by the Doctors (49.3%) while 6.5% claimed the antimalarial was self-recommended. Among the respondents, 23.4% admitted to not completing their recommended doses, and they stated that their reasons include feeling better half way (66.3%), odour (3.5%) and forgetfulness (30.2%).

Table 6. *Showing more characteristics of antimalarial treatments.*

Variable question and response	Frequency	%
How long after treatment before you need another?		
Less than a month	7	1.9
1 Month and above	58	15.8
>2 months - <6 months	111	30.2
6 Months and above	191	52.0
Total	367	100.0
Do you test before treatment?		
All the time	45	12.3
Sometimes	192	52.3
No	130	35.4
Total	367	100.0
Do you always complete the recommended doses?		
Yes	281	76.6
No	86	23.4
Total	367	100.0
Reasons for not completing recommended dose		
Felt better half way	57	66.3
Odour/taste more unpleasant	3	3.5
Forgetfulness	26	30.2
Total	86	100.0

Of the respondents 52% need to take another course of antimalarial within 6 months, while 30.2% need to take it within 2-6 months. However, 52.3% of the respondents sometimes test for malaria before treatment, and 35.4% admit to not testing for malaria before treatment.

Table 7. *Showing reasons why people switch antimalarial drugs.*

Variable	Frequency	Percentage %
Have you ever switched antimalarial drugs?		
Yes	160	43.6
No	207	56.4
Total	367	100.0
If yes, Why?		
Treatment Failure	77	48.1
Odour/Taste of medication	8	5.0
Side effects	30	18.8
Cost	40	25.0
Others	5	3.1
Total	160	100.0
Which Antimalarial drug did you switch to?		
Artemether – Lumefantrine	66	41.3
Dihydroartemisinin-Piperaquine	17	10.6
Artesunate – Amodiaquine	9	5.6
Halofantrine	5	3.1
Amodiaquine	3	1.9
Sulfadoxine – Pyrimethamine	36	22.5
Quinine	5	3.1
Chloroquine	15	9.4
Artesunate - Sulfadoxine/Pyrimethamine	4	2.5
Total	160	100.0

Out of the 367 respondents, 160 (43.6%) admitted to have switched from one antimalarial drug to another. And 48.1% of these of the people who switched drugs due to treatment failure and 25% claimed it was due to cost of drug. Of the respondents who switched drugs 41.3% switched to Artemether – lumefantrine, and very few (1.9%) switched to Amodiaquine.

3.2. Malaria Preventive Practices

Table 8. *Showing methods of preventing malaria used by the respondents.*

Variable	Frequency	Percentage %
Do you Spray Insecticide?		
Yes	81	22.1
Sometimes	237	64.6
No	49	13.4
Total	367	100.0
Do you sleep under Net?		
Yes	43	11.7
Always	3	0.8
Sometimes	74	20.2
No	247	67.3
Are your windows covered with Net?		
Yes	334	91.0
No	33	9.0
Total	367	100.0
Do you wear Clothes at night		
Yes	96	26.2
Sometimes	127	34.6
No	144	39.2
Total	367	100.0
Do you use mosquito repellent		
Yes	60	16.3
Sometimes	92	25.1
No	215	58.6
Total	367	100.0
Do you do Malaria Prophylaxis		
Yes	34	9.3
Always	10	2.7
Sometimes	78	21.3
No	245	66.8
Total	367	100.0

Of the respondents, 22.1% always spray insecticides, 12.5% sleep under insecticide treated net, and 91% of respondents have their windows covered with net. Also, 39.2% admitted to sleeping without clothes for malaria prevention purpose, 58.6% do not use mosquito repellent. However, a few respondents (9.3%) admitted to the regular use of antimalarial prophylaxis.

3.3. Blood Group and Genotype of Respondents

Of the 367 respondents, 339 (92.4%) know their blood group, and of this group, 148 (43.7%) are O+, 89 (26.3%) are A+, 31 (9.1%) and 26 (7.7%) are B+ and B- respectively. AB- has the least occurrence of 7 (2.1%) while 11 (3.2%) are AB+, 11 (3.2%) are O-, 16 (4.7%) are A- and 26 (7.7%) are B-. 28 (7.6%) of the respondents did not know their blood group. Also, 312 (85%) of the respondents know their genotype, 207 (66.3%) of whom are AA and 105 (33.7%) are AS. However,

some of the respondents 55 (15%) do not know their genotype.

