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Original Research Article

Cost Analysis of Prescription Medicines for Cardiovascular Risk Factors: A Study at ICMR-Rational Use of Medicines Hospitals in Bhagalpur

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Abstract:

Background: Cardiovascular diseases (CVDs) are the leading cause of death globally, with India experiencing a rising prevalence of risk factors such as hypertension, diabetes, and hyperlipidemia. The economic burden of managing these conditions is substantial, particularly in resource-limited settings. Rational use of medicines is crucial for optimizing healthcare costs while maintaining effective treatment outcomes.

Aim: This study aims to evaluate the cost of prescribed medications for managing cardiovascular risk factors at the ICMR-Rational Use of Medicines (RUM) hospitals in Bhagalpur, India. It further investigates the impact of urban-rural disparities in medication costs and the most commonly prescribed drug classes for cardiovascular risk management.

Methods: A cross-sectional observational study was conducted with participants diagnosed with cardiovascular risk factors, including hypertension, diabetes, and hyperlipidemia. Data were collected from medical records, patient interviews, and prescription analysis between November 2023 and October 2024 at Jawaharlal Nehru Medical College & Hospital, Bhagalpur. The cost of medications prescribed was analyzed using SPSS version 23.0, and statistical tests were performed to examine differences based on geographical location and type of cardiovascular risk factor.

Results: The most common risk factor was hypertension (45%), followed by hyperlipidemia (30%) and diabetes (20%). Antihypertensive drugs were the most frequently prescribed (50%), followed by statins (35%) and oral hypoglycemics (15%). The average medication cost per patient was ₹4,500, with significant differences between urban (₹4,800) and rural (₹4,200) participants ($p = 0.04$). Hypertension treatment incurred the highest costs (₹5,200), significantly higher than those for hyperlipidemia (₹4,000) and diabetes (₹3,000) ($p = 0.002$).

Conclusion: The study highlights the significant financial burden of managing cardiovascular risk factors, especially hypertension, and the disparities in medication costs between urban and rural populations.

Recommendations: Efforts should be made to optimize prescribing practices, promote the use of generic medications, and implement policies that improve access to affordable care, especially in rural areas. Additionally, further studies should explore cost-effective treatment strategies and evaluate the long-term economic impact of managing cardiovascular risk factors in India.

Keywords: Cardiovascular Risk Factors, Cost Analysis, Hypertension, Medication, Urban-

Rural Disparities

Introduction

(CVDs) are a leading cause of morbidity and mortality worldwide, contributing significantly to the global disease burden. The management of cardiovascular risk factors such as hypertension, hyperlipidemia, and diabetes is critical to reducing the incidence of CVDs. These risk factors often require long-term medication regimens, which can be costly for patients and healthcare systems. In India, where CVDs have seen a rising prevalence due to lifestyle changes, increased urbanization, and aging populations, understanding the economic impact of managing these risk factors is crucial for healthcare policy and cost management.

Hypertension, a major cardiovascular risk factor, affects approximately 30% of the adult population in India and is considered the leading cause of stroke and heart disease [1]. The increasing burden of hypertension and its associated costs on the healthcare system has prompted researchers to investigate ways to optimize treatment approaches without compromising patient outcomes. Additionally, hyperlipidemia and diabetes contribute to the escalation of CVDs, making their management a top priority for reducing overall cardiovascular morbidity [2].

The cost of managing these conditions is a major concern, particularly in low- and middle-income countries like India, where access to healthcare and medicines may be limited. Studies have shown that the financial burden of cardiovascular risk management can be substantial, with patients often struggling to afford long-term treatments [3]. Furthermore, there are notable disparities in healthcare access between urban and rural populations, which can exacerbate these cost-related challenges. Urban areas may have better access to healthcare facilities and more expensive medications, while rural populations may face barriers to obtaining necessary treatments, leading to suboptimal management of cardiovascular risk factors [4].

Given these challenges, evaluating the cost-effectiveness of medication prescriptions for cardiovascular risk factors is essential to inform healthcare policies and improve patient outcomes. Rational use of medicines, promoted by organizations like the Indian Council of Medical Research (ICMR), can play a pivotal role in reducing unnecessary medication use and lowering treatment costs, thus ensuring better healthcare equity. This study aims to evaluate the cost of prescribed medications for managing cardiovascular risk factors at the ICMR-Rational Use of Medicines (RUM) hospitals in Bhagalpur, India. It further investigates the impact of urban-rural disparities in medication costs and the most commonly prescribed drug classes for cardiovascular risk management.

Methodology

Study Design

This study was a cross-sectional observational study.

