Original Research Article

PHARAMCOECONOMIC OF ANTIMALARIAL DRUGS AVAILABLE IN KARACHI, PAKISATAN

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ABSTRACT:

Background: Malaria remains one of the communicable diseases threatening the human race especially young children and pregnant women. Falciparum malaria is becoming resistant to existing conventional treatments which are widely available and at a price that most people can afford. Whereas the newer treatments, such as artimisinin derivatives used in combination with older drugs are often far too expensive to be used.

Aim: To indicate that the most successful anti-malarial treatment i.e. artemisinin continue to have a significantly high price when compared with other conventional anti-malarial therapies.

Method: Survey with questionnaire (sample size n=200) was scrutinized and interviews were conducted with doctors from different localities, different medical stores and pharmacies on the subject of the most selling drugs(with or without prescription),cost effectiveness of selling drugs and secondary complication of malaria.

Result: The data showed that Artemisinin combination therapies can be over twenty times more expensive than ineffective therapies such as Amodiaquine or chloroquine, ; for example, some artemisinin combination therapies cost as much as Rs.400.00 (3.89 USD), while ineffective antimalarials typically cost Rs.12.00 (012 USD) and 20.00 (0.19 USD) respectively.

Conclusion: It is concluded that demand and utilisation of artemisinin combination therapy is restricted by their high price.

***Keywords*:** Artemisinin derivatives, falciparum malaria, anti-malarial resistance, low-cost anti-malarials.

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INTRODUCTION

Malaria is an irresistible public health problem. The number of cases of malaria worldwide appears to be growing because of the increasing risk of transmission in areas where malaria control has declined, increasing prevalence of drug-resistant strains of parasites e.g. chloroquine resistance, which is linked to multiple mutations in transporter protein (PfCRT) and because of increasing international travel [1]. Among four species of malarial parasites *P. falciparum* is responsible for severe illnesses and deaths whereas other species, include *P. vivax, P. ovale* and *P. malariae*, cause mainly a febrile illness and only rarely lead to severe disease [2]. Majority of malaria cases worldwide are mild and can be treated with oral drugs, but delay in diagnosis or effective treatment may develop life-threatening complications requiring parenteral therapy [2]. Antimalarial drugs can be classified biologically as tissue schizontocides used for prophylaxis e.g. pyrimethamine and primaquine, for preventing relapse primaquine is the prototype drug, pyrimethamine also has such activity then blood schizonticides includes chloroquine, quinine, mefloquine, tetracyclines sulfones, halofantrine, pyrimethamine, sulfadoxine etc, gametocytocides include chloroquine quinine, primaquine and sporontocides i.e. primaquine and chloroguanide [3]. WHO issued a statement that led to a major change in the treatment of malaria. Monotherapy antimalarial medicines are not recommended, treatment must be used in combination i.eArtemether-Lumefantrine and in the rare case of

a patient not responding to ACT (Artemisinin-based combination therapy), Quinine is recommended. Other ACTs available include Artesunate plus amodiaquine, .Artesunate plus mefloquine and Dihydroartemisinin plus piperaquine and trimethoprim combinations [4].

Most recently, in 2013 Anthony et al [5] reported low proportion of malaria patients in receiving appropriate ACT treatment. This was due to inadequate education regarding malaria treatment, the practice of presumptive therapies, and lack of knowledge that Coartem(R) was the recommended first-line treatment for malaria. The two artemisinin compounds had the broadest time window of action and may be particularly suitable for the treatment of severe malaria [6].

The focus of this article is allied to determine various parameters of malaria especially in Karachi i.e the prevailing causes of malaria, occurrence of resistance of different species of plasmodium to different anti malarial drugs in the individuals due to lack of awareness or the suffering indiviuals are not taking their course of therapy which is mainly due to cost of anti malarial drugs especially in the lower class folks which may leads to severe manifestations as a result of delayed or misdiagnosis or managed inappropriately .

