Research Article

Cost variations among gastric acid lowering medications used for treatment of Gastroesophageal Reflux Disease (GERD)

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Abstract

Objective: Objective of the study was to conduct cost variations among marketed pharmaceutical brands for two drug classes which are prescribed for the treatment of Gastroesophageal Reflux Disease (GERD) viz Histamine H_2 Receptor antagonists (H_2A) and Proton Pump Inhibitors (PPI). **Materials and Methods:** Two acid lowering drugs classes manufactured by the different Indian pharmaceutical industries were analysed for the cost variation. In this study, two authors has collected the data of the acid lowering drugs in the market of India from "Current Index of Medical Specialties" (CIMS) online edition and Mobile Application of National Pharma Pricing and used cost variation formula to find cost ratio and cost variations. **Results:** A total of 8 drugs molecules consisting of 18 formulations were accessed by 1198 brands that are present in the Indian market. Among all the acid lowering drugs, the highest cost ratio and percentage cost variation was found for the Pantoprazole 20 followed by Famotidine 20 mg, Omeprazole 20 mg and Ranitidine 150 mg. The highest frequencies of brands were found for Pantoprazole 40 mg followed by Rabeprazole 20 mg and omeprazole 20 mg. **Conclusions:** In India there are large number of brands available for the same drug with wide and variable cost variations in markets of India which indicate lot of catastrophic burden on india economy, there is need for the price fixation of these pharmaceutical formulations.

***Keywords*:** Acid lowering drugs, compliance, cost variation, marketed brands, health economics

Introduction

The pharmaceutical industries of the India are globally third number as compared to the global pharmaceutical industries and on 13th number on for the scale and value of production respectively (Chittoor et al., 2009) . India is leading in the supply of generic drugs around the world. It is believed that by 2020 India will be on 6th position in pharmaceutical market all over the world (Chaudhuri, 2012). The pharmaceutical market of India varies from the branded form to generics and if we talk about the revenue, branded drugs are occupying the 80% of the total market share (Abrol, 2004). In India the 2/3rd part of the total health expenditure is out of the pocket (Pal, 2012; Jangra and Chhabra, 2018). Due to the financial problems, the 19% of the urban population and 29% of the rural population do not pursue for the treatment (Weeks et al., 2006). This study was conducted to analyse the cost variations of the marketed brands of the two classes of drugs which are mainly used into the treatment of Gastroesophageal Reflux Disease (GERD) that are Histamine H2 Receptor antagonists (H2A) and Proton Pump Inhibitors (PPI) (Kahrilas, 2008). In these classes of drugs very wide cost variations are detected in the marketed brands.

GERD, also known as acid reflux which is a chronic illness in which stomach contents are reflexed back up into the oesophagus, results into symptoms or complications in patients such as taste of acid in the back of the mouth, bad breath, heartburn, vomiting, breathing problems, chest pain etc. (Khan and Orenstein, 2018). Complications comprise Barrett's esophagus, oesophageal strictures, and esophagitis. In the western countries 10 to 20% of the population are suffering from GERD (McColl, 2018). The main symptoms of the GERD is regurgitation, acidic taste in the mouth and heartburn and some other less common symptoms are increased salivation, pain with swallowing/sore throat,

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nausea, coughing and chest pain (Mermelstein et al., 2018).

GERD can also cause the injury to the oesophagus in some of the complications. These injuries include Reflux esophagitis (occurring of ulcers near the junction of oesophagus and stomach due to the inflammation of oesophageal epithelium), esophageal stricture (narrowing of the oesophagus due to the inflammation produced by the acid reflux), barrett's oesophagus (intestinal metaplasia of the distal oesophagus) and esophageal adenocarcinoma (a type of cancer) (Kahrilas, 2008). There are some risk factors for the GERD such as pregnancy, hiatus hernia, obesity, vomiting and due to the use of some medicines (Katz et al., 2013). Obstructive sleep apnea and gallstones, which can affect the ability to neutralize gastric acid are also linked with GERD. Diagnosis is done by the oesophageal pH Monitoring or oesophageal Manometry and in some cases it may involve Gastroscopy (Carroll, 2016). The treatment of the GERD could be done by lifestyle modifications, surgeries and medications (Hunt et al., 2017). Some foods and the way of living can also promote the GERD. There is avoidance of the some of the foods and after eating patient should not lie down for three hours (Gupta et al., 2013). Food that are believed to promote GERD includes alcohol, cigarette smoking, chocolate, coffee, acidic and spicy foods. Medications mainly includes Histamine H2 receptor blockers (H2A) and proton pump inhibitors (PPI). Surgery could be also there but when the primary measures are not working (Forgacs and Loganayagam, 2008). H2A are the H2 blockers that works by blocking the action of histamine at the H2 histamine receptors which are particularly located on the enterochromaffin like cells in the stomach lining (Fidler et al., 2018). H2A decreases the acid secretion in the stomach. H2A can also be used in the treatment of dyspepsia and peptic ulcers. PPIs are the class of drugs which are used for the long-lasting reduction of the acid secretion of the stomach (Mo et al., 2015). PPIs irreversibly inhibit the action of H+/K+ ATPase of the enterochromaffin like cells thus reducing acid secretion.

