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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 luminar surface of the enzyme, a tetracyclic sulfenamide. This is a planar molecule thus any enantiomer of a PPI loses stereospecifity 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-1. 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:

Cost ratio= Price of the costliest brand/Price of the least costly brand.

The percentage cost variation is calculated as follows:

Percentage cost variation = (Maximum cost-Minimum cost/minimum cost) x 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.[14-16] The situation becomes more complex due to the presence of number of brands with variety of names and prices.[17] 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 singnificant 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 creats 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).[18]

Limitation of study: We have only considered the PPIs which are available in our hospital 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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REFERENCES

1. Forte JG, Lee HC. "Gastric adenosine triphosphatases: A review of their possible role in HCl secretion". Gastroenterol. 1977;73(4 Pt 2): 921-6.
2. Snaeder W. Drug prototypes and their exploitation. Wiley. 1996:414–5.
3. Hemenway JN. "Case Study: Omeprazole (Prilosec)". Prodrugs. Biotechnology: Pharmaceutical Aspects. 2007:1313–21.
4. Olbe L, Carlsson E, Lindberg P. "A proton-pump inhibitor expedition: the case histories of omeprazole and esomeprazole". Nature Reviews. Drug Discovery. 2003;2(2):132-9.
5. Senn-Bilfinger J, Sturm E. "The Development of a New Proton-Pump Inhibitor: The Case History of Pantoprazole". Analogue-based Drug Discovery. 2006:115-36.
6. Lindberg P, Carlsson E. "Esomeprazole in the Framework of Proton-Pump Inhibitor Development". Analogue-based Drug Discovery. 2006:81–113.
7. Shin JM, Munson K, Vagin O, Sachs G."The gastric HK-ATPase: Structure, function, and inhibition". Pflügers Archiv - European J Physiol. 2008;457(3): 609-22.
8. Sachs G, Shin JM, Vagin O, Lambrecht N. Yakubov I, Munson K."The Gastric H,K ATPase as a Drug Target". J Clinic Gastroenterol. 2007;41(Suppl 2): S226-42.
9. Eaddy MT, Cook CL, O'Day K, Burch SP, Cantrell CR.How patients cost-sharing trends affects adherence and out comes: a literature review: PT. 2012;37:45-55.
10. Ahuja J, Gupta M, Gupta AK, Kohli K. Pharmacoeconomics. Natl Med J India. 2004; 17:80-3.

11. Sanchez LS. Pharmacoeconomics: Principles, methods and applications. In: Dipiro JT, Talbert RL,. Yee GC, Matzke GR, Wells BG, Posey ML, Eds. Pharmacotherapy: A pathophysiological approach. 7th Ed. McGraw Hill; New York; 2008:1-2.
12. Das SC, Mandal M, Mandal SC. A critical study on availability and price variation between different brands: impact on access to medicines. Indian J Pharm Sci. 2007;69(1):160-3.
13. Chawan VS, Gawand KV, Badwane SV. Cost analysis of oral hypolipidemic agents available in India. Int J Basic Pharmacol. 2014:3:954-7.
14. Thomas M. Rational drug use and essential drug concept. In: Parthasarthi G, Nyfort Hasen K, Editors. A Textbook of Clinical Pharmacy Practice. 1st Ed. Himayatnagar, Hyderabad: Orient Longman; 2004;72:3.
15. Creese A, Kotwani A, Kutzin J, Pillay A. Evauating pharmaceuticals for health policy in low and middle-income country settings. In: Freemantle N, Hill S, eds. Evaluating pharmaceuticals for health policy and reimbursement. Massachusetts, USA: Blackwell Publication; (in collaboration with WHO Geneva); 2004:227-43.
16. Mahal A, Karan A, Engelgau M. The Economic Implications of Non-Communicable Disease for India. Washington, DC: World Bank.2010. Available at http://siteresources.worldbank.org/HEALTHNUTRITIONANDPOPULATION/Resources/281627-1095698140167/EconomicImplicationsofNCDforIndia.pdf.
17. Rataboli PV, Garg A. Confusing brand names: nightmare of medical profession. J Postgrad Med. 2005;51:13-6.
18. Drug Cost Control Order, 2013, Government of India. Available at http://www.nppaindia.nic.in/DPCO2013.pdf.

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