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Research Article

Navigating Medication Challenges: A Strategic Approach to Cardiovascular Health at a Government Hospital

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Abstract

Background and Objective: During hospitalization, the prevalence of drug related problems underscores the necessity for targeted interventions in medication management, crucial for improving overall outcomes. The primary objective was to delve into the intricate realm of drug related problems (DRPs) prevalent among cardiovascular patients (CVP) receiving medical care at the facility. Through meticulous examination and analysis, the study aimed to uncover key insights into the challenges and complexities associated with medication regimens in this specific patient demographic during the specified timeframe. **Materials and Methods:** A study at Government General Hospital, Kurnool, from December 30, 2020, to August 27, 2021, examined 1100 cardiovascular patients. Trained personnel identified drug-related problems within 24 hrs post-admission, ensuring accuracy through medical professional confirmation. The rigorous methodology included linguistic considerations, daily supervision and meticulous statistical analysis using SPSS and Excel. The study categorized DRPs, offering insights into medication management challenges such as untouched indications, unjustified drug use, incorrect medicines, suboptimal dosage, overdose and medication noncompliance. **Results:** Gender-related trends in specific issues were observed, with insomnia more common among males, while cough and dyspnea were prevalent in females. Pantoprazole misuse occurred in 44.74% of cases. Sub-therapeutic dosing cases, particularly with sildenafil. Non-compliance, notably in nebulization-related issues (39.17%). **Conclusion:** The study concludes by underscoring the necessity for interdisciplinary collaborations to mitigate the impact of drug related problems on cardiovascular patients.

Key words: Cardiovascular, hospital, medication management, patients, prevalence

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Competing Interest: The authors have declared that no competing interest exists.

Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

Cardiovascular Diseases (CVDs) represent a critical category of health issues encompassing disorders affecting the heart and blood vessels. Their global impact is profound, accounting for a substantial 85% of total deaths, with heart attacks and strokes being predominant causes¹. The gravity of this health challenge is further accentuated in developing nations, where behavioral risk factors like smoking and poor diet exacerbate the prevalence of CVDs. These risk factors contribute significantly to the increased burden of CVDs in these regions, underscoring the urgency for timely detection and intervention strategies to effectively mitigate the impact of cardiovascular diseases on public health². Recognizing and addressing these factors is paramount to implementing proactive measures that can curb the rising tide of cardiovascular diseases, particularly in populations facing higher vulnerability due to socio-economic and lifestyle factors³.

This study addresses the prevalence of drug-related problems (DRPs) within hospital settings, contributing to increased costs and harm. In India, a potential DRP rate of 70% is identified, driven by factors like comorbidities, polypharmacy and medication adherence challenges⁴. The investigation in Kurnool underscores the elevated risk among ambulatory cardiovascular patients (CVPs), emphasizing the need for proactive measures in the healthcare system⁵.

Hospital admissions for cardiovascular conditions escalate DRP costs fourfold, amplifying morbidity, mortality and overall healthcare expenses. Common cardiovascular medications are implicated in DRPs, necessitating a focus on proactive measures to address the heightened risk among CVPs. The study aims to identify prevalent categories of DRPs and offer insights crucial for enhancing drug treatment safety and efficacy in cardiovascular care⁶.

This research identifies six prevalent categories of DRPs, encompassing untreated indications, unjustified drug use, incorrect medicines, suboptimal dosage, overdose and noncompliance.

MATERIALS AND METHODS

Study design and study setting: An interventional study was conducted at the Government General Hospital (GGH) in Kurnool, India, spanning from December 30, 2020, to August 27, 2021. It's noteworthy that the hospital is situated close to a medical institution.

Study populace and facts-gathering process: The research centered on a specific demographic of confirmed cardiovascular patients (CVPs) aged 18 and above within the health ward of GGH Kurnool. The data collection process was conducted by trained personnel who gathered information from the medical records of these patients, with a particular focus on the 24 hrs timeframe following admission. To identify drug-related problems (DRPs), a thorough medication assessment was undertaken. Subsequently, the identified DRPs underwent confirmation by medical professionals actively engaged in the study, ensuring the accuracy and reliability of the data. This meticulous approach aimed to provide a comprehensive understanding of the prevalence and nature of DRPs among the specified group of cardiovascular patients⁷.

