



## Original Article

## Cost Analysis Study of Topical Anti-Acne Drugs Currently Available in Indian Pharmaceutical Market

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## ABSTRACT

*Acne vulgaris* is a chronic inflammatory skin disease that affects approximately 90% individuals between puberty and 30 years of age at some point with peak prevalence in adolescence. According to Global Burden of Disease study conducted in 187 countries in 2010, acne is among top ten most prevalent disease worldwide and skin conditions are top cause of years lived with disability. The aim of the study was to analyze cost variations of different brands of topical medications used in *Acne vulgaris* in India. This analytical study was conducted in the Department of Pharmacology at Assam Medical College and Hospital over a period of 3 months. “Current Index of Medical Specialities (CIMS)” April - July, 2023 and “Drug Today India April - July 2023” drug manuals were used to compare cost of different formulations of topical acne medications. Drugs manufactured by only 1 company were excluded. Cost ratio (Maximum cost/ Minimum cost) and percentage cost variation ( $\frac{\text{Max cost} - \text{Min cost}}{\text{Min cost}} \times 100$ ) were calculated. For single preparations, the percentage cost variation was maximum for Clindamycin 1% 20 grams gel (1126.66%) with maximum cost ratio followed by Tretinoin 20 gm 0.025% (cream) 721.428. Percentage cost variation was minimum with Adapalene 0.1 % cream 15gm (32.69). Among the combination topical drugs, the percentage cost variation was maximum for Clindamycin 1% + Adapalene 0.1% 15 grams gel (1843.589) and it had maximum cost ratio of 19.43. Percentage cost variation was minimum with combination of Benzoyl Peroxide 2.5% + Clindamycin 1% 20gm gel(41.025). This study highlights price variation among different brands of drugs in CIMS, Drug Today and Pharma Sahi Daam app.

**Keywords:** Cost Analysis; Acne vulgaris; Percentage Cost Variation; Pharma Sahi Daam

## INTRODUCTION

*Acne vulgaris* (AV), often known as acne, is a skin condition affecting the pilosebaceous unit of skin in humans. It results in inflammatory lesions such as papules, pustules, and nodules, as well as non-inflammatory lesions including open and closed comedones with variable degrees of scarring<sup>1</sup>. It is marked by pilosebaceous gland inflammation and blockage. Acne mostly affects the face, although it can also affect the chest, upper arms, trunk, and back<sup>2</sup>.

*Acne vulgaris* can be graded with a simple grading system taking into account the predominant lesion to grade acne, it classifies acne vulgaris into four grades<sup>3</sup>.

Grade 1: Comedones, occasional papules

Grade 2: Papules, comedones, few pustules

Grade 3: Predominant pustules, nodules, abscesses

Grade 4: Mainly cysts, abscesses, widespread scarring

*Acne vulgaris* is commonly observed in adolescents and young adults. According to estimates, the prevalence rates among teenagers range from 35% to over 90%. When a person has preadolescent acne, the condition can naturally start as early as age 7 or 12 and go away by the time they reach their third decade of life. Acne can, however, sometimes linger into adulthood or even appear for the first time in age<sup>4</sup>. Quality of life issues are a very important concern for individuals (especially teenagers) with acne. Patients who have acne are more likely to experience depression, anxiety, and low self-esteem<sup>5</sup>.

Skin disease is one of the most common human illnesses and causes a huge disease burden globally. It affects between 30% and 70% of people worldwide and is prevalent across

all age groups and cultural contexts. In the global burden of disease study 2017, skin diseases ranked 10th whereas according to age-standardised years lived with disability<sup>6</sup>.

