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Safeguarding Lives: Identifying Factors Related to the Five Moments of Medication Safety Practices in Hypertension Management within Indonesian Primary Healthcare Settings

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ABSTRACT

Medication safety is a critical concern for patients with hypertension because proper medication management is essential for controlling blood pressure and preventing the development of complications. Medication errors that often occur in patients with hypertension are classified as those resulting from patient, dispenser, or prescription errors. This study aimed to investigate medication safety among patients with hypertension, focusing on their practices in medication safety in primary healthcare settings. This observational cross-sectional study was conducted between February and December 2023 at primary healthcare facilities in Surabaya, Indonesia. The study applied the WHO's "Five Moments for Medication Safety" framework to develop a comprehensive self-administered questionnaire. Participants included hypertensive patients aged > 18 years with a minimum three-month diagnosis. A total of 127 respondents participated in this study. This study revealed intriguing patterns in medication safety practices. Notably, significant differences were observed based on education level (p=0.000), occupation type (p=0.005), and salary (p=0.000), but not sex or comorbidities. A negative correlation was found between age and medication safety practice (p = 0.010; r =-0.228), whereas hypertension duration showed no correlation. Amlodipine (10 mg) emerged as the predominant antihypertensive medication, with diabetes being the most common comorbidity. This study provides novel insights into the socioeconomic determinants of medication safety in patients with hypertension. These findings underscore the urgent need for targeted interventions to address these factors and enhance patient outcomes. This study opens new avenues for exploring specific educational and economic strategies to improve medication safety in primary care settings, potentially revolutionizing the management of hypertension.

Keywords: Hypertension, practice, medication safety, primary healthcare

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INTRODUCTION

According to the World Health Organization (WHO), hypertension or high blood pressure is defined as persistent blood pressure ≥ 140/90 mmHg (WHO, 2021). It is a prevalent chronic disease and a major risk factor for multiple conditions, contributing to over one-fifth of cardiovascular diseases, causing over 10 million deaths, and 218 million disability-adjusted life-years globally (Boateng & Ampofo, 2023). In Southeast Asia, the prevalence of hypertension is 25%, which is slightly higher than the worldwide prevalence of (22%) (Ralapanawa 2023). Indonesian Basic Health Research in 2018 reported a 26.4% prevalence of hypertension among adults, which increased to 31.3% in 2023 (Astutik, et al., 2020; RI, 2023). This high prevalence demands attention, especially as Indonesia faces unique challenges in medication safety practices due to socioeconomic and healthcare factors.

Hypertension requires long-term management, often throughout a patient's lifetime. Effective blood pressure control and risk mitigation of complications depend on medication adherence (Mohammed et al., 2022; Wahyuni et al., 2019). Patients with hypertension, chronic comorbidities, and complications often require complex treatment regimens or polypharmacy, increasing the risk of drug-related problems (DRPs) (Kapoor et al., 2024). DRPs are events involving drug therapy that potentially hinder desired health outcomes (Reddy et al., 2023).

Medication errors in hypertensive patients arise from patient, dispenser, or prescription errors, such as omitting prescribed medications, taking unprescribed medications, or incorrect dosage (Fitzgerald, 2009). These errors are linked to poor blood pressure control and are modifiable risk factors for uncontrolled hypertension (Gala et al., 2020). Preventing medication errors ensures medication safety, which is defined as the correct use of medication to avoid injury or worsening of conditions (Bates et al., 2023). In 2019, the WHO introduced the "Five Moments for Medication Safety" which encompasses starting, taking, adding, reviewing, and stopping medication (Wu, 2023). Although the importance of medication safety in hypertension management is recognized, comprehensive studies on the application of the WHO's "Five Moments for Medication Safety" in hypertensive patients are limited. This framework aims to reduce medication-related harm by focusing on critical points in the medication process.

The "Five Moments for Medication Safety" tool has been shown to significantly improve patient outcomes when applied in long-term care settings. This includes stages such as taking and reviewing medication, which are crucial for patients with hypertension who often require long-term medication management (Ibrahim El-Sayed Aly & Karem Mohamed Elsayed 2022). While the "Five Moments for Medication Safety" tool shows promise in improving medication safety, particularly in long-term care settings, its specific application in primary care settings, particularly in hypertension management, remains underexposed. There is also a lack of comprehensive studies exploring the practices of Indonesian patients with hypertension in primary healthcare settings regarding the safety of medications.