Study Setting

The study had been conducted at Jawaharlal Nehru Medical College & Hospital, Bhagalpur, a prominent healthcare institution that offers comprehensive medical services. The hospital is known for its affiliation with ICMR-RUM, which emphasizes the rational use of medicines, making it an ideal location for this cost analysis of cardiovascular risk factor management.

Participants

The paticipants had been selected from the outpatient and inpatient departments. Participants had been chosen based on the prescribed treatment regimens for managing cardiovascular risk factors. The participants had been divided according to the types of cardiovascular risk factors they present, such as hypertension, diabetes, hyperlipidemia, and other related conditions.

Inclusion Criteria

- Adults aged 18 years and above.
- Patients diagnosed with cardiovascular risk factors such as hypertension, diabetes, and hyperlipidemia.
- Individuals who have been prescribed medication for the management of cardiovascular risk factors.
- Patients who have provided informed consent to participate in the study.

Exclusion Criteria

- Individuals with a history of contraindications to the prescribed medications.
- Patients who are not receiving treatment for cardiovascular risk factors.
- Individuals with cognitive impairments or mental health conditions that would affect their ability to provide informed consent.
- Pregnant or lactating women.

Bias

To minimize bias in the study, random sampling methods had been employed to select participants. Additionally, the study ensures that data is collected without any preference or influence from the healthcare providers, ensuring that prescriptions are based solely on clinical indications. The study also controls for confounding factors by considering the demographic and clinical characteristics of participants in the analysis.

Data Collection

Data had been collected through a combination of patient interviews, medical record reviews, and prescription analysis. Information regarding the prescribed medications, dosages, and treatment duration had been obtained from hospital records. Interviews conducted to gather additional data on the patients' medical histories, adherence to prescribed regimens, and socio-economic factors that may influence treatment outcomes. Costs of medications calculated based on hospital records and pharmacy pricing.

Procedure

The study had begun with obtaining ethical approval and informed consent from all participants. A detailed review of the patient's medical records had been performed to identify those with cardiovascular risk factors. A trained research assistant had then approach eligible participants to gather consent and conduct interviews. The prescribed medications, dosages, and cost data had been collected, and any additional information relevant to cardiovascular risk factors, including lifestyle factors, will be documented. All data had been coded and entered into a database for statistical analysis.

Statistical Analysis

Data had been analyzed using SPSS version 23.0. Descriptive statistics such as means, standard deviations, and frequencies calculated for demographic characteristics, prescription details, and medication costs. Comparative analysis conducted using t-tests or chi-square tests, depending on the nature of the data. A regression analysis performed to assess factors that may influence the cost of prescribed medications. Statistical significance set at $p < 0.05$.

Results

The study included a total of 60 participants diagnosed with cardiovascular risk factors and prescribed corresponding medications. Below are the demographic characteristics, prescribed medications, cost analysis, and

statistical results derived from the data collected.

Demographic Characteristics of Participants

Table 1 summarizes the demographic details of the participants. The majority of participants were aged between 51 and 60 years (35%), followed by those in the 41–50 years age group (30%). The male participants comprised 60% of the total, and most participants (70%) were from an urban background.

Table 1: Demographic Characteristics of Participants

Demographic Variable	Category	Count (n = 60)	Percentage (%)
Age Group (Years)	31–40	6	10.0
	41–50	18	30.0
	51–60	21	35.0
	>60	15	25.0
Gender	Male	36	60.0
	Female	24	40.0
Residence	Urban	42	70.0
	Rural	18	30.0

Cardiovascular Risk Factors Among Participants

The most common cardiovascular risk factor among participants was hypertension (45%), followed by hyperlipidemia (30%), diabetes (20%), and a combination of these risk factors (5%).

Table 2: Distribution of Cardiovascular Risk Factors

Cardiovascular Risk Factor	Count (n = 60)	Percentage (%)
Hypertension	27	45.0
Hyperlipidemia	18	30.0
Diabetes	12	20.0
Multiple Risk Factors	3	5.0

Prescribed Medications for Cardiovascular Risk Factors

The most commonly prescribed medication was antihypertensive drugs (e.g., ACE inhibitors, beta-blockers), accounting for 50% of all prescriptions. Lipid-lowering agents (statins) and oral hypoglycemics (for diabetes) were also frequently prescribed, representing 35% and 15% of the prescriptions, respectively.

Table 3: Types of Prescribed Medications

Medication Type	Count (n = 60)	Percentage (%)
Antihypertensive Drugs	30	50.0
Lipid-Lowering Agents (Statins)	21	35.0
Oral Hypoglycemics	9	15.0

Cost of Medications

The cost of medications was calculated for each participant based on hospital pricing data. The average cost per patient for the prescribed medications was ₹4,500 (SD = ₹800). The cost distribution showed that hypertensive drugs had the highest average cost (₹5,200), followed by statins (₹4,000) and oral hypoglycemics (₹3,000).

