

# Cost Analysis of Different Brands of New in Class Anti-Anginal drugs Marketed in India

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## ABSTRACT

Angina pectoris, is the foremost manifestation of Ischemic Heart Disease, bring about by transient interlude of Myocardial Ischemia that are due to disproportion in the myocardial oxygen supply-demand interconnection. The treatment aims to improve Myocardial Oxygen supply and workload reduction. Few recently introduced drugs for angina are Ranolazine and Ivabradine which is been used along with other medicines nowadays. This article aims to bring out the cost-effectiveness of varying doses of these drugs by different pharmaceutical companies. Prices of various brands of newer anti-anginal drugs of various strengths marketed by the pharmaceutical companies were collected from the current anthology of apothecary. The difference betwixt the top to bottom cost of the equivalent medication mass produced by different pharmaceutical firms and proportion variation in rate for ten tablets was computed. Maximum and Minimum cost of Ivabradine 5mg was 216.45 and 85 respectively and that of 7.5 mg was 265.03 and 108.9, respectively. Chart 2 depicts the percentage Cost variation of 5mg and 7.5mg formulations were 154.64% and 143.37% respectively. Ranolazine group the Maximum and Minimum cost of 500mg Tablet being 180 and 68 ,500mg ER tablet being 214.75 and 63, 500mg SR being 190 and 82 ,1000mg being 158 and 87, 1000mg ER being 207.35 and 120 respectively. Chart 4 illustrates, the Cost variation of each formulations were 500mg-164.7 %, 500mg ER-240.87% ,500mg SR-131.7%,1000mg-81.6%,1000mg ER-72%. The Newer anti-anginal drugs like ranolazine and ivabradine show wider cost % variation among different formulations of these drugs. So, while prescribing for the general public the clinician should not only be aware of the effectiveness but also the affordability of each individual for better long-term outcome.

**Key words:** New in class anti anginal, Myocardial infarction, Bradycardia, Cost analysis, Affordability

**HOW TO CITE THIS ARTICLE:** Soujania Singh G, Arul Amutha Elizabeth, Brigida S, Cost Analysis of Different Brands of New in Class Anti-Anginal drugs Marketed in India, J Res Med Dent Sci, 2021, 9(10): 175-178

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**Received:** 09/08/2021  
**Accepted:** 05/10/2021

## INTRODUCTION

The most common cause of mortality in above 35 age group, approximated to half or one third in developed country is Coronary artery diseases (CAD). The statistics is nowhere different in developing country as well. To combat this, many researchers, and doctors in pharmaceutical field across the world have come with notable results in managing such patients with advanced drugs with newer modality of action thereby addressing the CAD complications as well [1]. Off late the drugs with novel mechanism of action inducted for managing chronic stable angina are Ranolazine and Ivabradine which has revolutionized and is creating upheaval in treatment. Both these drugs help in coping up of myocardial workload with oxygen availability by diminution of the mismatch by a queer mechanism than that of typical standard anti-ischemic drugs. This study focuses on the cost-effective analysis of the newer drugs like Ranolazine and Ivabradine that has been widely used for angina in recent times [2].

Ranolazine is a derivative of piperazine group of drugs for Angina, gives relief from enfeebling and agonizing symptoms. With its divergent way of action, Ranolazine has turned to be a promising drug in overcoming the ischemic symptoms. It acts on ion channels (sodium and potassium) by blocking the currents, also on L type calcium channels exerting weak vasodilation effect on vessels as well as notable direct effect on AV nodal conduction modulation. It had gained its approval by the FDA in 2006 [3-5]. The divergent action of Ranolazine shows opposed activity against the alpha 1 ( $\alpha_1$ ) and beta 1 ( $\beta_1$ ) receptors of adrenergic system as well as against fatty acid oxidation [6]. Currently, the drug is used for Chronic Angina.

The other newer drug in this class is Ivabradine, this lowers the heart rate (HR) and used for the effective relief of symptoms in case of stable Angina Pectoralis and Chronic Heart Failure patients. FDA gave approval for the drug in 2015, because the Non -DHP group of calcium channel blockers and beta blockers which are used to reduce the heart rate exhibit adverse effect by exerting negative inotropic effect. To combat this, Ivabradine which exerts the beneficial effect of lowering the heart rate alone in contrast to the available drugs in market, by

its action on funny current channels (If) in the SA node that too in a dose dependent manner favoring the patients by improvising myocardial workload and oxygen demand. This new-fashioned drug contributes anginal therapy with less serious side effects profile [7].

Being newer drugs the compliance of usage of these drugs by the general population is questionable, Our study aims to put the cost variation of these drugs. Rational prescribing should be practiced for all patients. Doctors most used brand names in prescription orders. Prescribing by generic names gives more flexibility to the pharmacist in choosing the particular drug product and therefore offers the patient a potential saving when the prices are competitive [8].

**METHODS**

Current index of medical stores (CIMS) 2020 was used as information guide to review the prices of drugs used in the treatment of angina [8].

