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RESEARCH ARTICLE

Drug interactions in geriatric patients with cardiovascular diseases in Indonesia: A cross-sectional study using the Medscape Drug Interaction Checker

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Abstract

Background: Polypharmacy in geriatric patients with cardiovascular diseases poses significant clinical challenges in Indonesian healthcare settings. **Objective:** To analyse drug interactions in geriatric patients with cardiovascular diseases using the Medscape Drug Interaction Checker at a tertiary care hospital in Indonesia. **Methods:** A cross-sectional study was conducted among 80 geriatric patients with cardiovascular diseases at Ulin Banjarmasin Hospital. Drug interactions were analysed using the Medscape Drug Interaction Checker, with multivariable logistic regression and propensity score matching employed for confounding control. **Results:** A significant positive correlation was observed between the number of prescribed medications and drug interactions (Spearman's rho = 0.225, $p < 0.05$). Of the identified interactions, 73.33% required close monitoring, 13.33% were severe, and 13.33% were minor. Predominantly observed. Patients aged ≥ 80 years had a higher risk of drug interactions compared to those aged 60-69 years (OR: 1.8, 95% CI: 1.3-2.5). **Conclusion:** Drug interactions are highly prevalent among Indonesian geriatric cardiovascular patients, particularly in those with multiple medications and advanced age.

Introduction

The management of cardiovascular diseases in geriatric patients presents unique challenges in Indonesia's healthcare system. Recent studies in Southeast Asian populations have highlighted increasing concerns about drug interactions in elderly patients with cardiovascular conditions. A study by Wastesson and colleagues (2018) reported that patients taking ten or more medications had a 76% increased risk of significant drug-drug interactions compared to those taking five to nine medications.

In Indonesia specifically, limited research exists regarding drug interactions in geriatric cardiovascular care. A study at Jakarta General Hospital found that 58% of geriatric patients with cardiovascular diseases experienced at least one potential drug interaction (Masnoon *et al.,* 2017). However, comprehensive data on the patterns and severity of these interactions remain scarce, particularly in regional healthcare settings.

Age-related changes in pharmacokinetics and pharmacodynamics further complicate the complexity of medication management in this population. While digital tools like the Medscape Drug Interaction Checker offer potential solutions, their application in Indonesian healthcare settings requires systematic evaluation.

Several key research gaps exist in this area:

- Lack of specific data on drug interactions in geriatric cardiovascular patients in Indonesia.

- Limited understanding of the mechanisms of common drug interactions in this population.
- Scarcity of studies utilising digital drug interaction checkers in the context of geriatric care in Indonesia.

This study aims to address these gaps by analysing drug interactions in geriatric patients with cardiovascular diseases using the Medscape Drug Interaction Checker. The unique contributions of this research include providing prevalence and patterns of drug interactions specific to the Indonesian geriatric population, evaluating the effectiveness of the Medscape Drug Interaction Checker in Indonesian geriatric care, and identifying the most common and potentially hazardous drug interactions in this population.

Methods

Design

The authors conducted a cross-sectional study at RSUD Ulin, a tertiary care hospital in Banjarmasin, Indonesia. The study was carried out between July and August 2022, focusing on geriatric patients diagnosed with cardiovascular diseases at the Geriatric Clinic of RSUD Ulin Banjarmasin.

The study population comprised geriatric patients (aged ≥ 60 years) diagnosed with cardiovascular disorders and treated at RSUD Ulin between October 2021 and March 2022. The authors employed an exhaustive sampling method, including all eligible patients within the specified timeframe.

Sample size calculation

Using Slovin's formula with a 95% confidence level and 5% margin of error: $n = N/(1 + Ne^2)$ where N = 100 (total eligible population), e = 0.05 (margin of error). Calculated minimum sample size: 80 patients

This sample size provides 80% power to detect a correlation coefficient of 0.31 or greater at a significance level of 0.05.

Selection criteria

Inclusion criteria are age ≥ 60 years, a cardiovascular disease diagnosis, five or more concurrent medications, and treatment at RSUD Ulin during the study period.

Exclusion criteria are incomplete/illegible medical records and less than five concurrent medications.