Pharmacoeconomics can be a significant factor in developing nations, where financial hardship can result in non-compliance and therapeutic failure, since it plays a major role in prescribing of medicines. The selection of a medication based on its effectiveness, side effect profile, patient preference, and cost determines the outcome of the treatment. The Indian pharmaceutical industry is expanding at a very fast rate and as a result, there are many different companies producing branded generics which make upto 70-80% of the retail market<sup>7</sup>. It can be seen that there is significant price fluctuations in same formulations of the different brands<sup>8</sup>. Due to these price differences, it makes the prescriptions not affordable to many and mostly in the conditions which have a long course of treatment. According to the 'Market Study On The Pharmaceutical Sector In India' data in July 2020, in the dermatology sector there were a total of 281 formulations, 4227 brands and 15 brands per formulation<sup>7</sup>.

As prescribing by brand name is common in India, it is important that both the clinician and the patient are aware of these differences in price of the drugs they choose and make an informed decision with mutual consent. Limited studies are available in Indian scenario which compare the cost of different brands of drugs for *acne vulgaris*. Hence the present study was carried out for cost variation analysis of the available topical treatment of *acne vulgaris*.

## MATERIALS & METHODS

This analytical study was conducted in the Department of Pharmacology at Assam Medical College and Hospital over a period of 3 months. "Current Index of Medical Specialities (CIMS)" April-July, 2023 and "Drug Today India April – July 2023" drug manuals was used to compare cost of different formulations of topical acne medications. There were no patients involved and the data was taken from Drug Formularies in the study. The approval from Institutional Ethics Committee was taken.

A total of Minimum and maximum cost in INR of various topical medications used in treatment of *Acne vulgaris* of same strength and formulation were obtained from the above mentioned drug manuals and "Pharma Sahi Daam" mobile app (developed by National Pharmaceutical Pricing Authority, Ministry of Chemicals and Fertilizers, Government of India and launched in August 2016). Various drugs with same strength and formulations were included for the study. Considering the variation in packaging cost, formulations of same quantity were compared. Drugs manufactured by only 1 company were excluded. Gels, ointments, lotions and creams were compared separately. All costs are given in Indian rupees (INR). The cost ratio & the cost variation of the formulations have been compared using

the following formulas<sup>9-11</sup>:

$$\text{Cost ratio} = \frac{\text{Highest cost}}{\text{Lowest cost}}$$

$$\text{Cost Variance} = \frac{\text{Price of the most expensive brand} - \text{Price of the least expensive brand}}{\text{Price of the least expensive brand}} \times 100$$

The total number of brands for a particular drug or combination was obtained by adding the number of individual brands for its various preparations & strength. Drug preparations with a single brand or having more than one brand but with no price difference was not included. To compare the prices of brand drug with generic drug, the prices of the JanAushadhi were used as source for generic drug price<sup>12</sup>.

## RESULTS

A total of 25 formulations of various topical medications used in *acne vulgaris* were compared. It included 14 monotherapy preparations of 7 different drugs and 11 FDCs of 5 different drug combinations. Wide variation in prices of same medications was found in this study manufactured by different companies across various brands.

On comparing the percentage cost variation of single topical anti-acne preparations, it was found that the highest cost variation was seen with Clindamycin 20gm 1%(gel) i.e. 1126.66, followed by Tretinoin 20gm 0.025% (cream) 721.428 and Nadifloxacin 10gm 1% (cream) 614.285. The cost ratio of the same were as follows respectively 12.26, 8.21 and 7.14.

Percentage cost variation was minimum with Adapalene 0.1 % cream 15gm (32.69) with cost ratio of 1.32, minimum cost of INR 65 & maximum cost of INR 86.25 followed by Tretinoin 0.025% 20gm gel (50) with cost ratio of 1.5, minimum cost was INR 80 and maximum cost was INR 120.

