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Screening Medication Interactions in Elderly Patients with Ischaemic Heart Disease

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ABSTRACT

Drug interactions are an important medication safety concern among elderly patients with ischaemic heart disease (IHD), particularly because age-related physiological changes and comorbidities may increase vulnerability to adverse drug effects. This study aimed to identify potential drug interactions and describe the sociodemographic and clinical characteristics of elderly patients with IHD. A quantitative, descriptive study with a retrospective cross-sectional design was conducted using medical records of elderly patients treated between January and December 2025. The study included 100 patients aged 60 years or older who had an IHD diagnosis and documented concurrent use of more than one medication. Data were collected through medical record observations and analyzed using descriptive statistics, including frequency distributions and percentages. Potential drug interactions were screened using the Medscape Drug Interaction Checker and classified according to their mechanisms and severity. The results showed that 58% of patients were male, while 83% were aged 60–74 years. Bisoprolol was the most frequently prescribed medication, accounting for 92% of patients. Furthermore, 96% of patients had comorbidities, and 62% received fewer than five medications. Potential drug interactions were identified in 90% of patients, with a total of 185 interaction events. Pharmacodynamic interactions predominated, accounting for 94.6% of all identified interactions, while pharmacokinetic interactions represented 5.4%. Regarding severity, moderate interactions were the most common (82.7%), followed by major interactions (16.2%) and minor interactions (1.1%). The aspirin–bisoprolol combination was the most frequently identified interacting drug pair, accounting for 31.4% of interaction events. These findings demonstrate the high prevalence of potential drug interactions among elderly patients with IHD, even when most patients receive fewer than five medications. Routine medication review, systematic interaction screening, and continuous clinical monitoring are therefore essential. Pharmacists should collaborate with physicians and other healthcare professionals to assess interaction significance, optimize pharmacotherapy, and improve medication safety.

***Keyword**: Ischaemic Heart Disease (IHD); elderly Patients; Drug Interactions.*

Introduction

Cardiovascular disease remains the leading cause of morbidity and mortality worldwide. In 2022, the WHO estimates that approximately 19.8 million deaths will be due to cardiovascular disease, representing approximately 32% of all global deaths. Of these deaths, approximately 85% will be caused by heart attacks and strokes. Meanwhile, in Indonesia, the prevalence of coronary heart disease, based on doctor-diagnosed data from the 2018 Basic Health Research (Riskesdas), is 1.5% and will continue to increase with age (Kemenkes, 2018) . Coronary heart disease

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(CHD) or ischemic heart disease (IHD) is a disorder of heart function that occurs due to reduced blood and oxygen supply to myocardial tissue. This condition is caused by narrowing or blockage of the coronary arteries so that blood perfusion to the heart muscle becomes inadequate (Dipiro et al., 2015). Narrowing of the coronary arteries is generally initiated by the process of atherosclerosis which develops gradually. This process is characterized by the accumulation of fat and other components on the walls of blood vessels so that atherosclerotic plaques form. As the plaque size increases, the blood vessel wall becomes narrower and blood flow to the myocardium will also decrease (Dipiro et al., 2015). Clinical manifestations that are often found in patients include shortness of breath (dyspnea), orthopnea, and paroxysmal nocturnal dyspnea (PND). In addition to respiratory disorders, some patients also experience edema on cooling accompanied by weight gain related to fluid retention(Harahap & Putri, 2025). Risk factors for coronary heart disease are influenced by various factors, both those that cannot be changed and those that can be changed. Modifiable factors include age, gender, and family history, while modifiable factors include other unhealthy lifestyle habits and stress.

In addition, diseases such as hypertension, diabetes mellitus, and hypercholesterolemia are also known to increase the risk of coronary heart disease and worsen the patient's clinical condition. Research by Arsyad *et., al*Arsyad et al.,(2023) reported that approximately 65% of diagnosed coronary heart disease patients in Indonesia are included in the group with a very high risk of experiencing recurrent cardiovascular events over the next ten years. These results indicate that optimal pharmacological management is needed to reduce mortality, prevent disease recurrence, and reduce the need for re-treatment. In clinical practice, therapy for CHD patients generally involves a combination of several drug classes, such as β-blockers, nitrates, calcium channel blockers (CCBs), antiplatelets, anticoagulants, angiotensin-converting enzyme inhibitors (ACEIs), angiotensin receptor blockers (ARBs), and statins (PERKI, 2018).

