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# **Cost variation analysis of various non-steroidal anti-inflammatory drugs available in the Indian market**

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**Abstract**---Background: Non Steroidal Anti Inflammatory Drugs (NSAIDs) are used to treat a variety of conditions associated with pain and inflammation. Analysis of price variation among different brands of NSAIDs provides a guide for cost - effective prescribing and helps to reduce the financial burden on the patient and improves patient compliance. Aim: To analyze price variation of various single NSAID's formulations available in the Indian market. Material & Methods: Price of NSAIDs manufactured by different pharmaceutical companies in India of same strength was obtained from Current Index of Medical Specialties, January-March 2022. Difference between maximum and minimum price of the same formulation, cost ratio and percentage cost variation was calculated. Results: Large price variation was seen with Celecoxib 100mg capsule (476.6%) followed by Celecoxib 200mg capsule (402.3%), Nimesulide 100mg tablet (358.33%) and Paracetamol 500mg tablet (285.06). Price variation was lowest for

Mefenamic acid 250mg tablet (8%). Among the syrup formulations, it was seen that there was a price variation of 29.5% for Paracetamol 125mg/5ml, 54.15% for Ibuprofen 100mg/5ml and 37.1% for Mefenamic acid 100mg/5ml. Among the injectable NSAID's, price variation was maximum for Diclofenac 75mg/ml (441.39%). Diclofenac 1%w/w 30gm gel showed price variation of 264.86% among the topical NSAID's. Conclusion: There is a wide cost variation among different brands of NSAIDs available in India.

**Keywords**---cost variation analysis, non steroidal anti inflammatory drugs, generic drugs.

## Introduction

NSAIDs are one of the most commonly used drugs worldwide for their analgesic, anti-inflammatory, and anti-pyretic therapeutic properties.<sup>1</sup> The data of global and Indian studies showed that the total number of NSAIDs prescription ranges from 15% to 40%.<sup>2</sup> As stated by the WHO, rational use of drug requires that patients receive medication appropriate to their clinical needs, in doses that meet their own individual requirements for an adequate period and at the lowest cost to them and their community.<sup>3</sup> Generic medicines are copies of brand medicines in terms of dosage, side effects, safety, risks, route of administration, strength as well as efficacy. Generic drug differs from the brand drug only in non essential characteristics such as colour, taste and packaging<sup>4</sup>

Generic drugs provide the opportunity for major savings in healthcare expenditure since they are usually substantially lower in price than the innovator brands.<sup>5</sup> However, physicians are apprehensive regarding the quality of generic drugs.<sup>6,7</sup> Indian pharmaceutical industry is one of the largest pharmaceutical markets in the world having large number of branded formulations and generic brands of the same drug with a large difference in their selling price.<sup>8</sup> A systematic review of 38 randomized controlled trials of generic and brand-named cardiovascular drugs concluded that they were clinically equivalent.<sup>9</sup>

The code of ethics for doctors by Medical Council of India, mentions that "Every physician should, as far as possible, prescribe drugs with generic names."<sup>10</sup> In India, the cost of the drug determines patient's access to medicines. There are limited studies in India on cost variation analysis of NSAID's. Hence, the present study was carried out to analyze the price variation among different NSAIDs available in the Indian market to facilitate better accessibility of patients to drugs.

## Materials and Methods

The cost of various Non Steroidal Anti Inflammatory Drugs (NSAIDs) available in the same strength and dosage forms manufactured by different companies was obtained from Current Index of Medical Specialties (CIMS) January - March 2022. The cost of the all the NSAIDs was estimated for an average of ten tablets.

**Inclusion criteria**

- NSAID's which are available as individual preparations.
- NSAID's manufactured by two or more pharmaceutical companies.

**Exclusion criteria:**

- The drugs being manufactured by only one company.
- Fixed dose combinations(FDC) of NSAID's.

Cost ratio was calculated by dividing the maximum cost by minimum cost of the various brands of the same drug.

Percentage cost variation was calculated as follows:

Percentage cost variation = maximum cost – minimum cost / minimum cost x 100

**Statistical Analysis**

Data were analyzed using percentages and proportions.

**Results**

We have evaluated the cost of 12 NSAID's which are available in 39 different formulations and manufactured by different pharmaceutical companies. Large price variation was seen with Celecoxib 100mg capsule (476.6%) followed by Celecoxib 200mg capsule (402.3%), Nimesulide 100mg tablet (358.33%) and Paracetamol 500mg tablet (285.06). Price variation was lowest for Mefenamic acid 250mg tablet (8%), followed by Mefenamic acid 100mg/5ml suspension and Paracetamol 250 mg/5 ml (29.5%). (Table 1). Among the syrup formulation for NSAID's, it was seen that there was a price variation of 29.5% for Paracetamol 125mg/5ml, 54.15% for Ibuprofen 100mg/5ml and 37.1% for Mefenamic acid 100mg/5ml. Thus for all syrup formulations price variation was <100%. Paracetamol drops 100mg/ml showed a price variation of 235.73% (Table 1).

