ORIGINAL ARTICLE

Exploration of Determinants of Adherence to Antihypertensive Medication: A Multilevel Analysis of the Fifth Wave of the Indonesia Family Life Survey

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ABSTRACT

Introduction: The prevalence of hypertension in Indonesia is increasing, but adherence to antihypertensive medication remains low. Previous studies have mostly examined medication adherence determinants separately at individual and environmental levels, with limited research integrating these factors comprehensively. This study investigates the factors influencing adherence to antihypertensive medication in Indonesia. **Materials and methods:** The study utilised data from the IFLS-5, involving 2,334 respondents aged ≥ 15 years diagnosed with hypertension. Multilevel logistic regression is used to identify predictor variables for medication adherence. The effect size is determined by odds ratio (OR) and significance at p-value < 0.05. **Result:** Contextual household factors influence up to 22.45% of the variation in adherence to antihypertensive medication. Variables that influence medication adherence are comorbid diabetes (OR = 1.53, 95% CI: 1.04 – 2.23, p=0.029), had a heart attack (OR = 2.84, 95% CI: 1.79-4.52, p<0.0001), comorbid stroke (OR = 2.79, 95% CI: 1.59 – 4.90, p<0.0001), routine medical check-up (OR = 1.70, 95% CI: 1.23-2.36, p=0.001), feel healthy (OR = 0.59, 95% CI: 0.43-0.72, p<0.0001), aged ≥ 47 years (OR = 2.84, 95% CI: 2.10-3.84, p<0.0001), and households with social protection cards (OR = 0.61, 95% CI: 0.40-0.93, p=0.022). **Conclusion:** Higher adherence occurs in hypertensive patients with diabetes, stroke, heart attack, routine check-ups, and aged ≥ 47 years. However, lower in feeling healthy and households with social protection cards. Programs to improve medication adherence should focus on hypertension without comorbidities, aged <47 years, feeling healthy, and low-income families.
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INTRODUCTION

Hypertension is a critical disease that can lead to complications such as heart attacks and strokes, which frequently act as a precursor to mortality. One in four adults worldwide suffers from hypertension, making it a global health burden (1–4). In Indonesia, the prevalence of hypertension is on the rise, affecting various age groups, and the proportion of hypertension patients who do not regularly take their medication, which reaches 32.27%, and those who do not take drugs at all, amounting to 13.33% (5). Hypertension is influenced by many factors. (6,7). However, controlling blood pressure to normal levels is crucial for individuals with hypertension to prevent dangerous complications (8).
Pharmacological therapy through the consumption of antihypertensive medications is an effective effort to control blood pressure. However, there are still many hypertension sufferers who do not consistently take their medication (9–11). Adhering to a regular medication regimen is key for hypertension patients to keep their blood pressure in a normal range. (12,13). According to Haynes (1979) and Rand (1993) adherence is "the extent to which a person's behaviour – taking medication, following a diet, and/or executing lifestyle changes, corresponds with agreed recommendations from a health care provider." (14)

Previous research has identified various determinant factors that influence medication adherence in hypertensive patients, both at the individual and environmental levels. Significant individual factors include age, gender, education level, type of occupation, marital status, family support, perception of medication benefits, income, experience with outpatient services, comorbidities, alcohol consumption, and duration of suffering from hypertension (15–17). Meanwhile,

environmental factors that also play a role include the distance between residence and healthcare facilities, availability of counsellors for patients, number of medications consumed, socioeconomic status, household income, satisfaction with the services received, and place of residence (18–20).

Previous research generally limits the analysis of the determinants of medication adherence to individual and environmental levels separately, with little focus on the context of developing countries. To address this limitation, this study aims to explore the determinant factors of medication adherence among hypertension patients in Indonesia, using the latest data from the Fifth Wave of the Indonesia Family Life Survey (IFLS-5). The data obtained includes individual, household, and public health centre levels. This research offers an important contribution by providing comprehensive and layered insights into the determinants of compliance. This finding is not only relevant to Indonesia's context, but it also lays the groundwork for the development of more effective hypertension interventions in developing countries.

