Patient Preference and Adherence

Dovepress
Taylor & Francis Group

Open Access Full Text Article

ORIGINAL RESEARCH

Socioeconomic Factors Associated with Non-Adherence to Antihypertensive Treatment Among Older Adults Affiliated to the "Pension 65" Program in Peru

Juliana Anabella Schutt-Cerdan[1], Yngrid Estrella Marcelo-Lluen[1], Susan M Oblitas-Guerrero[1], Norma Del Carmen Gálvez-Díaz[1], Jacksaint Saintila[2]

[1]School of Nursing, Faculty of Health Sciences, Universidad Señor de Sipan, Chiclayo, Peru; [2]School of Medicine, Faculty of Health Sciences, Universidad Señor de Sipán, Chiclayo, Peru

Correspondence: Jacksaint Saintila, School of Medicine, Universidad Señor de Sipán, Km 5, Carretera a Pimentel, Chiclayo, Lambayeque, 14001, Peru, Email jacksaintsaintila@gmail.com

Background: Hypertension is one of the leading causes of morbidity and mortality among older adults, and its management largely depends on treatment adherence. Previous studies have shown that socioeconomic factors such as income, education, and access to healthcare can significantly influence adherence. However, little is known about how these factors affect older adults living in extreme poverty in Peru, particularly beneficiaries of the "Pension 65" program. This study aims to explore these associations in a highly vulnerable population.

Objective: To identify the socioeconomic factors associated with non-adherence to antihypertensive treatment in older adults enrolled in the "Pension 65" program in Peru.

Methods: A cross-sectional and analytical study was conducted among 108 older adults enrolled in the "Pension 65" program in Peru. Participants were selected using non-probabilistic convenience sampling. Data on sociodemographic and economic characteristics were collected through a validated questionnaire, and non-adherence to antihypertensive treatment was self-reported. Logistic regression models were applied to identify factors independently associated with non-adherence.

Results: Being male (OR = 28.3, 95% CI: 5.3–149.7), single (OR = 10.9, 95% CI: 2.501–48.0), having an incomplete primary education (OR = 7.7, 95% CI: 1.9–30.5), and being affiliated with the Comprehensive Health Insurance (SIS) (OR = 25.3, 95% CI: 5.3–119.6) were significantly associated with a higher likelihood of non-adherence to treatment. Furthermore, individuals who had never held formal employment (OR = 4.4, 95% CI: 1.6–11.8), those with an income below $120 USD per month (OR = 8.8, 95% CI: 2.1–35.6), and those who did not receive financial support (OR = 3.2, 95% CI: 1.1–9.3) were more likely to be non-adherent to treatment.

Conclusion: The findings indicate that various socioeconomic factors hinder adherence to antihypertensive treatment in this vulnerable population. These results highlight the need for interventions, including public policies aimed at improving health education and strengthening access to healthcare services, particularly for older adults with economic constraints.

Keywords: vulnerable populations, hypertension, socioeconomic factors, morbidity, pensions, antihypertensive agents

Introduction

High blood pressure (HBP) is clinically defined as a systolic pressure of ≥140 mmHg or a diastolic pressure of ≥90 mmHg and is a primary risk factor for cardiovascular, renal, and other chronic diseases.[1] Globally, the World Health Organization (WHO) estimates that 1.28 billion adults aged 30 to 79 have hypertension, with the highest burden in low- and middle-income countries.[2] In Peru, an estimated 5.5 million people over the age of 15 have high blood pressure, representing 22.1% of the population;[3] with a higher prevalence in urban areas.[4] Among older adults, 35.3% of

Received: 19 February 2025
Accepted: 29 April 2025
Published: 12 June 2025

individuals aged 60 or older were found to have hypertension.[4] Therefore, it is essential to implement effective strategies for the prevention, detection, and management of high blood pressure, particularly in vulnerable populations such as older adults.