Patients with coronary heart disease are one of the groups vulnerable to drug interactions because the therapy given generally involves more than one type of drug. The concurrent use of m(Furqon et al., 2023)ultiple medications (polypharmacy) increases the likelihood of interactions, both pharmacokinetic and pharmacodynamic. A study conducted in China reported that approximately 72.9% of CHD patients experienced potential drug interactions. The combination of clopidogrel with a calcium channel blocker was the most common interaction, followed by combinations of antihypertensives such as valsartan, ACE inhibitors, β-blockers, diuretics, and CCBs, and the combination of rosuvastatin with clopidogrel (Zhao et al., 2022). This condition indicates that polypharmacy can increase the likelihood of drug interactions that could potentially affect patient

therapeutic outcomes. Polypharmacy can increase the risk of drug interactions and have an adverse impact on patient therapeutic outcomes (Reyaan et al., 2021)

Age is one physiological factor that can influence the severity of drug interactions. Elderly patients generally have more than one chronic disease, requiring the use of several types of medications simultaneously. This condition makes therapy for elderly patients more complex than for other age groups. Furthermore, the aging process also results in changes in physiological function that can affect the pharmacokinetics and pharmacodynamics of a drug. These changes can increase the risk of side effects and drug interactions in elderly patients (Fauziyah et al., 2017). Recent international evidence supports this concern. Zhou et al. (Zhou et al., 2024) reported that potentially serious drug-drug interactions are common among older adults, particularly those involving cardiovascular medications. Similarly, Anfinogenova et al (Anfinogenova et al., 2024) identified a substantial burden of potential drug-drug interactions among older cardiovascular patients, with polypharmacy being an important contributing factor. Giri et al (Giri, 2025) also demonstrated that potential drug interactions remain an important medication-safety concern among geriatric cardiac patients receiving outpatient care.

Indonesia has a rapidly growing elderly population. Data from the 2020 Population Census indicated that approximately 26 million Indonesians aged 60 years or older, representing around 9.92% of the total population. This proportion is projected to increase to 16.6% by 2035 (Statistik, 2020). Although previous studies have reported a high prevalence of potential drug interactions among elderly and cardiovascular populations, most have focused on broader cardiovascular populations, hospitalized patients, or specific cardiovascular conditions. Evidence specifically addressing potential drug interactions among elderly patients with IHD receiving outpatient care in Indonesia remains limited. In addition, information on the prevalence, mechanisms, severity, and most frequently interacting drug combinations in this population is still insufficient. This research gap highlights the need for further evaluation to provide a more specific understanding of potential drug interactions and support safer pharmacotherapy in elderly patients with IHD.

Based on this background, this study aimed to analyze potential drug interactions among elderly patients with ischaemic heart disease receiving outpatient care during January–December 2025. The study assessed patient characteristics, the prevalence, mechanisms, and severity of potential drug interactions, as well as the most frequently interacting drug combinations.

Methods

This study refers to the use of quantitative research based on retrospective descriptive design and refers to a cross-sectional approach. In this study, secondary

data was used in the form of medical records of elderly patients diagnosed with Ischaemic Heart Disease (IHD) during the period January - December 2025. A retrospective approach was use because data that has already been recorded in the patien s' medical records, while the cross-sectional design is very capable of being used as a form of depiction of potential drug interactions. The study was conducted from February to April 2026.

