Research Article

Pharmacoeconomic evaluation of Antisecretory drugs in Tertiary Care Hospital

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Abstract

Background: Indian drug market is flooded with many drug formulations of antisecretory drugs. The volume of prescribing antisecretory drugs has had a substantial impact on prescribing expenditure worldwide. Pharmacoeconomic research focuses on providing quality care within limited financial resources. **Objective:** The purpose of this study was to perform Pharmacoeconomic evaluation and determine cost saving measures in the treatment of patients with conditions requiring antisecretory medications. **Materials and methods:** We conducted a prospective observational randomized active control open label study. Cost effectiveness ratio for Ranitidine and Pantoprazole was calculated by dividing the cost of treatment by it's clinical outcome (FSSG score) . Cost minimization analysis was done with three proton pump inhibitors available in the hospital pharmacy assuming that they have equal efficacy as well as from the patient's perspective (pocket payments) in accordance with the cost of PPIs available in market (over the counter). **Results:** In our Hospital, pantoprazole was the most commonly prescribed drugs. The mean improvement score with pantoprazole was 6.27, while in ranitidine group it was of 1.96. The cost of reducing 1 unit FSSG score per day was Rs.0.12 with Pantoprazole and 0.32 with Ranitidine. Cost minimisation analysis showed that Omeprazole is the most economical treatment among available PPI in hospital pharmacy as well as PPI available in market. **Conclusion:** Pantoprazole was found to be more cost effective drug than Ranitidine as per the price of drug available in Central Hospital Pharmacy. Amongst all PPI , substitution by Omeprazole would be expected to produce cost savings .

***Keywords*:** Pharmacoeconomic evaluation, Pantoprazole, antisecretory drugs, FSSG score

Introduction

Inevitable changes in the lifestyle and food habits of Indian population along with excessive use of medications are the reasons for increased gastric acid secretion. This leads to gastroesophageal reflux disorder (GERD), ulceration , esophagitis ,erosive gastritis ,etc. Dyspeptic symptoms are common in the general population and affect about 25- 54 % adults in a year (El-Serag et al., 2004). All these changes further leads to rapid rise in use of antisecretory drugs.

Antisecretory drugs constitute about 4-11% of total medical budget (Westbrook et al., 2001). High volume of prescribing these drugs may reflect the high efficacy and less adverse drug effects. Proton Pump Inhibitors are among the top ten bestselling drugs. They are the most prescribed drugs in India. Over 1000 brands of antisecretory drugs are available with significant difference in their costs(Current Index of Medical Specialties 2016; Drug Today, 2017). The antisecretory drugs mostly used in India are pantoprazole, omeprazole, rabeprazole, lansoprazole, esmoprazole, ranitidine, famotidine, etc. The proton pump inhibitors and H2 blockers have equivalent efficacy at comparable doses. Though there is similarity in efficacy and safety of these drugs, there is significant difference in their costs.

Considering the above factors , a pharmacoeconomic research of antisecretory drugs was conducted. Pharmacoeconomics is a branch of health economics which particularly focuses upon the costs and benefits of drug therapy (M.Kiran Babu et al., 2014). It provides quality care within limited financial resources and helps to make

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decision when various drugs are available. It reduces the cost burden and increases patient compliance.

There are four main techniques used in pharmacoeconomic assessment :Cost minimization analysis, Cost effectiveness analysis, Cost benefit analysis, Cost utilization analysis (Kulkarni et al., 2009).

Cost minimization analysis and cost effectiveness analysis was used in this study. The objective of this study was to determine the cost saving measures in treatment of patients with conditions requiring antisecretory medication.

Materials and methods

The method used in our study was Prospective Observational Randomized Active Control Open Label Study in a Tertiary care hospital for a period of two months with a sample size 200. The patients included were of either gender, more than 18 years of age, admitted to the Medicine, Orthopaedics, Surgery and Gynaecology wards prescribed with antisecretory drugs and were willing to participate in the study.

The pharmacoeconomic parameters used were:

1) Number and cost of PPI brands available: which was collected from CIMS and Drug Today **(**Current Index of Medical Specialties, 2016; Drug Today, 2017).