There is a scarcity of research focusing on how Indonesian patients with hypertension perceive and implement the WHO's "Five Moments for Medication Safety" in their medication management practices. Current evidence lacks a detailed exploration of how Indonesian patients with hypertension implement or perceive the WHO's Five Moments for Medication Safety in their daily lives, indicating a significant unmet need to optimize medication safety practices. The WHO's "Five Moments for Medication Safety" framework has shown promise in improving outcomes in long-term care settings.

Therefore, this study aimed to bridge this gap by providing detailed insights into the practices of Indonesian hypertension regarding medication safety, with a particular focus on the implementation of the WHO's 'Five Moments for Medication Safety.' Specifically, this study aimed to assess the current medication safety practices among hypertensive patients in Indonesian primary healthcare settings and identify factors influencing medication safety practices, including sociodemographic variables. This study contends that enhancing medication safety practices among Indonesian patients with hypertension requires targeted educational and socioeconomic interventions to reduce medication errors and improve health outcomes.

MATERIALS AND METHODS

Study design and settings

This observational cross-sectional study was conducted between February and December 2023 among patients with hypertension at primary healthcare facilities in Surabaya, Indonesia.

Sampling technique and sample size

Using a purposive sampling technique, patients aged > 18 years with hypertension who had been diagnosed with hypertension for at least three months were invited to participate. The researcher approached patients at primary healthcare facilities and explained the study objectives and eligibility criteria to the potential respondents.

The eligibility criteria included patients who were prescribed antihypertensive medication, were willing to provide informed consent, and had completed the questionnaires. Patients without a history of hypertension, those not taking antihypertensive drugs, and those who did not complete the questionnaires were excluded from the study. The online Raosoft sample size calculator estimated a minimum sample size of 96 hypertensive patients to ensure a confidence level of 95% with a 5% margin of error.

Data collection

A self-administered questionnaire was used to assess the medication safety practices of the patients with hypertension. The questionnaire was designed based on the "Five Moments for Medication Safety" Questionnaire from the World Health Organization and translated into Indonesian. To avoid bias in language translation, the questionnaire was developed in the Indonesian language and was validated to ensure linguistic and cultural equivalence before use. The reliability of the questionnaire was measured by conducting a pilot study of 30 patients with hypertension, and Cronbach's alpha was 0,937, indicating excellent internal consistency. Additionally, face validity was evaluated by an expert panel to ensure that the questions were clear, relevant, and appropriate for the study population.

All patients visiting primary healthcare facilities were screened for eligibility based on the inclusion criteria. Data collection was conducted after obtaining written informed consent from the participants, following a detailed explanation of the study objectives. Patients were then interviewed using the questionnaire by data collectors, who were fourth-year pharmacy students. A trained research assistant administered the questionnaire.

The questionnaire was divided into three sections: the first section included an introduction to the study goals and objectives of data collection, as well as informed consent. The second section contained questions about respondents' demographics, including age, sex, level of education, occupation, income, duration of diagnosed hypertension, antihypertensive medications used, and comorbidities. The third section consisted of ten questions regarding practices concerning the implementation of medication safety in the hospital. The 10 questions were based on the WHO's Five Moments for Medication Safety and consisted of what the participants did when they started antihypertensive medication, took prescribed medications, added new medications or managed potential drug interactions, reviewed medications with healthcare providers, and stopped antihypertensive medications.

To enhance response validity, a prior briefing session and examples were provided to the data collectors. The questionnaire developed in this study is attached as a supplementary file.

Data analysis

Data were analysed using the Statistical Package for Social Sciences (SPSS) software (version 26). Descriptive statistics were used to present the results as percentages and frequency. The normality of the data was checked before conducting further analysis. Spearman's rho test was used to determine the correlation between variables for not normally distributed data. A difference test was conducted to determine whether there were differences between the variables of sex and the presence of comorbidities in medication safety practices.

The total data score for medication safety practices was normally distributed ($p>0.05$); therefore, differences in medication safety practices between variables were assessed using parametric independent sample t-tests (two variables) and one-way ANOVA (three or more variables). The total score for medication safety practices was categorized as poor (27-62), average (63-98), or good (99-135).

