

COST ANALYSIS OF PRIMARY CARE ANAESTHETICS IN INDIAN MARKET: GENERIC VERSUS BRANDED

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ABSTRACT]

Objective: The aim of the study was to study the degree of compliance of primary care anesthesia dispensing companies in following the pricing norms set by drug price control order 2013 (DPCO).

Methods: This is an observational and analytical study where the dosage, strength, and ceiling price of the generic primary care anesthetics were obtained from the National pharmaceutical pricing authority updated price list 2022 and similar data of their various counterpart brands were obtained from www.medguideindia.com. Thereafter, comparisons of their ceiling price along with the brands cost range, cost ratio, and percent cost variation were sought.

Results: Our study retrieved 150 brands of total 11 injectable/topical primary care anesthetics available in India of which 39.33% brands had prices more than DPCO recommended ceiling price. Maximum price violation (90%) was noticed with brands of Inj. Midazolam 5 mg/mL. The maximum cost variation and cost ratio was seen with brands of Inj. Lignocaine 1–2% (10 mg/mL) of 148.37% and 149.37, respectively.

Conclusion: The adjuvant sedative hypnotic, Midazolam which is often used to supplement the action of primary sedative hypnotics in inducing general anesthesia, violating price ceiling is a matter of great concern as it would adversely impact the primary patient care; the most basic level of health care which almost whole population needs at some time or the other. Similarly adding to the misery of the common man is the maximum cost ratio and percent cost variation of the local anesthetic, Inj. Lignocaine 1–2% as it continues its prominence as the most widely used local anesthetic agent.

Keywords: Anesthetics, Primary care, Essential drug, Drug price control order.

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INTRODUCTION

Listing of medicines in National list of essential medicines (NLEM) 2022 with reference to the levels of healthcare, namely, Primary (P), Secondary (S), and Tertiary (T) healthcare signifies the essentiality of a particular drug in terms of its need as per the disease severity and consequent treatment complexities [1].

Of all the three health-care levels, the World Health Organization had recognized the primary healthcare (PHC) as the key role player for achieving health and well-being for all, at all ages. A stronger PHC is thus essential in achieving health-related Sustainable Development Goals and universal health coverage. India's 2017 National Health Policy therefore commits the government to invest a major proportion (>2/3rds) of resources to PHC providing whole-person care for health needs throughout the lifespan and not just for a set of specific diseases. Focusing on the drugs price control order of "primary care drugs" can in a way be a very useful tool to understand that to what extent, this "limb" of care, which addresses the broader determinants of health and focuses on the comprehensive and interrelated aspects of physical, mental and social health and well-being [2], is universally and economically accessible to the poorest of poor.

Moreover, choosing to study the cost regulation of the general, local, and pre-operative/short-term procedure anesthetics of the PHC over other drug categories of the same level, is to explore the actual vastness of the implicit unfair drug pricing practices and its impact on the economic feasibility of "procedural efficacies," that is, surgeries, which is considered as the highest level of medical expertise at the primary care level, self-implicating that if it is well regulated, then the rest of the things down the hierarchy would automatically fall in place. Furthermore, it would be an indirect indicator of a governance that is moving in the

right direction; achieving the goals of "universal" health coverage along with taking the healthcare to another level of self-reliance in specialized fields which are catered at the secondary and tertiary level of care.

To understand this, let's explore this fact that a drug which is labeled as a secondary and/or tertiary care level drug, may not be listed at the primary care level but all the primary care level drugs are listed at both the secondary and tertiary care levels. Thus, it is not hard to understand that the primary care level drugs are in fact very much there at all the three levels of care and thus constitute the major component of healthcare in spite of being the most basic entity. Hence, if this component of healthcare is taken care of, in terms of cost control, it will definitely have a good impact on overall health management.

Health management of a developing country like India, where accessibility to lifelong basic medical care to economically weaker sections, is primarily governed by its price control policies; therefore, even a slight laxity in governance can cause cost escalation defeating the goal of universal health coverage. To achieve this goal, National pharmaceutical pricing authority (NPPA) was constituted in 1997 as an attached office of the Department of Pharmaceuticals, Ministry of Chemicals and Fertilizers as an independent regulator for pricing of drugs and to ensure the availability and accessibility of medicines at affordable prices. It fixes/revises the prices of controlled bulk drugs and formulations and enforces prices and availability of the medicines in the country, under the Drugs (Prices Control) Order, 1995.

Drugs (Prices Control) Order, 1995 is an order issued by the Government of India under Sec.3 of Essential Commodities Act, 1955. For the purpose of implementing the provisions of drug price control order (DPCO), powers of the government have been vested in NPPA.

