



Economic Evaluation of Different Brands of Commonly Prescribed Drugs Used in the Management of Angina Pectoris in Indian Market

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ABSTRACT

Introduction: Coronary artery disease (CAD) is one of the most common causes of cardiovascular mortality and morbidity in developing countries like India. Initial management includes use of many anti-anginal drugs. If angina pectoris not managed adequately results in significant morbidity and mortality too due to the complications. Anti-anginal drugs are used for lifelong. Therefore, analysis of the price of different drugs used in ischemic heart disease will help to improve patient compliance.

Objective: (1) To assess the cost variation of different drugs available as antianginal agents in India. (2) To assess the cost ratio and percentage price variation of different formulations.

Method: The maximum and minimum price of each brand of the drugs given in Indian rupees (INR) was noted by using 'Drug Today' (Oct 2022 – Jan 2023, volume II). The cost range, cost ratio, and the percentage cost variation for individual drug brands were calculated. The cost of tablets/capsule was calculated, and the cost ratio and percentage cost variation of various brands was compared.

Results: After calculation of cost ratio and percentage cost variation for each brand of anti-anginal drugs, tab Diltiazem (60 mg) had a maximum percentage cost variation of 459.76% and a cost ratio of 5.59 while tab GTN (6.4 mg) had a minimum percentage cost variation of 76.19% and cost ratio of 1.76.

Conclusions: There is a wide variation in the price of different brands of anti-anginal drugs available in India. The clinicians prescribing these drugs should be aware of these variations to reduce the financial burden of drug therapy and improve compliance.

Key Words: Anti-anginal drugs, Cost ratio, Percent cost variation, Angina Pectoris, Drug Today, Cost Range

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 Angina pectoris is common cardiovascular conditions treated by physicians.^{2,3,4} In addition to having symptomatic limitation, patients with angina require long term drug treatment, are

often admitted to hospital (with an exacerbation of angina or an acute coronary syndrome), and often require revascularization (percutaneous coronary intervention or coronary artery bypass grafting).^{5,6,7} As a result of these factors, the treatment of angina pectoris consumes a substantial proportion of overall spending on health care.^{8,9,10}

The increase in incidence of CAD is due to rapid urbanization and changing lifestyle such as dietary changes, increased alcohol consumption, physical inactivity and increased prevalence of diabetes.^{11,12,13}

Drugs effective in the treatment of angina are organic nitrates, beta-adrenergic blocking agents, calcium channel

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blockers and potassium channel openers. Recent advances include cytoprotective such as ranolazine and ivabradine. Nitrates are used in the treatment of acute attack of angina and beta-blockers are most prescribed in chronic prophylaxis.¹⁴

Patients are usually initiated with lowest dose as monotherapy. If the symptoms are not controlled adequately, then dose titration is done, or patient is prescribed add on drug or a fixed dose combination of two drugs to improve adherence to therapy. However, this will increase the financial burden of the patient, which may result in poor compliance.¹⁵ Inadequately treated ischemic heart disease can result in complications like myocardial infarction, cerebrovascular accident, and thromboembolic disorders, which may be fatal.

The Indian pharmaceuticals market is the third largest in terms of volume and thirteenth largest in terms of value, as per the report by Equity Master. Also, India is the largest provider of generic drugs globally with the Indian generics accounting for 20 per cent of global exports.¹⁶ coronary artery diseases (CAD) are the prevalent cause of mortality, accounting for around 50% of the death resulting from non-transmissible diseases. For the treatment of angina pectoris, we have a wide range of medications created by several pharmaceutical companies.

Therefore, we designed this study to identity cost variability in different antianginal drugs formulation developed by different pharmaceutical companies. This study will be useful to determine cost difference between various anti-anginal drugs to lower therapy costs, promote patient compliance, and use medications more judiciously.

