

Pharmacoeconomics of Antimalarials in Private-for-Profit (PFP) Drug-Outlets in Gulu and Kitgum Towns, Northern Uganda

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Abstract Background: Clinically-diagnosed malaria is the leading cause of morbidity and mortality in Uganda accounting for 25 to 40% of outpatients, 15 to 20% of all hospital admissions, and 9 to 14% of all hospital deaths. This situation was exacerbated by The Lord's Resistance Army (LRA) rebellion in northern Uganda which completely ran down the health care system. While malaria remains the number one killer disease in northern Uganda, antimalarials are lacking in the public health facilities. Consequently, Private-for-profit drug-outlets have come up to help bridge the gap. However, the cost-effectiveness and treatment outcome ratings of antimalarials are not clear. **Objective:** To assess the pharmacoeconomics of malaria treatment in Private-for-profit (PFP) drug-outlets in Gulu Municipality and Kitgum Town Council. **Methodology:** This was a descriptive cross-sectional study sites were registered drug outlets. Study participants were drug-outlet owners, their employees, and malaria patients. We employed both purposive and random sampling methods to select the study participants. Data were collected using questionnaires and analysed using the SPSS computer package. **Results:** Up to 91.1% of the respondents indicated that antimalarials are expensive. The prices varied from less than 5,000 to over 20,000 Ugandan shillings per dose (*Exchange rate: 1\$ = Ush 2,650*). Fansidar and chloroquine were rated as being relatively cheap and ACTs expensive (Ush 11,000 to 15,000). Duration of treatment, frequency of administration, needles and syringes, raised the cost of some medicines. Most patients preferred cheap medicines (76.2%); those with low administration frequencies (77.5%); and those with short treatment duration (95%). Most patients (80.9%) buy antimalarials without testing, while 66.6% do not buy full doses. **Conclusion:** The cost benefit analysis of the use of antimalarials is unfavourable. The unit price of the medicines, their irrational use and the lack of professionals in the outlets together add up to high overall costs and poor treatment outcomes.

Keywords: malaria, pharmacoeconomics, northern Uganda, private-for-profit drug outlets, ACTs

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1. Background

In Uganda, malaria is the most commonly reported disease by both public and private health facilities. According to Malaria Consortium (2010) clinically-diagnosed malaria is the leading cause of morbidity and mortality accounting for 25 to 40% of outpatients, 15 to 20% of all hospital admissions, and 9 to 14% of all hospital deaths. Nearly half of in-patient deaths among children under the age of five are attributed to clinical malaria. Malaria has also been the leading cause of death in the IDP population in northern Uganda, apart from being the most frequent cause of hospital admission as well as the second leading cause of in-hospital mortality (Ogwang, 2008). The war in northern Uganda between the Government and the Lord's Resistance Army (LRA) that

lasted for more than two decades resulted into insecurity, deaths, and disruption of all societal systems. People had to move to the Internally Displaced Person's (IDP) camps for protection (UNICEF, 2006). As of 2004 about 1.7 million people were in these camps (UNAIDS, 2006). The war completely ran down the health sector leading to the region's high disease burden. Indeed, HIV/AIDS, malaria, tuberculosis, diarrhoea, several bacterial infections, and rare diseases such as Ebola, yellow fever, and Hepatitis E ravaged the region.

To appreciate the magnitude of the problem, many initiatives and programmes have been tried out to address the problem and so have many organisations come in to help. Among the initiatives, programmes, and the organisations are: the Roll Back Malaria Partnership; the United States President's Malaria Initiative (PMI); The Global Fund to Fight AIDS, Tuberculosis and Malaria; the

World Health Organization (WHO); the World Bank; Malaria No More; the Bill and Melinda Gates Foundation; and nongovernmental organizations [NGOs] (Malaria Consortium, 2010). Specifically for northern Uganda, the Northern Uganda Malaria, AIDS & Tuberculosis (NUMAT) Project is trying to address the issue among the other diseases.