It is also important to note that all drugs marketed in the country aren't under price control except the drugs listed in the NLEM. The NLEM which is being updated from time to time is adopted as the primary basis for determining essentiality, which constitutes the list of scheduled medicines for the purpose of price control. As per the provisions of DPCO, NPPA fixes the ceiling price for medicines in the controlled category. The organization is also entrusted with the task of recovering amounts overcharged by manufacturers for the controlled drugs from the consumers [3].

Having known all the facts and challenges in the field of pharmaceuticals for primary care, we planned our study focusing on the cost analysis of the various brands of the primary care anesthetics mentioned in NLEM in India to assess the degree of compliance of these generic-brands with their ceiling prices given in the NPPA updated Price List 2022 [4]. Thus, our study had the following objectives: (A) to evaluate the variation in the prices of different brands of the same drug (primary care anesthetics) and (B) to compare the branded price of the formulations of different drugs with their corresponding ceiling price.

METHODS

The present, analytical, and observational study was conducted, from August to October 2022. First, the primary care anesthetics of primary care level were retrieved from the NLEM 2022. Then, the dosage, strength, and ceiling price (w.e.f 1.4.2022 with Wholesale Price Index @ 10.76607%) of primary care anesthetics (injectables/topical) was obtained from the NPPA updated price list 2022 [4]. For dosage and prices of the counterpart brands available in India, medguideindia.com [5] was chosen for data extraction. Those drug formulations were dropped from the study which had only a single brand. The cost of the drugs was enumerated in Indian rupees. Later, the drugs were categorized as per their mode of administration into general anesthetics, local anesthetics, and pre-operative/short procedure anesthetics. For each generic drug, all its available single generic brands from www.medlineindia.com were counted. Furthermore, the price range (minimum cost – maximum cost) for each formulation was tabulated.

Percentage of brands with cost more than the DPCO ceiling price was derived using the given formula

$$\frac{\text{Nos. of brands with price} > \text{DPCO ceiling price} \times 100}{\text{Total number of brands}}$$

Cost ratio, the ratio of the cost of the costliest to the cheapest branded formulations of the same drug, which tells us by how many times the cost of the most expensive drug is higher than the cheapest one for each of the drugs considered for evaluation was derived using the formula

$$= \frac{\text{Maximum cost of drug A of brand} \times \text{minimum cost of drug A of brand Y}}{[6]}$$

Percentage cost variation is the indicator of what you expected to spend versus what you actually spent. It can be positive variance or negative variance and is calculated as follows:

$$= \left\{ \frac{[\text{Max. brand price of drug A} - \text{min. brand price of drug A}]}{\text{Min. brand price of drug A}} \times 100 \right\} [6]$$

All the above derived values were then tabulated and subsequently interpreted both as under a combined heading of "Anaesthetics" as well as under multiple heads as general anesthetics, local anesthetics, and pre-operative/short-term procedure anesthetics.

Statistical analysis

The data obtained from the mentioned sources [1,4] were analyzed using Microsoft Excel® 2019 software. The data were expressed in discrete or continuous values or percentages and the results have been shown in a table, bar charts, a line graph, and a scatter plot.

Ethical clearance

Was not required.

RESULTS

As per the NPPA updated price list, a total of six anesthetics (topical/injectables) of three categories (general, local, and pre-operative/short-term procedure anesthetics) with their cumulative 11 different formulations were selected for the study. A total of 150 brands for all 11 formulations of three categories of single generic brand primary care anesthetics were retrieved out of which 59 (39.33%) brands were found to have prices more than DPCO recommended ceiling price while 91 (60.67%) brands had prices less than their commended limit (Table 1).

It was observed that the maximum number of brands that were available in the market were of Inj. Ketamine HCl 50 mg/mL (34 brands) followed by Inj. Lignocaine 1–2% (25 brands) and Inj. Midazolam 1 mg/mL (24 brands). The minimum number of brands available in the market was for Inj. Morphine 10 mg/mL with just three brands (Fig. 1).

Maximum cost ratio was for Inj. Lignocaine 1–2% (149.37) followed by Inj. Ketamine 10 mg/mL while minimum cost ratio was for Inj. Morphine 10 mg/dL (1.42) (Fig. 2).