2) Cost Minimisation Analysis (Kulkarni et al., 2009) was carried out as per Hospital Pharmacy and patient's perspective, that is, pocket payments and over the counter drugs. It is the simplest type of pharmacoeconomic analysis which compares the cost of equally effective therapeutic options for the given condition is used to define the most economical treatment.

3) The Cost Effectiveness Ratio (Kulkarni et al., 2009) for Ranitidine and Pantoprazole was also calculated by dividing the cost of treatment by it's clinical outcome, that is, FSSG score.

4) The FSSG score was calculated from the FSSG questionnaire which has a range of questions relating to gastric symptoms like heartburn, burping, etc (Kusano et al., 2004).

Results and discussion

There are various brands of antisecretory drugs available in the Indian market. Amongst the Proton Pump Inhibitors , Pantoprazole has the highest number with about 350 brands, followed by Rabeprazole , Lansoprazole , Esmoprazole and Omeprazole with 175, 150, 50 and 25 respectively and amongst H2 blockers Ranitidine had the highest number with about 35 brands followed by Famotidine and Roxatidine with 20 and 3 brands respectively.

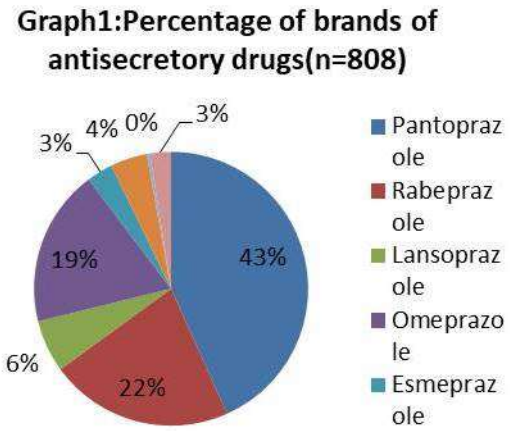

Figure 1. Graph1:Percentage of brands of antisecretory drugs(n=808

Table1. Use of antisecretory drugs per Department

Department	Pantoprazole	Ranitidine	Pan D	Others
Orthopaedics	44	6	0	-
Surgery	48	1	2	1
Medicine	37	5	7	2
Gynaecology	4	46	0	-
Total	130	61	9	3
	65%	30.50%	4.50%	1.50%

Amongst all the antisecretory drugs ; Pantoprazole was the most prescribed drug in Medicine, Surgery and Orthopaedics with about 73 % , 92% and 88% prescriptions while Ranitidine was the most prescribed drug in Gynaecology department with about 92 % prescriptions.

Table 2. Pre and post intervention FSSG (Frequency Scale for the Symptoms of GERD) score in patients (50 patients/ward)

Ward	Frequency Scale for the Symptoms of GERD Questionnaire					
	Reflux Score		Dysmotility score		Total score	
	Pre	Post	Pre	Post	Pre	Post
Orthopaedics	1.56	0.34	1.12	0.40	2.68	0.74
Surgery	2.92	0.51	3.02	1.06	5.94	1.57
Gynaecology	1.32	0.60	1.88	1	3.20	1.62
Medicine	6.74	1.58	6.84	2	13.58	3.58
Average	3.13	0.75	3.21	1.11	6.35	1.87

The score was assessed based on the FSSG questionnaire which included a variety of symptoms ranging from heartburn to burping. The FSSG scores calculated pre-prescription and post -prescription of antisecretory drugs shows that on an average the total pre score was 6.35 which significantly reduced to 1.87 post prescription.

Table 3. Cost minimisation analysis of the drugs available in Hospital Pharmacy

Drugs	Cost per Tablet	Per month Cost	Total Per month cost/14900 pts
Pantoprazole	Rs.0.78	Rs.23.4	11622
Rabeprazole	Rs.0.70	Rs.21	10430
Omeprazole	Rs.0.57	Rs.17.1	8493
Ranitidine	Rs.0.32 (0.32X2=0.64)	Rs.19.2	9536

Cost minimisation analysis of the drugs available in Hospital Pharmacy was carried out using the cost per tablet, per month cost and the total per month cost for 14,900 patients. It was found that Omeprazole is the cheapest drug available and Pantoprazole was the costliest drug. Ranitidine is cheaper than Proton pump inhibitors.