Under these initiatives, several interventions have unsuccessfully been tried out to eradicate malaria. Among them are: the use of Insecticide-treated mosquito nets (ITNs), indoor residual spraying (IRS), the use of mosquito repellents, and most importantly the use of antimalarials. Intermittent preventive treatment for pregnant women (IPTp) which consists of administration of sulfadoxine-pyrimethamine (SP) is also in practice. Currently Artemisinin-based combination therapies (ACTs) are the recommended first-line treatment for uncomplicated malaria as per the Ministry of Health (MoH) Policy on malaria. Other ACTs, quinine, and SP can be used depending on the prevailing circumstances and category of patient.

1.1. Pharmacoeconomics

Health economics is about making health choices between options when there is scarcity of resources and it involves weighing the costs and benefits of one option with another (Walley, 2003). Pharmacoeconomics is a sub-discipline of health economics that deals with comparing the value of one pharmaceutical medicine or drug therapy to another. It evaluates the cost (expressed in monetary terms) and effects (expressed in terms of monetary value, efficacy or enhanced quality of life) of a pharmaceutical product (Carswell and Paladino, 2010). Relating this to antimalarials, it is important to undertake a cost-benefit analysis as well as a (cost-effectiveness analysis) considering the many available varieties and brands in the market.

The ACT policy in Uganda was launched in 2006 (Batwala, Magnussen, & Nuwaha, 2010) in which artemether-lumefantrine (AL) (which is an ACT), SP, and quinine are to be used in the treatment of malaria depending on its severity and the category of patient. The adoption of AL use has, however, been dogged by several limitations, including a twice-daily dosing regimen, recommendation for administration with fatty food, and a high risk of re-infection soon after therapy in high transmission areas when compared to Dihydroartemisinin-piperazine (DP), another ACT, that is dosed once daily, which has a long post-treatment prophylactic effect, and patients treated with it have a significantly lower risk of recurrent parasitaemia (Yeka et al., 2008). In their study, Zurovac et al., (2008) established that reports on translation of AL implementation activities into clinical practice are scarce and that as much as the use of AL has picked, it is not yet optimal as other antimalarials such as chloroquine, SP, amodiaquine, and quinine are being used partly when AL is out of stock or as an alternative to AL. Among the common ACT based combinations that can be used in the absence of AL are artesunate/amodiaquine; artesunate/SP; artesunate/mefloquine; artesunate/sulfamethoxy-pyrazine/pyrimethamine and dihydroartemisinin/ piperazine.

For methods and materials section

Of the eight Millennium Development Goals (MDGs), combating malaria, HIV/AIDS and other diseases is Goal Number 6. Focusing on malaria, its eradication seems unattainable by the target date of 2015 because, not only does Uganda have a 100% population at risk of contracting malaria (WHO, 2009), it also has the third highest deaths from malaria in Africa (Malaria Consortium, 2007). According to PMI (2010), in 2007 child mortality (for under-fives) was 130 per 1,000 live births; the number of reported malaria cases was 12,792,759; and the number of reported malaria deaths was about 47,000. Similarly, UNICEF (2009) indicates that the under-5 mortality of 135/1,000 live births in Uganda in 2008 was largely due to malaria. With the erratic availability of antimalarials in the public sector health facilities, patients are forced to buy them from the PFP drug-outlets. The questions then are: what cost and what cost options are available to a patient? Considering that the economy of northern Uganda is the lowest nationally, then, the cost-effectiveness, and treatment outcome of the PFP-facility treated malaria are in doubt. Ideally, pharmacoeconomics studies serve to guide optimal healthcare resource allocation, in a standardized and scientifically grounded manner (Carswell & Paladino, 2010) and, as such, are considered relevant in trying to explain the situation in northern Uganda. There are currently different types of ACTs in the PFP drug-outlets that also are sold at different prices. Some are different in terms of the combinations of the active ingredients while others by the trade name only, as in the case of generic medicines. How efficacious and cost-effective these ACT and other antimalarials are in relation to each other as used in the PFP in the study areas is not clear since there is limited literature to that effect.