METHODOLOGY

Two methods of data collection were used; prescription survey and assessment questionnaires. A survey was conducted within different areas of drug shops in Karachi. Data was collected by using structured questionnaires, including a questionnaire provided to capture data on drug shops (n=200) including provider characteristics, knowledge on treatment of malaria, types of drug stocked, reported drug sales, most selling medicines, use of anti-malarial drugs prior to attending the health facilities, cost effectiveness of selling drugs, patient compliance and adherence on course of therapy and another questionnaire was used to collect data from (n=200) who were diagnosed clinically and/or parasitologically for malaria in Karachi regarding the alarming symptoms of malaria, prescribing of medicines according to species and patient financial status, most common secondary complications and its management and the barrier towards effective treatment. In addition, the anti-malarial therapy given an outcome at the hospital were assessed.

Statistical analysis

The result were expressed in percentages to compare the most prescribing antimalarial drug in different places of Karachi by using standard statistical tools i.e. pie chart and bar chart.

RESULTS AND DISCUSSION

A total of 200 samples were collected from different areas of drug shops, pharmacies, hospitals, and physicians' clinics in Karachi. Table: 1 shows most prescribing drugs stated as Chloroquine(17.5%), Halofantrine(4%), Amodiaquine(19%), Artemether + Lumefantrine (31.5%), Pyrimethamine + Sulfadoxine(21%) and Cefixime (7%) as well as cost of complete course associated with these drugs.

Malaria is one of the major public health concerns in developing countries which can be avoided by selecting appropriate therapy. Drug resistance has also played a significant role in the occurrence and severity of malaria. The public health goal of treatment is to reduce transmission of the infection to others and to prevent the emergence and spread of resistance to antimalarial medicines [1]. The other considerations for selecting appropriate anti-malarial therapy are: the adverse effect profile, tolerability and the rapidity of therapeutic response.

Table. 1- Cost of complete regimen of most prescribing antimalarials.

Class of Antimalarial drugs	Name of drugs	Prescribing % percentages	Dose regime	Cost of complete course
4- Aminoquinolone	Chloroquine phosphate ResochinR	17.5%	4 stat then 2 after 6 hour then 2 O.D for 2 days	20 rupees
	Amodiaquinedihydrate (150 mg) BasoquinR	19%	2 tab after 6, 24 and 48 hours	12 rupees
Phenanthrene methanol	Halofantrine hydrochloride (250 mg) HalfanR	4%	2 tab after 6 hours interval for 1 day	188 rupees
Combination therapy	Artemether + Lumefantrine Artem D.SR &Arceva	31.5%	80/480 1 tab after 12 hours interval for 3 days	198 rupees
			40/240 2 tab after 12 hours interval for 3 days	396 rupees
	Pyrimethamine + Sulfadoxine FansidarR	21%	2-3 tab once in a week	18 rupees
Cephalosporin	Cefixime (400mg) CeboshR	7%	1 cap O.D	103 rupees

The majority of malaria prevalent countries changed malaria treatment policies more than three years ago due to extensive drug resistance to monotherapies and adopting extremely effective artemisinin combination therapy [7]. However, results of our present study showed continuous use of relatively cheaper but less effective medicines among studied groups fig.1.

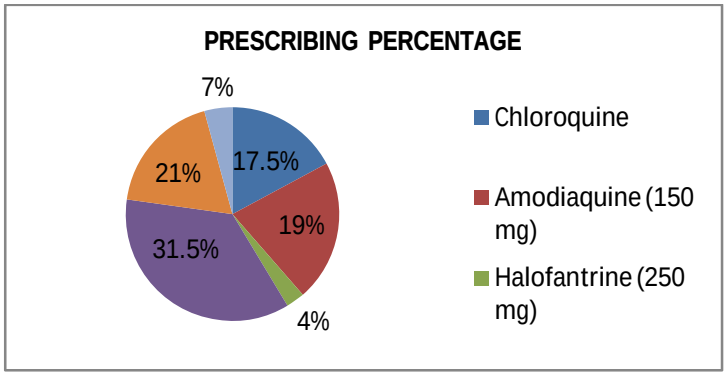

Fig. 1- Most prescribing antimalarial drugs in Karachi expressed as percentage.