This study extends previous research by integrating the analysis of individual and environmental factors in a comprehensive framework, especially in the Indonesian context, which has previously received less attention. In addition, our study also focuses on the multilevel identification of determinants of medication adherence in hypertensive patients so as to gain a deeper understanding of the interactions between these factors. This will provide sufficient information to make intervention policies to improve medication adherence comprehensively at both the individual level and the environmental level.

MATERIALS AND METHODS

Subject and data source

The research subjects involve individuals aged 15 years and older who have been diagnosed with hypertension. The data source is the IFLS-5, a longitudinal and continuous socio-economic and health survey in Indonesia that gathers information at the person, home, and community health centre levels. The sample in this IFLS represents approximately 83% of Indonesia's population, which lives in 13 provinces. The IFLS-5 survey was performed from late October 2014 to the end of April 2015 in South Sulawesi, South Kalimantan, West Nusa Tenggara, Bali, East Java, the Special Region of Yogyakarta, Central Java, West Java, Jakarta, Lampung, South Sumatra, West Sumatra, and North Sumatra. We conducted stratified sampling at the provincial level, stratifying by urban/rural areas. The provinces are chosen to maximise the representation of the population, capturing the cultural and socio-economic diversity of Indonesia. Census blocks are randomly selected using the framework of the National Socioeconomic Survey sample, and subsequently, households are randomly chosen. A household is defined as a group of people who live in the same building and share food from the same kitchen. We selected twenty households from each urban census block and thirty households from each rural census block (21,22). We will treat the IFLS data in this study as cross-sectional data.

The process of selecting research samples began with 58,325 respondents in the IFLS-5 survey. A total of 34,258 respondents were diagnosed with hypertension by healthcare professionals. As many as 30,054 respondents were excluded due to missing data on the response variable, the subject did not give a "yes" or "no" answer to the question, "In order to deal with hypertension, are you currently taking prescribed medication on a weekly basis?" (21). A total of 4,204 respondents indicated whether they consumed antihypertensive medication or not. Finally, we excluded 1,870 respondents due to missing data on several predictor variables. There were 2,334 eligible respondents for analysis. Figure 1 shows the flow of the sample selection.

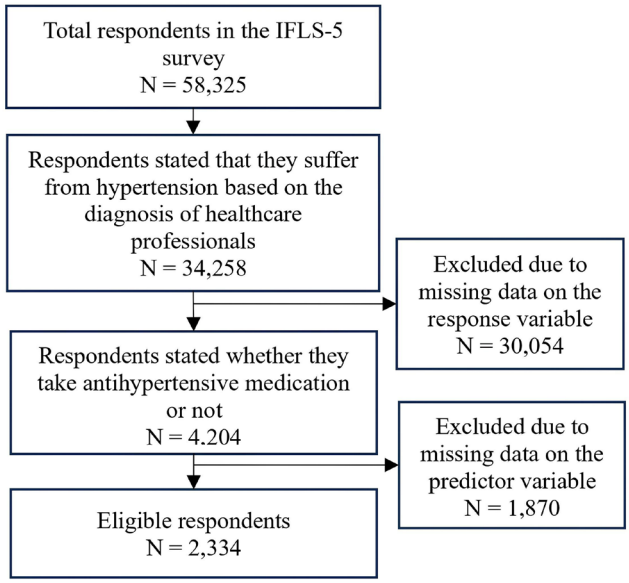

Figure 1: Sample selection flow

Variable studied

The response variable in this study is adherence to antihypertensive medication (yes and no). Medication adherence was defined as the subject's response to the question "In order to deal with hypertension, are you currently taking prescribed medication on a weekly basis?" posed by the surveyor. Those who answered "yes" were considered to have medication adherence, while those who answered "no" were considered to have medication non-adherence (21). Meanwhile, the predictor variables are grouped into three levels: individual level, household level, and community health centre level.