The objective of this study was therefore to assess the pharmacoeconomics of malaria treatment in PFP drug-outlets in Gulu and Kitgum towns in Northern Uganda

2. Materials and Methods

2.1. Study Design and Setting

This was a descriptive cross-sectional study carried out in Gulu Municipality and Kitgum Town Council in northern Uganda. The region is estimated to have a population of 1,383,000 (OCHA, 2008) against the national figure of 33.4 million (2010 estimate), and a life expectancy of 52 years for male and 54 years for female (US Census Bureau, 2010).

2.2. Study Population

The facility study population constituted of all licensed PFP pharmacies and drug-shops in the study areas. Respondents were drawn from the staff and proprietors of these facilities, and adult patients suffering from malaria who visited these drug-outlets at the time of study. The study was carried out using a combination of cluster, purposive, and simple random sampling methods. The two study sites were considered as separate clusters. All the pharmacies were included in the study because of the small number. The PFP drug shops were randomly sampled out of the lists of those registered. All proprietors of the sampled PFP drug-outlets were included in the

study while one staff per PFP drug-outlet was randomly selected. Two and four patients were randomly selected from those who went to purchase medicines (antimalarials) from every drug-shop and pharmacy respectively. Informed consent was obtained from each of the study participants. Data were collected using pre-tested questionnaires. In the case of illiterate or semi-illiterate patients, Luo-speaking research assistants were engaged since Luo is the local language. The data were then analysed using the Statistical Package for Social Sciences (SPSS) computer software. Ethical clearance was obtained from Gulu University research ethics committee.

3. Results

3.1. Response Rates

The response rate was 79.5%. This was deemed adequate to allow for data analysis and generalisation of the findings of this study.

A total of 268 participants took part in this study; 142 (53%) were from Gulu Municipality and only 48 (17.9) were from pharmacies.

Male participants were 36.2%. The research participants were between 18 to 44 years of age. About 29.1% of the patients had only attained Primary Level of Education (PLE) while all the staff and proprietors who participated in the study had at least attained (an O-Level education. Registered midwives and registered nurses were the majority owners (32.6%) of drug shops, while nursing assistants were the majority employees (68.3%) in the drug-outlets. By profession, the nursing assistants dominated the picture as either proprietors or staff at 41.7% (Figure 1).