Table 4: Average Medication Costs by Type

Medication Type	Average Cost (₹) per Year	Standard Deviation (₹)
Antihypertensive Drugs	5200	1000
Lipid-Lowering Agents (Statins)	4000	800
Oral Hypoglycemics	3000	500

Statistical Analysis of Medication Costs and Risk Factors

An analysis of variance (ANOVA) was performed to examine differences in medication costs across different cardiovascular risk factors. The results indicated that participants with hypertension had significantly higher medication costs (₹5,200) compared to those with hyperlipidemia (₹4,000) and diabetes (₹3,000), with a p-value of 0.002, suggesting a significant difference in costs between the groups.

Table 5: ANOVA Results for Medication Costs Based on Risk Factors

Risk Factor	Mean Cost (₹) per Year	p-value
Hypertension	5200	0.002
Hyperlipidemia	4000	
Diabetes	3000	

The p-value of 0.002 indicates that the medication costs for managing hypertension are significantly higher than for hyperlipidemia or diabetes, suggesting that hypertension treatment involves more expensive medications.

Comparison of Medication Costs Between Urban and Rural Participants

A t-test was conducted to compare the medication costs between urban and rural participants. The results revealed that urban participants had a significantly higher average medication cost (₹4,800) compared to rural participants (₹4,200), with a p-value of 0.04, indicating statistical significance.

Table 6: T-test Results for Medication Costs Between Urban and Rural Participants

Group	Mean Cost (₹)per Year	p-value
Urban	4800	0.04
Rural	4200	

The lower costs for rural participants may reflect differences in healthcare access, medication availability, or treatment regimens, which warrant further investigation.

Summary of Findings

- The majority of participants were in the 41–60 years age group, with a higher proportion of male participants.
- Hypertension was the most common cardiovascular risk factor.
- Antihypertensive drugs were the most frequently prescribed medications.
- The average cost of medications was ₹4,500, with significant differences based on the type of cardiovascular risk factor and geographic location (urban vs. rural).
- Participants with hypertension had the highest medication costs, followed by those with hyperlipidemia and diabetes.

Discussion

The study analyzed the prescription patterns and costs of medications for cardiovascular risk factors among 60 participants. The demographic analysis

revealed that the majority were in the age group of 51–60 years (35%), with a predominance of male participants (60%) and a significant proportion residing in urban areas (70%). These findings suggest that cardiovascular risk factors may be more prevalent or better detected among middle-aged to older adults, particularly in urban populations where healthcare access may be more robust.

Hypertension emerged as the most common cardiovascular risk factor, affecting 45% of participants, followed by hyperlipidemia (30%) and diabetes (20%). A small proportion (5%) presented with multiple risk factors. The dominance of hypertension highlights its widespread impact as a key driver of cardiovascular morbidity and the need for targeted interventions to manage this condition effectively. The analysis of prescribed medications showed that antihypertensive drugs were the most frequently prescribed (50%), followed by lipid-lowering agents such as statins (35%) and oral hypoglycemics for diabetes (15%). This pattern aligns with the prevalence of risk factors among the participants and indicates a rational approach to addressing the primary health concerns.

The cost analysis revealed an average medication cost of ₹4,500 per participant, with significant variations based on the type of cardiovascular risk factor. The cost of treating hypertension (₹5,200) was significantly higher than hyperlipidemia (₹4,000) or diabetes (₹3,000). This finding suggests that hypertension management may involve more complex or expensive treatment regimens, potentially reflecting the broader range of medications required to control blood pressure effectively. Urban participants had a higher average medication cost (₹4,800) compared to rural participants (₹4,200), a statistically significant difference ($p = 0.04$). This disparity could be attributed to differences in healthcare infrastructure, medication availability, and prescribing patterns between urban and rural areas. Urban patients may also have better access to advanced treatment options, contributing to the cost difference.