The retail price of Ranolazine and Ivabradine manufactured by various pharmaceutical companies in the same dose, strength and number was compared.

Cost of Ranolazine and Ivabradine were calculated for ten tablets as the number of tablets available per strip differed. Maximum and minimum drug cost for the same formulation manufactured by different pharmaceutical companies was noted. The variation between the two is considered.

Percentage cost variation was calculated as follows:

$$\% \text{Cost variation} = \frac{\text{Maximum cost} - \text{Minimum cost}}{\text{Minimum cost}} \times 100$$

$$\% \text{Cost Variation} = \frac{(\text{Maximum Cost} - \text{Minimum Cost})}{\text{Minimum Cost}} \times 100$$

**RESULTS**

The cost of both Ivabradine and Ranolazine and their different Formulations were analyzed that was manufactured by different pharmaceutical companies in India and the cost being described in rupees.

For the drug Ivabradine there was 48 different formulations, among which were in the doses of 5mg, 7.5mg, 10mg and 2.5mg. In 10mg and 2.5mg only one brand was available, so it was not analyzed.

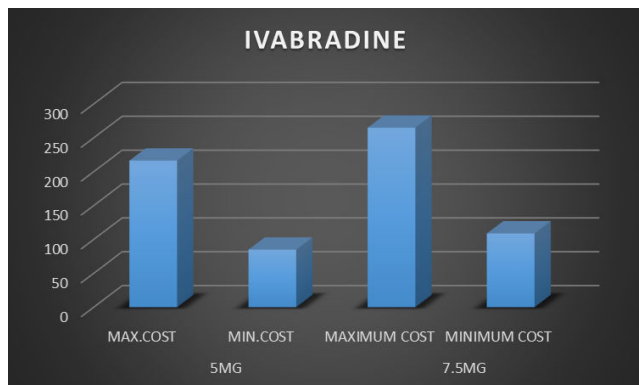
The Drug Ranolazine was available in 53 formulations, in doses of 500mg, 500mg - ER, 500mg-SR, 1000mg, 1000mg -ER tablets.

Table 1 and Figure 1 shows the maximum and minimum cost of Ivabradine 5mg was 216.45 and 85 respectively and that of 7.5 mg was 265.03 and 108.9 respectively. Figure 2 depicts the percentage Cost variation of 5mg and 7.5mg formulations were 154.64% and 143.37% respectively.

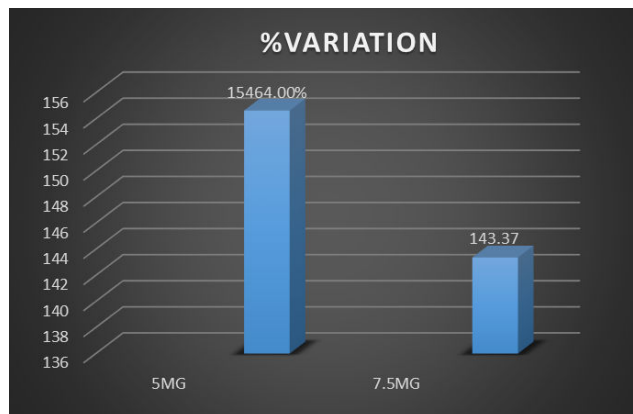
Table 2 and Figure 3 describes various formulation of Ranolazine group and the maximum and minimum cost of 500mg Tablet being 180 and 68, 500mg ER tablet being 214.75 and 63, 500mg SR being 190 and 82, 1000mg being 158 and 87, 1000mg ER being 207.35 and 120 respectively. Chart 4 illustrates, the Cost variation of each formulations were 500mg-164.7%, 500mg ER-240.87%, 500mg SR-131.7%, 1000mg-81.6%, 1000mg ER-72%.

**Table 1: Cost and Percentage variation of ivabradine.**

Drug-Ivabradine	5mg		10mg	
Cost	Maximum	Minimum	Maximum	Minimum
	216.45	85	265.03	108.9
% Variation	154.64%		143.37%	



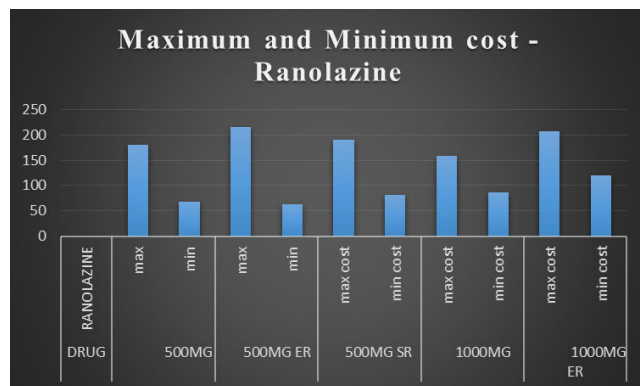
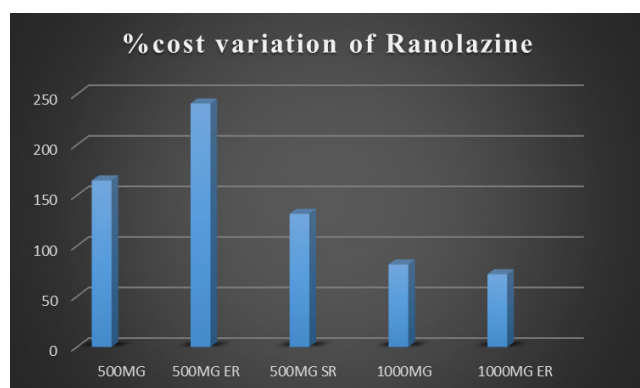
**Figure 1: Maximum and minimum cost of ivabradine.**