RESULTS AND DISCUSSION

This study was conducted using the "Five Moments for Medication Safety" framework developed by the WHO. This study analyzed the medication safety practices of patients with hypertension. The "Five Moments for Medication Safety" framework by the WHO emphasizes five critical stages in the medication process: starting, taking, adding, reviewing, and stopping medication, to enhance safety and reduce errors. This study focused on patients with hypertension and highlighted the prevalence and impact of

medication-related problems and errors in this population group. These findings underscore the need for targeted interventions to improve medication safety and patient outcomes, which could also be applied to patients with other chronic conditions, including diabetes mellitus, chronic pulmonary disease, and cardiovascular disease.

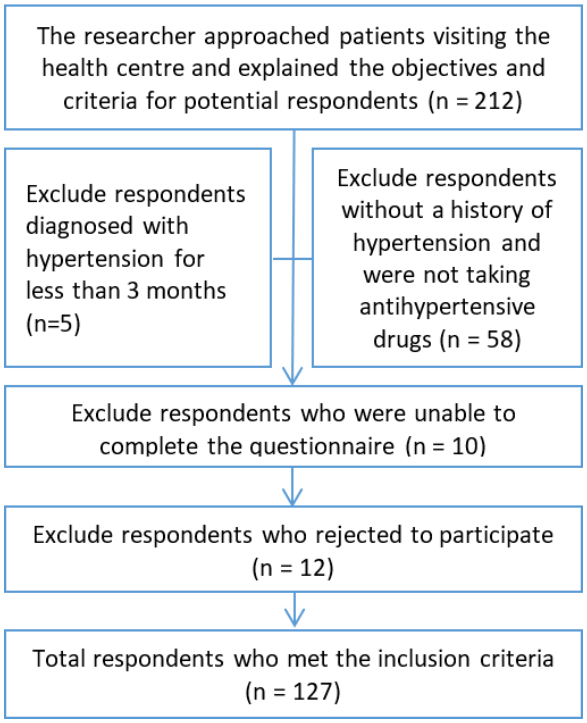


Figure 1. Flow chart of participant's recruitment

Of the 212 respondents, 127 completed the questionnaire, yielding a 59.91% response rate (Figure 1). The primary reasons for exclusion from the study included a diagnosis of hypertension for less than three months, no history of hypertension, no use of antihypertensive medications, inability to complete the questionnaire, and refusal to participate, mainly due to lack of time or other prior appointments.

The most patients with hypertension in this study were female, 43.3% had senior high school education, 29.9% were unemployed, 57.5% had no salary, and 58.3% had no comorbidities (Table I). These demographic details underscore the importance of considering the diverse socioeconomic backgrounds of medication safety practices.

The median duration of participants diagnosed with hypertension was 60 months (five years), ranging from 3 to 420 months (Table II). The most used antihypertensive medication was amlodipine (10 mg, 56.7%). Hypertension is one of the diseases that can be caused by the presence of other chronic diseases include kidney disease, diabetes, obstructive sleep apnea, and hormonal disorders. In this study, diabetes was another disease experienced by most respondents. A total of 38 (71.7%) of the 53 respondents who had other diseases had diabetes. Diabetes and hypertension often occur together and may have common causes, such as poor lifestyle (lack of physical activity), excessive calorie intake, obesity, inflammation, oxidative stress, and insulin resistance (Jia & Sowers, 2021). Individuals with diabetes often do not have enough insulin or have ineffective insulin to manage glucose obtained from food. High blood sugar levels can trigger damage to tissues and organs, such as blood vessels and kidneys, which can lead to increased blood pressure (Przezak, Bielka, & Pawlik, 2022). Metformin (500 mg, 60.4%) was also commonly used (Table II).