Table 4. Cost minimization analysis from the patient's perspective ('pocket payments')

Drugs	Cost per Tablet	Per month Cost
Pantoprazole(40/20)	Rs.8/5	Rs.240/150
Rabeprazole(20mg)	Rs.6.8	Rs.204
Lansoprazole(30mg)	Rs.4.5	Rs135
Omeprazole(20mg)	Rs.3.5	Rs.105
Esmeprazole(20/40mg)	3.5/6	Rs.105
Ranitidine150mg	Rs. O.84 Or 1.68	Rs.25.2 Or 50.4

The Cost minimisation analysis calculated from the patient's perspective: This result showed that Omeprazole is the cheapest while Pantoprazole was the costliest Proton Pump Inhibitor available, and Famotidine was the cheapest H2 blocker available.

Table 5. Average cost effectiveness ratio for Pantoprazole and Ranitidine in total

Parameters	Pantoprazole(n=130)	Ranitidine(n=61)
(A) Cost/2 week	Rs.10.92	Rs.8.96
FSSG Score (Pre	10.165	3.18
FSSG Score (post	3.895	1.22
(B) Difference in	6.27	1.96
A/B	1.74	4.57
Per day reduction in	Rs.0.12	Rs.0.32

The Average Cost Effectiveness Ratio was calculated for Pantoprazole and Ranitidine used in total. It was found that in order to reduce the same unit of FSSG score, Rs.1.74 was required for Pantoprazole while for Ranitidine it was Rs.4.57. The per day cost per decrease in score was Rs.0.12 for Pantoprazole and Rs. 0.32 for Ranitidine.

Table 6. Average cost effectiveness ratio for orthopaedics and gynaecology department

Parameters	Pantoprazole (N=44)	Ranitidine (N=46)
(A)Cost/ 2 Week	Rs.10.96	Rs.8.96
FSSG score (pre prescription)	2.68	3.18
FSSG score (post prescription)	0.74	1.22
(B) Difference in FSSG Scores	1.94	1.96
A/B	5.62	4.57

Discussion

We conducted pharmacoeconomic study on 200 prescriptions containing an antisecretory drugs. In our study amongst all the antisecretory drugs; Pantoprazole was the most prescribed drug in Medicine, Surgery and Orthopaedics with about 73 %, 92% and 88% prescriptions respectively while Ranitidine was the most prescribed drug in Gynaecology department with about 92 % prescriptions. The combination of Pantoprazole and Domperidone, that is, Pan D was prescribed in about 4 % and 2% prescriptions in Medicine and Surgery wards. Similar to this other studies also observed that around 51.4% OPD patients and 80% Indoor patients are prescribed PPI in their prescriptions (Bargade et al., 2016; Solis et al., 2013). The highest availability of oral and injectable Pantoprazole might be the reason for this over prescription (as seen in figure 1). Pantoprazole has the highest number (43%) with about 350 brands.

This also indicate general tendency among clinicians to prescribe latest, more expensive and heavily promoted agents as their 1st choice of therapy rather than old, less expensive and equieffective drug. There is need to sensitize doctors about cost of drug and rationality of using of PPI.

This study basically observed expenditure on Antisecretory drugs. When we conducted cost minimisation analysis we found out that Ranitidine and Omeprazole among PPI are cheapest drugs. Ranitidine price is low as it is included in essential drug list and comes under price control (Tripathi, 2013; WHO:Essential Medicine List 2017). Ranitidine HCL displayed negative price trend (-7.44 percent), signifying price declines. Celling price of tablet Ranitidine (150mg) is 0.70 (Gazzette of India, 2017).

We would also like to highlight the difference among cost of drug by patient perspective (pocket money) and hospital perspective. Such type of Pharmacoeconomic study also help in highlighting the price difference between Generic drug and branded drugs. As seen in table 3&4 the drug

procured from Hospital pharmacy that is non Branded Generic are much cheaper than Branded generics drugs available at medical store and sell at MRP.