A critical factor in hypertension management is poor adherence to treatment, which worsens clinical outcomes and places additional strain on healthcare systems.[5] It is estimated that 85% of patients do not follow their medication regimen correctly, primarily due to forgetfulness (48.2%), although other barriers such as cost, side effects, and lack of time also contribute.[6] Although 80% of patients are aware of the risks associated with poorly controlled hypertension, such as strokes and heart disease, most seek medical attention only when symptoms appear.[7] Furthermore, 94% of patients do not follow medical recommendations for regular check-ups, reflecting a mistaken belief about a cure.[8]

Non-adherence to antihypertensive treatment is a multifactorial issue influenced by various sociodemographic and economic factors. Among the key determinants identified in the literature, sex significantly impacts treatment adherence, with studies indicating that men are less likely to follow medical recommendations than women.[9–11] For example, a study by Williams et al[12] found that men exhibited lower adherence compared to women. This difference may be attributed to health behavior patterns, as men tend to seek medical attention less frequently and underestimate the perceived risk of chronic diseases such as hypertension.[13] On the other hand, women tend to take a more active role in self-care and health management, which may explain their higher adherence rates.[14] However, it is important to note that these differences are not consistent across all studies. For example, a systematic review with meta-analysis found no significant differences in adherence to antihypertensive medication between sexes; in fact, the study reported lower self-reported adherence among women.[15]

Marital status has also been identified as a key factor in treatment adherence. Previous studies have shown that individuals who are married or living with a partner have higher rates of therapeutic adherence compared to those who are single, widowed, or divorced.[16,17] A study of 2,122 older adults found that unmarried men had lower adherence compared to those who were married.[12] Another study also reported that divorced or separated patients had the highest risk of non-adherence, suggesting that the dissolution of a relationship may negatively impact treatment management.[18] This finding is attributed to the emotional and practical support provided by a partner in disease management, such as medication reminders and accompaniment to medical appointments.[19] In contrast, single older adults may experience greater social isolation and less supervision in treatment adherence, contributing to higher rates of non-adherence.[20] However, studies have reported that married patients may also be at a higher risk of non-adherence, possibly due to family dynamics that interfere with treatment follow-up.[18] Regardless, these findings emphasize the importance of considering marital status as a key factor in designing strategies to improve adherence among hypertensive patients.

Educational level is another key determinant of adherence to antihypertensive treatment. The literature suggests that patients with lower education levels struggle to understand the importance of treatment, interpret medical instructions, and properly manage their medication.[21] Low health literacy can impair patients' ability to follow medical recommendations and adopt healthy habits that support pharmacological treatment.[16] This issue is particularly relevant for older adults living in poverty, where access to health information is often limited.

From an economic perspective, income and access to social security significantly influence treatment adherence. Patients with lower incomes often struggle to afford medication, doctor's appointments, and transportation to health centers, which may result in treatment interruptions.[22] In many low- and middle-income countries, including Peru, unequal access to healthcare services creates additional barriers for older adults, who rely on social assistance programs such as "Pension 65" to meet their basic needs.[23,24] Similarly, the lack of financial support from family members or the state can lead to financial stress, affecting the prioritization of healthcare expenses and, consequently, adherence to antihypertensive treatment.[25]

Hypertension is a major public health concern, particularly among older adults, who face a higher risk of cardiovascular complications and other comorbidities associated with inadequate blood pressure control. Adherence to antihypertensive treatment is essential for preventing adverse outcomes. In this context, older adults benefiting from the "Pension 65" program—a Peruvian government initiative that provides financial support to individuals aged 65 and older living in extreme poverty—represent a particularly vulnerable group.[26,27] In addition to the challenges of aging, this population

has limited access to medication, healthcare services, and social support networks, which may impact their adherence to treatment.