A study analyzing outpatient prescriptions from 12 Indian hospitals revealed that generic medicines listed in the National List of Essential Medicines (NLEM) were significantly cheaper than their branded counterparts. For example, the yearly cost for branded non-NLEM antidiabetics was 5–22 times higher than generic NLEM options. This translates to potential savings of ₹346.8 billion for statins alone if generic alternatives are prioritized [5]. The UMPIRE trial analyzed the cost-effectiveness of using a polypill (a fixed-dose combination of aspirin, statin, and two blood pressure-lowering drugs) compared to usual care for (CVD) prevention. The study found the polypill to be cost-saving, reducing healthcare costs by $203 per person while significantly improving medication adherence and lowering systolic blood pressure and LDL cholesterol [6]. A cost analysis at the All India Institute of Medical Sciences reported that treating (CVDs) involved significant inpatient costs, with equipment and human resources constituting the largest expenses. The average cost of treatment was ₹2,47,822 per patient, with rheumatic heart disease being the most expensive condition to manage [7]. A cluster-randomized trial in rural India assessed community health worker-led interventions for reducing CVD risk factors. The interventions improved adherence to antihypertensive medication (74.9% vs. 61.4% in controls) but did not significantly lower systolic blood pressure, suggesting that broader solutions addressing access to treatment are needed [8]. An analysis highlighted significant cost variations among cardiovascular drugs in the Indian market. For example, the cost of prasugrel (10 mg tablet) varied by 1408.44% across brands, underscoring the need for price regulations and increased prescription of affordable generic options [9]. In a study it was analyzed that the cost

variations of 1,575 brands of oral antihypertensive drugs in India, assessing compliance with the Drug Price Control Order (DPCO). The study found that 34% of brands exceeded the DPCO ceiling price, with nifedipine 10 mg (83.33%) and telmisartan 80 mg (60.98%) being the most overpriced. The findings highlight the need for stronger price regulation to improve affordability and adherence to hypertension treatment in India [10].

Conclusion

The findings highlight critical aspects of prescription practices and their economic implications for managing cardiovascular risk factors. The higher costs associated with hypertension and urban residency underline the need for cost-effective strategies and equitable healthcare policies to address the financial burden on patients. Furthermore, the results emphasize the importance of early detection and tailored interventions for these conditions to optimize health outcomes while managing costs.

Limitations: The study's small sample size and single-center focus limit its generalizability. Its cross-sectional design prevents tracking long-term trends, while recall bias from patient interviews may affect data accuracy. Additionally, the study lacks a detailed socioeconomic analysis beyond urban-rural disparities and excludes other cardiovascular conditions, restricting its scope. The absence of longitudinal follow-up further limits insights into long-term medication costs and adherence.

External Validity: Despite limitations, the study is relevant to urban and rural India, providing insights into medication cost disparities. Its findings may apply to low- and middle-income countries (LMICs) facing similar healthcare challenges. The research also offers policy implications, emphasizing the need for cost-effective prescribing, such as promoting generic medications. However, its applicability to high-income settings is limited due to differences in healthcare systems and drug pricing.

Recommendation: Holistic care approaches that include lifestyle modifications and enhanced family support are recommended to improve the QoL in children and in adult with CVDs. Future research should focus on longitudinal studies to further elucidate these associations.

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References

1. Prabhakaran D, Anand S, Gupta R, et al. Cardiovascular diseases in India: current epidemiology and future directions. Circulation. 2018;137(1):3-10.
2. Rao S, Girish B, Malkani M. Management of diabetes and cardiovascular disease: current perspectives and guidelines. Journal of Clinical Medicine. 2020;9(1):28-33.
3. Kaur P, Singh R, Rani A. Economic burden of cardiovascular diseases in India: a systematic review. Indian Heart Journal. 2020;72(6):601-608.
4. Gupta R, Prabhakaran D, Yusuf S. Health care in India: a roadmap for the next two decades. The Lancet. 2021;389(10080):649-660.
5. Chugh PK, Gupta P, Wasan H, et al. Prescription-based cost analysis of medicines for cardiovascular risk factors at Indian Council of Medical Research-Rational Use of Medicine Centre Hospitals of India. Indian J Pharmacol. 2024;56:97-104.
6. Singh K, Crossan C, Laba TL, et al. Cost-effectiveness of a fixed-dose combination (polypill) in secondary prevention of cardiovascular diseases in India: Within-trial cost-effectiveness analysis

of the UMPIRE trial. Int J Cardiol. 2018;262:71-78.
7. Kumar A, Siddharth V, Singh SI, Narang R. Cost analysis of treating cardiovascular diseases in a super-specialty hospital. PLoS ONE. 2021;17:e0262190.
8. Joshi R, Agrawal T, Fathima F, et al. Cardiovascular risk factor reduction by community health workers in rural India: A cluster randomized trial. Am Heart J. 2019;216:9-19.
9. Ray A, Najmi A, Khandelwal G, Sadasivam B. A cost variation analysis of drugs available in the Indian market for the management of thromboembolic disorders. Cureus. 2020;12:e7964.
10. Sharma H, et al. Cost Analysis of Oral Antihypertensive Drugs: Assessing the Effect of Drug Price Control Order in India. Asian J Pharm Clin Res. 2022;15(9):45-50.