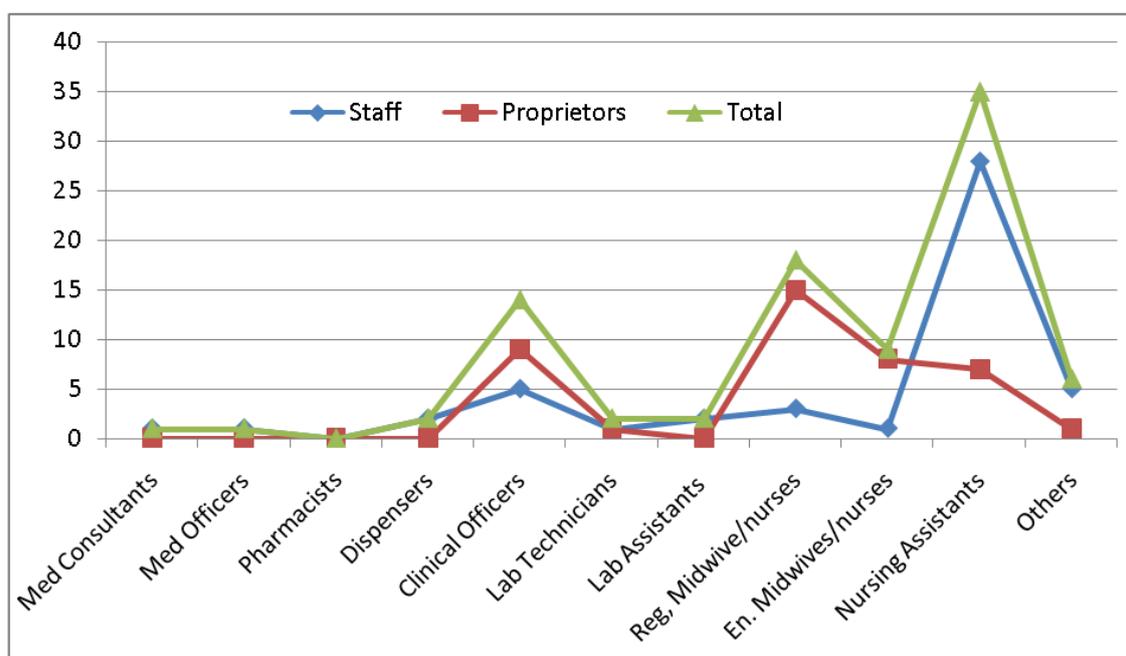


Figure 1. Professions of PFP Drug-outlet Respondents

Table 1. Price Distribution of the Various Antimalarials

Antimalarial Drug	Price Range ('000 Ush)				
	<5	5 - 10	11 - 15	16 - 20	>20
1 Artimeter + Lumefantrine (Coartem)	10.3	63.7	13.8	2.9	2.9
2 Sulfadoxine + Pyrimethamine (Fansidar)	66.5	9.4	2.1	0.7	1.4
3 Oral Quinine tablets	27.2	51.9	2.8	2.0	1.4
4 Injectable Quinine	29.2	38.9	8.3	2.1	1.4
5 Oral Chloroquine tablets	46.2	11.4	6.0	0.7	0.0
6 Injectable Chloroquine	33.5	13.4	2.8	1.4	1.4
7 Artemether Injection	4.9	12.8	7.5	8.1	8.4
8 Artemether Tablets	1.4	9.0	6.2	8	7.7
9 Compound Naphthoquine (Arco tablets)	0.7	4.3	16.7	4.5	1.7
10 Dihydroartemesinine/Piperaquine (Duo-cotecxin)	1.7	7.3	20.4	4.9	1.4
11 Artesunate + Amodiaquine (Larimal)	8.2	10.4	3.1	4.1	2.0
12 Artesunate + mefloquine (Artequin)	4.1	2.5	4.5	4.1	3.4
13 Artesunate + sulfamethoxypyrazine/ pyrimethamine	2.4	3.8	3.4	2.0	2.0
14 Sulfamethoxypyrazine/pyrimethamine (Metakelfin)	4.5	3.9	5.5	1.7	0.0
15 Artesunate Tablets	6.1	7.3	4.1	4.1	1.4

Exchange rate: 1\$ = Ush2,650.

3.3. Pharmacoeconomics Results

3.3.1. Pricing of Antimalarials

About 91.1% of the respondents indicated that antimalarials are expensive. The pricing varied considerably from less than 5,000 to over 20,000 Ugandan shillings (About \$2 to \$8) per dose as shown in Table 1. Fansidar (sulfadoxine-pyrimethamine) and chloroquine (both tablet and injectable formulations) were rated to being relatively cheap by the majority of the respondents for costing below Ush.5,000 per complete dose. While 88.5% of the respondents indicated so for chloroquine tablets, for Fansidar and chloroquine injection the percentages were 86.5% and 75% respectively. On the other hand, Dihydroartemesinine/Piperaquine (Duo-cotecxin), Artesunate + mefloquine (Artequin), and Sulfamethoxyprazine/ pyrimethamine (Metakelfin) were

found to cost between Ush 11,000 to 15,000 by most respondents in those categories. Some antimalarials were also reported to cost more than Ush. 20,000.

3.3.2. Other cost Factors

Other cost influencing factors that were established included longer duration of treatment, higher frequency of administration of the medicine per day, use of water for injection, use of water for reconstitution, needles and syringes, refrigeration, and the need for trained personnel.

3.3.3. Treatment Preference

On a scale of 1 to 5 (where 1= strongly disagree; 2 = disagree; 3 = undecided; 4 = agree; and 5 = strongly agree), respondents rated their preferences for the different antimalarials as in Table 2:

Table 2. Preferences for different Antimalarials

S. No	Statement	1	2	3	4	5
1	Most patients prefer coartem even though it is expensive	6.4	10.6	4.3	44.7	34.0
2	Most patients prefer the cheap medicines	6.4	8.5	6.4	48.9	29.8
3	Most patients prefer not to buy full doses of antimalarials	6.7	26.7	0.0	42.2	24.4
4	Most patients prefer antimalarials with fewer frequencies per day	11.4	2.3	11.4	40.9	34.1
5	Most patients prefer antimalarials with shorter treatment days	2.2	0.0	4.4	57.8	35.6
6	Most patients would buy antimalarials based on their financial status	8.7	6.5	4.3	43.5	37.0
7	Most patients will come to buy antimalarials even when they have not done malaria test because it is cheaper that way	4.3	8.5	6.4	51.1	29.8