Data quality assurance: During the research phase, the lead investigator played a pivotal role in ensuring consistency by providing training to data collectors. This training aimed to maintain uniformity in surveys conducted in both English and Telugu, accommodating the linguistic diversity of the study population. To refine the research instruments, a pre-test involving 100 patients was conducted, gauging the clarity of the checklist. Adjustments were made based on valuable insights derived from this pre-test, enhancing the effectiveness of data collection tools.

Daily operations were closely monitored by the principal investigator, who actively supervised the actions of the data collectors. This oversight ensured the completion of surveys during each day's data collection, reinforcing the reliability and accuracy of the gathered information. The commitment to training, pre-testing and continuous supervision underscored the methodological rigor employed in the research, contributing to the overall robustness of the study's findings⁸.

Data processing, statistical analysis and presentation: The collected data underwent comprehensive analysis using statistical tools, specifically SPSS (Statistical Package for the Social Sciences) and Microsoft Excel. The analytical process involved multivariate analysis, wherein factors with significance levels of $p \leq 0.25$ were initially considered. Subsequently, a more stringent threshold of 0.05 was applied, with factors meeting this criterion selected for inclusion in the final analysis. This meticulous approach to statistical analysis aimed to identify and prioritize the most relevant variables, ensuring the robustness and meaningful interpretation of the study's findings⁹.

Ethical consideration: Ethical approval for the research involving human subjects was successfully obtained from the Research and Study Department at Government General Hospital, Kurnool. The approval is documented with a valid registration number, GGH/KNL/EA/19-08 and a designated research number, SJCPs/R-19-38. The process involved strict adherence to a protocol that aligns with the guidelines established by health authorities. This commitment to ethical standards and regulatory compliance underscores the conscientious approach taken to ensure the welfare and rights of the participants involved in the study. These details will be integral to the documentation and reporting of the research, reinforcing transparency and credibility per ethical research practices.

Groups of DRPs: The research initiative formed specific groups to study drug-related problems (DRPs) in patients. These groups were likely designed to focus on different aspects of DRPs or to address specific patient populations. Further details about the composition and objectives of these groups would provide a clearer understanding of the research structure and goals¹⁰.

Untouched indication: This occurs when a patient necessitates a medication that is not prescribed for their specific medical condition. This situation implies that the prescribed medications may not sufficiently address the patient's needs, highlighting a potential gap or oversight in the treatment plan. Addressing this issue is crucial to ensure that patients receive the appropriate and effective medications tailored to their specific health requirements¹¹.

Drug use deprived of sign: The category referred to as "unjustified drug use" denotes patients who are taking medication without valid medical reasons. This term emphasizes that the usage lacks a clear necessity or justification based on established medical criteria. Identifying and addressing cases of unjustified drug use is essential to ensure that patients receive medications that are medically warranted and aligned with their health needs, promoting safe and effective healthcare practices¹².

Indecorous drug assortment: The situation described falls within the category known as "incorrect medicines." This term refers to a scenario where there is an erroneous selection of a drug for the patient's condition. It indicates that the chosen medication may not be suitable or effective for addressing the patient's specific health issue. Identifying and rectifying instances of incorrect medicines are crucial to ensure that patients receive the most appropriate and beneficial treatment tailored to their medical needs¹³⁻¹⁵.

Sub-therapeutic dose: The category described as "suboptimal dosage" signifies instances where patients receive lower-than-required medication doses. This situation may lead to inadequate therapeutic effects due to the insufficient dosage. Recognizing and addressing suboptimal dosage is essential to ensure that patients receive the appropriate amount of medication needed to achieve the desired therapeutic outcomes and optimize their overall health. Adjusting dosages based on individual patient needs is a critical aspect of effective and personalized medical care¹⁶.

Overdose: The situation described falls under the category of "overdose." This term pertains to a scenario where a patient consumes an excessive quantity of medication, surpassing safe or recommended dosages. An overdose poses a risk of potential adverse effects or toxicity due to the excessive dose, highlighting the importance of monitoring and ensuring that patients adhere to prescribed dosage guidelines. Addressing cases of overdose is crucial to mitigate potential harm and promote patient safety in the context of medication management¹⁷.