On the other hand, in Peru, there is limited information on the relationship between socioeconomic conditions and adherence to antihypertensive treatment among older adults. Most studies on adherence to chronic treatments have focused on the general population or patients receiving care in urban centers with greater access to healthcare services. However, there is a gap in the literature regarding how vulnerability factors—such as low educational attainment, lack of stable income, and limited access to healthcare—impact therapeutic adherence among older adults living in extreme poverty. Since the "Pension 65" program serves a population with distinct socioeconomic characteristics, it is essential to generate specific evidence to better understand the factors influencing non-adherence to treatment and its impact on beneficiaries' health.

Therefore, this study aimed to identify the socioeconomic factors associated with non-adherence to antihypertensive treatment among older adults enrolled in the "Pension 65" program in Peru, building on prior evidence about how these factors influence adherence in older adults globally. By focusing on a particularly vulnerable group within the Peruvian context, this study contributes to filling a gap in the literature and supports the development of tailored interventions for improving treatment outcomes in low-income elderly populations.

Material and Methods

Study Design and Participants

A cross-sectional and analytical study was conducted among older adults enrolled in the "Pension 65" program in Peru. The sample was drawn from the city of Chiclayo, located in the Lambayeque region, with the support of local health personnel and community leaders. According to the available records, a total of 600 older adults affiliated with "Pension 65" in Chiclayo were identified as having a diagnosis of hypertension. From this group, 132 individuals were approached and invited to participate. After excluding those who did not sign the informed consent (n = 10) and those with incomplete or invalid data (n = 14), the final sample consisted of 108 participants, resulting in a response rate of approximately 81.8% (Figure 1).

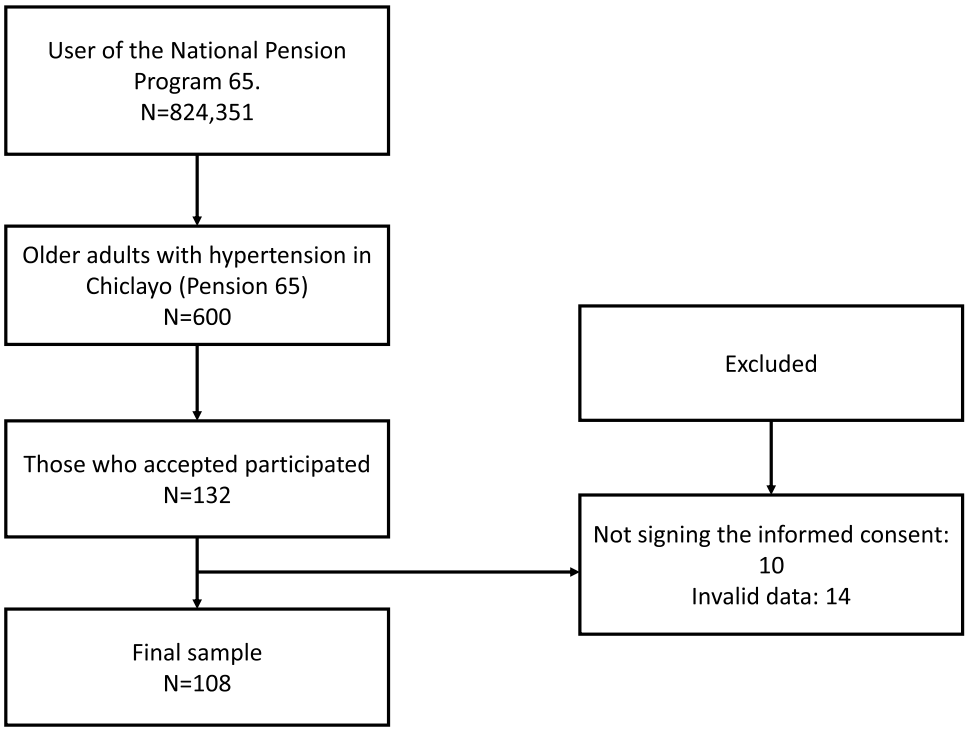

Figure 1 Study Design.

https://doi.org/10.2147/PPA.S523651

Participants were selected through non-probabilistic convenience sampling. Although the National "Pension 65" Program serves 824,351 users nationwide,[28] disaggregated national data on beneficiaries diagnosed with hypertension was not available at the time of data collection. Therefore, the study focused on accessible and eligible individuals within the Chiclayo area.