The population of this study was all patients diagnosed with Ischaemic Heart Disease (IHD) and met the inclusion criteria. The sample size was determined using the Lemeshow formula for an unknown population size, with a 95% confidence level (Z = 1.96), a population proportion of 0.5, and a precision level of 10%. The calculation resulted in a minimum sample size of 96.04 patients, which was rounded to 100 patients. Furthermore, the study sample used a non-probability sampling technique based on the accidental sampling method, resulting in a sample size of 100 patients. Accidental sampling was selected because the study used retrospective medical records, and eligible records that were available and met the predetermined inclusion and exclusion criteria during the study period were selected until the required sample size was reached.

The inclusion criteria were: (1) patients aged ≥60 years; (2) patients diagnosed with IHD based on the medical records; and (3) medical records documenting the use of more than one medication concurrently. The exclusion criterion was incomplete, missing, or unclear medical record data that did not contain the information required for analysis.

Data were collected through medical record observations using a data collection sheet and analyzed univariately, specifically to describe the characteristics of the respondents, their clinical characteristics, the potential for drug interactions, the severity of drug interactions, and the mechanisms of drug interactions. Potential drug-drug interaction werw screening using Medscape Drug Interaction Checker. The screening result were clasification base on the mechanism and severity of the interaction. Subsequently, the data were processed through editing, coding, data entry, and data cleaning before descriptive statistical analysis was perfomed using frequency distributions and percentages.

Result and Discussion

This study screened potential drug interactions among 100 elderly patients with Ischemic Heart Disease (IHD) admitted between January and December 2025. The findings showed that the majority of patients were male (58%) and aged 60–74 years (83%). The higher proportion of male patients may be related to their greater exposure to cardiovascular risk factors, including smoking and diabetes mellitus, as well as sex-related hormonal factors (Kim, 2024). This finding is also consistent with Harahap and Putri (2025)(Harahap & Putri, 2025), who reported that 70.1% of

patients with coronary heart disease were male. Furthermore, increasing age is a well-established risk factor for cardiovascular disease because aging is associated with endothelial dysfunction, reduced vascular elasticity, and progressive atherosclerosis, which may contribute to the development of ischemic heart disease(Bayraktutan, 2023)

Table 1. Overview of Sociodemographic Characteristics

Sociodemographic Characteristics	Frequency N = 100	Percentage (%)
Gender		
Man	58	58.0
Woman	42	42.0
Age		
60-74 years (Ederly)	83	83.0
75-89 years (Old)	17	16.0
≥ 90 years (Very old)	0	0

Regarding clinical characteristics, bisoprolol was the most frequently prescribed medication (92%). This finding reflects the important role of β-blockers in the management of ischemic heart disease by reducing myocardial oxygen demand and cardiac workload. Antiplatelet therapy was also frequently prescribed, with aspirin used in 58 patients and clopidogrel in 20 patients. These findings are consistent with the therapeutic approach to cardiovascular disease, in which multiple medications are often required to manage ischemia, prevent thrombotic events, and control comorbid conditions.

Table 2. Clinical Characteristics Overview

Clinical Characteristics	Frequency N = 100	Percentage (%)
Number of Drug Items		
≤5 drugs	62	62.0
> 5 drugs	38	38.0
Comorbidities		
No Comorbidities	4	4.0
With Comorbidities	96	96.0

Table 3. Types of drugs

Drug Name	Frequency
Amlodipine	47
Aspirin	58
Bisoprolol	92
Nitoglycerin	48
Simvastatin	27

Most patients (62%) received fewer than five medications, while 38% received more than five medications. Therefore, based on the definition used in this study, polypharmacy was not present in the majority of patients. However, the absence of polypharmacy in most patients did not correspond to a low prevalence of potential drug interactions. This finding is important because drug interaction risk is not determined solely by the number of medications but may also depend on the specific drug combinations, patient characteristics, comorbidities, and age-related changes in pharmacokinetics and pharmacodynamics. Older adults are particularly susceptible to clinically relevant drug interactions because physiological changes associated with aging can alter drug disposition and response.

Furthermore, 96% of the patients in this study had at least one comorbidity. The high prevalence of comorbidity may contribute to the complexity of pharmacotherapy because additional diseases often require additional medications and may increase the possibility of clinically relevant drug combinations. Multimorbidity is common among older adults with cardiovascular disease and is associated with increased medication burden and greater complexity of treatment.