At the individual level, the predictor variables include comorbid diabetes was assessed with the question,

"Has a doctor/paramedic/nurse/midwife ever told you that you had diabetes?" (yes and no), ever had a heart attack was assessed with the question, "Has a doctor/paramedic/nurse/midwife ever told you that you had heart attack?" (yes and no), comorbid stroke was assessed with the question, "Has a doctor/paramedic/nurse/midwife ever told you that you had a stroke?" (yes and no), suffering kidney disease was assessed with the question, "Has a doctor/paramedic/nurse/midwife ever told you that you had kidney disease?" (yes and no), gender (female and male), marital status (married and unmarried), highest education level (≤ senior high school and college), personality prone to worry was assessed by the subject's response to the statement "I see myself as someone who worries a lot" (yes and no), having health insurance was assessed with the question, "Are you the policyholder/primary beneficiary of health benefits, health insurance?" (yes and no), not using traditional medicine was assessed with the question, "During the past 4 weeks, have you ever consumed traditional herbs or traditional medicines as treatment?" (yes and no), routine medical check-up (yes and no), not consuming tobacco was assessed with the question, "Have you ever chewed tobacco, smoked a pipe, smoked self-rolled cigarettes, or smoked cigarettes/cigars?" (yes and no), feeling about general health unhealthy was assessed with the question, "In general, how is your health?" (healthy yes and unhealthyno), religious adherence was defined as having good religious observance, referring to the subject's response to the question "How religious are you?" Those who answered "very" or "somewhat" were considered to have religious adherence, while those who answered "rather" or "not" or "refuse" were considered to have religious non-adherence (adherence yes and non-adherenceno), and age (< 47 years old and ≥ 47 years old) (21).

At the household level, the predictor variables include the residence location (urban and rural), having a social protection card (yes or no), and using a certificate of inability to pay (yes and no). At the level of community health centres, the predictor variables include awareness of the minimum service standards (yes or no) and receiving operational health assistance (yes and no) (21).

Data analysis

We conducted data analysis using Stata version 14.0. Descriptive statistics are used to summarise the distribution of response variables based on predictor variables. Further analysis is conducted to examine individual, household, and community health centre-level predictor variables that may significantly relate to adherence to antihypertensive medication, as well as to explore the contextual effects at the household and community health centre levels on adherence to antihypertensive medication.

A sample of 2,334 respondents living in 2,064 household groups and 306 community health centre groups was used in the final modelling. The average number of respondents per household group is 1.1, with a minimum and maximum of 1 and 4, respectively. The average number of respondents per community health centre group is 7.6 people, with a minimum and maximum of 1 and 24 people, respectively. Multilevel logistic regression as an extension of the analysis from the single-level logistic regression model is conducted due to the hierarchical structure of the IFLS-5 data, where individuals are nested within households and community health centres.

Some people argue that an intraclass correlation (ICC) value close to zero indicates that multilevel analysis is unnecessary (23). The design effect is used to determine the need for multilevel modelling. Some researchers believe that a design effect estimate greater than 2 indicates the necessity for multilevel analysis. The design effect takes into account the average number of respondents in a group (nc) and the ICC, so the formula for calculating the design effect is 1 + (nc - 1) x ICC (24,25). Intraclass correlation (ICC) is used to measure the contextual influence of household factors and community health centre factors on the variation in adherence to antihypertensive medication. We measure the effect size of the predictor variable using the odds ratio (OR) with a 95% confidence interval (CI). We use a p-value of less than 0.05 to indicate statistical significance. We examined the final model's suitability using the likelihood ratio test (LRT) and the Akaike information criterion (AIC).

RESULTS

Sample characteristics

Out of 2,334 hypertensive respondents, it was found that 1,725 (73.91%) were non-compliant with taking antihypertensive medication, while 609 (20.09%) were compliant with taking antihypertensive medication. Significant predictor variables associated with an adherence to antihypertensive medication at the individual level include comorbid diabetes, ever had a heart attack, comorbid stroke, married, routine medical check-ups, feeling healthy, religious adherence, and age ≥ 47 years old. At the household level, urban residence and having a social protection card are significant. Meanwhile, at the level of community health centres, there are no significant predictor variables. Table I presents more details.