Maximum price violation was noticed with Inj. Midazolam 5 mg/mL with nine out of 10 brands being sold above DPCO price (90%) followed by Inj. Propofol 10 mg/mL (68.42%) and Inj. Thiopentone 1 g (powder) where four out of eight brands were being sold above DPCO recommended price (50%). Inj. Ketamine HCl 10 mg/mL showed the least, that is, (non-zero) violation of price from the DPCO ceiling limit, that was 9.09%. and the minimum/no price violation was seen with Inj. Morphine 10 mg/mL (0%). Thus, three drug formulations were found to have more than 50% of brands having selling prices above the recommended DPCO price although all drug formulations except Inj. Morphine 10 mg/mL, violated DPCO ceiling price (Table 1) (Fig. 3).

The maximum percent cost variation was seen in Inj. Lignocaine 1–2% (14837%) and the lowest cost variation was seen in Inj. Morphine 10 mg/mL (42.85%) with no brands above DPCO price (Fig. 4).

A moderately strong positive correlation ($r=0.36$) was seen between the number of brands and % cost variations.

Of the five general anesthetic formulations, Inj. Ketamine 10 mg/mL had maximum cost ratio and % cost variation with Inj. Propofol 10 mg/mL with maximum percentage of cost violation brands.

Of the two local anesthetic formulations, Inj. Lignocaine HCl 1–2% had maximum cost ratio and % cost variation with Topical lignocaine HCl 2–5% with more cost violation brands.

Of the four pre-operative/short-term procedure anesthetic formulations, Inj. Midazolam 1 mg/mL had maximum cost ratio and % cost variation with Inj. Midazolam 5 mg/mL with maximum percentage of cost violation brands (Table 1).

DISCUSSION

In our study, the maximum number of brands available in the Indian market were of the three primary care anesthetic formulations (Inj. Ketamine HCl 50 mg/mL followed by Inj. Lignocaine 1–2% and Inj. Midazolam 1 mg/mL.) which strategically belonged to three different categories of anesthetic agents, that is, general versus local versus pre-op/short procedure and all did correspond with their wide usage at all level of healthcare in India, that is, primary, secondary, and tertiary.

Inj. Ketamine being a very versatile inexpensive drug, playing an invaluable role in the developing world where access and funding for a

Table 1: Cost comparison of single generic brands of primary care anesthetic formulations (NLEM) to DPCO price list

Drug	Dosage form and strength#	DPCO price## (w.e.f. 1.4.22)	Range (Min-max) (Rs/unit)	No. of brands	%Brands with price>DPCO	Cost ratio	%Cost variation
General anesthetics							
Ketamine HCL	Inj. 10 mg/mL	11.76	1.50-126.0	11	9.09	84	8300
	Inj. 50 mg/mL	11.61	5.00-28.80	34	35.29	5.38	476
Propofol	Inj. 10 mg/mL	8.02	5.48-17.43	19	68.42	3.18	218.06
Thiopentone	Inj. powder 0.5g	45.23	30.00-52.20	07	28.57	1.74	74
	Inj. powder 1 g	54.87	40.00-87.00	08	50.00	2.17	117.5
Local anesthetics							
Lignocaine HCL	Topical 2-5%	1.20	0.72-16.61	12	41.66	23.06	2206
	Inj. 1-2%	1.10	0.16-23.90	29	17.24	149.37	14837
Pre-operative/short-term procedure anesthetics							
Midazolam	Inj. 1 mg/mL	6.56	4.14-9.00	25	48	2.17	117.39
	Inj. 5 mg/mL	16.12	6.35-37.80	10	90	5.95	495
Morphine	Inj. 10 mg/mL	26.37	17.50-25.00	3	0	1.42	42.85
	Inj. 15 mg/mL	32.91	22.00-42.85	4	25	1.94	94.77