Study was approved from AIIMS Patna Ethics Committee (AIIMS/Pat/IEC/2022/979)

METHODS

Price in INR of anti-anginal drugs manufactured by different pharmaceutical companies in India, in the different strengths was obtained by using Drug Today (October 2022 - January 2023, volume II) as they are a readily available source of drug information and are updated regularly. The cost of 10 tablets/capsules was calculated. The costs of drugs were also cross-checked at a pharmacy or retail drug store. The difference in the maximum and minimum price of the same drug formulation manufactured by different pharmaceutical companies and percentage variations in prices were calculated. The cost ratio, calculated as the ratio of the costlier brand to that of the cheapest brand of the same drug, is calculated as follows.

Cost ratio

Price of the costlier brand/ price of the cheapest brand

Percentage cost variation

$[(\text{Maximum cost} - \text{minimum cost}) / \text{minimum cost}] \times 100$

Maximum and minimum percentage cost variation and cost ratio of a particular drug was noted down.

Inclusion criteria

Anti-anginal drugs from branded manufacturing companies and drugs of the same and different strengths were included. Dosage forms of anti-anginal tablet/capsule were included.

Exclusion criteria

Anti-anginal drugs in combinations with other groups of drugs, fixed-dose combinations and drugs with no price information were excluded from the study.

RESULTS

The costs of a total of 11 anti-anginal drugs available in 14 different formulations were analyzed and a substantial variation in cost was observed. Out of 14 drug formulations studied, the percentage cost variation of 12 drug formulations was more than 100% out of which 3 drug formulations had more than 400%. The cost ratio was also observed to be very high, and 12 drug formulations had this ratio of more than 2. After calculation of cost ratio and percentage cost variation for each brand of anti-anginal drugs, tab Diltiazem (60 mg) had a maximum percentage cost variation of 459.76% and a cost ratio of 5.59 while tab GTN (6.4 mg) had a minimum percentage cost variation of 76.19% and cost ratio of 1.76.

So ideally, we use the drug which cost ratio less than 2 and percentage prize variation less than 100.

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.

This study revealed a wide variation in prices of antianginal drugs. Out of 14 different formulations were analyzed and a substantial variation in cost was observed. Out of 14 drug formulations studied, the percentage cost variation of 12 drug formulations was more than 100% out of which 3 drug formulations had more than 400%. The cost ratio was also observed to be very high, and 12 drug formulations had this ratio of more than 2.

As the prevalence of CAD is increasing in Indians, early management using antianginal drugs will reduce the

cardiovascular mortality and morbidity. Despite increasing growth in pharmaceutical market in India, the Indian population is not getting benefited because of their low socioeconomic status. Physicians play an important role in prescribing drugs to patients and they should prescribe drugs according to their financial condition. Physicians must notify the government about the market availability of these expensive drugs so that the Indian Government could reduce the pricing of antianginal drugs by bringing them under Drug Pricing Control Order (DPCO). The drugs under DPCO have minimum percentage variation in prices than the drugs which do not come under it.^{17,18}

Some previous price analysis studies of oral hypolipidemic drugs, antiepileptic drugs, oral fluoroquinolone antibiotics and anxiolytic drugs have also showed such a wide variation in prices in Indian market.^{19,20,21,22} This study also highlights the wide variation in prices amongst antianginal drugs marketed in India.

CONCLUSION

There was a wide variation in the cost of various brands of antianginal drugs available in India. For rational drug use, the cost is an equally important factor that commonly gets ignored while prescribing. Therefore, such studies comparing the cost of different brands of a class of drugs can help in the prescription of drugs affordable to the common man. Generic drug prescribing can decrease the expenditure of patients on the drug and compliance can be improved. Adequate information should be provided to the physicians regarding cost, bioequivalence, and quality of drugs. 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 patient's socioeconomic status. There is a strong need to create awareness about this huge price variation among the general public, healthcare providers, healthcare payers, government agencies, policymakers, and pharmacists for appropriate intervention to reduce the economic burden on patients as well as the healthcare system.

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Study design and planning of study - All the authors.