Inclusion criteria were: being aged 65 or older, being a registered "Pension 65" beneficiary, having a medical diagnosis of hypertension, and providing informed consent. The exclusion criteria, established prior to data collection, were applied during recruitment and data processing. Participants were excluded if they (a) had not attended the program in the past year (based on program records), (b) could not be contacted due to a changed or non-functioning telephone number, (c) were temporarily residing outside the jurisdiction, or (d) did not complete the questionnaire.

Regarding sample size, we used Soper's Free Statistical Calculator (version 4.0)[29] to estimate the minimum required sample size for a multiple regression analysis. Based on an expected effect size of 0.35, power of 0.80, ten explanatory variables, and an alpha level of 0.05, the minimum required sample size was calculated to be 54 participants. A total of 108 older adults voluntarily participated, exceeding the required sample size.

Ethical Aspects

Data collection was conducted following the approval of the research project by the Faculty of Health Sciences at Señor de Sipán University (Resolution No. 0369–2022/FCS-USS). Subsequently, authorization was requested from the administrator of the *Pension 65* program to access user data (Approval No. D000001-2024-MIDIS/P65-UT Lambayeque). Once authorization was obtained, participants were contacted and informed about the study's objectives and procedures. Voluntary participation was ensured through the signing of an informed consent form by each older adult, guaranteeing anonymity and confidentiality in data handling. The study adhered to the ethical principles of respect, beneficence, and justice, in accordance with the Declaration of Helsinki and current ethical standards.

Study Variables

Sociodemographic and Economic Factors

To assess the sociodemographic and economic factors associated with non-adherence to antihypertensive treatment in older adults, we used the *Questionnaire for the Evaluation of Socioeconomic Factors Associated with Non-Adherence to Treatment in Hypertensive Persons*. This instrument included 44 closed-ended items that collected information on personal and contextual characteristics such as gender, age, marital status, education, employment status, income, and type of health insurance. The instrument's content validity was confirmed by five experts, yielding a validity coefficient of 0.965 using Aiken's V. Reliability was assessed using Cronbach's alpha, with values ranging from 0.79 to 0.85, indicating high internal consistency.

Non-Adherence to Antihypertensive Treatment

Adherence to antihypertensive treatment was evaluated using the Morisky-Green test, a validated four-item questionnaire with dichotomous (yes/no) responses, widely employed to assess therapeutic adherence in patients with chronic conditions.[30] This tool has been extensively applied in both clinical and community-based settings, including among older adults with hypertension.[31] Notably, its use has also been documented in the Peruvian context, such as in the study by Carhuallanqui et al.[32]

Statistical Analysis

Descriptive statistics and association tests were used for data analysis. Initially, a descriptive analysis of sociodemographic and economic variables was performed using absolute and relative frequencies, and measures of central tendency and dispersion for quantitative variables. To assess associations between independent variables and non-adherence to antihypertensive treatment, chi-square tests were used in the bivariate analysis. Subsequently, a binary logistic regression model was conducted to identify factors independently associated with non-adherence, calculating adjusted odds ratios (OR) and 95% confidence intervals (CI). Statistical significance was set at a p-value of < 0.05. All analyses were performed using SPSS version 26.

Results

Table 1 presents the sociodemographic and insurance characteristics of the 108 older adults participating in the study. Most participants were between 65 and 75 years old and the majority were male. A large proportion were affiliated with the SIS health insurance system, and over half reported non-adherence to antihypertensive treatment.