Looking at the last two columns of 'agree' and 'strongly agree', it can be deduced that most patients preferred Coartem even though it is expensive going a combined 'yes' response of 80.9%. Most patients preferred cheap medicines (76.2%); those to be taken less frequently per day (77.5%); and those with shorter treatment duration (95%). Also, 66.6% of the patients preferred not to buy full doses and that 80.9% would buy

antimalarials without carrying out a test for malaria parasites.

3.3.4. Treatment Outcomes

The results on treatment outcome of the different antimalarial medicines based on the experience of both the patient and PFP drug-outlet respondents are shown in Table 3.

Table 3. Treatment outcome ratings by Patients (P) and PFP Staff (PS)

Antimalarial Drug	Treatment Outcome Rating										
	Poor		Fair		Good		Very good		Excellent		
	P	PS	P	PS	P	PS	P	PS	P	PS	
1	Artemether + Lumefantrine (Coartem)	0	1.1	2.1	1.1	50	35.1	26.4	39.4	15.7	18.1
2	Sulfadoxine + Pyrimethamine (Fansidar)	15	7.4	21.4	35.1	21.4	38.3	8.6	7.4	2.9	1.1
3	Oral Quinine tablets	1.4	1.1	14.3	9.6	45.7	29.8	18.6	41.5	1.4	12.8
4	Injectable Quinine	5	4.3	5.7	9.6	33.6	18.1	29.3	31.9	5	18.1
5	Oral Chloroquine tablets	15.7	13.8	17.9	28.7	20	14.9	7.1	7.4	15	3.2
6	Injectable Chloroquine	6.4	13.8	7.9	16	29.3	13.8	25	6.4	0.7	1.1
7	Artemether Injection	2.1	1.1	5	4.3	7.9	12.8	16.4	27.7	2.1	12.8
8	Artemether Tablets	2.9	1.1	5.7	5.3	13.6	19.1	6.4	22.3	1.4	10.6
9	Compound Naphthoquine (Arco tablets)	2.9	1.1	3.6	5.3	19.3	30.9	2.9	16	0	5.3
10	Dihydroartemesinine/Piperaquine (Duo-cotecxin)	0	1.1	5	5.3	16.4	22.3	2.1	23.4	0	5.3
11	Artesunate + Amodiaquine (Larimal)	1.4	2.1	1.4	7.4	7.1	17	0	8.5	0	5.3
12	Artesunate + mefloquine (Artequin)	0	3.2	2.1	7.4	1.4	12.8	0	7.4	0.7	2.1
13	Artesunate + sulfamethoxyprazine/pyrimethamine	0	3.2	2.1	5.3	0.7	12.8	0	8.5	0	1.1
14	Sulfamethoxyprazine/pyrimethamine (Metakelfin)	3.6	2.1	2.1	10.6	2.1	9.6	1.4	6.4	0.7	4.3
15	Artesunate Tablets	1.4	0	2.9	7.4	2.9	13.8	0.7		0.7	3.2

Using the figures in Table 3, line graphs for 'poor' and 'excellent' ratings were generated. Whereas the 'poor' rating by both the patients and PFP staff were generally similar (Figure 2(a)), the 'excellent' rating line graph of

the PFP staff was generally above that of patients (Figure 2(b)). Apparently, none of the antimalarials scored 'excellent' as its highest score.