Given the superior efficacy of PPIs compared to other acid inhibiting agents, therapeutic substitution may not be an acceptable option for many patients (van Pinxteren et al., 2010; Moayyedi et al., 2008). Therapeutic switching to an equivalent cheaper or generic PPI would reduce financial burden on the patients without affecting the quality of patient care. There is need to start more no of generic stores. It also proved that tertiary care Hospital can give better efficacy drug with less expenditure.

We also conducted ACER which is other important pharmacoeconomic parameter. Not only cost but efficacy of drug is also consider in this type of analysis (Gattani, 2009). As we had conducted study in our Hospital, we had considered cost of drug as per hospital formulary. We found that surprisingly Pantoprazole is more cost effective than Ranitidine. The reason behind it is the efficacy and compliance of pantoprazole is better than Ranitidine (Kaspari, 2001; Meneghelli, 2000). Another reason is Pantoprazole was available at such low cost as seen in table 3 in our hospital as hospital supplies Generic Pantoprazole. Similar low cost of PPI were observed by Wenjie Zeng in China (Wenjie Zeng et al., 2015).

The limitation of this result is baseline score (FSSG) higher in pantoprazole group. As maximum number of patients from medicine IPD who are symptomatic had been given this drug. To overcome this bias we had done analysis between Orthopaedic and Gynaecology Department where these two drugs are prescribed equally and where no other drugs were used (Table 1). Out of 50 patients, 46 and 44 patients were prescribed Ranitidine and Pantoprazole each. And results indicate that Ranitidine treatment t is more cost effective with ACER 4.57 as seen in table 6.

Similar to our observation, another studies in primary care reported initial treatment with a PPI followed by maintenance therapy with a H2 antagonist to prevent symptomatic recurrence as the optimal strategy (Goeree et al., 2002) and even treatment with H2 antagonists was also the optimal strategy for the prevention of non-steroidal anti-inflammatory drug induced gastro-intestinal toxicity (Brown et al., 2006).

In other study it was shown that H2 antagonist are the drugs 1 st indicated in the standard treatment of NSAID gastritis and PPI are not shown to be superior to them in controlling NSAID induced gastritis, hence PPI can be reserved for severe or non-responsive cases to H2 antagonist(Tasneem, 2013). New Canadian guidelines also states that, prescribing of PPI should be reduced even without considering economic point of view (Barbara et al., 2017).

When cost analysis of these two group was compared, there is vast difference in the cost of treatment. As per patient perspective monthly expenditure of even most economical PPI was twice that of H2 Antagonist (table 4). Thus costs can be potentially reduced by one half to one quarter with use of step down therapy.

We also found out that majority of patients were prescribe maximum therapeutic dose for long duration. Similar observations were mentioned by Westbrook (Westbrook et al., 2001). A regular maintenance low dose of most PPIs will prevent recurrent GORD symptoms in 70-80% of patients (NHS National Institute for Excellence 2000; NHS National Institute for Excellence (NICE), 2004; Mason et al., 2005). Maintenance therapy is indicated for duodenal ulceration, non-steroidal anti-inflammatory drug (NSAID) induced ulceration and gastro oesophageal reflux disease (GERD) (Fahey et al., 2012). Cost of therapy can be significantly reduced by using maintainance low dose of PPI. There is need to motivate clinicians to adopt guidelines or changes in prescribing practices

Conclusion

Therefore, this study helps to choose the most economic antisecretory drug depending upon the socioeconomic status of the patient. Therefore, it is important for the doctor to have knowledge about the drug cost an it's application in practice would add benefits to the patient. Three scenario were identified for most cost effective antisecretory prescribing considering their indication and relative efficaciousness.

The decrease in drug expenditure can thus be brought about by:

1) Substitution by Omeprazole or least expensive brand amongst the Proton Pump Inhibitors.
2) Substitution by Famotidine/H_2blockers as per the Patient's perspective.
3) In case of Pantoprazole, using it's maintenance dose, that is, 20 mg because most patients do not show significant gastric symptoms, that is, they have a FSSG score of less than 8.

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