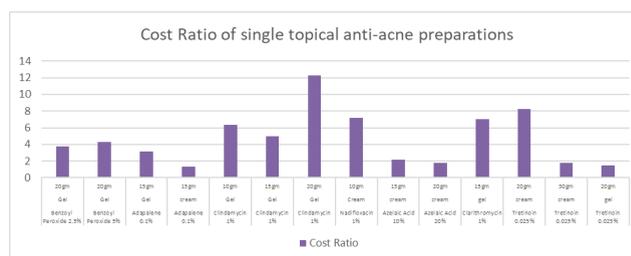
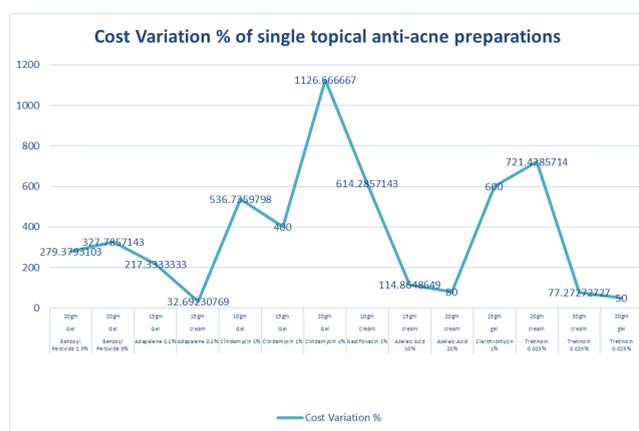


Fig. 1: Cost Ratio of single topical anti-acne preparations

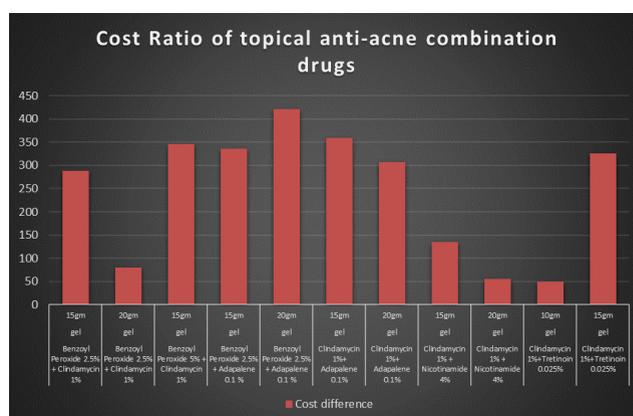
Among the combination topical drugs, the percentage cost variation was maximum for Clindamycin 1% + Adapalene 0.1% 15 grams gel (1843.589) and it had maximum cost ratio of 19.43. This drug's minimum cost was INR 15.87 and maximum cost was INR 90. The next maximum percentage cost variation was observed for Clindamycin 1% + Adapalene 0.1% 20gm gel(713.488) with cost ratio of

**Table 1: Percentage cost variation of different single drug formulations of topical medications used for acne**

| Sl.No | Drug                  | Formulation | Amount | Minimum cost (INR) | Maximum cost (INR) | Cost difference | Cost Ratio | Cost Variation % |
|-------|-----------------------|-------------|--------|--------------------|--------------------|-----------------|------------|------------------|
| 1     | Benzoyl Peroxide 2.5% | Gel         | 20gm   | 29                 | 110.02             | 81.02           | 3.793      | 279.37           |
| 2     | Benzoyl Peroxide 5%   | Gel         | 20gm   | 42                 | 179.67             | 137.67          | 4.277      | 327.78           |
| 3     | Adapalene 0.1%        | Gel         | 15gm   | 75                 | 238                | 163             | 3.173      | 217.33           |
| 4     | Adapalene 0.1%        | cream       | 15gm   | 65                 | 86.25              | 21.25           | 1.326      | 32.69            |
| 5     | Clindamycin 1%        | Gel         | 10gm   | 15.87              | 101.05             | 85.18           | 6.367      | 536.73           |
| 6     | Clindamycin 1%        | Gel         | 15gm   | 65                 | 325                | 260             | 5          | 400              |
| 7     | Clindamycin 1%        | Gel         | 20gm   | 18.75              | 230                | 211.25          | 12.266     | 1126.66          |
| 8     | Nadifloxacin 1%       | Cream       | 10gm   | 28                 | 200                | 172             | 7.142      | 614.28           |
| 9     | Azelaic Acid 10%      | cream       | 15gm   | 148                | 318                | 170             | 2.148      | 114.86           |
| 10    | Azelaic Acid 20%      | cream       | 20gm   | 150                | 270                | 120             | 1.8        | 80               |
| 11    | Clarithromycin 1%     | gel         | 15gm   | 10                 | 70                 | 60              | 7          | 600              |
| 12    | Tretinoin 0.025%      | cream       | 20gm   | 28                 | 230                | 202             | 8.214      | 721.42           |
| 13    | Tretinoin 0.025%      | cream       | 30gm   | 110                | 195                | 85              | 1.772      | 77.27            |
| 14    | Tretinoin 0.025%      | gel         | 20gm   | 80                 | 120                | 40              | 1.5        | 50               |



