

COST VARIATION STUDY OF VARIOUS ARTEMISININ FORMULATIONS AVAILABLE IN INDIAN MARKET

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ABSTRACT

Introduction: Artemisinin based therapy is nowadays drug of choice for complicated as well as uncomplicated P.falciparum malaria. In the Indian market various artemisinin group of drugs are available in different formulations. This creates a lot of problem with physician to decide the drug of choice for individual patients. **Objective:** To evaluate price variation of different Artemisinin formulations available in Indian market. **Materials and Methods:** Cost of a particular drug in the same strength and dosage forms being manufactured by different companies was obtained from “Current Index of Medical Specialties” (CIMS) Jan-Apr, 2015 and “Indian Drug Review” (IDR) Issue 1,2015. Difference between the maximum and minimum cost of the same drug manufactured by different pharmaceutical companies was calculated

and percentage cost variation was calculated. **Results:** Arteether injection(150mg/2ml) showed maximum price variation of 1001.32% while Artesunate inj.(50 mg) showed least variation in price. Percentage variation in cost was found to be 400% with Artesunate 50mg tab while minimum price variation was found with Syrup Artemether 20mg, Lumefantrine 120mg/5ml(60 ml). **Conclusion:** Our findings revealed that the prices of various Artemisinin derivatives shows great variation. Some measures must be taken by the government to bring about the uniformity in the price.

KEYWORDS: Artemisinins, Falciparum Malaria, Cost variation.

INTRODUCTION

Malaria is a major public health problem in India, accounting for sizeable morbidity, mortality and economic loss. Around 1.5 million laboratory confirmed cases of malaria are annually reported in India and 50% of cases reported is due to *P.falciparum*. One of the reasons attributed to rise in proportion of *P.falciparum* cases is resistance to chloroquine, which was used for a long time as the first line of treatment of malaria cases. *P.falciparum* infections are known to lead to severe malaria, if timely treatment with effective drugs is not administered.^[1]

According to the recent guideline on Diagnosis and treatment of Malaria 2013 [NVBDCP], artemisinin based therapy is the nowadays drug of choice for complicated as well as uncomplicated falciparum malaria.^[2] Artemisinin combination therapy (ACT) consists of an artemisinin derivative combined with a long acting partner antimalarial drug with a different mechanism of action.^[3]

In the developing countries like India, the cost of drugs is a major concern to both physician and patient and an important factor influencing compliance with treatment. Differential pricing could potentially be a very effective strategy to improve access to essential medicines in low and middle-income countries where most patients pay for medicines out-of pocket and therefore cannot afford the prices compared to high income markets.^[4] Drug price control order (DPCO) is an order issued by the government, to fix prices of drug. Once medicine is brought under DPCO, it cannot be sold at a price higher than that, fixed by the government. In India, in 1979, 80-85% of the drugs in the market were under price control and the number has slowly decreased in subsequent years. Among Artemisinin derivatives, only artesunate is included in DPCO,2013.^[5]

In the Indian market various artemisinins are available in different formulations. This creates a lot problem with physician to decide the drug of choice for individual patients. Also in the literature very less studies are available which compare the cost of drugs of different brands. So, we decided to carry out the study which compares prices of different Artemisinin derivatives.

MATERIALS AND METHODS

Cost of a particular drug in the same strength and dosage forms being manufactured by different companies was obtained from “Current Index of Medical Specialties” (CIMS) Jan-

Apr, 2015 and “Indian Drug Review” (IDR) Issue 1,2015. The drug prices available in CIMS & IDR were compared, as they are readily available source of drug information and are updated regularly. The drugs being manufactured by only one company or the drugs, price of which were not given in the CIMS and the IDR were excluded. Difference between the maximum and minimum cost of the same drug manufactured by different pharmaceutical companies was calculated

Percentage cost variation was calculated as follows:

$$\text{Cost Variation (\%)} = \frac{\text{Max cost} - \text{Min cost}}{\text{Min cost}} \times 100^{[6]}$$

RESULT AND DISCUSSION

Table1. Treatment of Complicated *P. falciparum* Malaria

Drug	Dose & Strength	Number of manufacturing companies	Minimum Cost(INR)	Maximum Cost(INR)	% Variation in Cost
Arteether injection	75mg/ml [1ml]	8	26.67	52	94.97
	75mg/ml [2ml]	8	45.71	90	96.89
	150mg/2ml	49[4*]	20.43	225	1001.32
Artemether injection	80mg/ml [1ml]	2	67.3	181.6	169.84
Artesunate injection	50mg [1 vial]	2	150	190	26.67
	60mg [1 vial]	35[6*]	61.67	230	272.95
	120mg [1 vial]	2	424	424	0

* Prices were not written.

The prices of artemisinin derivatives in treatment of *P.falciparum* malaria, available in different formulations were analyzed. These formulations are manufactured by different pharmaceutical companies. Table 1. shows price variation in treatment of complicated *P. falciparum* malaria. Arteether injection(150mg/2ml) shows maximum price variation of 1001.32% followed by Artesunate injection(60mg) which shows variation of 272.95% while Artesunate inj.(50 mg) shows least variation in price.