Literature search – RK, CK, PKM

Tables – CK, AKR, SP

Data acquisition and analysis – RK, PKM

Manuscript preparation – RK, CK, PKM

Manuscript editing and manuscript review- All the authors.

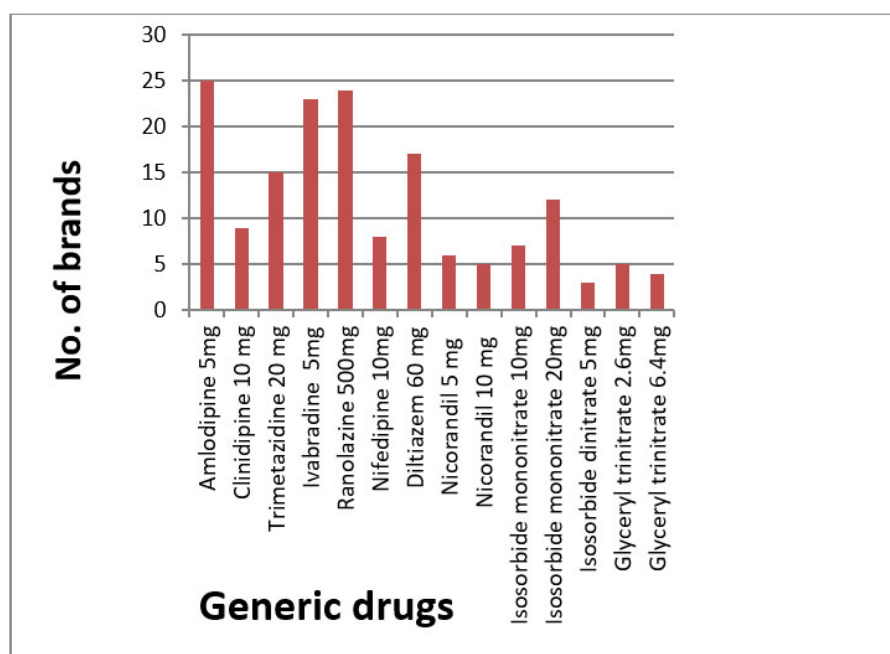
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Table 1: Cost ratio and percentage cost variation of anti-anginal drugs available in the Indian market

Generic drugs and strength/10 tab	No. of brands	Cost range (INR)	Cost ratio	Percent cost variation
Amlodipine 5mg	25	6.80-36.38	5.35	435
Clinidipine 10 mg	9	49.50-136.76	2.76	176.28
Trimetazidine 20 mg	15	30-165	5.50	450
Ivabradine 5mg	23	131-346	2.64	164.12
Ranolazine 500mg	24	68-270.20	3.97	297.35
Nifedipine 10mg	8	9.72-27.11	2.78	178.90
Diltiazem 60 mg	17	18.07-101.15	5.59	459.76
Nicorandil 5 mg	6	69-125	1.81	81.15
Nicorandil 10 mg	5	97.50-204.50	2.09	109.74
Isosorbide mononitrate 10mg	7	10.52-21.78	2.07	107.03
Isosorbide mononitrate 20mg	12	10-49	4.9	390
Isosorbide dinitrate 5mg	3	3.80-7.90	2.07	107.89
Glyceryl trinitrate 2.6mg	5	31-71	2.29	129.03
Glyceryl trinitrate 6.4mg	4	42-74	1.76	76.19