**Figure 2: Percentage cost variation of ivabradine.**

**Table 2: Cost and percentage variation of ranolazine.**

Drug - ranolazine	500mg		500mg ER		500mg SR		1000mg		1000mg ER	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
Cost	180	68	214.75	63	190	82	158	87	207.35	120
%Variation	164.70%	240.87%	131.70%	81.60%	72%					

**Figure 3: Maximum and minimum cost of ranolazine.****Figure 4: Percentage cost variation of ranolazine.**

### DISCUSSION

Antianginal drugs are to be used lifelong in most victims of angina and those who have established Coronary Artery Disease, Rational prescription of drugs after its cost analysis and safety profile and prescribing to patients according to their socio-economic status helps ineffective treatment and decrease the incidence of treatment failure.

Ranolazine and Ivabradine are the two widely used newer antianginal drugs. It is obvious in practice and from the studies that Ranolazine and Ivabradine which has revolutionized and is creating upheaval in treatment of Angina pectoris and are widely used by many physicians [9]. The wide cost variation of these drugs significantly points out the importance of rational prescribing practice in our country.

Earlier Cost-effective studies on different groups of drugs show wide variation. Pricing of the drugs should be regularized [8]. This tells that not only for antianginal drugs [8] but for antidepressants [10], antihypertensive [11], dyslipidemia drugs [12] and antidiabetic [13] also cost variation is wide.

The enormous growth of newer pharmaceutical companies and the marketing skills of certain companies fix physicians to prescribe particular sets of drugs and pass on the same knowledge to their residents, so more light should be thrown to regularize the prescribing pattern of medicine in our country for the benefits of patients, doctors and also small industrial companies [8].

### CONCLUSION

The newer anti-anginal drugs like ranolazine and ivabradine show wider cost % variation among different formulations of these drugs. So while prescribing for the general public the clinician should not only be aware of the effectiveness but also the affordability of each individual for better long-term outcomes.

### FUNDING

No funding sources.

### CONFLICT OF INTEREST

None declared.

### ETHICAL APPROVAL

Not sought as it is not required.

### REFERENCES

1. Kandaswamy E, Zuo L. Recent advances in treatment of coronary artery disease: Role of science and technology. *Int J Mol Sci* 2018; 19:424.
2. Cacciapuoti F. Ranolazine and Ivabradine: two different modalities to act against ischemic heart disease. *Therap Adv Cardiovas Diseases* 2016; 10:98-102.
3. Cacciapuoti F. Ranolazine and ivabradine: Two different modalities to act against ischemic heart disease. *Therap Adv Cardiovas Diseases* 2016; 10:98-102.
4. Rayner-Hartley E, Sedlak T. Ranolazine: A contemporary review. *J Am Heart Assoc* 2016; 5:e003196.
5. Saad M, Mahmoud A, Elgendy IY, et al. Ranolazine in cardiac arrhythmia. *Clin Cardiol* 2016; 39:170-178.
6. Bhandari B, Subramanian L. Ranolazine, a partial fatty acid oxidation inhibitor; its potential benefit in angina and other cardiovascular disorders. *Recent Patents Cardiovas Drug Discovery* 2007; 2:35-9.

7. Yancy CW, Jessup M, Bozkurt B, et al. ACC/AHA/HFSA focused update of the 2013 ACCF/AHA guideline for the management of heart failure: A report of the American college of cardiology/American heart association task force on clinical practice guidelines and the heart failure society of America. *J Am College Cardiol* 2017; 70:776-803.
8. Akila L, Rani RJ. Cost analysis of different brands of antianginal drugs available in India. *Int J Basic Clin Pharmacol* 2015; 4.
9. Panel OT. 32nd congress of the ESP and XXXIII international congress of the IAP. *Virchows Archiv* 2020; 477:S1-390.
10. Kamath L. Cost variation analysis study of oral anti-depressant drugs available in India. *Int J Basic Clin Pharmacol* 2017; 6:973.
11. Karve AV, Chattar KB. Cost analysis study of oral antihypertensive agents available in Indian market. 2014; 3.
12. Patel KP, Joshi HM, Khandhedra C, et al. Study of drug utilization, morbidity pattern and cost of hypolipidemic agents in a tertiary care hospital. 2013; 4.
13. Sriram S, Elizabeth AA, Akila L. Cost analysis of SGLT2 inhibitors in patients with type 2 Diabetes in India. *Res J Pharm Technol* 2020; 13:5861-5865.