Table 9. *Showing a cross tabulation between Teaching and Non-Teaching Staff and malaria treatment pattern.*

Variable	Teaching Staff		Non-Teaching Staff		Total		X^2	df	P-value
	Freq	%	Freq	%	Freq	%			
Where do you normally go for treatment									
Hospital	27	22.0	133	54.5	160	43.6	40.071	4	0.001
Pharmacy	68	55.3	68	27.9	136	37.1			
Chemist	15	12.2	29	11.9	44	12.0			
Herbalist	6	4.9	4	1.6	10	2.7			
Church/Prayers	7	5.7	10	4.1	17	4.6			
Total	123	100	244	100	367	100			
Which do you normally take?									
Artemether – Lumefantrine	102	82.9	159	65.2	261	71.1	45.646	8	0.001
Dihydroartemisinin	6	4.9	15	6.1	21	5.7			
Artesunate – Amodiaquine	6	4.9	38	15.6	44	12.0			
Artesunate – Mefloquine	0	0	15	6.1	15	4.1			
Amodiaquine	0	0	4	1.6	4	1.1			
Sulfadoxine - Pyrimethamine	6	4.9	0	0	6	1.6			
Quinine	0	0	9	3.7	9	2.5			
Artesunate - Sulfadoxine/Pyrimethamine	3	2.4	0	0	3	0.8			
Others	0	0	4	1.6	4	1.1			
Total	123	100	244	100	367	100			
Adherence to National Guideline									
Poor	6	4.9	28	11.5	34	9.3	4.584	2	0.101
Fair	105	85.4	198	81.1	303	82.6			
Good	12	9.8	18	7.4	30	8.2			
Total	123	100	244	100	367	100			
Who normally recommends the antimalarial for you									
Doctor	43	11.7	138	37.6	181	49.3	24.026	4	0.000
Nurse	3	0.8	8	2.2	11	3.0			
Pharmacist	52	14.2	71	19.3	123	33.5			
Chemist	9	2.5	19	5.2	28	7.6			
Self	16	4.4	8	2.2	24	6.5			
Total	123	33.5	244	66.5	367	100			

4. Discussion

Appropriate education is central to safe and effective use of drugs. The risk of harm or of development of drug resistance and irrational use of drug is less when antimalarial or other types of drugs are prescribed by an informed health practitioner. Drug utilization pattern can serve as a means to identify causes/origins of drug resistance which increases malaria prevalence. The knowledge of headache, body pain, high temperature, nausea and vomiting as symptoms of malaria among the respondents in this study is consistent with other reports from Ghana and Tanzania in which knowledge on symptoms of malaria were similar. However, most of these symptoms are not just specific to Malaria; this therefore emphasizes the need for adequate testing/diagnosis before treatment.

This study revealed that, majority of the respondents (80.7%) obtains malaria treatment from hospitals and pharmacy. This was in line with recommendations. 6.5% of the respondents however reported to be involved in self-medication which should be discouraged, as this could lead to the development of drug resistance [9].

ACTs especially Artemeter-Lumefantrine (71.1%) was reported as the first choice for the treatment of malaria infections by the respondents. This agrees with the works many researchers including Ifeoluwa Akanni and colleagues [15]. This is in line National and WHO Guidelines for the treatment of uncomplicated malarial. The recommended ACTs include Arthemeter-Lumefantrine, Artesunate-Amodiaquine, Artesunate-mefloquine, Dihydroartemisin-Piperaquine and Artesunate-Sulfadoxine-Pyrimethamine. From the study, ACTs generally have 93.7% utilization, this corresponds with a study carried out by Dodoo et al. [10] where 90.8% of the respondents used artemisinin-based compound in their treatment regimen. And also that carried out by Ezenduka et al. [11] where the ACTs recorded 72.7% use. Teaching staff were observed to have a higher prevalent use of ACTs (95.1%) as compared to the Non-Teaching staff (94.6%) at a p-value of <0.05. In this study, the use of Artemisinins was comparatively more than quinines (71.1% vs 2.5%), this corresponds well to the findings by Tola *et al,* 2017 [12].