Table 2 shows that males are significantly more likely to be non-compliant with treatment than females (p = 0.036). Similarly, affiliation with SIS showed a strong association with non-adherence (p = 0.000). Marital status was also

Table 1 Characteristics of the "Pension 65" Affiliates (N=108)

Variables	Categories	n	%
Age (years)			
	65–75	65	60.2
	76–80	34	31.5
	>80	9	8.3
Sex			
	Female	39	36.1
	Male	69	63.9
Type of insurance			
	EsSalud*	29	26.9
	Private	1	0.9
	SIS**	78	72.2
Marital status			
	Single	11	10.2
	Married	73	67.6
	Divorced	4	3.7
	Widower	20	18.5
Level of education			
	Incomplete primary	44	40.7
	Complete primary	23	21.3
	Incomplete secondary	21	19.4
	Complete secondary	20	18.6
Adherence			
	No	56	51.9
	Yes	52	48.1

Note: *EsSalud: Seguro Social de Salud (Social Health Insurance), a Peruvian public institution that provides healthcare services to policyholders and their dependents. **SIS: Seguro Integral de Salud (Integral Health Insurance), a Peruvian social program that offers free healthcare services to individuals living in poverty.
Abbreviation: n, number of participants; %, percentage.

https://doi.org/10.2147/PPA.S523651

Table 2 The Variables Studied According to Non-Adherence to Antihypertensive Treatment

Variables	Adherence		X^2	p-value
	Yes	No		
Sex				
Female	24 (46.2%)	15 (26.8%)	4.384	0.03
Male	28 (53.8%)	41 (73.2%)		
Type of insurance				
SIS**	29 (55.8%)	49 (87.5%)	13.532	0.01
EsSalud* and private	23 (44.2%)	7 (12.5%)		
Marital status				
With partner	23 (44.2%)	12 (21.4%)	6.400	0.01
Without partner	29 (55.8%)	44 (78.6%)		
Level of education				
Incomplete primary	20 (38.5%)	31 (55.4%)	4.088	0.04
Others	22 (61.5%)	12 (44.6%)		
Previous employment				
Self-employed	30 (57.7%)	44 (78.6%)	5.449	0.02
Others	22 (42.3%)	12 (21.4%)		
Monthly income				
≤ $120	18 (34.6%)	38 (67.9%)	11.934	0.01
> $120	34 (65.4%)	18 (32.1%)		
Receives financial support				
No	8 (15.4%)	24 (42.9%)	9.760	0.01
Yes	44 (84.6%)	32 (57.1%)		

Note. *EsSalud: Seguro Social de Salud (Social Health Insurance), a Peruvian public institution that provides healthcare services to policyholders and their dependents. **SIS: Seguro Integral de Salud (Integral Health Insurance), a Peruvian social program that offers free healthcare services to individuals living in poverty. X^2: chi-square statistic.

a significant factor (p = 0.011). Regarding educational level, a statistically significant difference was observed (p = 0.049). Regarding economic factors, having previously worked in self-employed occupations was associated with a higher likelihood of non-adherence (p = 0.020). Furthermore, older adults with a monthly income below $120 had a higher rate of non-adherence (p = 0.001). Finally, the lack of financial resources was also associated with a higher rate of non-adherence to treatment (p = 0.002).

Table 3 presents the factors associated with non-adherence to antihypertensive treatment among "Pension 65" affiliates. Several statistically significant variables were identified, with being male showing the strongest association with non-adherence (*OR* = 28.334, 95% *CI*: 5.359–149.794, p = 0.000), followed by being single (*OR* = 10.960, 95% *CI*: 2.501–48.035, p = 0.001), having incomplete primary education (*OR* = 7.785, 95% *CI*: 1.986–30.512, p = 0.003), previous formal employment (*OR* = 4.352, 95% *CI*: 1.601–11.829, p = 0.004), and having an income below $120 (*OR* = 8.768, 95% *CI*: 2.158–35.622, p = 0.002). It was also observed that not receiving financial support was significantly