Table 1: variation in cost- oral NSAID's

DRUG	STRENGTH & FORMULATION	MAXIMUM COST (INR)	MINIMUM COST (INR)	COST RATIO	PRICE VARIATION (%)
PARACETAMOL	500mg Tablet	33	8.57	3.85	285.06
	650mg Tablet	34	14	2.42	142.8
	1000mg Tablet	45	22	2.04	104.5
	125mg /5ml	22.85	17.04	1.34	34.09
	Syrup	39.50	30.50	1.29	29.5
	250mg/5 ml	28	8.34	3.35	235.73
	Syrup 100mg/ml drops				

ACECLOFENAC	100mg Tablet	52	14.48	3.59	259.11
	100mg FC	46.80	20.90	2.21	123.9
	200mg SR	75.75	30	2.52	152.5
DICLOFENAC	50mg Tablet	22	8.55	2.57	157
	50mg EC	63	14.09	4.47	347.1
	75mg SR	85.80	34	2.52	152.35
	100mg SR	74.77	25	2.99	199.08
IBUPROFEN	400mg Tablet	9.13	6.34	1.44	44
	100mg/5ml Suspension	13.18	8.55	1.54	54.15
MEFENAMIC ACID	100mg Dispersible tablet	17.90	16	1.18	11.87
	250mg Tablet	21.42	19.80	1.08	8.1
	500mg Tablet	27.50	24	1.14	14.58
	100mg /5ml Suspension	34.64	25.25	1.37	37.1
PIROXICAM	20mg Tablet	44	20	2.2	120
	20mg Dispersible tablet	60	30	2	100
MELOXICAM	7.5mg Tablet	22	10.92	2.01	101.46
CELECOXIB	100mg Capsule	121.10	21	5.76	476.6
	200mg Capsule	209.50	41.70	5.02	402.3
ETORICOXIB	60mg Tablet	95	45	2.11	111.11
	90mg Tablet	165	49.5	3.33	233.3
	120mg Tablet	240	72.5	3.31	231.03
KETOROLAC	10mg Tablet	70	25	2.8	180
NIMESULIDE	100mg Tablet	55	12	4.58	358.33
	100mg Dispersible tablet	52	20	2.6	160
	56	22	2.54	154.54	
	200mg Tablet				
ETODOLAC	400mg Tablet	135	79.84	1.69	69

SR: Sustained release

FC: Film coated

Minimum price variation is also seen with syrup formulation of Paracetamol 250 mg/5 ml (29.5%). Thus, formulations of paracetamol show maximum price variation. Among the injectable NSAID's, price variation was maximum for Diclofenac 75mg/ml (441.39%) and least for Aceclofenac 150mg/ml (60%) (Table 2)

Table 2: variation in cost- injectable NSAID's

DRUG	STRENGTH & FORMULATION	MAXIMUM COST (INR)	MINIMUM COST (INR)	COST RATIO	PRICE VARIATION (%)
PARACETAMOL	1000mg (100ml) Infusion	371	180	2.06	106.11
ACECLOFENAC	150mg(1ml) Injection	24	15	1.6	60
DICLOFENAC	25mg /ml (3ml) Injection	11.18	3.75	2.98	198.13
	75mg/ml (1ml) Injection	24.85	4.59	5.41	441.39
PIROXICAM	20mg/ml Injection	40	18	2.22	122.2
	40mg/2ml Injection	25	14.50	1.72	72.41
KETOROLAC	30mg (1ml) Injection	32.50	14.50	2.24	124.13

Diclofenac 1%w/w 30gm gel showed price variation of 264.86% among the topical NSAID's (Table 3).

Table 3 : variation in cost- topical NSAID's

DRUG	STRENGTH & FORMULATION	MAXIMUM COST (INR)	MINIMUM COST (INR)	COST RATIO	PRICE VARIATION (%)
DICLOFENAC	1%W/W 30gm gel	135	37	3.64	264.86

## Discussion

This study was carried out with the objective of analyzing the percentage price variation among NSAID's of different brands available in the Indian market. 31 dosage formulations of NSAID's have price variation of 100% or more than 100%. This leads to a forced economic burden on the patient. There are 12 NSAID's available in 39 different formulations in the Indian market. Only 5 NSAID's with 16 formulations have been included in National List of Essential Medicines (NLEM) 2015. These are Acetyl salicylic acid, Diclofenac, Ibuprofen, Mefenamic acid and Paracetamol.<sup>11</sup>

In our study, large price variation was seen with Celecoxib capsule, Nimesulide, Paracetamol and Diclofenac which are commonly prescribed NSAID's. Various studies show that there is high frequency of use for paracetamol, followed by diclofenac, aceclofenac, ibuprofen, and ketorolac.<sup>2</sup> Another study done by Gupta K et al<sup>12</sup> revealed large price variation for Nimesulide 100 mg (5476.74), Piroxicam DT 20 (3071.46), Piroxicam 20 mg (2853.36), Diclofenac 50 mg

(2786%), Aceclofenac 100 mg (2345.6%), and Ibuprofen 400 mg (1198.70%) In a study done by Patel BS<sup>13</sup> et al highest price variation was seen with Diclofenac, Nimesulide, Paracetamol and Aceclofenac. Drug prices are controlled according to Drug Price Control Order 2013 (DPCO). Ceiling price of drugs are fixed by National Pharmaceutical Pricing Authority (NPPA), government of India in accordance with DPCO 2013.<sup>13</sup>

If a particular drug is a component of NLEM then the price of that drug is covered under the Drug Price Control organization (DPCO) 2013<sup>14</sup>. There should be inclusion of more number of NSAID's in NLEM which can lead to availability of more cost effective treatment options. To facilitate ease of prescribing for physician regarding cost variation of different brands of the same drug, provision of a manual having relevant information on comparative drug costs can be done.

### **Limitations**

- FDC of NSAID's have not been included in this study.
- Only CIMS has been used to compare the costs of various brands.
- Price of generic drugs available in the market has not been considered.

### **Conclusion**

There is presence of large number of brands of NSAID's in the Indian market with a wide cost variation. Inclusion of Pharmacoeconomics concepts in the medical curriculum will help doctors in prescribing cost effective drugs to patients. Government should also enforce more stringent measures in regulating costs of those drugs also which are not included in NLEM. This will lead to marked reduction in health care costs and better patient compliance for a healthier India.

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