Potential drug interactions were identified in 90% of patients, with a total of 185 interaction events. This prevalence was comparable to the findings of Devarashetty et al. (2020)(Devarashetty et al., 2020), who reported potential drug-drug interactions in 94% of 520 patients with IHD in a tertiary care hospital. A relatively high prevalence of potential drug interactions has also been reported among older adults with chronic coronary syndrome. Zhao et al. (2022) (Zhao et al., 2022)identified potential drug interactions in 72.9% of 402 older patients with chronic coronary syndrome, demonstrating that drug interaction exposure is a common concern in older cardiovascular populations.

Table 4. Potential drug interactions

Clinical Characteristics	Frequency N = 100	Percentage (%)
Potential Drug Interactions		
Yes	90	90.0
No	10	10.0

The high prevalence observed in the present study may be related to the concomitant use of cardiovascular medications and the high prevalence of comorbidities. Although most patients did not meet the study definition of polypharmacy, the presence of multiple cardiovascular agents and medications for comorbid conditions may still produce clinically relevant combinations. This finding emphasizes that screening for potential drug interactions should not be limited to patients receiving five or more medications. Rather, the specific combinations of medications and individual patient risk factors should also be considered. Previous evidence indicates that older adults, particularly those with multiple medications, renal impairment, or drugs with a narrow therapeutic index such as digoxin, are more vulnerable to clinically important drug interactions.

Pharmacodynamic interactions accounted for the majority of identified interactions (94.6%), while pharmacokinetic interactions accounted for 5.4%. Pharmacodynamic interactions occur when one drug modifies the pharmacological effect of another without necessarily altering its concentration, and may result in additive, synergistic, or antagonistic effects. In this study, several pharmacodynamic interactions involved cardiovascular drugs with overlapping effects on blood pressure, heart rate, renal function, or electrolyte balance. The predominance of pharmacodynamic interactions may therefore reflect the use of multiple cardiovascular medications with related physiological effects.

The most frequently identified interacting drug pair was aspirin and bisoprolol, accounting for 58 interaction events (31.4%). According to the Medscape Drug Interaction Checker, this combination may result in a pharmacodynamic interaction in which aspirin may reduce the antihypertensive effect of bisoprolol through inhibition of prostaglandin synthesis. In addition, the combination was identified as potentially increasing the risk of elevated serum potassium. Therefore, although this interaction was classified as moderate in the present study, its clinical significance should not be overlooked, particularly in elderly patients with impaired renal function or other risk factors for electrolyte disturbances.

The predominance of moderate interactions in this study also warrants attention. Of the 185 identified interaction events, 153 (82.7%) were classified as moderate, 30 (16.2%) as major, and 2 (1.1%) as minor. Moderate interactions generally require closer monitoring and may require adjustment of therapy depending on the patient's clinical condition, while major interactions may result in serious clinical consequences and therefore require more immediate clinical attention(Reyaan et al., 2021). The high proportion of moderate interactions indicates that the majority of potential interactions identified in this study may not necessarily be immediately life-threatening, but they should not be considered clinically insignificant. In older adults, the accumulation of several moderate-risk interactions may increase the overall risk of adverse drug events, particularly in the presence of renal impairment, cardiovascular instability, or other comorbidities. Evidence from older populations indicates that clinically relevant drug interactions can contribute to adverse outcomes and hospitalization, emphasizing the importance of early identification and risk minimization.

Table 5. Potential Drug Interactions Based on Mechanism and Severity of Interaction

Potential Drug Interactions	Frequency N = 185	Percentage (%)
Drug Interaction Mechanism		
Pharmacokinetics	10	5.4
Pharmacodynamics	175	94.6
Unknown	0	0
Interaction Severity Level		
Minor	2	1.1
Moderate	153	82.7
Major	30	16.2

The 16.2% proportion of major interactions is particularly important from a patient-safety perspective. Several major interactions identified in this study involved clinically important outcomes, including potential renal impairment, bradycardia, increased digoxin effects, and increased risk of rhabdomyolysis. For example, interactions involving digoxin and other cardiovascular medications may increase the risk of bradycardia or elevated digoxin effects, while combinations involving renin-angiotensin system inhibitors may increase the risk of impaired renal function or electrolyte disturbances. Other major interactions, such as the combination of fenofibrate and simvastatin, may increase the risk of muscle toxicity.