Table 3 Factors Associated with Non-Adherence to Antihypertensive Treatment Among Pension 65 Affiliates

Variables	B	SE	Wald	*p*	Exp(B)	95% CI	
						Lower	Upper
Male	3.344	0.850	15.492	0.00	28.3	5.3	149.7
Age ≥76 years	0.016	0.037	0.198	0.65	1.0	0.9	1.0
Single	2.394	0.754	10.085	0.00	10.9	2.5	48.0
Incomplete primary	2.052	0.697	8.670	0.00	7.7	1.9	30.5
Not previously in formal employment	1.471	0.510	8.309	0.00	4.352	1.6	11.8
Income of ≤ $120	2.171	0.715	9.213	0.00	8.768	2.1	35.6
Not receiving financial support	1.165	0.544	4.589	0.03	3.207	1.1	9.3
Be affiliated to SIS*.	3.231	0.793	16.614	0.00	25.305	5.3	119.6
Normal BMI	0.005	0.003	2.616	0.11	1.005	0.9	1.0
Normal WC	0.080	0.046	3.011	0.08	1.083	0.9	1.1
Constant	−10.582	2.058	26.448	0.00	0.000		

Notes: Multivariate logistic regression model adjusted for all variables shown in the table.
Abbreviations: B, Beta coefficient; SE, standard error; p, probability; Exp(B), Multivariate Odds Ratio; *SIS, Seguro Integral de Salud (Integral Health Insurance) a Peruvian social program that offers free healthcare services to individuals living in poverty; BMI, body mass index; WC, waist circumference; 95% CI, 95% confidence interval.

associated with non-adherence (*OR* = 3.207, 95% *CI*: 1.104–9.315, $p = 0.032$), as was having SIS insurance (*OR* = 25.305, 95% *CI*: 5.352–119.652, $p = 0.000$). In contrast, normal WC, age, and BMI did not show statistically significant associations.

Discussion

High blood pressure is a major risk factor for the development of cardiovascular diseases, which are among the leading causes of mortality in older adults.[33] Antihypertensive treatment, which includes medication and lifestyle modifications, is essential for controlling blood pressure and preventing serious complications.[34] However, adherence to this treatment remains a challenge, particularly among vulnerable populations such as older adults.[35] In Peru, the "Pension 65" program provides financial support to older adults living in extreme poverty.[27,36] Despite this support, socioeconomic barriers may still affect adherence to antihypertensive treatment. This study aims to identify and analyze the socioeconomic factors associated with non-adherence to treatment in this population, with the goal of developing strategies to improve adherence and, consequently, the health of "Pension 65" affiliates. In the current study, the main findings indicate that non-adherence to antihypertensive treatment is significantly associated with various socioeconomic factors.

Sex

Specifically, men were more likely to be non-adherent to antihypertensive treatment compared to women. This finding aligns with previous research indicating that men tend to have lower adherence rates to chronic treatments, including antihypertensive therapy.[10] Studies conducted in various countries have shown that men are less likely to adhere to medical recommendations, which may be influenced by perceptions of self-sufficiency or a lower concern for their health compared to women.[9–11] However, a systematic review with meta-analysis found no significant differences in adherence to antihypertensive medication between sexes; in fact, the study reported lower self-reported adherence among women.[15] Regardless, the differences observed in our study may be exacerbated by cultural and social factors specific to the

Peruvian context, where traditional gender roles tend to place greater responsibility on women for family health care, while men may downplay the need for medical treatment.[37]

Furthermore, men's lack of adherence may be linked to barriers in accessing healthcare services, as they tend to seek medical attention less frequently than women, delaying the monitoring of chronic conditions such as hypertension.[13] This is especially relevant in vulnerable populations, such as those affiliated with the "Pension 65" program, who face economic and logistical challenges that further hinder access to healthcare services.[27,36] The perception of invulnerability, combined with the lack of an adequate support network, may contribute to men's reluctance to strictly follow prescribed treatments.[38] These factors highlight the need for interventions aimed at improving treatment adherence among men by addressing both cultural and structural barriers within the Peruvian healthcare system.