NLEM 2022, ## Source – NPPA updated price list 2022

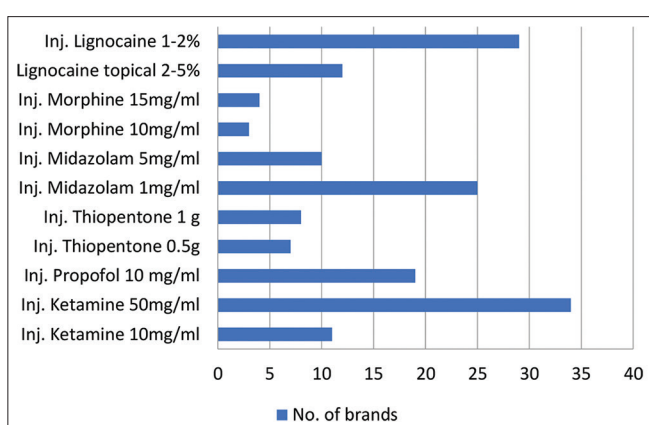


Fig. 1: Number of brands of primary care anaesthetics in Indian market

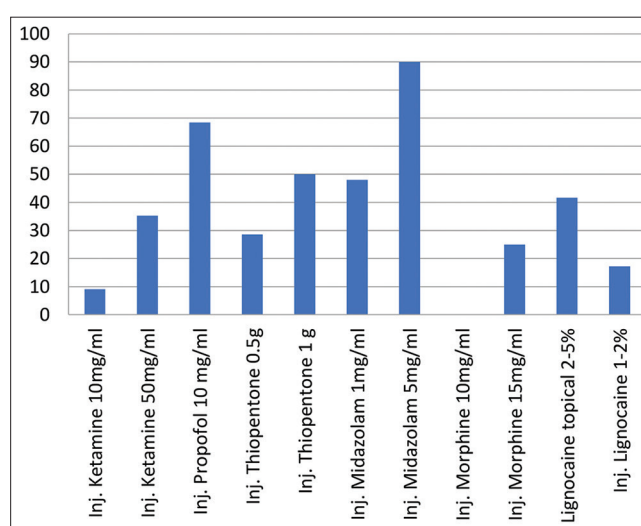


Fig. 3: %Brands of primary care anaesthetics with price > DPCO

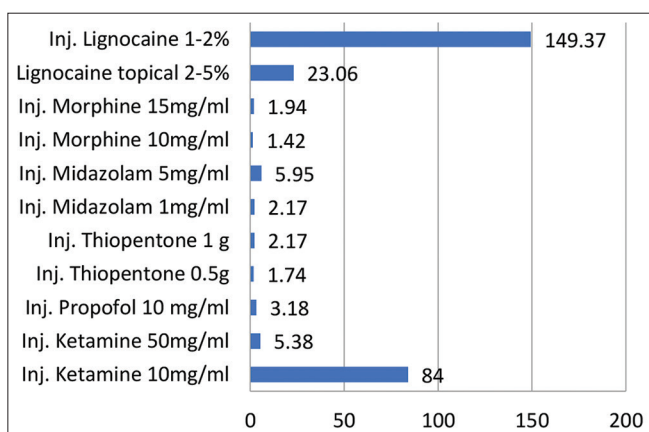


Fig. 2: Cost ratio of primary care anaesthetics

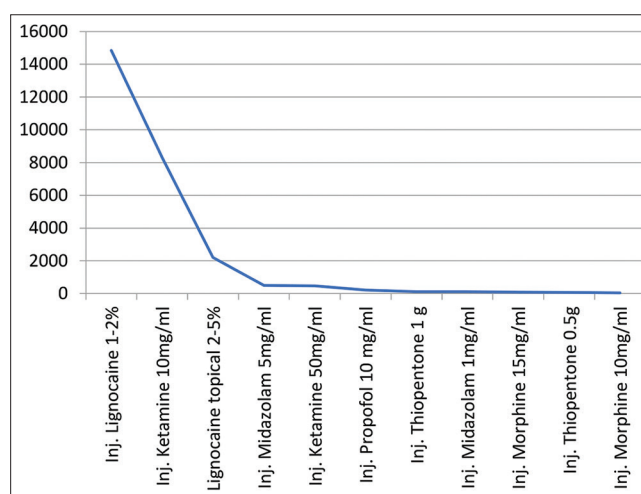


Fig. 4: Cost variation of primary care anaesthetics

wider range of drugs is problematic, through its broad range of clinical applications is ideal for use. Its good safety profile and ease of storage makes it ideal for use in areas where refrigerators, complex monitoring, electricity, and oxygen may all be in short supply or unreliable [7]. It shows hypnotic (sleep-producing), analgesic (pain-relieving), and amnesic (short-term memory loss) effects all at the same time; which no other drug used in clinical practice could provide [8]. Thus, this might be the reason why this drug is manufactured more and in high dosage formulations (50 mg/mL) which is recommended to prepare diluted solutions for infusion purposes rather than 10 mg/mL injection vial which is not recommended for dilution [9].