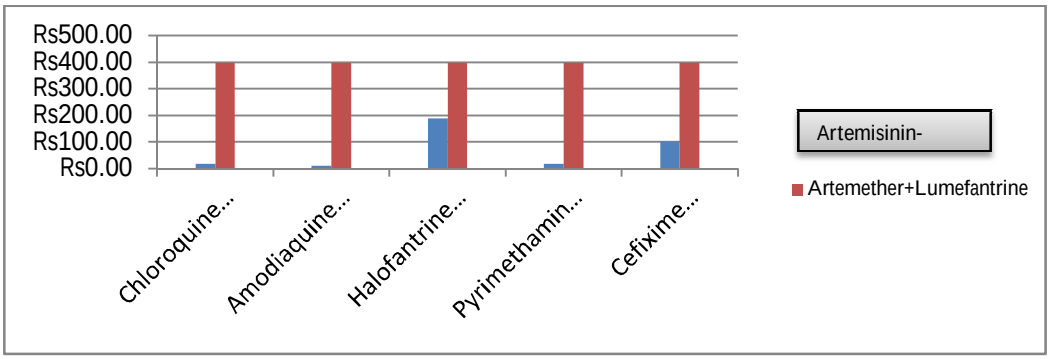

Fig. 2- Comparison of cost of ACT with the other conventional antimalarials.

Results of present study also showed that artemisinin combination therapies can be over twenty times more expensive than ineffective therapies such as Amodiaquine or chloroquine fig.2 ; for example, some

artemisinin combination therapies cost as much as Rs.400.00 (3.89 USD), while ineffective antimalarials typically cost Rs.12.00 (0.12 USD) and 20.00 (0.19 USD) respectively.

Among various available antimalarials the rationale combination is often more effective. Treatment with non-artemisinin based combination, comprises sulfadoxine-pyrimethamine plus chloroquine (SP+CQ) or amodiaquine (SP+AQ), is not recommended now due to high prevalence of resistance to these medicines as monotherapy. Similarly chloroquine plus sulfadoxine-pyrimethamine combination is not recommended because of failure in providing any additional benefit over SP; amodiaquine plus sulfadoxine-pyrimethamine can be more effective than either drug alone; but it is usually inferior to ACTs (Artemisinin-based combination therapy), and it is no longer recommended for the treatment of malaria [2]. Data of our study also showed the high prevalence of amodiaquine hydrate (19%) and sulfadoxine-pyrimethamine (21%) use as a monotherapy or combination as compare to ACTs.

The data of our study presented in Table: 1 revealed that most effective antimalarials are sold at around $1.89 to $3.78 which although still expensive compared to ineffective monotherapy sold for $0.12 cents to $0.19cents. Based on the findings of our study it is concluded that although the frequency of prescribing artemisinin-based combination therapy is still comparatively high (31.5%) among various available antimalarials in the studied group fig.1, but the frequent use of other cheaper and less effective antimalarials as monotherapy or in combination revealed that access to ACTs may be restricted by their high price.

Failure in selection of rational combination to combat malaria also results in other associated infections which are more common in patients with P. falciparum malaria. Members of the artemisinin group are used in the management of severe malaria and also in the treatment of uncomplicated falciparum malaria usually in combination with other drugs, [8]. Based on our findings if patients with P. falciparum malaria are not treated with members of the artemisinin group just because of their high prices the risk of associated infection may be increased in those patients which can be severe and sometimes even life-threatening.

CONCLUSION

Based on the findings of our study it is concluded that the only effective anti-malarial against the P. falciparum parasite (the most common and deadly of the five strains of malaria) is artemisinin that is significantly more expensive than older, synthetic forms of malaria medicine.

Since risk of drug resistance is increased when arterminisin is used as monotherapy because most of the patients may discontinue the treatment prematurely may be due to high prices of these drugs following the rapid disappearance of disease symptoms. This practice results in development of more resistant parasites due to incomplete treatment. Our primary objective is to dramatically reduce the final price of combination malaria treatments in the retail sector especially at the level of community pharmacy where malaria treatment is most commonly required. We also conclude that if ACTs are affordable they will help crowd out the use of arterminisin as an effective anti-malarial therapy, thereby slowing artemisinin resistance.

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