These potential consequences are especially relevant in elderly patients because age-related reductions in renal and hepatic function can increase susceptibility to adverse drug effects.

The findings also demonstrate that potential drug interactions may occur even when the number of medications is relatively limited. For example, the combination of bisoprolol and amlodipine was classified as a moderate pharmacodynamic interaction because of their additive blood-pressure-lowering effects, potentially increasing the risk of hypotension, dizziness, or bradycardia. Similarly, bisoprolol and candesartan may produce additive antihypertensive effects and may require monitoring of blood pressure, renal function, and serum potassium. These examples illustrate that medication review should consider not only the total number of medications but also pharmacological effects, therapeutic indications, renal function, and patient-specific risk factors.

From a clinical management perspective, these findings support the need for structured medication review in elderly patients with IHD. Medication review should involve a systematic assessment of all prescribed medications, their indications, potential interactions, doses, and patient-specific risk factors, followed by appropriate monitoring or modification when clinically indicated. Clinical guidance recommends structured medication reviews for older people and patients receiving multiple medicines or treatment for chronic conditions, with the objective of optimizing treatment and minimizing medication-related problems. In older adults with cardiovascular disease, pharmacist-led medication review and multidisciplinary collaboration may further support the identification and management of potentially inappropriate medication combinations.

Therefore, the use of a drug interaction screening tool such as the Medscape Drug Interaction Checker can serve as an initial screening strategy to identify potentially problematic drug combinations. However, the identification of a potential interaction should not automatically be interpreted as evidence that an adverse clinical event has occurred. The clinical significance of each interaction should be evaluated in relation to the patient's diagnosis, laboratory findings, renal and hepatic function, dosage, duration of therapy, and other medications. This approach is particularly important because international expert consensus has identified numerous clinically significant drug interactions in older adults, many of which involve cardiovascular and antithrombotic medications and may require treatment modification.

Overall, the findings indicate that potential drug interactions are highly prevalent among elderly patients with IHD in this study, despite most patients not

meeting the study definition of polypharmacy. The predominance of moderate interactions and the presence of a substantial proportion of major interactions highlight the importance of proactive medication review and monitoring. Particular attention should be given to combinations involving cardiovascular drugs, antithrombotic agents, drugs affecting renal function or electrolyte balance, and medications with a narrow therapeutic index. In this context, pharmacists have an important role in identifying potential interactions, assessing their clinical relevance, recommending appropriate monitoring or therapeutic adjustments, and collaborating with physicians and other healthcare professionals to improve medication safety in elderly patients.

Conclusion

This study demonstrated that the potential medication interactions were identified in 90% of ederley patiens with Ischaemic Heart Disease (IHD), with most interactions being pharmacodynamic (94.6) and of moderate severity (82.7%). These findings highlight the importance of routine medication interaction screening and continuous monitoring by pharmacists to optimize therapy, minimize the risk of adverse drug events, and improve patient safety. In clinical practice, pharmacist-led medication review and monitoring programs, supported by collaboration among pharmacists, physicians, and other healthcare professionals, are recommended to facilitate early identification and management of potential drug interactions in elderly patients with IHD. Future research should evaluate the effectiveness of pharmacist-led and multidisciplinary interventions in reducing clinically relevant drug interactions and improving medication safety and patient outcomes.

Suggestion

Given the high prevalence of potential drug interactions in elderly patients with CIHD, routine medication review and laboratory monitoring are recommended to minimize medication-related risks. Further research should incorporate more comprehensive clinical and laboratory data to evaluate the relationship between potential drug interactions and clinical outcomes.

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