**Fig. 2: Cost Variation % of single topical anti-acne preparations**

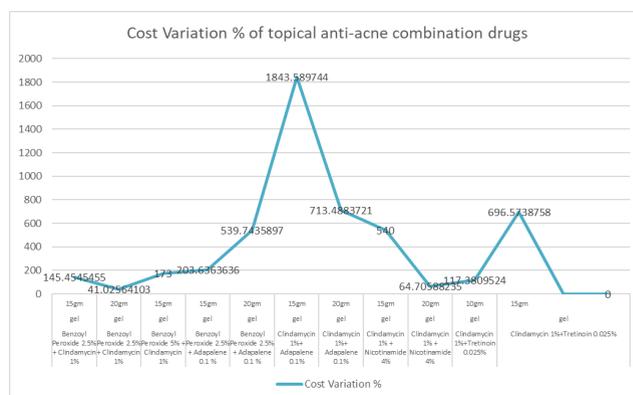


**Fig. 3: Cost Ratio of combination topical anti-acne preparations**

8.13 followed by Clindamycin 1% +Tretinoin 0.025% 15gm gel(696.573) with cost ratio of 7.965.

Percentage cost variation was minimum with combination of Benzoyl Peroxide 2.5% + Clindamycin 1% 20gm gel(41.025) with cost ratio of 1.41,minimum cost of INR 195 & maximum cost of INR 275 followed by Clindamycin 1% + Nicotinamide 4 % 20gm gel (64.705) with cost ratio of 1.64,minimum cost was INR 85 and maximum cost was INR 140.

On comparing the generic price and the maximum price of topical preparations it was found that Benzoyl Peroxide 2.5% + Adapalene 0.1% 15gm gel INR 476 had the highest cost difference and Benzoyl Peroxide 2.5 % 20gm gel had the lowest cost difference of INR 88.02.



**Fig. 4: Cost Variation % of topical anti-acne combination drugs**

**Table 2: Percentage cost variation of different combination drug formulations of topical medications used for acne**

| Sl.no | Drug                                    | Formulation | Amount | Minimum cost (INR) | Maximum cost (INR) | Cost difference | Cost Ratio | Cost Variation % |
|-------|-----------------------------------------|-------------|--------|--------------------|--------------------|-----------------|------------|------------------|
| 1     | Benzoyl Peroxide 2.5% + Clindamycin 1%  | gel         | 15gm   | 198                | 486                | 288             | 2.454      | 145.45           |
| 2     | Benzoyl Peroxide 2.5% + Clindamycin 1%  | gel         | 20gm   | 195                | 275                | 80              | 1.410      | 41.02            |
| 3     | Benzoyl Peroxide 5% + Clindamycin 1%    | gel         | 15gm   | 200                | 546                | 346             | 2.73       | 173              |
| 4     | Benzoyl Peroxide 2.5% + Adapalene 0.1 % | gel         | 15gm   | 165                | 501                | 336             | 3.036      | 203.63           |
| 5     | Benzoyl Peroxide 2.5% + Adapalene 0.1 % | gel         | 20gm   | 78                 | 499                | 421             | 6.397      | 539.74           |
| 6     | Clindamycin 1%+ Adapalene 0.1%          | gel         | 15gm   | 19.5               | 379                | 359.5           | 19.435     | 1843.58          |
| 7     | Clindamycin 1%+ Adapalene 0.1%          | gel         | 20gm   | 43                 | 349.8              | 306.8           | 8.134      | 713.48           |
| 8     | Clindamycin 1% + Nicotinamide 4%        | gel         | 15gm   | 25                 | 160                | 135             | 6.4        | 540              |
| 9     | Clindamycin 1% + Nicotinamide 4%        | gel         | 20gm   | 85                 | 140                | 55              | 1.647      | 64.70            |