Table I: Distribution of adherence to antihypertensive medication based on respondent characteristics

Predictor variables	Adherence with taking antihypertensive medication n = 2,334		p-value*
	No n = 1,725 (%)	Yes n = 609 (%)	
Individual level variable			
Comorbid diabetes	121 (7.01)	88 (14.45)	<0.001
Ever had a heart attack	65 (3.77)	74 (12.15)	<0.001
Comorbid stroke	39 (2.26)	51 (8.37)	<0.001
Suffering kidney disease	47 (2.72)	19 (3.12)	0.613
Male	634 (36.75)	197 (32.35)	0.051
Married	1,600 (92.75)	594 (97.54)	<0.001
College	1,543 (89.45)	546 (89.66)	0.887
Personality prone to worry	974 (56.46)	350 (57.47)	0.666
Have health insurance	903 (52.35)	338 (55.50)	0.180
Using traditional medicine	418 (24.23)	168(27.59)	0.101
Routine medical check-up	205 (11.88)	119 (19.54)	<0.001
Consuming tobacco	512 (29.68)	159 (26.11)	0.094
Feeling healthy	1,113 (64.52)	292 (47.95)	<0.001
Religious adherence	1,407 (81.57)	536 (88.01)	<0.001
Age ≥ 47 years old	900 (52.17)	478 (78.49)	<0.001
Household level variable			
Urban residence	1,008 (58.43)	392 (64.37)	0.010
Having a SPC	210 (12.17)	48 (7.88)	0.004
Using a CIP	407 (23.59)	122 (20.03)	0.071
CHC level variable			
Awareness the MSS	45 (2.61)	19 (3.12)	0.507
Receive OHA	1,449 (84.00)	524 (86.00)	0.231

Description: *) Chi Square Test.

Abbreviations: SPC: social protection card, CIP: certificate of inability to pay, MSS: minimum service standards, OHA: operational health assistance, CHC: community health centre.

Selection of multilevel logistic regression models

The variation in adherence to antihypertensive medication at the household level shows a greater value compared to the community health centre level in Models 1, 2, 3, and 4. Model 1 (empty model) shows an ICC of 20.47%, indicating that 20.47% of the variation in adherence to antihypertensive medication is influenced by contextual factors at the community health centre and household levels (Table II). The average number of respondents in each household group (nc) is 1.1 people, leading to an estimated design effect of > 2 (1 + [1.1 – 1] x 20.47 = 3.05). Based on the ICC of 20.47% and the estimated design effect of 3.05, a multilevel analysis is necessary (24,25).

Table II: Multilevel logistic regression models of determinant factors for adherence to antihypertensive medication

