

## Original Research Article

# Cost variation analysis of antimalarial drugs available in India

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**Received:** 21 June 2017

**Accepted:** 18 July 2017

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### ABSTRACT

**Background:** Malaria has been a problem in India for centuries. There are innumerable brands of antimalarial present in the market. Malaria can be extremely fatal if not treated promptly. Costly drugs can lead to economic burden which results in decreased compliance or even non-compliance. Non-compliance leads to incomplete treatment which tends to increase morbidity. Increase in the patient medication cost was found to be associated with decreased adherence to prescription medication. Hence this study was done to assess the cost variation of malaria therapy.

**Methods:** The maximum and minimum price of each brand of the drug in INR was noted by using CIMS January to April 2017 edition and Drug Today January to March 2017, Vol 2. The cost ratio and the percentage cost variation for individual drug brands was calculated. The cost of 10 tablets was calculated in case of oral drug and the cost of 1 ampoule or vial was noted in case of injectable drug. At last the cost ratio and % cost variation of various brands was compared.

**Results:** The analysis of data reflected a considerable cost variation among antimalarial drugs. Artemether injection showed the highest cost ratio and cost variation (cost ratio = 16.96 and % cost variation = 1596). Overall injectable antimalarials showed considerable cost variation as compared to oral antimalarial agents. Chloroquine which is one of the most used antimalarial showed very low values for cost variation and cost ratio.

**Conclusions:** The analysis showed that there is not much significant price variation among oral antimalarial drugs. The maximum variation shown by oral antimalarial was found to be for fixed dose combination of Artemether and Lumefantrine [cost ratio > 2 (2.03) and % price variation > 100 (103.7)]. But there was significant price variation among injectable antimalarial. Injectable antimalarials are often the choice of drug when dealing with critically ill malaria patients specially when suffering from complicated malaria. So, such significant price variation creates burden on poor patients economically which leads to non-compliance and hence increased morbidity and mortality due to incomplete treatment.

**Keywords:** Antimalarial drugs, Compliance, Cost ratio, Percent cost variation

## INTRODUCTION

Malaria has been a problem in India for centuries. Details of this disease can be found even in the ancient Indian medical literature like the Atharva Veda and Charaka Samhita. During the latter parts of nineteenth and early twentieth centuries, nearly one-fourth of India's population suffered from malaria, particularly in the

states like Punjab and Bengal.<sup>1</sup> The government of India launched the national malaria control programme in April 1953. Initially the programme was a success as the number of malaria cases significantly declined.<sup>2</sup> The programme was changed to national malaria eradication programme in 1958. The incidence dropped further to a mere 49151 cases, with no deaths by 1961.<sup>3</sup> But since then the programme suffered repeated set-backs and the

cases started rising again. In the late 1960s malaria cases in urban areas started to multiply. As a result, in 1976, 6.45 million cases were recorded by the national malaria eradication programme (NMEP), highest since resurgence.

Malaria, at one time a rural disease, diversified under the pressure of developments into various ecotypes. These ecotypes have been identified as forest malaria, urban malaria, rural malaria, industrial malaria, border malaria and migration malaria. Further, malaria in the 1990s has returned with new features not witnessed during the pre-eradication days. These are the vector resistance to insecticides, exophilic vector behaviour, extensive vector breeding grounds due to urbanization and industrialization, resistance in *P. falciparum* to chloroquine and other anti-malarial drugs; and human resistance to chemical control of vectors.<sup>4</sup>

According to the world malaria report 2014, 22% (275.5m) of India's population live in high transmission (> 1 case per 1000 population) areas, 67% (838.9m) live in low transmission (0-1 cases per 1000 population) areas and 11% (137.7m) live in malaria-free (0 cases) areas.<sup>5</sup> In 2013, 0.88 million cases have been recorded, with 128 million tests being conducted on the suspected cases, with *P. falciparum* causing 53% and *P. vivax* causing 47% of the infections. The incidence of malaria in India accounted for 58% of cases in the South-East Asia Region of WHO.<sup>5</sup> At present, according to NVBDCP indicate 0.7-1.6 million confirmed cases and 400-1,000 deaths annually.<sup>6,7</sup> Given the magnitude of Malaria in our country antimalarial drugs should be supplied at government sectors and at private pharmacies at prices which will not create economic burden on the largely poor population. There are innumerable brands of antimalarial present in the market. Malaria can be extremely fatal if not treated promptly.

Patients from poor socioeconomic background must have access to the correct drug at the nominal price. Costly drugs can lead to economic burden which results in decreased compliance or even non-compliance. Non-compliance leads to incomplete treatment which tends to increase morbidity. There is a gross variation in the cost of different brands of same generic drugs available in India. Increase in the patient medication cost was found to be associated with decreased adherence to prescription medication.<sup>8</sup>

Cost analysis is the study in which comparison of costs of two or more alternative medication is made without regard to outcome.<sup>9,10</sup> Studies conducted in past show a wide variation in cost of branded and generic versions of same drug.<sup>11,12</sup>

Hence, the present study was conducted to evaluate the cost variation amongst the different brands of antimalarial drugs available in India.

