Original Research Article

Study of the price variation analysis of proton pump inhibitors available in Indian pharmaceutical market

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ABSTRACT

Background: In now day’s proton pump inhibitors are prescribing more and more by Indian physicians not only in peptic ulcer, gastroesophageal reflux disease, gastritis but also along with non-steroidal anti-inflammatory drugs to overcome the side effects as gastric irritation and discomfort by non-steroidal anti-inflammatory drugs. There are many brands of PPI drugs available in Indian market. 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 associated with decreased adherence to prescription medication. Hence this study was done to assess the cost variation of proton pump inhibitors (PPI) drugs.

Methods: The maximum and minimum price of each brand of the drug in INR was noted by using Drug Today January to April 2020 edition, Vol-1. The cost ratio and the percentage cost variation for individual drug brands was calculated. The cost of 10 tablets/capsules was calculated in case of oral drug. At last the cost ratio and percentage cost variation of various brands was compared.

Results: Percentage variation in cost for proton pump inhibitors marketed in India was found to be tablet/capsule Esomeprazole [20mg]: 297.65, tablet/capsule Esomeprazole [40mg]: 344.41, capsule/tablet Omeprazole [10mg]: 74.51, capsule/tablet Omeprazole [20mg]: 542, Tablet/capsule Pantoprazole [40mg]: 3297.33, tablet/capsule Rabeprazole [10mg]: 1160, tablet/capsule Rabeprazole [20mg]: 1101.05, capsule/tablet Lansoprazole [15mg]: 306.69, capsule/tablet Lansoprazole [30mg]: 336.33, capsule/tablet Dexlansoprazole [60mg]: 7.69.

Conclusions: Capsule Pantoprazole [40mg] shows highest cost ratio and percentage cost variation as 33.97 and 3297.33. While capsule Dexlansoprazole [60mg] shows lowest cost ratio and percentage cost variation as 1.07 and 7.69.

Keywords: Compliance, Cost ratio, PPI, Percentage cost variation

INTRODUCTION

Proton pump inhibitors are very important drugs for GIT disorders as peptic ulcer, gastroesophageal reflux disease, gastritis, oesophagitis, Zollinger Ellison’s syndrome etc. In now days proton pump inhibitors are prescribing in more and more amount by the Indian physicians not only in GIT disorder but also along with NSAIDS [Non-steroidal anti-inflammatory drugs] to overcome the side effects by NSAIDS. Evidence emerged by the end of the 1970s that the newly discovered proton pump (H⁺/K⁺ ATPase) in the secretory membrane of the parietal cell was the final step in acid secretion.¹ Literature from anaesthetic screenings led attention to the potential antiviral compound pyridylthioacetamide which after further examination pointed the focus on an anti-secretory compound with unknown mechanisms of action called timoprazole.²-⁴
Timoprazole is a pyridylmethylsulfinyl benzimidazole and appealed due to its simple chemical structure and its surprisingly high level of anti-secretory activity.\(^5\) Optimization of substituted benzimidazoles and their antisecretory effects were studied on the newly discovered proton pump to obtain higher pKa values of the pyridine, thereby facilitating accumulation within the parietal cell and increasing the rate of acid-mediated conversion to the active mediate. As a result of such optimization the first proton pump inhibiting drug was released on the market, omeprazole.\(^6\) Other PPIs like lansoprazole and pantoprazole would follow in its footsteps, claiming their share of a flourishing market, after their own course of development. Proton pump inhibitors are prodrugs and their actual inhibitory form is somewhat controversial. In acidic solution, the sulfenic acid is isolated before reaction with one or more cysteines accessible from the luminal surface of the enzyme, a tetracyclic sulfenamide. This is a planar molecule thus any enantiomer of a PPI loses stereospecificity upon activation.\(^7\) The effectiveness of these drugs derives from two factors: their target, the H\(^+/\)K\(^+\) ATPase which is responsible for the last step in acid secretion; therefore, their action on acid secretion is independent of the stimulus to acid secretion, of histamine, acetylcholine, or other yet to be discovered stimulants. Also, their mechanism of action involves covalent binding of the activated drug to the enzyme, resulting in a duration of action that exceeds their plasma half-life.\(^8\) 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 increased morbidity. There is a gross variation in the cost of different brands of same generic drugs available in Indian market. Increase in the patient medication cost was found to be associated with decrease adherence to prescription medication.\(^9\) Cost analysis is the study in which comparison of costs of two or more alternative medication is made without regard to outcome.\(^10\)-\(^11\) Studies conducted in past show a wide variation in cost of branded and generic versions of same drugs.\(^12\)-\(^13\) Hence the present study was conducted to evaluate the cost variation amongst the different brands of proton pump inhibitors available in India.