**Table 3: Comparison between Generic price(Jan Aushadhi price), Minimum price & Maximum price of different drug formulations of topical medications used for acne**

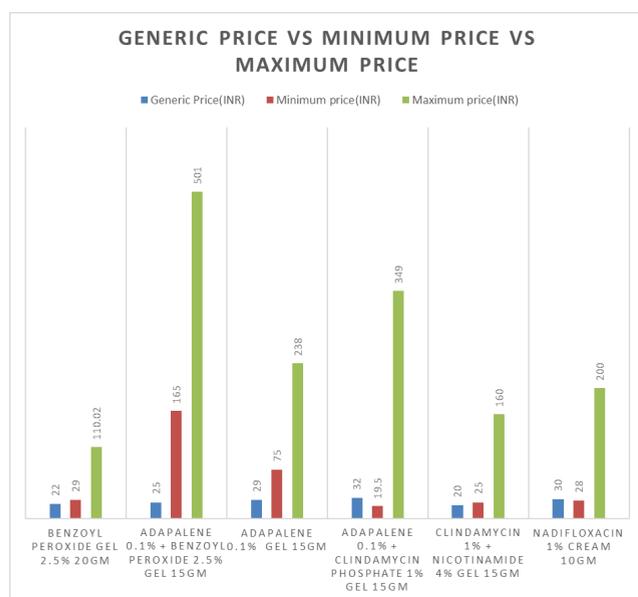
| Sl.no | Drugs dosage & Formulation                         | Generic Price (INR) | Minimum price (INR) | Maximum price (INR) |
|-------|----------------------------------------------------|---------------------|---------------------|---------------------|
| 1     | Benzoyl peroxide Gel 2.5% 20gm                     | 22                  | 29                  | 110.02              |
| 2     | Adapalene 0.1% + Benzoyl Peroxide 2.5% gel 15gm    | 25                  | 165                 | 501                 |
| 3     | Adapalene 0.1% gel 15gm                            | 29                  | 75                  | 238                 |
| 4     | Adapalene 0.1% + Clindamycin Phosphate 1% gel 15gm | 32                  | 19.5                | 349                 |
| 5     | Clindamycin 1% + Nicotinamide 4% gel 15gm          | 20                  | 25                  | 160                 |
| 6     | Nadifloxacin 1% cream 10gm                         | 30                  | 28                  | 200                 |

## DISCUSSION

The present study showed a very high variation in the maximum and minimum price of various topical formulations of drugs used in the treatment of acne vulgaris which are manufactured by different pharmaceutical companies in India. The cost ratio was also observed to be very high. The highest % cost variation was found for Clindamycin 20gm 1%(gel) i.e. 1126.66 among single drug topical preparations and Clindamycin 1% + Adapalene 0.1% 15 grams gel (1843.589) among combination topical drug preparations. The lowest % cost variation was of Adapalene 0.1 % cream 15gm (32.69) among single drug preparations & Benzoyl Peroxide 2.5% + Clindamycin 1% 20gm gel(41.025) among combination preparations. The percentage variation in the cost was above 100% for 17 out of 25 formulations.