Table I. Differentiation among practice of medication safety with sex, education, occupation, salary, and comorbidity variables (n = 127)

Variable	n (%)	Mean ± SD	*p*
Sex[1]			
Male	49 (38.6)	75.78±14.871	0.488
Female	78 (61.4)	73.42±20.497	
Education Level[2]			
No Education	14 (11.0)	63.14±10.014	
Primary School	27 (21.3)	68.56±20.696	
Junior High School	27 (21.3)	69.41±14.006	0.000*
Senior High School	55 (43.3)	81.13±17.036	
Bachelor/master's degree	4 (3.2)	92.25±30.467	
Occupation[2]			
Unemployed	38 (29.9)	70.05±13.774	
Housewife	27 (21.3)	66.63±19.968	0.005*
Private worker	33 (26.0)	82.67±14.491	
Business	19 (15.0)	76.74±23.426	
Others	10 (7.9)	79.30±21.603	
Salary[1]			
No Salary	73 (57.5)	69.32±16.278	0.000*
<IDR 3,000,000	34 (26.8)	77.15±20.742	
>IDR 3,000,000	20 (15.8)	87.85±14.676	
Presence of comorbidity[1]			
Yes	53 (41.7)	73.55±20.194	0.688
No.	74 (58.3)	74.89±17.308	

*$p < 0.05$;
[1])*Independent T-test*;
[2])*One-Way ANOVA*

Table II. Patients' Comorbidities and Medication used (n = 127)

Dimension	n (%)
Duration of Hypertension	60 [420-3]*
Antihypertensive medications used	
Amlodipine 5 mg	43 (33.9)
Amlodipine 10 mg	72 (56.7)
Captopril 12,5 mg	1 (0.8)
Captopril 25 mg	2 (1.6)
Others	9 (7.1)
Types of comorbidities	
Diabetes	38 (71.7)
Cholesterol	11 (20.8)
Cardiovascular Disease	2 (3.8)
Bone Disease	4 (7.5)
Others	5 (9.4)
Medications used for other diseases	
Metformin 500 mg	32 (60.4)
Glimepiride 2 mg	8 (15.1)
Glimepiride 4 mg	1 (1.9)
Glibenclamide 2,5 mg	4 (7.6)
Glibenclamide 5 mg	3 (5.7)
Simvastatin 40 mg	1 (1.9)
Simvastatin 20 mg	2 (3.8)
Simvastatin 10 mg	7 (13.2)
Ca lactate 500 mg	5 (9.4)
Others	12 (22.6)
*median [max-min]	

Table III. Correlation between Age, Duration of Hypertension, and Practice in Medication Safety (n = 127)

Variable	Practice	
	Spearman's correlation (r)	p-value
Age	-0.228*	0.010*
Duration of Hypertension	-0.040	0.654

*significant at 0.01 (2-tailed)

There was a negative correlation between age and medication safety practice scores, indicating that older patients may have poorer practice (Table III). Older adults often face challenges in medication management owing to cognitive decline and physical limitations that can negatively affect medication safety practices. Cognitive impairment, including dementia, significantly affects the ability to manage medications effectively, leading to an increased risk of hospitalization and adverse outcomes (Wang, Cheng & Li, 2024). Cognitive impairment without dementia also presents challenges; however, to a lesser extent, it affects medication adherence and management (Wang et al., 2024). Physical limitations, such as frailty, further complicate medication management, as they may hinder adherence to prescribed regimens (Dixe et al., 2023). These factors underscore the need for targeted interventions to support older adults in safely managing their medications.

In this study, no correlation was found between the duration of hypertension and the safety practices (Table III). The relationship between the duration of hypertension and the safety of medication practices is complex. Although a longer hypertension duration potentially leads to better familiarity with medication regimens, the evidence suggests a more nuanced picture. Some studies have indicated that a longer duration of hypertension is correlated with lower adherence to medication, which could negatively affect safety. However, increased familiarity with the condition over time may have contributed to improved medication management in some cases. This indicates that a longer duration of hypertension was associated with better medication safety practices, which could be attributed to increased familiarity with the condition and prescribed treatments over time. One review addressed the significant correlation between the duration of hypertension and the level of adherence to antihypertensive medication, with longer durations associated with lower adherence levels (Burnier & Egan, 2019). The lack of correlation between the duration of hypertension and safety practices in this study highlights the multifaceted nature of medication management. Although a longer duration may increase familiarity, it does not guarantee improved safety. This finding underscores the need for a personalized medication management approach.

Most patients with hypertension in this study (66.1%) demonstrated average medication safety practices (Table IV). A quarter of the patients (25.2%) showed good practices, whereas a small proportion (8.7%) showed poor medication safety practices. These findings suggest that while most patients follow moderate levels of medication safety, there is room for improvement, particularly for the 8.7% of patients with poor practices. Healthcare providers may need to focus on education and interventions to enhance medication safety practices among hypertensive patients, especially those in the poverty and categories.