The objective of present study was to evaluate the differences of cost between the various brands of the same generic acid lowering medications. The purpose of the study is to determine the cost variations of the various marketed brands of acid lowering agents. This information could be applied to confirm the treatment of lower cost regimens to improve the patient's compliances.

Materials and methods

Acid lowering drugs which are manufactured by the different Indian pharmaceutical industries were analysed for the cost variation.

In this study, author has collected the data of the acid lowering drugs in the market of India from "Current Index of Medical Specialties" (CIMS) online edition and Mobile Application of National Pharma Pricing.

Inclusion Criteria

- Acid lowering drug are taken those which are available as or having its individual preparations.
- Acid lowering drugs manufactured by two or many pharmaceutical industries in India market.
- Acid lowering drugs those are having complete information regarding formulations, strengths, cost and brand name.
- Acid lowering drugs which are available as an oral capsule or tablet and injection.
- Cost was calculated on the basis of stripes of 10 medicines.

Exclusion Criteria:

- Acid Lowering drugs other than oral and injection formulations.
- Acid lowering drugs which are only produced by one industry.
- Combination of acid lowering drugs.
- Acid lowering drugs with incomplete information of strengths, brand name, formulation and cost.
- Cost ratio was calculated on the basis of dividing the maximum cost of the drug by minimum cost of the drug.

Cost percentage variation was calculated by using the following formula:

$$\text{Cost variation (\%)} = \frac{\text{Max. cost} - \text{Min. Cost}}{\text{Min. cost}} \times 100$$

Results

A total of 8 drugs molecules consisting of 18 formulations were accessed by 1198 brands that are present in the Indian market. Through study we have founded that there is wide variation of costs in the marketed brands of acid lowering drugs accessible in market of India. There are many brands providing acid lowering medications in the Indian market.

Among all the acid lowering drugs, the highest cost ratio and percentage cost variation was found for the Pantoprazole 20 mg that is 1:849.83 and 84883.33 followed by Famotidine 20 mg [1:55.04 and 5404.48], Omeprazole 20 mg [1:22.17 and 2117.90] and Ranitidine 150 mg [1:12.35 and 1135.29]. The highest number of brands are for Pantoprazole 40 mg [344] followed by Rabeprazole 20 mg [343] and omeprazole 20 mg [159](Table 1).

Table 1. Price variations among the marketed Acid Lowering drugs

Acid Lowering Drugs	No. of Brands	Dosage Form	Strength	Minimum Cost in Indian Rupees (INR)	Maximum Cost in Indian Rupees (INR)	Cost Ratio	Percentage Cost Variation (%)
Cimetidine	5	Tablet	200 mg	7.4	19.04	2.57	157.29
	3	Tablet	400 mg	13.98	36.69	2.62	162.44
Ranitidine	60	Tablet	150 mg	4.25	52.5	12.35	1135.29
	26	Tablet	300 mg	7.81	45.71	5.85	485.27
	20	Injection	25 mg/ml	2.29	10	4.36	336.68
	10	Injection	50 mg	3	89.91	29.97	2897
Famotidine	18	Tablet	20 mg	2.18	120	55.04	5404.58
	18	Tablet	40 mg	3.63	102.9	28.36	2736.91
Omeprazole	159	Capsule	20 mg	6.87	152.37	22.17	2117.9
Pantoprazole	344	Tablet	40 mg	8.75	125	14.28	1328.57
	52	Tablet	20 mg	0.12	101.98	849.83	84883.33
	10	Capsule	40 mg	32.93	75.55	2.29	129.42
	137	Injection	40 mg	17.5	113.37	6.47	547.82
	3	Injection	20 mg	43.39	87.5	2.01	101.6
Rabeprazole	343	Tablet	20 mg	9	100	11.11	1011.11
	39	Tablet	10 mg	9.87	95.22	9.64	864.74
Lansoprazole	40	Capsule	30 mg	17.32	90	5.19	419.63
	12	Capsule	15 mg	19.8	82.76	4.17	317.97
	3	Tablet	30 mg	56	108.5	1.93	93.75
	5	Tablet	15 mg	52	92	1.76	76.92
Esomeprazole	40	Tablet	40 mg	20.46	75.4	3.68	268.52
	21	Tablet	20 mg	19.22	114.28	5.94	494.58
	10	Injection	40 mg	68.57	101.5	1.48	48.02

Conclusion

There is extensive and variable cost variations and existence of more number of brands of acid lowering drugs in the markets of India.

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Conflict of interest: All the authors declare no conflict of interest.

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