Medication adherence/non-compliance: The category referred to is commonly known as "noncompliance" or "non-adherence." This term denotes situations where patients do not adhere to prescribed medication schedules or recommended health actions, indicating a lack of compliance with the prescribed treatment plans. Addressing noncompliance is crucial to improving therapy, safety and overall outcomes, often necessitating intervention from healthcare professionals. Proactive measures to enhance patient education, communication and support are essential components in addressing noncompliance and promoting effective and successful healthcare interventions¹⁸.

RESULTS

Demographic details: The study encompassed patients aged 18 years and above, consisting of 626 males and 474 females. Figure 1a of gender-specific data is vital, as recognizing gender disparities is crucial for improving outcomes in Cardiovascular Diseases (CVD). Future research endeavors should systematically consider gender-related aspects in the context of CVD to develop optimized strategies that account for potential variations in disease presentation, progression and treatment response between males and females. This approach enhances the comprehensiveness and relevance of cardiovascular research, contributing to more tailored and effective healthcare strategies.

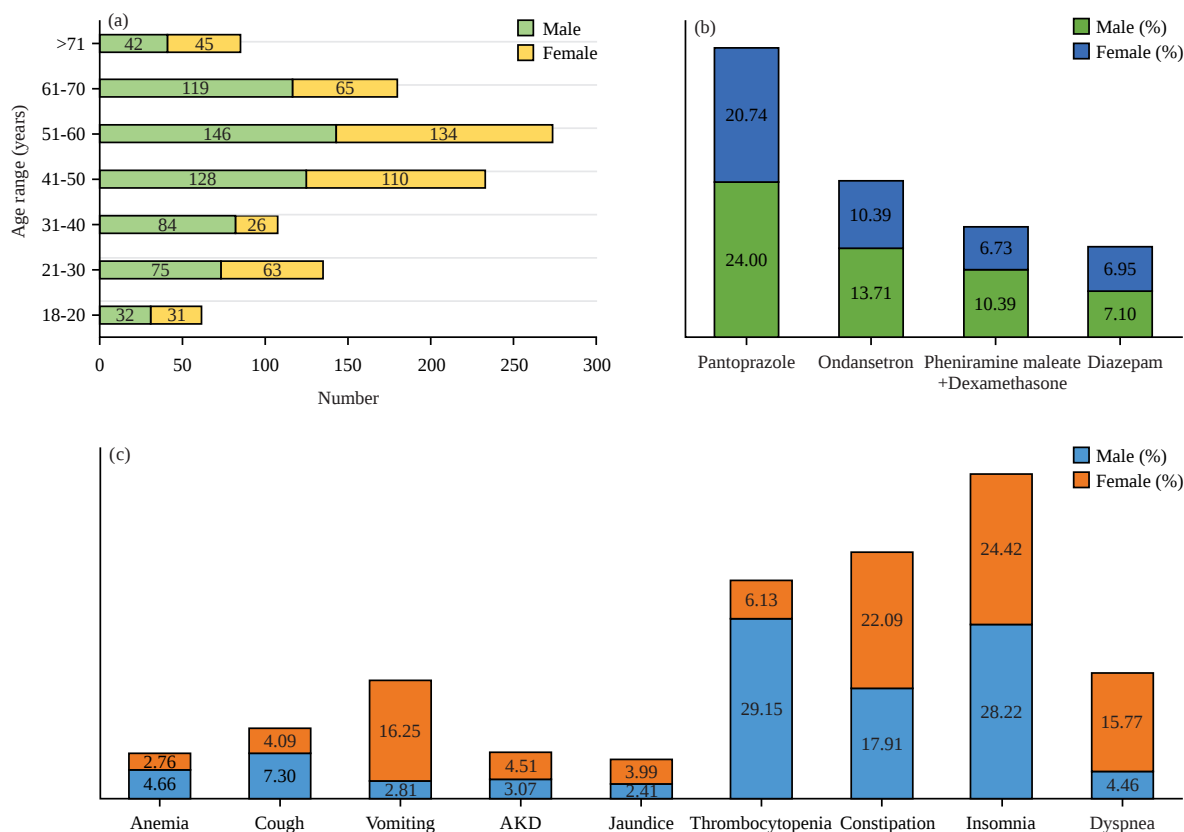


Fig. 1(a-c): Analysis of drug-related problems in cardiovascular patients, (a) Demographic details in the study, (b) Drugs used without indication and (c) Untreated indication

Demographic details (a) Include age, gender and relevant characteristics of the study population, (b) Analysis further explores instances of drug use without indication and (c) Untreated indications among cardiovascular patients, shedding light on specific challenges within medication management

Drug use without indication: The study observed that medications such as pantoprazole, ondansetron, diazepam, pheniramine maleate and dexamethasone lacked valid indications (Fig. 1b). The utilization of medications without proper medical reasons can potentially lead to avoidable issues and increased healthcare costs. Prudent medical practice underscores the importance of using medications only when medically necessary and justified. Ensuring that medications are prescribed based on valid indications is not only crucial for patient safety but also aligns with the principles of cost-effective and responsible healthcare management.