Predictor variables	Model 1	Model 2	Model 3	Model 4	Model 5
		OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Fixed Effect					
Individual level variable					
Comorbid diabetes	-	1.58* (1.08 – 2.30)	1.53* (1.04 – 2.23)	1.53* (1.05 – 2.24)	1.44* (1.05 – 1.97)
Ever had a heart attack	-	2.82** (1.78 – 4.48)	2.84** (1.79 – 4.52)	2.86** (1.79 – 4.55)	2.45** (1.69 – 3.55)
Comorbid stroke	-	2.83** (1.62 – 4.96)	2.79** (1.59 – 4.90)	2.79** (1.59 – 4.91)	2.38** (1.51 – 3.76)
Suffering kidney disease	-	1.11 (0.57 – 2.19)	1.13 (0.57 – 2.24)	1.13 (0.57 – 2.24)	1.09 (0.61 – 1.96)
Male	-	0.82 (0.58 – 1.17)	0.83 (0.58 – 1.18)	0.83 (0.58 – 1.19)	0.86 (0.63 – 1.16)
Married	-	0.62 (0.33 – 1.18)	0.60 (0.31 – 1.14)	0.60 (0.31 – 1.14)	0.62 (0.35 – 1.11)
College	-	0.97 (0.65 – 1.44)	0.89 (0.59 – 1.33)	0.89 (0.59 – 1.33)	0.93 (0.66 – 1.31)
Personality prone to worry	-	1.04 (0.82 – 1.32)	1.05 (0.83 – 1.33)	1.05 (0.83 – 1.33)	1.06 (0.86 – 1.29)
Have health insurance	-	1.10 (0.87 – 1.40)	1.15 (0.90 – 1.47)	1.16 (0.91 – 1.48)	1.13 (0.92 – 1.40)
Using traditional medicine	-	1.05 (0.81 – 1.36)	1.03 (0.80 – 1.34)	1.03 (0.79 – 1.34)	1.01 (0.81 – 1.27)
Routine medical check-up	-	1.76* (1.27 – 2.44)	1.70* (1.23 – 2.36)	1.71* (1.23 – 2.38)	1.60* (1.21 – 2.10)
Consuming tobacco	-	0.90 (0.62 – 1.30)	0.90 (0.62 – 1.30)	0.89 (0.62 – 1.30)	0.90 (0.66 – 1.23)
Feeling healthy	-	0.57** (0.44 – 0.73)	0.56** (0.43 – 0.72)	0.56**(0.43 – 0.72)	0.62** (0.51 – 0.76)
Religious adherence	-	1.29 (0.92 – 1.82)	1.29 (0.91 – 1.81)	1.29 (0.91 – 1.81)	1.25 (0.93 – 1.68)
Age ≥ 47 years old	-	2.91** (2.16 – 3.92)	2.84** (2.10 – 3.84)	2.85** (2.11 – 3.85)	2.50** (1.98 – 3.16)
Household level variable					
Urban residence	-	-	1.19 (0.91 – 1.56)	1.21 (0.92 – 1.58)	1.14 (0.93 – 1.41)
Having a SPC	-	-	0.61* (0.40 – 0.93)	0.61* (0.40 – 0.93)	0.65* (0.46 – 0.93)
Using a CIP	-	-	0.89 (0.66 – 1.19)	0.88 (0.66 – 1.18)	0.91 (0.71 – 1.17)
CHC level variable					
Awareness the MSS	-	-	-	0.66 (0.32 – 1.36)	-
Receive OHA	-	-	-	1.10 (0.78 – 1.57)	
Random Effect					
Constant	0.295**	0.127**	0.126**	0.171**	0.167**
Variance (SE) of CHC	0.188 (0.092)	0.148 (0.098)	0.154 (0.098)	0.148 (0.098)	-
Variance (SE) of households	0.659 (0.440)	0.789 (0.520)	0.799 (0.528)	0.815 (0.532)	-
ICC CHC (%)	4.55	3.50	3.62	3.50	-
ICC CHC and household (%)	20.47	22.17	22.45	22.65	-
Model Fit					
Likelihood ratio test	11.66*	8.25*	8.46*	8.32*	-
Akaike information criterion	2673.9	2462.4	2459.5	2461.9	2463.9

Description: *significant at the level of $p < 0.05$, ** significant at the level of $p < 0.001$, Model 1: empty model, Model 2: multilevel (individual), Model 3: multilevel (individual and household), Model 4 multilevel (individual and household and community health centre), Model 5: single-level.

Abbreviations: OR: odds ratio, 95% CI: 95% confidence interval, SE: standard error, ICC: intraclass correlation coefficient, SPC: social protection card, CIP: certificate of inability to pay, MSS: minimum service standards, OHA: operational health assistance, CHC: community health centre.

Predictors of adherence to taking anti-hypertensive drug

The significant predictor variables for adherence to antihypertensive medication in Models 2, 3, 4, and 5 at the individual level are comorbid diabetes, ever had a heart attack, comorbid stroke, routine medical check-ups, feeling healthy, age ≥ 47 years old, and at the household level, having a social protection card. More details can be seen in Table II.

Model 3 has the smallest AIC value of 2459.5, indicating that model 3 is the most fitting model. The results of the likelihood-ratio test between Model 3 and Model 4 show a p-value of 0.458 (p-value > 0.05), indicating that the addition of the predictor variable for the health centre level in Model 4 does not improve the predictive model for adherence to antihypertensive medication compared to Model 3. Therefore, Model 3 is the best model that fits the observational data. More details can be seen in Table II.