**Figure 1:** Number of brands of different antianginal drugs.

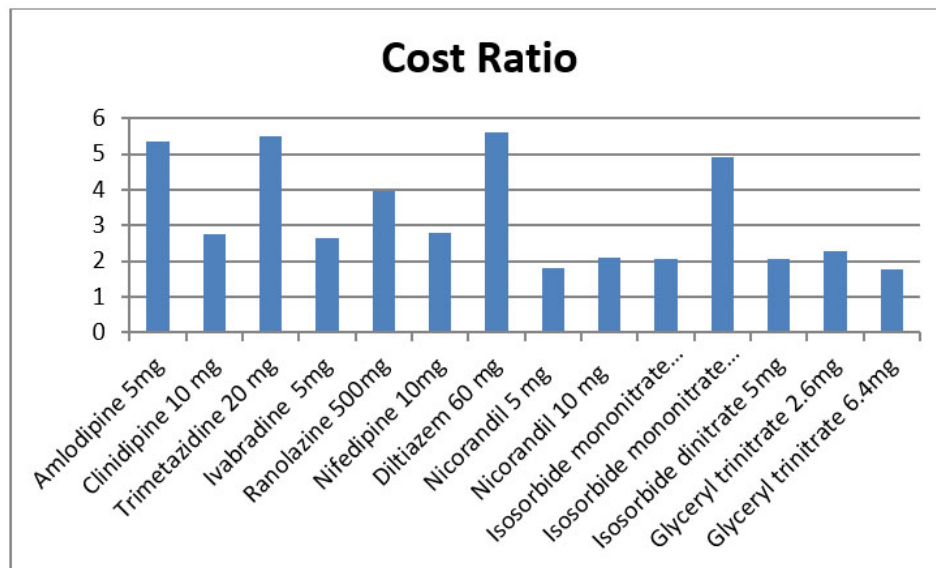


Figure 2: Cost Ratio of different brand of Anti-anginal drugs.

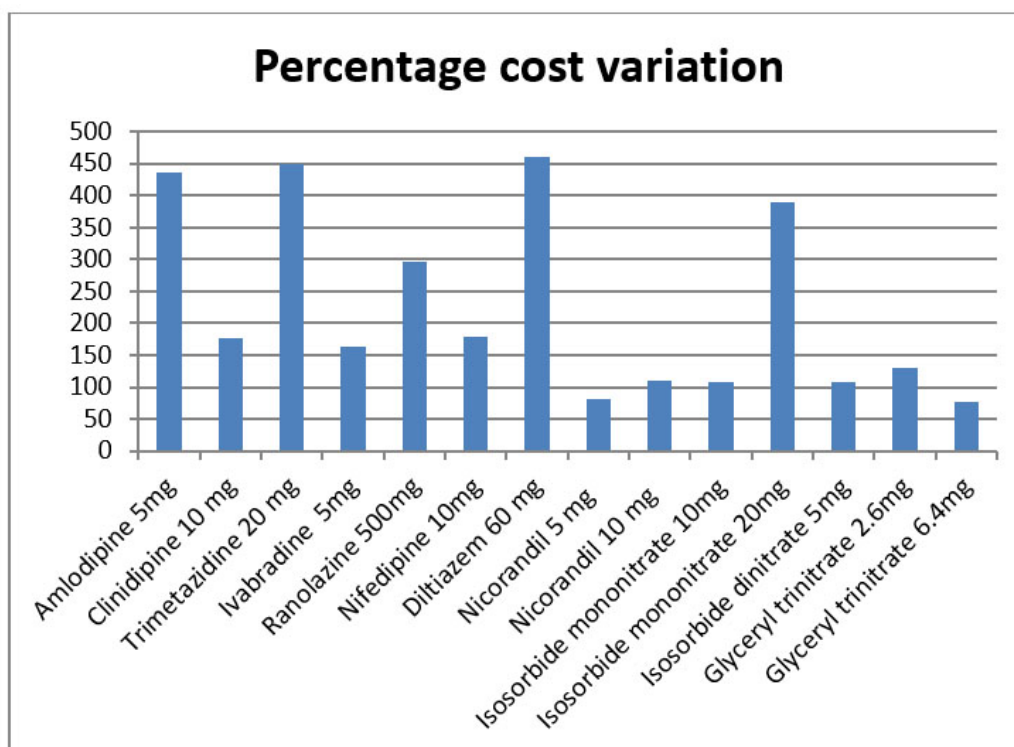


Figure 3: Percentage cost variation of different brand of Anti-anginal drugs.