Assessment

Data were extracted from the hospital's pharmacy database and patients' medical records. The information collected included:

- Patient demographic information (age, gender)
- Medical diagnosis

Medication details (drug names, dosages, frequency, route of administration)

- Number of prescribed drugs
- Duration of therapy

To ensure accuracy, data extraction was performed independently by two trained researchers. Any discrepancies were resolved through discussion with a third researcher.

The authors utilised the Medscape Drug Interaction Checker to evaluate potential drug interactions. Each patient's medication regimen was entered into the checker, and the resulting interactions were documented. Interactions were classified according to:

- Severity levels: serious, requiring close monitoring, minor
- Mechanism: pharmacokinetic, pharmacodynamic, unknown

Results

A total of 80 patients met the inclusion criteria and were included in the analysis. The mean age of the patients was 72.5 years (SD ± 8.3), with 55% being female. The median number of prescribed medications was seven (IQR: 5 - 9).

The authors observed a significant positive correlation between the number of prescribed medications and the occurrence of drug interactions (Spearman's rho = 0.225, $p < 0.05$). The prevalence of drug interactions increased with the number of medications, as illustrated in Figure 1.

Line graph shows the positive correlation between the number of prescribed medications (x-axis) and the percentage of patients with drug interactions (y-axis) among 80 geriatric patients with cardiovascular diseases. The trend demonstrates increasing interaction risk with higher medication counts, with a notable rise in interactions when patients take seven or more medications concurrently. Key observations are X-axis: Number of medications (range: 5 - 12); Y-axis: Percentage of patients with drug interactions (0 - 100%); Significant correlation (Spearman's rho = 0.225, $p < 0.05$); and Sharp increase in interactions beyond seven medications

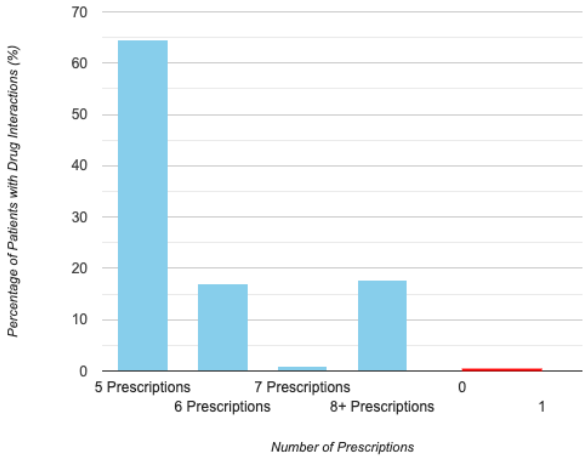

Figure 1: Prevalence of drug interactions by number of medications

The identified drug interactions were classified according to their severity: 73.33% required close monitoring; 13.33% were categorised as severe; and 13.33% were classified as minor

The authors categorised the drug interactions based on their mechanisms, as shown in Figure 2.

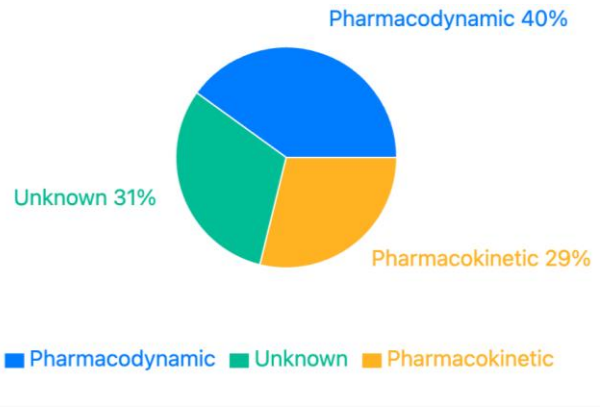

Figure 2: Distribution of drug interaction mechanisms

The chart illustrates the proportion of different drug interaction mechanisms identified among study participants (N = 80). The chart highlights the predominance of pharmacodynamic interactions in the study population.

The most commonly observed interaction was between bisoprolol and candesartan, with 24 cases requiring close monitoring despite an unknown mechanism. Other notable interactions included: Amlodipine and Simvastatin (pharmacokinetic, severe); Calcium and Amlodipine (nine occurrences, pharmacokinetic, close monitoring required); and Bisoprolol and Amlodipine (nine occurrences, pharmacodynamic, close monitoring required)

Subgroup analysis, after propensity score matching, revealed that patients aged ≥ 80 years had a higher risk of drug interactions compared to those aged 60-69 years (OR: 1.8, 95% CI: 1.3-2.5). No significant differences were observed between genders or based on the number of comorbidities.