Table2. Treatment Of Uncomplicated P. falciparum Malaria

Drug	Dose & Dosage formulations	Number of manufacturing companies	Minimum Cost(INR)	Maximum Cost(INR)	% Variation in Cost
Artesunate	50mg[4Tab]	17[2*]	62.73	121.9	94.32
Artesunate	50mg[10Tab.]	8[1*]	40	200	400
Artemether 20mg, Lumefantrine 120mg	FDC[8 Tab.]	5[1*]	99	110	11.11
Artemether 40mg, Lumefantrine 240mg	FDC[6 Tab.]	10[1*]	92	118	28.26
Artemether 80mg, Lumefantrine 480mg	FDC[6 Tab.]	46[5*]	120	224	86.67
Artemether 20mg, Lumefantrine 120mg/5ml	30ml syrup	2	85	100	17.65
Artemether 40mg, Lumefantrine 240mg/5ml	30ml syrup	5[2*]	85	140	64.70
Artemether 20mg, Lumefantrine 120mg/5ml	60ml syrup	2	140	151	7.86
Artesunate (3 tabs) 200mg, Pyrimethamine 25mg & Sulphadoxine(3 tabs)500mg	1 kit	2	189	225	19.05

* Prices were not written.

Table 2. shows variation in the cost of Artemisinin used in treatment of uncomplicated P.falciparum malaria. Percentage variation in cost was found to be 400% with Artesunate 50mg tab. followed by Artemether 80 mg, Lumefantrine 480mg(86.67%) while minimum price variation was found with Syrup Artemether 20mg, Lumefantrine 120mg/5ml(60 ml).

Our findings revealed that the prices of various Artemisinin derivatives shows great variation. P. falciparum is a morbid condition which requires prompt treatment. So the cost of Artemisinins is the major deciding factor for the patients' compliance. The reasons for this price variation could be as follows:

1. Increase competition among the manufacturing companies
2. Government regulations and pricing policies
3. Cost of raw materials and promotion
4. Asymmetry of information or imperfect information

The implications of such price differences are

- a) In the absence of information on comparative drug prices and quality, it is difficult for doctors to prescribe the most economical treatment. The clinicians in addition to remembering the pharmacological and trade names also have to remember the prices of various brands. so decision-making is difficult.
- b) It is reported that the pharmacists do not dispense the same brand as prescribed by the doctor and try to substitute it with other alternatives, quoting the reason of non-availability. This is often done with vested interest for economic gains as some brands have a higher profit margin.
- c) Literate patients may buy cheaper brands of medicine and change the brand on their own. This may result in variation in bioavailability and response. ^[7]
- d) Expensive brands may pose greater economic burden on the patients which may lead to stoppage of the treatment in the middle of the disease which can be a important factor in the development of resistance in the future.

The Indian pharmaceutical industry has become a cornucopia of medicines with wide variation in prices for the same medicine marketed under different brand names and there is no system of registration of medicines. ^[7] There is a need for concerted action from regulatory authorities, doctors, pharmacists and general public at large to address this issue of antimalarial drugs price variation. Many doctors are not very conscious about price variation. So the treating physician must keep this factor in mind while prescribing appropriate brand drugs considering the financial background of the patient. There is a general feeling that a very low-priced drug although affordable may not fulfill the bioavailability standards expected of a good brand and a high-priced drug could be better. However, pricing does not give any assurance of the product's quality, although most of the companies are careful about quality control. It is felt that physicians could provide better services and reduce costs of drugs if information about drug prices was readily available. ^[8] Studies have shown that providing a manual of comparative drug prices annotated with prescribing advice to physicians reduced their patients' drug expense. ^[9] Hence, wherever possible a cheaper brand should be prescribed because the superiority of any particular brand over the others has never been proved scientifically. ^[8]

Pharmacoeconomics could also be introduced as a practical lesson to undergraduate medical curriculum, wherein students could be taught to use CIMS or MIMS for selecting the

cheapest available formulation of a particular drug. In this context, students would also come to realize the enormous difference in cost of the newer agents compared to the older drugs.^[10]

Currently, very few medicines are under drug prices control order(DPCO). Government should have a policy whereby the prices of branded-generic drugs can be made realistic and affordable to common man.^[11] We need to have legislation to that effect. Hence it is desired that the Government should bring all lifesaving and essential medicines under price control. At the hospital level authorities and concerned committees have to frame policies on these aspects. The situation can be improved by incorporating an analysis of prescription costs in the medical curriculum.

CONCLUSION

Our study shows that there is a wide price variation among the artemisinins manufactured by different companies. As India is endemic region for malaria, some measures must be taken by the government to bring about the uniformity in the price. It is recommended that the appraisal and management of marketed drugs should be directed toward maximizing the benefits of therapy and minimizing negative personal and economic consequences.^[12]

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