Untreated indication: The untreated indications identified in the study encompassed various conditions, including anemia, cough, vomiting, acute kidney damage, jaundice, thrombocytopenia, constipation, insomnia and dyspnea (Fig. 1c). Failing to address these untreated indications could have a substantial impact on patient health and overall quality of life. This underscores the critical importance of providing

proper medical care for these unmet needs. Addressing untreated indications is not only crucial for mitigating potential health risks but also aligns with the overarching goal of enhancing patient well-being and ensuring a comprehensive approach to healthcare delivery.

Sub-therapeutic dose: The study revealed a higher occurrence of untreated indications in males (56.9%, Fig. 2a), potentially attributed to physiological differences. This observation underscores the importance of healthcare providers taking into account gender-related traits and considering adjustments in dosages accordingly. Addressing gender disparities in healthcare is essential for improving overall outcomes, as tailoring medical interventions to account for potential variations in disease presentation and response between genders can lead to more effective and personalized patient care. This recognition of gender-specific considerations enhances the precision and relevance of healthcare strategies, contributing to improved health outcomes for both male and female patients.

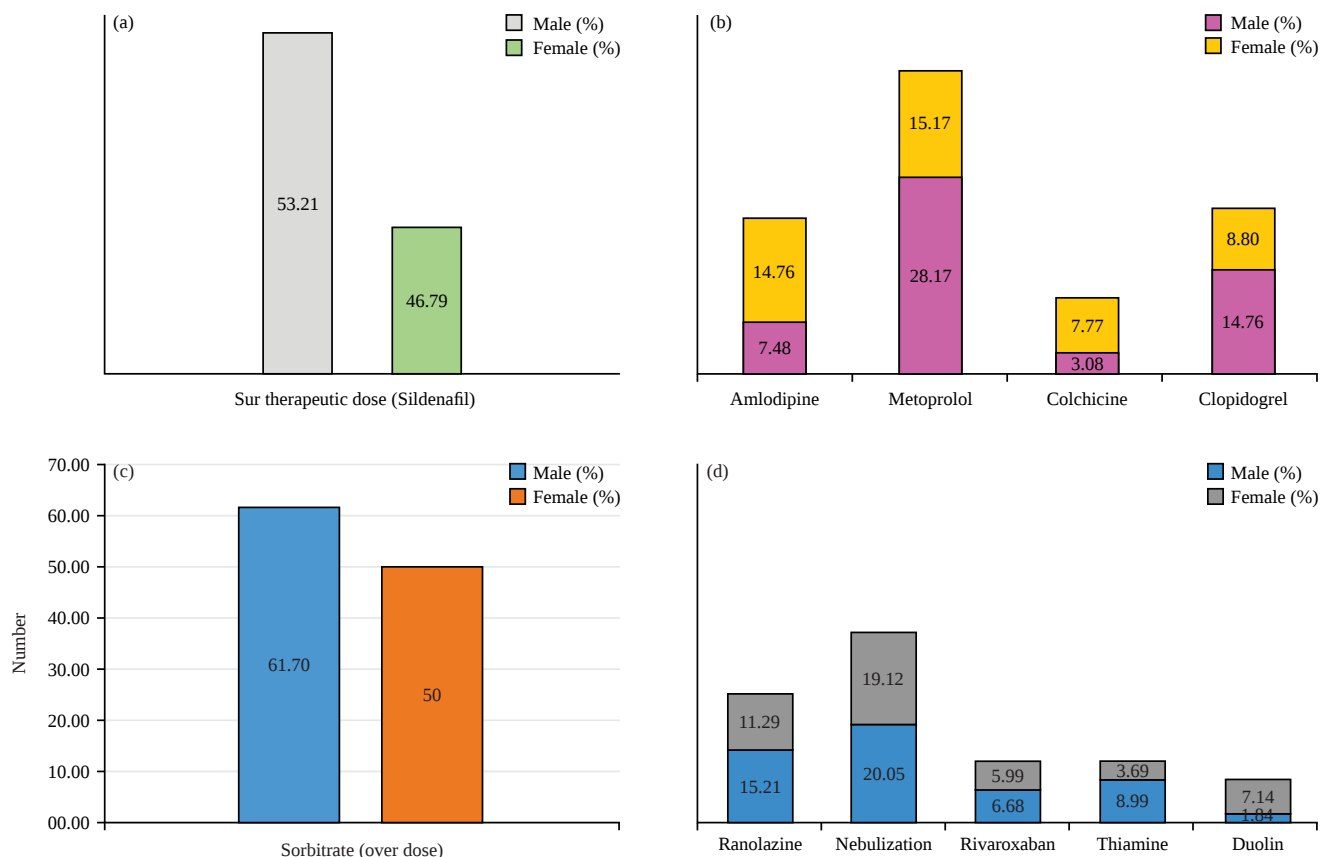


Fig. 2(a-d): Assessment of drug-related problems categories in cardiovascular patients, (a) Sub-therapeutic dose, (b) Improper drug selection, (c) Overdose and (d) Medication adherence/non-compliance

(a-b) Highlight issues related to medication dosages and selection, emphasizing instances of sub-therapeutic doses and improper drug choices, (c) Focuses on cases of overdose, while (d) Centers on medication adherence/non-compliance among cardiovascular patients, offering comprehensive insights into diverse challenges within the medication management landscape

Improper drug selection: The study identified a high incidence of metoprolol misuse (43%), with gender trends indicating 53.5% in males and 46.5% in females (Fig. 2b). The observed misuse of metoprolol raises concerns about inadequate drug choice, posing potential risks to well-being. This underscores the critical need for improved prescribing practices in cardiovascular care. Aligning prescription choices with established guidelines is essential for ensuring safety and favorable outcomes. Enhancing awareness among healthcare providers about appropriate drug selection, dosage and monitoring is crucial to mitigate the risks associated with medication misuse and promote optimal patient care.