Table V. Dimension scores of medication safety among patients with hypertension (n = 127)

Dimension	Category	n (%)
Practice of Medication Safety (range of scores: 27 ~ 135)	Good	32 (25.2)
	Average	84 (66.1)
	Poor	11 (8.7)

The results of the differentiation tests showed no differences in medication safety practice scores based on sex (p=0.488) or the presence or absence of comorbidities (p=0.88). Significant differences were found in the education level (p=0.000), occupation type (p=0.005), and salary (p=0.000) (Table I). There was an association between respondents' age and medication safety practice score (p=0.010; r=-0.228), and no association between hypertension duration and medication safety practice score (p=0.654) (Table III).

Although most of the hypertensive patients who participated in this study were female, there were no differences between sex and medication safety practice scores among the hypertensive patients. Gender is one of the most important factors influencing health-related behavior. This result is inconsistent with that of another study that reported significant differences between men and women in terms of the intensity of medication use, adherence to medications, and the likelihood of receiving guideline-based drug therapy (Manteuffel et al., 2014). In this study, sex did not show a significant difference because the respondents were hypertensive patients; therefore, it is likely that the respondents already had a clear understanding of the disease they suffered from, which made no difference in practice between men and women.

Most hypertensive patients had a senior high school education, and the results showed significant differences between education levels and medication safety practices among hypertensive patients. Respondents with bachelor's degrees and senior high school education levels had much better practices than those with lower education levels. This finding aligns with other studies that state that education level correlates with better health literacy, leading to improved health outcomes, including medication safety practices (Hoffmann & Lutz, 2019).

This study found that most respondents with hypertension were unemployed and lacked regular income, and that there were significant differences between occupation and salary with medication safety practices among hypertensive patients. A previous study reported that employment factors may help develop interventions to improve medication adherence (Kearney, Aldridge, Castle, Peterson, & Pringle, 2016). Individuals with lower incomes and unstable employment may face barriers to accessing healthcare and obtaining necessary medications, contributing to poorer adherence and health outcomes (Petrie, Guzik, & Touyz, 2018). This suggests that socioeconomic factors play a crucial role in determining medication safety in hypertensive individuals. Addressing these socioeconomic barriers may involve implementing policies that provide better financial assistance and healthcare coverage for low-income individuals.

No significant difference was found between the scores for medication safety practices and the presence or absence of other diseases among respondents with other diseases and those with only hypertension who took only one routine drug. This result is quite different from those of previous studies. Commonly, the presence of other diseases can improve a person's health practices because comorbidities can increase a person's level of concern about the disease. However, on the other hand, it can also reduce practice because patients with comorbidities will certainly get more drugs than patients without comorbidities (Cho & Kim, 2014). In this study, the majority of hypertensive patients with comorbidities had diabetes mellitus as the primary comorbidity. Diabetes mellitus is frequently identified as a common comorbid condition in patients with hypertension. Previous studies have shown a significant overlap in the prevalence of hypertension among patients with diabetes, with diabetes being one of the most common comorbidities observed at the time of diagnosis in individuals with hypertension (Nowakowska et al., 2019). This is because patients with hypertension often exhibit insulin resistance and are at a greater risk of developing diabetes than normotensive patients (Chen et al., 2023). Understanding the correlation between these conditions is critical for developing effective management strategies, as both diabetes and hypertension significantly increase the risk of cardiovascular events.

Although medication safety is crucial for patients with hypertension, inadequate attention to this aspect can lead to serious health risks and ineffective treatment of hypertension. Failure to provide comprehensive patient education, conduct regular medication reviews, or implement

strategies to improve adherence may result in poor blood pressure control and increased complication rates. Without proper guidance, patients may not promptly understand the importance of taking prescribed medications, monitoring side effects, or reporting their concerns. Neglecting to maintain an up-to-date list of all medications, including over-the-counter drugs and supplements, can lead to dangerous interactions. Furthermore, the absence of technology-based solutions, such as medication reminders and electronic health records, may hinder efforts to improve medication safety. Consequently, healthcare systems that overlook these critical aspects of medication safety have higher rates of medication errors and poorer patient outcomes in terms of hypertension management than others.