METHODS

Price in Indian rupees (INR) of proton pump inhibitors manufactured by different pharmaceutical companies in India, in the same strength were obtained from Drug Today, January to April 2020 edition, Volume-I. The cost of 10 tablets/capsules was calculated. The cost ratio, calculated as the ratio of the costlier brand to that of the cheapest brand of the same drug, calculated as follows:

\[
\text{Cost ratio=} \frac{\text{Price of the costliest brand}}{\text{Price of the least costly brand}}
\]

The percentage cost variation is calculated as follows:

\[
\text{Percentage cost variation } = \frac{(\text{Maximum cost} - \text{Minimum cost})}{\text{Minimum cost}} \times 100.
\]

Maximum percentage cost variation and cost ratio of a particular drug should be noted down. Minimum percentage cost variation and cost ratio of a particular drug should be noted down.

Inclusion criteria

Drugs belong to group of proton pump inhibitors only should be included. Doses form of PPI Drugs will be only capsule or tablets. Drugs belong to branded manufacturing companies should be included. Drugs belong to same strength should be included.

Exclusion criteria

PPI drugs in combinations with other drugs as prokinetic drugs are excluded. PPI Drugs available in doses form of syrup are excluded. The drug formulation being manufactured by only one company or being manufactured by different strengths are excluded. Drugs belong to bogus manufacturing companies should be excluded.

Place of study

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RESULTS

Percentage variation in cost for proton pump inhibitors marketed in India was found to be tablet/capsule Esomeprazole [20mg]: 297.65, tablet/capsule, Esomeprazole [40mg]: 344.41, capsule/tablet Omeprazole [10mg]: 74.51, capsule/tablet Omeprazole [20mg]: 542, Tablet/capsule Pantoprazole [40mg]: 3297.33, tablet/capsule Rabeprazole [10mg]: 1160, tablet/capsule Rabeprazole [20mg]: 1101.05, capsule/tablet Lansoprazole [15mg]: 306.69, capsule/tablet Lansoprazole [30mg]: 336.33, capsule/tablet Dexlansoprazole [60mg]: 7.69. Capsule Pantoprazole [40mg] shows highest cost ratio and percentage cost variation as 33.97 and 3297.33 While Capsule Dexlansoprazole [60mg] shows lowest cost ratio and percentage cost variation as 1.07 and 7.69 We should prescribe those drugs who bears lowest cost ratio and lowest percentage cost variation. So we should prescribe capsule dexlansoprazole 60 mg among all drugs which are mentioned in Table 1.
Table 1: Drug costs, cost ratio and percentage cost variation of proton pump inhibitors available in India.

| Drug              | Dose  | No. of brands | Maximum price [rs] | Minimum price [rs] | Cost ratio | Percentage cost variation |
|-------------------|-------|---------------|--------------------|--------------------|------------|---------------------------|
| Tab/cap .esomeprazole | 20 mg | 11            | 67.50              | 17                 | 3.97       | 297.65                    |
| Tab/cap.esomeprazole | 40 mg | 21            | 120                | 27                 | 4.44       | 344.41                    |
| Tab/cap .omeprazole | 10 mg | 8             | 33                 | 18.91              | 1.74       | 74.51                     |
| Tab/cap . Omeprazole | 20 mg | 113           | 50.59              | 7.88               | 6.42       | 542                       |
| Tab/cap .rabeprazole | 10 mg | 14            | 63                 | 5                  | 12.6       | 1160                      |
| Tab/cap . Rabeprazole | 20 mg | 133           | 114.10             | 9.5                | 12.01      | 1101.05                   |
| Tab/cap .pantoprazole | 40 mg | 163           | 509.60             | 15                 | 33.97      | 3297.33                   |
| Tab/cap.dexlansoprazole | 60 mg | 3             | 210                | 195                | 1.07       | 7.69                      |
| Tab/cap. Lansoprazole | 15 mg | 11            | 74.06              | 18.21              | 4.06       | 306.69                    |
| Tab/cap. Lansoprazole | 30 mg | 28            | 130.90             | 30                 | 4.36       | 336.33                    |

DISCUSSION

People living in developing countries pay heavy cost of medicines. In India ,more than 80% health financing is borne by patients. The situation becomes more complex due to the presence of number of brands with variety of names and prices. 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 in Tab/ Cap. Dexlansoprazole as comparison to Tab/ Cap. Pantoprazole shows significant cost ratio and percentage cost variation as 33.97 and 3297.33, while Tab/ Cap. Dexlansoprazole does not show significant cost ratio and percentage cost variation as 1.07 and 7.69 which are <2 and 100. Significant price variation creates economic burden on poor patients. 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 drugs are controlled by the drug cost control order 2013 (DPCO).

Limitation of study: We have only considered the PPIs which are available in India even though there are 1122 brands of PPIs available in India. Therefore, further Pharmacoeconomics analysis are warranted for better quantification of the outcome.

CONCLUSION

In now days prices of few drugs are under government control through DPCO. Hence the physician should always remember that he should not avoid treating the patients with a particular drug because it is expensive and should rather balance his therapeutic decisions in prescribing a particular drug by considering the patients socioeconomic status. Hence we need to draw attention to the prices of various drug formulation brands available to reduce the cost of therapy.

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