Likewise, Inj. Midazolam because of its water-soluble nature, has a rapid onset of action and can be used to manage status epilepticus when intravenous administration of other medications is not feasible. It has a high rate of tolerance, can be used for anxiolysis and hypnosis and is superior to thiopental in the maintenance of anesthesia because of the less need for adjunct medications. Midazolam is also

an adjunct medication to regional and local anesthesia for a wide range of diagnostic and therapeutic procedures and has greater patient and physician acceptance [10-12]. These facts make a strong ground for more manufacturing units and thus more brands of this drug. Furthermore, as its recommended initial IV and IM doses are low (0.5 mg, 0.025–0.05 mg/kg, respectively) which are slowly up titrated as needed or are reduced in concomitant administration of narcotics [13] or in adults over 60 years of age, debilitated, or chronically ill patients [14], there is hardly any surplus need of high dose formulations (5 mg/mL) of Inj. Midazolam, low dose formulation brands thus being manufactured more.

Similarly, Inj. Lignocaine being one of the safest short-acting anesthetic agents is the most commonly used local anesthetic for the minor surgical procedures [15] thus paving the way to manufacturing on a large scale by multiple brands.

Adding to the maze of which brand to choose from, the maximum cost ratio and percent cost variation of this local anesthetic (Inj. Lignocaine 1–2%) has further baffled the human brains (Fig. 2). Where by setting an example, Inj. Morphine as the best controlled drug in terms of cost ratio, percent cost variation, and ceiling cost violation has built the common man's faith on the laws of the system. It is undeniably the result of extreme vigilance because of it being one of the most common abusive drugs [16].

Although the Government of India, to overcome, all the problems of drug cost have worked in the direction of increasing the availability of generic medicines to the population through the launch of Jan Aushadhi Scheme in 2008 but lack of support from the state government, flawed supply chain and its poor management, non-prescription of generic medicines, poor perspectives, and lack of awareness defeated its purpose on the long run [17].

The impact of the number of brands of a particular drug formulation on the price was also explored (Fig. 5). A moderate positive correlation found between the two parameters, suggested that the number of brands have a moderate impact on cost variation. Since this study was focused mainly on commonly used anesthetics used for primary care (NLEM), this might not be applicable as a universal fact. Only larger pharmacoeconomic analyses involving other therapeutic classes can help to see the broader perspective. The cause of the drug ceiling cost violation is generally justified by the add on costs due to cost dependent manufacturing, import duty, etc. to escape any posed penalty. Besides, such cost variations have been observed previously among other groups of drugs [18-20] as well but to the best of our literature search, we did not find any study on cost variance of anesthetics of primary care to compare or comment upon.

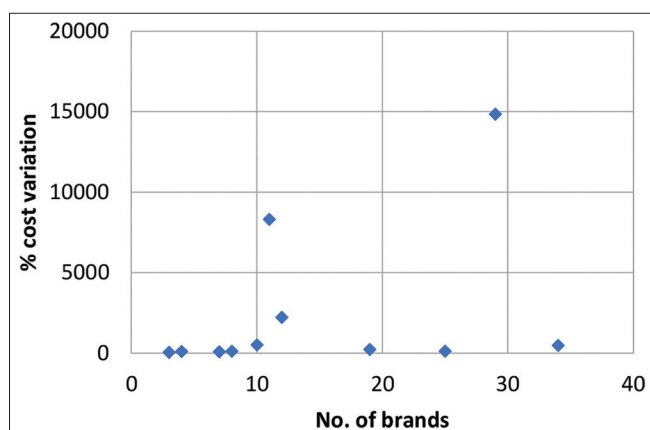


Fig. 5: A scatter plot showing the correlation between the number of brands and the cost variation percentage (Correlation coefficient, $r=0.36$)

CONCLUSION

This drug pricing analysis is certainly an eye-opener to the policy and law makers to tighten their reins on the increasing variance of drug price. Market governed pricing as recommended by several committees seems a right choice in nation like ours which is democratic as well as developing. Only a strong and well-balanced PHC can cater to the needs of the vast population of India where people belonging to lower middle class constitute a major proportion. The three-prong approach of (a) Moral consciousness on part of pharmaceutical companies and prescribing physicians, (b) practitioners' awareness about the pricing variation of similar drug formulations, and (c) a strong legal hold on the cost pricing malpractice is the need of the hour. "Rational prescribing" which consists of prescribing the right drug at the right dose and right formulation for the right duration and at the right price, which the concerned patient can afford [21] can only be possible with this three-prong approach.

AUTHORS CONTRIBUTION

- Preeti Kanawjia (Guarantor) – concept, design, definition of intellectual content, data acquisition, data analysis, statistical analysis, manuscript preparation, manuscript editing, and manuscript review
- Anupama Gupta – literature search and manuscript review
- Madhu Chaudhary – literature search and manuscript review.

CONFLICTS OF INTERESTS

None declared.

AUTHORS FUNDING

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