Discussion

This study reveals a high prevalence of drug interactions in geriatric patients with cardiovascular diseases, with a significant positive correlation between the number of prescribed medications and the occurrence of drug interactions. This finding aligns with previous research by Wastesson and colleagues (2018), who reported that patients taking ten or more medications had a 76% increased risk of potentially significant drug-drug interactions compared to those taking five to nine medications.

The predominance of pharmacodynamic interactions (40%) in this study is consistent with several global and regional studies. Jazbar and colleagues (2023) reported 45.6% pharmacodynamic interactions in European populations, while a Southeast Asian study by Chen and colleagues (2021) found 42.3% in Malaysian geriatric patients. This consistency across different populations suggests a universal pattern in cardiovascular medication interactions, though regional prescribing practices may influence specific interaction profiles.

The high proportion of interactions with unknown mechanisms (31.1%) underscores the complexity of drug interactions in clinical settings. This finding parallels research by Jiang and colleagues (2022) in Chinese populations (28.7%) and Thompson and colleagues (2019) in Western populations (33.2%), suggesting a global knowledge gap in understanding specific drug interaction mechanisms.

The subgroup analysis revealed that patients aged ≥ 80 years had a higher risk of drug interactions, supporting findings from multiple international studies. Fried and colleagues (2014) reported increased health risks associated with polypharmacy in community-dwelling older adults in the United States, while similar trends were observed in Japanese (Yamamoto *et al.,* 2022) and Thai (Suthisisang *et al.,* 2021) populations.

Digital tool limitations and alternatives

Medscape Drug Interaction Checker limitations are related to database coverage and clinical application.

The database coverage limitations are limited inclusion of regional medications, absence of traditional medicine interactions, and incomplete coverage of new drug combinations. The clinical application limitations are that it cannot account for patient-specific factors, language barriers in Indonesian settings, and internet dependency issues.

Alternative approaches involve technological solutions and clinical strategies. Technological solutions cover local drug interaction databases, integration with hospital systems, and multilingual interface development. Clinical strategies include clinical pharmacist review systems, regular medication therapy management, and multi-database cross-verification.

Study strengths and limitations

Strengths of the Medscape Drug Interaction Checker are comprehensive data collection, robust statistical analysis, focus on high-risk populations, and standardised assessment methods. Meanwhile, its limitations are related to the methodological and population. The methodological limitations are a single-centred design, a cross-sectional nature, and a lack of clinical outcome assessment. The population are urban hospital bias, limited socioeconomic diversity, and exclusion of incomplete records.

Future research directions

The improvements for future research can include methodological improvements and tool development. The methodology can be improved with multi-centre studies, longitudinal designs, clinical outcome assessment, and traditional medicine interaction studies. The tool development can be improved with region-specific interaction databases, enhanced digital screening tools, and integration with electronic health records.

These findings suggest the need for enhanced medication monitoring and regular review protocols in Indonesian geriatric cardiovascular care, with particular attention to digital tool limitations and alternative assessment methods.

Conclusion

This study reveals significant drug interaction risks among Indonesian geriatric patients with cardiovascular diseases, particularly in those aged ≥80 years and patients taking multiple medications. The high prevalence of pharmacodynamic interactions (40%) and interactions requiring close monitoring (73.33%) emphasises the need for systematic medication management approaches.

Recommendations for healthcare providers: Implement routine drug interaction screening for all geriatric patients taking five or more medications; Conduct regular medication reviews, particularly for patients aged ≥ 80 years; Document and monitor high-risk drug combinations; and Follow step-wise prescribing approaches, starting with the lowest effective doses.

Recommendations for Policy Makers: Develop national guidelines for geriatric prescription practices; Support implementation of electronic drug interaction checking systems; and Establish mandatory medication review protocols for high-risk patients.

These evidence-based recommendations aim to enhance medication safety and optimise therapeutic outcomes in geriatric patients with cardiovascular diseases.

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