## METHODS

Price in Indian rupees (INR) of antimalarial drugs manufactured by different pharmaceutical companies in India, in the same strength were obtained from Current index of medical specialties (CIMS) January to April 2017 and from Drug Today January to March 2017, Vol (2). The cost of 10 tablets/capsules and that of one ampoule/vial was calculated.

The cost ratio, calculated as the ratio of the costliest brand to that of the cheapest brand of the same drug, calculated as follows:

Cost ratio = Price of the costliest brand /Price of the least costly brand.

Percentage cost variation was calculated as follows:

Percent cost variation = (maximum cost - minimum cost/ minimum cost) X 100.

## RESULTS

The analysis of data showed a large variation in costs of different brands of antimalarial drugs available in india. The highest cost ratio and percentage cost variation was seen for Artemether injection 150mg/2ml (cost ratio = 16.96 and % cost variation = 1596). The lowest cost ratio was found for Artesunate 120 mg injection (cost ratio = 1.10 and % cost variation = 10.25). Overall the injectable antimalarial showed considerable cost ratio and cost variation for e.g. Artesunate 60 mg injection (4.06 and 306.69) followed by Artemether 80mg-1ml injection (2.69 and 169.83) respectively. The oral antimalarial on the other hand showed low cost ratio and cost variation for e.g. the maximum was seen for the Artemether+Lumefantrine combination (2.03 and 103.7) and the lowest was seen for Chloroquine 500 mg tablets (1.11 and 10.60).

## DISCUSSION

People living in developing countries pay heavy cost of medicines. In India, more than 80% health financing is borne by patients.<sup>13-15</sup> The situation becomes more complex due to the presence of number of brands with variety of names and prices.<sup>16</sup> The price variation assumes significance when the cost ratio exceeds 2 and percentage cost variation exceeds 100. By this fact the above analysis showed that there is not much significant price variation among oral antimalarial drugs. The maximum variation shown by oral antimalarial was found to be for fixed dose combination of Artemether and Lumefantrine (cost ratio>2 [2.03] and % price variation >100 [103.7]) while other oral drugs all showed cost ratio less than 2 and % cost variation less than 100. But there was significant price variation among injectable antimalarial for example there is significant cost ratio and

cost variation of Artemether injection 150mg/2ml (cost ratio = 16.96 and % cost variation = 1596).

Injectable antimalarials are often the choice of drug when dealing with critically ill malaria patients specially when suffering from complicated malaria. So, such significant price variation creates economic burden on poor patients. This often leads to non-compliance or abrupt cessation of

treatment which adds on the morbidity and mortality due to malaria.

The treating physician should be made aware of the cheapest drug available among the various brands so that the patient bears lesser burden of treatment cost. Costs of drug are controlled by the drug cost control order 2013 (DPCO).<sup>17</sup>

**Table 1: Drug costs, cost ratio and percentage cost variation of antimalarial drugs available in India.**

Drug	Dose	No. of brands	Maximum price (Rs.)	Minimum price (Rs.)	Cost ratio	% Cost variation
Artemether	Inj. 150mg/2ml-2ml	47	346.50	20.43	16.96	1596.03
	Inj. 75mg/ml-1ml	14	176.40	34.00	5.18	418.82
	Inj. 75mg/ml-2ml	07	66.00	45.71	1.44	44.38
Artemether	Inj. 80 mg-1ml	03	181.60	67.30	2.69	169.83
Artesunate	Inj. 60 mg	33	250.81	61.67	4.06	306.69
	Inj. 120 mg	03	467.50	424.00	1.10	10.25
	Tab. 50 mg x 10 tabs	14	304.75	190.00	1.60	60.39
Chloroquine	Tab. 250 mg x10	14	6.55	3.29	1.99	99.08
	Tab. 500 mg x10	03	12.52	11.32	1.11	10.60
	<b>Inj. 40 mg/ml</b>					
	2ml	02	4.30	2.90	1.48	48.27
	5ml	04	5.46	3.45	1.58	58.26
Mefloquine	30ml	06	17.83	12.90	1.38	40.54
	Tab. 250mgx10	06	566.67	383.33	1.47	47.83
Quinine sulphate	Tab. 100mgx10	03	28.00	20.00	1.4	40.00
	Tab. 300mg x10	14	69.25	42.25	1.64	63.90
	Tab. 600mg x10	06	111.00	97.00	1.14	14.43
Artemether+ Lumefantrine	Tab. 480+80 x10	12	458.33	225.00	2.03	103.70

## CONCLUSION

Ceiling cost of drugs are fixed by national pharmaceutical pricing authority (NPPA) government of India in accordance with DPCO 2013. Despite this there exists a wide variation of drug costs within one drug with the availability of various brands. Also, the national pharmaceutical pricing authority (NPPA) should act strictly to ensure that the prices of antimalarial drugs and their combinations are brought under control so that all patients irrespective of the economical class should be able to afford these medicines and get treated completely.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: The study was approved by the Institutional Ethics Committee*

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**Cite this article as:** Kumar L, Dinkar JK, Mohan L, Dikshit H. Cost variation analysis of antimalarial drugs available in India. *Int J Res Med Sci* 2017;5:4051-4.