Hypertensive patients with comorbid diabetes have 1.53 times higher odds of adhering to antihypertensive medication compared to those without comorbid diabetes (OR = 1.53, 95% CI = 1.04 – 2.23, p = 0.029). Those who had a heart attack have 2.84 times higher odds of adhering to antihypertensive medication compared to those who never had a heart attack (OR = 2.84, 95% CI = 1.79 – 4.52, p <0.0001). Patients with comorbid stroke have 2.79 times higher odds of adhering to antihypertensive medication compared to those without comorbid stroke (OR = 2.79, 95% CI = 1.79–4.52, p<0.0001). Individuals who routinely undergo medical check-ups have 1.70 times higher

odds of adhering to antihypertensive medication compared to those who do not have routine medical check-ups (OR = 1.70, 95% CI = 1.23 – 2.36, p = 0.001). Hypertensive patients who feel healthy 44% lower odds of adhering to antihypertensive medication compared to those who feel healthy (OR = 0.56, 95% CI = 0.43 – 0.72, p<0.0001). Hypertensive patients aged ≥ 47 years old have 2.84 times higher odds of adhering to antihypertensive medication compared to those aged < 47 years old (OR=2.84, 95% CI=2.10 – 3.84, p<0.0001). Conversely, hypertensive patients from households with social protection cards have 39% lower odds of adhering to antihypertensive medication compared to those without social protection cards (OR = 0.61, 95% CI = 0.40–0.93, p = 0.022). As much as 22.45% of the variation in adherence to antihypertensive medication is influenced by differences between households. More details can be seen in Model 3, Table II.

DISCUSSION

The proportion of adherence to antihypertensive medication in Indonesia is still low. This finding is in accordance with other studies in Indonesia that reported a non-compliance rate of 78% for antihypertensive medication (n = 162) (26). Other Asian countries also show a high proportion of non-compliance, such as China at 72.54% (n = 354) (27), Thailand at 87% (n = 354) (28), and Saudi Arabia at 58% (n = 177) (29). A meta-analysis study indicates that the average non-compliance rate in Asia is around 48% (30). High non-compliance with antihypertensive medication poses a risk of unstable blood pressure, which can increase the risk of cardiovascular diseases and other serious health conditions (31,32).

The presence of comorbid stroke, comorbid diabetes, and having ever had a heart attack increases adherence to antihypertensive medication among hypertension patients. This finding supports previous studies in Taiwan that reported patients with comorbidities are more compliant with hypertension treatment (15). Hypertensive patients with comorbidities such as obesity, heart disease, stroke, and diabetes show higher odds of adherence, at 1.97 times, 2.38 times, 4.45 times, and 2.05 times, respectively, compared to those without comorbidities (33). However, a study in Gaza showed the opposite, indicating that comorbidities can decrease adherence to antihypertensive treatment (34). This finding highlights the importance of considering comorbid factors when designing an intervention to improve adherence to hypertension treatment. For instance, healthcare facilities can incorporate non-communicable disease services into their health programs.

Patients with hypertension who undergo routine medical check-ups exhibit higher adherence to antihypertensive medication. Regular medical check-ups are associated with increased knowledge, awareness, and responsibility towards their own health. This was confirmed by a study in Poland that found good health knowledge is associated with adherence to hypertension treatment (35). In addition, our study found that hypertensive patients who feel unwell are more compliant with taking antihypertensive medication compared to those who feel healthy. This is consistent with survey findings in Indonesia, which show that patients who do not regularly take their medication do so because they feel healthy (5). This finding emphasises the need for the integration of blood pressure monitoring and hypertension treatment with medical check-ups for individuals with hypertension. Individuals with hypertension need to foster early awareness of the risks of hypertension complications and responsibility for their health.