Overdose: The study found that 61.70% of overdoses of sorbitrate occurred in males (Fig. 2c). Accurate dosing and patient education are crucial to preventing such incidents. Swift medical attention is imperative in cases of overdose. Regular monitoring and education are key elements in healthcare practices aimed at preventing and managing

such situations through increased awareness and diligent monitoring. The findings underscore the importance of robust patient education programs and healthcare provider vigilance to ensure proper medication use, dosage adherence and timely intervention in the event of potential overdoses.

Medication adherence/non-compliance: The study revealed non-compliance with drugs, particularly in nebulization, with a rate of 39.17%. Gender differences were noted, with 20.05% in males and 19.12% in females (Fig. 2d). Accurate dosing and patient adherence are crucial for successful outcomes. Healthcare professionals play a key role in educating patients to enhance adherence and overall treatment outcomes. The observed gender differences emphasize the need for tailored educational strategies to address specific adherence challenges in both male and female patients. Healthcare providers' proactive efforts in patient education can contribute significantly to improving medication adherence and consequently, the effectiveness of treatment regimens.

DISCUSSION

The study focused on cardiovascular patients aged 18 to 70, with 626 males (56.9%) and 474 females (43.0%). The findings revealed notable gender-related trends in the prevalence of specific issues. For instance, insomnia was more common among males, whereas cough and dyspnea were prevalent in females. These gender-related patterns may be influenced by physiological differences and warrant further investigation¹⁹.

Pantoprazole misuse was identified as a frequent issue, occurring in 44.74% of cases, similar studies were observed by Shamliyan *et al.*²⁰. Improper drug selection, on the other hand, showed no significant gender difference, an identical study was performed by Bremer *et al.*²¹ and they also found no significant gender differentiation. This highlights a potential area for improvement in prescribing practices, particularly with medications like pantoprazole.

Sub-therapeutic dosing cases were observed, notably with sildenafil. Additionally, Sorbitrate overdoses showed no significant gender discrepancy, emphasizing the importance of accurate dosing and patient education to prevent such occurrences Agrawal and Mishra²² found similar results with sildenafil and tadalafil.