Reasons for this price disparity can be argued to be because of the following:

1. The number of brands generated is disproportionately higher than the number of formulations
2. Pharmaceutical companies use brand promotion measures to foster a perception of higher quality in certain brands, as well as a price-quality correlation, with no real quality difference between different branded generic versions or between unbranded generic and branded generic versions of the same molecules.
3. As customers are unable to make an informed decision and the quality/efficacy of pharmaceuticals is intrinsically unknown, they rely on doctor's brand prescriptions, which are frequently affected by aggressive brand advertising by pharmaceutical firms.
4. Generic versions without brand names are marketed in nations with stringent regulatory requirements. Branding is simply a means for pharmaceutical companies to establish fake product difference and niches,



**Fig. 5: Comparison between Generic price (Jan Aushadhi price), Minimum price & Maximum price of different drug formulations of topical medications used for acne**

especially in off-patent pharmaceuticals, in order to command brand premium prices while maintaining high domestic market shares.

A study conducted by Gupta A et showed that the most common topical medications for treatment of acne were retinoids and antimicrobials like erythromycin and clindamycin. In their study, they found percentage cost variation for tretinoin cream of 176.92% and for adapalene gel of 166.66%<sup>13</sup>. It was observed that there is a wide (from 4.76% to 1130.76%) variation in prices of these drugs manufactured by different pharmaceutical companies. The maximum cost variation was seen with Hydroxyzine (1130.76%) followed by Doxycycline (458.33%). The least cost variation was seen with the Mometazone +Terbinafine (4.76%) combination cream which might be due to the fact that the drug is not yet manufactured by many pharmaceutical companies and hence available options do not vary much in their prices. A study on percentage cost variation of anti-diabetic drugs done by Jadhav et al. concludes that as the number of manufacturing companies increases, the percent price variation also increases<sup>14,15</sup>.

Also, as per the COMPEDIUM OF CEILING PRICES 2023<sup>16</sup> it was found that among the topical preparations available for treatment of acne, only the ceiling prices of benzoyl peroxide have been mentioned. The ceiling prices were as follows: Benzoyl Peroxide 2.5% gel INR 3.62 (For 1gm), Benzoyl Peroxide 3.5% gel INR 9.02 (1gm), Benzoyl Peroxide 5% gel INR 7.97 (1gm) and Benzoyl Peroxide 2.5% cream INR 2.90 (1 gm).

Therefore, due consideration must be placed on inclusion of more number of topical drugs of acne in the National List of Essential Medicines to increase their accessibility to common people and subsequently their ceiling prices to be determined by the NPPA.

## CONCLUSION

The results of our study demonstrate that there is significant variation in the cost of the same topical medications used to treat acne vulgaris among different brands in India. Additionally, the longer treatment duration increases the financial burden of the condition, therefore a therapy that is easily accessible, affordable, and available to a large population is required. Patients take the prescriptions that doctors prescribe and pharmacists dispense, because they are unaware of the therapeutic qualities and alternatives to drugs and lack the independence and expertise required to decide for themselves and influence market dynamics in their advantage.

The National Pharmaceutical Pricing Authority (NPPA), a division of the Ministry of Chemicals & Fertilizers, controls medicine prices in India by publishing a list of medicines and their maximum ceiling prices. This ensures the supply of reasonably priced medications and normalizes the prices of drugs available in the Indian market. In order to lessen the financial burden on patients and the healthcare system, it is imperative that the general public, healthcare professionals, government agencies, policy makers, and pharmacists be made aware of this larger price variance.

## Limitations of the study

There are a few limitations in our study. First, we considered a handful of different drug brands stated in CIMS and Drug Today India, despite the fact that there are many more on the market. Second, the pricing of generic drugs was collected from the official website of the Pharmaceuticals and Medical Devices Bureau of India (PMBI), which is part of the Department of Pharmaceuticals, Government of India. However, there are branded generics accessible on the market whose prices have not been considered. There has been relatively lesser number of studies done in this topic, leading to a paucity of evidence-based data and direct comparisons. To address these constraints and provide a more accurate picture of cost, similar studies should be conducted on a larger scale using the same therapeutic class of medications.

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