Our study found that hypertensive patients aged ≥ 47 years are more compliant with taking antihypertensive medication compared to those aged < 47 years. Other studies in Switzerland, Taiwan, Saudi Arabia, and Morocco confirm that patients aged ≥ 45 years are more compliant with hypertension treatment compared to those who are younger. (10,15,36–38). However, a study in Nepal found no significant relationship between age and medication adherence in patients with hypertension (39). However, it is important to note that as age increases, the burden of hypertension tends to rise (32). A study in Poland shows that each additional year of life increases the total adherence score to hypertension treatment by 0.2 points (40). An older person has a higher sensitivity to health disturbances. Therefore, they are more motivated to adhere to their treatment compared to those who are younger. Poor adherence to antihypertensive medication has become a major factor reducing the effectiveness of treatment across all ages (41). This finding highlights the importance of considering age when designing an intervention to improve adherence to hypertension treatment.

Individuals in households with social protection cards exhibit lower adherence to antihypertensive medication. The government designed social protection cards as an assistance program to support impoverished households. A study in Peru found that socioeconomic factors contribute to the decline in adherence to antihypertensive medication (42). A meta-analysis reported that higher income is significantly associated with better medication adherence among hypertensive patients (43). This finding indicates that households' socioeconomic factors should be considered when designing interventions for antihypertensive medication adherence.

Another important finding is that household factors have a contextual influence of 22.45%. This suggests that differences among household groups drive the variation in adherence to antihypertensive medication.

Previous studies have found that family support and the environment influence a person's health status (44,45). Research in China found that support from partners or friends plays a significant role in the medication adherence of hypertension patients (46,47). Conversely, a study in Poland showed that family support could decrease medication adherence by up to 1.91 points compared to those living alone (40). A study in China found that the cost of medication for hypertension accounts for about 16.4% of the total expenditure of each family (48). Therefore, we must empower families to remind patients to adhere to their antihypertensive medication regimen. A caring and supportive family environment can enhance the patient's self-confidence and sense of responsibility towards their health.

Effective education in healthcare settings can mitigate hypertension prevalence and avert consequences (49). The WHO emphasizes the importance of considering the interplay of five dimensions when formulating intervention strategies: the patient, the patient's condition, socioeconomic factors, healthcare services, and therapy (14). Our findings provide insights and implications for programs designed to reduce hypertension prevalence by increasing adherence to antihypertensive treatment. Efforts to improve adherence to antihypertensive medicine should prioritise households with low socioeconomic status. The intervention focusses on adults under 47 years of age with hypertension, devoid of comorbidities, who do not engage in regular medical check-ups and perceive themselves as healthy.

The findings provide implications for policymakers and health practitioners. The implication for policymakers is to design and implement awareness-raising programs on the risk of uncontrolled hypertension, with more focus on low-income households and younger individuals with hypertension without comorbidities. For example, providing subsidies for antihypertensive drugs, improving access to primary health centres, and campaigning on the importance of regular blood pressure checks. While the implication for health practitioners is to use a more personalised and empathic approach to raise awareness about the importance of adherence to antihypertensive treatment. For example, providing counselling both at primary health centres and through home visits, educating families in the same house to always remind patients to take medicine and check blood pressure regularly, and providing evidence-based information about the adverse effects of uncontrolled hypertension.
Our study has limitations; all information is self-reported by respondents, potentially introducing bias into the data. The number of eligible respondents, of which only 2,334 out of 34,258 could be analysed, may affect the generalisability of the findings. The cross-sectional study design also constrains the investigation of causal linkages. The variables within the household contextual element and the contextual elements of community health centres necessitate further investigation. In addition, future research should focus on standardising medication adherence measures and developing comprehensive interventions that are effective at the individual and household levels to improve medication adherence.

CONCLUSION

Hypertension patients with comorbid diabetes, a history of myocardial infarction, concomitant stroke, regular medical check-ups, perceptions of poor health, and individuals aged 47 years or older have higher adherence to antihypertensive medicine, whereas households with social protection cards have lower adherence. The government should create a policy program that increases the awareness of hypertensive patients and their families of the risks of uncontrolled hypertension, with a focus on individuals aged ≥47 years without comorbidities and low-income households. In addition, health practitioners should use a personalised and empathic approach to raise patients' awareness about the importance of taking medication regularly and having their blood pressure checked regularly with evidence-based information. Therefore, we propose strategic measures to improve access to health services for low-income households, provide training to health practitioners on a more personalised and empathic approach to education, and continue to develop evidence-based health education programs.

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