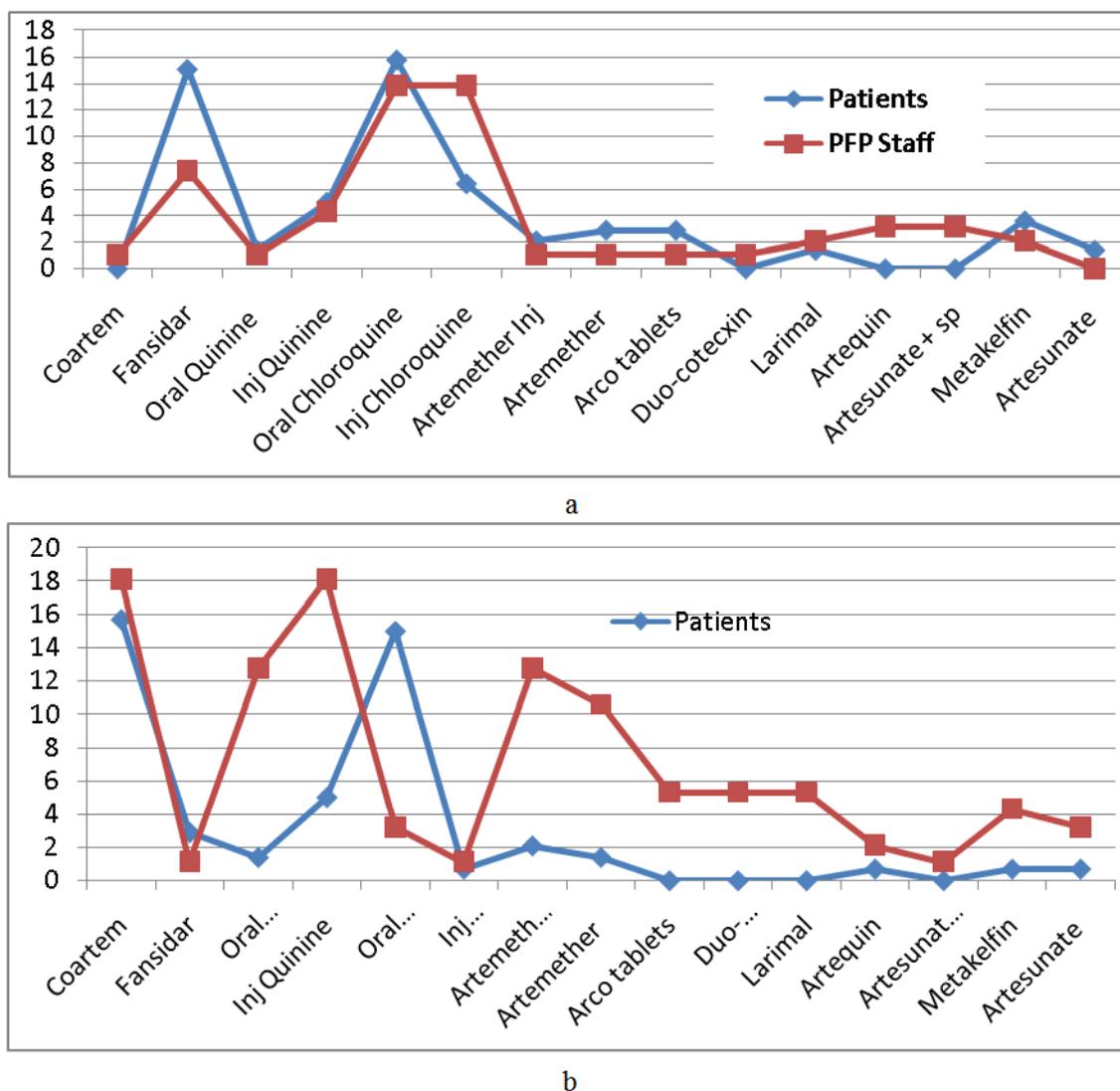


Figure 2. a. Poor Rating, b. Excellent Rating

4. Discussions

The overall gender distribution was 36.2% male and 63.8% female. However, there were variations within the different categories. For instance, despite random sampling of the patient respondents, the ratio of female: male was 3:2. This could probably agree with the suggestion that women have a better health seeking behaviour than men (Wyrod, 2011). Further to that, most respondents were aged between 18 to 44 years, possible due to the fact that the life expectancy of Uganda is approximately 50 years (reference if possible), and that level of literacy is low considering that 29.1% of the patients had only reached the Primary Level of Education (PLE).