Non-compliance was a prevalent concern, with a higher incidence in males (229/434 cases), particularly in nebulization-related issues (39.17%). Non-compliance is a multifaceted issue that can impact treatment efficacy and patient outcomes²³. Healthcare providers play a crucial role in addressing these issues through patient education, regular monitoring and personalized interventions. These findings collectively shed light on the nuanced challenges within cardiovascular care, underscoring the need for tailored strategies to enhance prescribing practices, dosing accuracy and patient adherence.

Indeed, addressing gender-related differences in cardiovascular health is a crucial aspect of healthcare, as highlighted by various studies. MacTavish *et al.*²⁴ underscores the significance of recognizing gender disparities in the manifestation and treatment of cardiovascular diseases. Their findings emphasized that tailoring healthcare approaches based on gender-specific factors is vital for providing optimal care and improving outcomes in cardiovascular health.

By acknowledging and understanding the nuanced ways in which cardiovascular diseases may manifest and be treated differently in males and females, healthcare professionals can develop more effective and personalized interventions. This recognition contributes to the advancement of gender-sensitive healthcare strategies, ultimately enhancing

the quality of care and health outcomes for diverse patient populations. The importance of such insights is evident in promoting equity, preventing disparities and optimizing cardiovascular health on a broader scale.

The studies by Gurwitz *et al.*²⁵ and Blaschke *et al.*²⁶ emphasize the critical role of patient education and tailored interventions in mitigating medication misuse and non-compliance. These interventions are particularly essential for enhancing adherence to prescribed medications. Strategies outlined in these studies may include targeted approaches to address specific issues such as nebulization-related non-compliance.

Patient education is key in empowering individuals to understand the importance of their medications, adhere to prescribed regimens and manage potential side effects. Tailored interventions take into account individual patient needs preferences and potential barriers to adherence, making them more effective in promoting sustained and effective treatment outcomes.

In the context of nebulization-related non-compliance, understanding and addressing the specific challenges associated with this form of medication delivery are crucial. Tailored interventions may involve clear communication about the importance of nebulization, practical demonstrations and addressing any concerns or misconceptions patients may have.

The study advocates for a collaborative healthcare model, involving clinical pharmacists and physicians, to address predictors of DRPs. Clinical pharmacists focus on patient education and medication adherence, while physicians consider overall health when prescribing. This integrated approach aims to comprehensively manage complex issues like comorbidity and polypharmacy, enhancing patient outcomes through patient-centered healthcare. The strategy optimizes medication use, fosters proactive patient involvement and underscores the importance of interdisciplinary collaboration for the best outcomes⁷.

By implementing education and tailored interventions, healthcare providers can enhance patient understanding, engagement and adherence, ultimately improving the overall effectiveness of cardiovascular care and reducing the risks associated with medication misuse and non-compliance.

CONCLUSION

The study underscores the significance of a collaborative healthcare approach involving clinical pharmacists, physicians and specialists to address predictors of drug-related problems (DRPs), such as prolonged hospital stays, comorbidity and

polypharmacy. In this integrated model of care, clinical pharmacists assume a pivotal role in patient education, heightening risk awareness and formulating strategies to enhance medication adherence. Their responsibilities include conducting thorough reviews and assessing and optimizing medication regimens. Meanwhile, physicians take into account the patient's overall health status when prescribing. This collaborative effort ensures comprehensive care by addressing complex issues like comorbidity and polypharmacy, contributing to the monitoring and management of DRPs. The ultimate goal is to enhance patient outcomes by providing well-rounded, patient-centered healthcare that addresses the intricacies of their medical conditions. This integrated approach not only optimizes medication use but also cultivates a proactive and informed role for patients in their care. It exemplifies a holistic healthcare strategy that recognizes the importance of interdisciplinary collaboration in achieving the best possible outcomes for patients.

SIGNIFICANCE STATEMENT

This study examined drug-related problems (DRPs) among cardiovascular patients at Government General Hospital, Kurnool. It aimed to uncover challenges in medication management, emphasizing the need for targeted interventions. Key findings identified various DRPs and despite their high prevalence, minimal disruption to daily routines suggested the potential effectiveness of systemic interventions. Collaborative efforts among healthcare stakeholders are crucial and the study calls for interdisciplinary collaborations to mitigate DRP impact. Further research is needed to develop targeted interventions and enhance systemic approaches in addressing DRPs among cardiovascular patients.

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