A longer duration of hypertension might lead to better familiarity with medication regimens; however, this does not automatically translate to improved medication safety practices. Factors such as socioeconomic status, access to healthcare, and the complexity of medication regimens also play crucial roles in adherence, which can affect medication safety practices (Montealegre et al., 2022). Educational programs have been used to improve patients' knowledge of hypertension and adherence to medication regimens, suggesting that increased awareness can enhance medication safety practices (Abdalla et al., 2023). The complexity of managing multiple medications and the presence of comorbidities can also affect adherence and medication safety practices (Montealegre et al., 2022). Therefore, interventions focusing on these areas could enhance the safety of medication practices for patients with long-term hypertension. The impact of hypertension duration on medication safety may vary among individuals owing to factors such as age, cognitive function, and overall health status. Older patients with long-standing hypertension may face challenges in medication management because of age-related cognitive decline and physical limitations.

Medication safety is a critical concern for patients with hypertension, because proper medication management is essential for controlling blood pressure and preventing complications. A comprehensive approach to medication safety should include patient education, regular medication reviews, and strategies to improve patient adherence. Healthcare providers should emphasize the importance of taking prescribed medications, monitoring side effects, and promptly reporting any concerns to the physician. To prevent potential drug interactions, patients should be encouraged to maintain an updated list of all medications, including over-the-counter drugs and dietary supplements. Implementing technology-based solutions, such as medication reminders and electronic health records, can help improve medication safety practices. By focusing on these aspects, healthcare systems can significantly reduce medication errors and enhance overall patient outcomes in hypertension management.

Healthcare providers should consider implementing regular medication reviews and adjustments in patients with long-term hypertension. This approach could help address potential issues arising from prolonged medication use, such as side effects and drug interactions. The study results suggest that healthcare interventions should focus on continuous education and support throughout a patient's journey with hypertension rather than whether time alone will improve medication safety practices.

Future research should explore the specific factors that contribute to medication safety practices in patients with long-term hypertension. This could include investigating the role of support systems, the use of technology in medication management, and the impact of regular follow-ups with healthcare providers. These findings highlight the potential need for tailored interventions based on the duration of hypertension. Newly diagnosed patients may benefit from intensive education programs, whereas those with long-standing hypertension may require strategies to combat complacency and medication fatigue.

Strengths and limitations

The focus on medication safety has primarily been on healthcare workers' roles in ensuring patient adherence to safe practices. This study is the first to assess the importance of medication safety practices among patients with hypertension in primary healthcare settings in Indonesia. The use of the WHO's "Five Moments of Medication Safety" framework provides a standardized approach for assessing medication safety in the community. The results of this study can help identify specific areas for intervention and future research, such as addressing socioeconomic barriers and implementing targeted educational programs.

However, this study had some limitations that should be considered. First, this was a cross-sectional study, which limits its ability to determine

causality and changes in medication safety practices over time. This study was conducted at five primary healthcare centers in Surabaya, with the majority of patients having hypertension, which potentially limits generalizability to other regions or healthcare settings. Data collection relied on self-reported data, which may have been subject to recall or social desirability biases.

Future research should explore the effectiveness of specific educational and economic interventions in enhancing medication safety practices among patients with hypertension, potentially extending these findings to other regions with similar healthcare challenges. Although these gaps highlight significant challenges, it is essential to consider the role of healthcare providers in addressing them. Enhancing the roles of clinical pharmacists and physicians in monitoring and managing drug therapy can help mitigate DTPs and improve patient adherence. Additionally, tailored interventions focusing on lifestyle modifications could further enhance hypertension management outcomes in this population. Moreover, exploring the potential of digital health tools and mobile applications to enhance medication safety and patient engagement is necessary.

CONCLUSION

The study revealed that most medication safety practices among hypertensive patients in primary healthcare settings in Surabaya, Indonesia fell within the moderate category. Notably, differences in medication safety practice scores were observed according to patients' education level, occupation, and income. However, no significant differences were observed in terms of sex or comorbidities. Additionally, the duration of hypertension treatment and age were identified as factors associated with medication safety in the present study. Therefore, targeted educational programs and socioeconomic support initiatives should be implemented. Strengthening primary healthcare services and training healthcare workers on these factors can further enhance patient outcomes.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

Consent to participate

Informed consent was obtained from all the participants in this study.

Research involving human participants

Ethical approval was obtained, and all procedures performed in this study were approved by the ethical standards of the Human Research Ethics Committee.

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