4.1. Pharmacoeconomics

The majority of patients (91.1%) indicated that antimalarials are expensive. This implies that they are not comfortable buying the medicines but are forced by the circumstances that these medicines are lacking in the public health facilities where they are supposed to be accessed free of charge. Secondly, this stresses the fact

that malaria is a serious problem that forces patients to go and buy medicines despite the medicines being considered expensive. Majority of the Ugandan population, and more so those from northern Uganda earn less than a dollar per day, absolutely necessary. Therefore, buying medicines that range from about \$2 to \$8 is definitely a big financial burden to the patients. Consequently, in order to try and minimise the cost of treating malaria, 80.9% of the patients buy antimalarials without carrying out malaria tests. This is worsened by the fact that, despite there being different ACTs of different prices, the patients do not know them and as such they cannot take advantage of the price differences and purchase the cheaper of those available. On the other hand, the PFP drug-outlet staff members do not mind about this since it gives them the opportunity to sell the most expensive medicine.

This situation was considered to be the reason as to why chloroquine tablets, Fansidar tablets and, chloroquine injection were rated as being cheap by 88.5%, 86.5% and 75% of the patients respectively. Apparently many patients buy these medicines yet they are not recommended by the treatment guidelines policy for malaria. The use of chloroquine was banned while that of Fansidar was restricted for prophylaxis against malaria in pregnant women. The Drug outlets are also stocking these

medicines partly because they know that their clients can only afford such, regardless of the treatment outcome. ACTs such as Dihydroartemisinin/Piperaquine (Duo-cotecxin), Artesunate + mefloquine (Artequin), and Artesunate + Amodiaquine (Larimal) are considered to be expensive and indeed, many drug shops, which incidentally are the sources of medicines to the majority of the population, do not stock them.

Although the scope of the study did not cover the calculations associated with the administration of the different antimalarials, it was established that some medicines which seem cheap based on the unit cost, were in the long run expensive. This is because they require longer duration of treatment periods, since their frequency of administration is higher; Others required additional inputs in the form of water for injection, water for reconstitution, needles/syringes and refrigeration. The requirement of special skills as is the case with administration of injections, is an additional cost. Injectable medicines are not preferred by the patients even when their prices are low. Indeed, Coartem tablets despite being expensive were the most preferred. This, though, could also be due to the fact that it is what is recommended by policy and that it is only administered twice a day and for only three days. However, up to 66.6% of the patients do not buy full treatment doses, and this poses another serious challenge of possible resistance against the antimalarials. Indeed, none of the medicines scored 'excellent' as its highest score with few-Coartem, quinine, and artemether injection-being rated by just about a third of the respondents as having 'very good' treatment outcome.

Running of drug-shops seems to be a line favoured by the lower cadres in the health structure considering that registered midwives and registered nurses were the majority owners (32.6%) while as high as 68.3% of the employees were nursing assistants. Pharmacists and pharmacy dispensers did not feature much and this is probably because they are very few in number. Incidentally, none of the four pharmacies (are they 4 or 8)? that participated in the study is owned by a pharmacist or pharmacy dispenser.

5. Conclusion

The cost-benefit analysis of the antimalarials in the study areas is unfavourable. First of all, the medicines are very expensive. Secondly, patients are not getting value for their money because of factors such as missed doses, under-dosing, procurement of ineffective medicines, blind-treatment of malaria as many do not base their purchase on laboratory results, and general irrational use of the medicines. Adequately trained personnel are lacking in most cases, and so do the recommended ACTs for the treatment of uncomplicated malaria.

6. Recommendations

The following recommendations were made based on the study findings:

1. The District Health Offices should enforce strict medicine management systems.

2. The Ministry of Health should ensure that there are adequate stocks of the recommended antimalarials in the public sector so that patients don't have to buy from the PFP drug-outlets
3. The National Drug Authority (NDA) should ensure that qualified staff, who can professionally guide patients on their purchase of antimalarials, run the PFP drug-outlets
4. All drug outlets should not stock un-recommended medicines, such as chloroquine, for the treatment of malaria.
5. The NDA should sensitize the public on the dangers of irrational use of medicines.

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