Adherence to National treatment guidelines alone does not determine the success of malaria treatment, the correct use of these drugs is also very important. This made it necessary to ascertain the number of respondents that actually completed their recommended medication during their malaria episodes. A greater percentage of the study group (76.6%) usually complete their recommended dose during the episodes while 23.4% of respondents admitted to not completing the recommended dose. The major reason given for not

completing the dose being that they felt better half way (66.3%) and therefore did not see the need to complete the medication, while 30.2% attributed it to forgetfulness. A lesser percentage of the respondents (3.5%) attributed the cause to the odour and taste of the drug being unpleasant. Irrational use of drug poses a major challenge and can be linked to the continuous prevalence of malaria. This shows that there is still the need for patient counseling or education by health practitioners. A major occurrence in the treatment of malaria is the switching from one antimalarial to another, however only 43.6% of this study group admitted to switching, with the major reason being treatment failure (48.1%), other reasons include side effects (18.8%), cost (25%) and odour/taste of medication (5%). A good number of the respondents however switched to Artemeter-Lumenfantrine (41.3%) which is still in line with the national guideline.

With reference to the National guideline which recommends testing/diagnosis (either by microscopy or Rapid Diagnostic Test) and treatment using ACTs (Artemether-Lumefantrine as first line therapy and Artesunate-Amodiaquine as second line drug), a comparison was drawn between the adherence levels of Teaching Staff to that of Non-Teaching Staff to the National guideline; the study revealed that 9.8% of the Teaching staff showed good/full compliance, 85.4% showed fair compliance and 4.9% had poor compliance while 7.4% of Non-Teaching staff complied fully, 81.1% had a fair compliance with 11.5% having a poor compliance level. This further reveals that the Teaching Staff adhered better to the diagnosis and treatment guidelines as compared to the Non-Teaching Staff at p-value<0.005.

WHO recommends the use of insecticide treated nets (ITN) as well as indoor residual spraying of environment, use of chemoprophylaxis, use of mosquito repellants amongst others as preventive strategies against malaria (WHO, 2015). The study revealed that the respondents has good preventive behaviours towards malaria as 91% have their home windows covered with net, this in contrast with a study carried out by Kennedy Diema et al. [13] where low comparable net use (60%) was recorded. Usage of mosquito sprays as malaria control strategy was reported by 86.7% which is commendable. However, a low percentage of respondents agreed to sleeping under ITN (32.8%) which is in accordance with a study carried out in University of Lagos.

Studies have revealed that blood group 'O' confers resistance against severe falciparum infection while 'B' has a four-fold increased risk of developing malaria infection. In other studies, 92.4% of the respondents know their blood group and a greater percentage were O+ (43.7%), while the rest were A+ (26.3%), A- (4.7%), B+ (9.1%), B- (7.7%), AB+ (3.2%), AB- (2.1%) and O- (3.2%). The high occurrence of O+ can be linked to the fact that majority of the respondents feel malaria symptoms just once a year. Genotype determination is also important as a study carried out by K. N. Opara et al., 2006 in Uyo revealed a relationship between genotype and degree of susceptibility to malaria [14]. In their study, genotype AA (92.3%) was more susceptible to malaria parasite than AS (5.1%) and SS (2.6%) at a p-value of<0.001%. 66.3% of the respondents stated that they were AA while 33.3% were AS.

5. Conclusion

Artemisinine-based combination therapies (ACTs) are the most commonly used antimalarial medications amongst Teaching and Non-Teaching staffs of University of Port Harcourt with Artemether-Lumefantrine being the most predominant ACT in use. This is an indication of adherence to WHO recommendation and National guidelines which was more with the Teaching than non-Teaching staff. Irrational use of antimalarial agents was however, still being practiced among some of the Staff of the University. Also, good preventive practices for the control of malaria were noted in the study with the covering of windows with mosquito net being the most applicable.

6. Recommendations

1. More emphasis should be placed on rational use of Guideline recommended antimalarial agents during further enlightenment programs.
2. Also, more advice on sleeping under insecticide treated nets should be strengthened as covering of windows with nets alone would not be enough a preventive measure against the bites of malaria vectors.

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