Marital Status

Additionally, our study found that being single was associated with a higher likelihood of non-adherence to antihypertensive treatment. Similarly, other studies have reported that marital status plays a significant role in adherence to chronic disease treatments. Findings from a study on the US population suggest that married individuals tend to have higher adherence rates to treatment,[16] likely due to the presence of an emotional and social support network, typically led by their partner, which facilitates adherence to medical instructions.[17] Having a spouse may provide constant reminders to take medication, support for attending medical appointments, and assistance in adopting lifestyle changes that enhance therapeutic adherence.[19] However, inconsistencies exist in these associations. For example, a study by Abbas et al[18] found that married individuals were more likely to be non-adherent to antihypertensive treatment.

In the Peruvian context, these differences may be even more pronounced. In many Latin American cultures, including Peru, family support plays a fundamental role in health management, and single individuals or those without a stable partner may lack the same level of support as married individuals.[39] This issue is exacerbated in the most vulnerable populations, such as affiliates of the "Pension 65" program, who may live alone and have limited access to social or family support networks.[40] This not only reduces the likelihood of proper treatment follow-up but also increases feelings of isolation, which may negatively impact motivation to adhere to the therapeutic regimen.[41] On the other hand, stress management and daily responsibilities are additional factors that may explain this association. Single individuals, particularly those of advanced age, may experience higher stress levels due to loneliness and lack of emotional support, which can result in lower adherence to treatment.[42] In comparison, individuals who are married or living with a partner may have greater emotional and practical resources to manage the demands of hypertension and the complexities of treatment, leading to higher adherence rates.[42,43] This finding underscores the importance of social and family networks in promoting treatment adherence among older adults living alone.

Educational and Economic Factors

Another key finding of this study is that having less than a primary school education is associated with non-adherence to antihypertensive treatment. Our results align with previous studies, which have consistently shown that lower educational levels are linked to reduced adherence to treatments for various diseases. It has also been noted that individuals with lower educational levels or limited health literacy tend to have restricted access to health-related information, making it difficult for them to understand medical instructions and the importance of adhering to long-term treatment.[44,45] A study by Farah et al[21] found that a higher level of education was significantly associated with increased adherence to hypertension medication. This lack of knowledge and understanding may lead patients to underestimate the severity of hypertension, resulting in non-adherence to treatment.

Older adults who did not complete primary education have likely faced economic and social barriers throughout their lives, which may limit their access to quality healthcare resources and their understanding of the risks associated with non-adherence to antihypertensive treatment.[46] Furthermore, a low level of education may be associated with limited access to the healthcare system, making individuals less likely to attend regular medical check-ups or seek assistance when they do not understand their doctor's instructions.[47] A low level of education can also impact risk perception and health self-management.[48] Patients with limited primary education may have lower health literacy, which can impact their ability to interpret medication labels, follow instructions, or understand the importance of adhering to a continuous

treatment regimen.[45] Older adults enrolled in the *Pension 65* program, who rely on social assistance for their livelihood, may have limited access to health education programs that could help them effectively manage their condition.[40]

Another possible explanation for this finding is that individuals with lower education levels often face economic and employment disadvantages, making them more likely to hold informal, unstable, or low-income jobs. This, in turn, limits their ability to consistently afford necessary medications. These economic and logistical challenges can hinder consistent access to necessary treatments, ultimately compromising therapeutic adherence.[49] In the case of older adults in Peru, this issue is particularly critical, as these limitations are further exacerbated by the inadequate health infrastructure in rural areas, where many of them reside, making access to medical care even more challenging.[24]

In our study, we found that older adults who had never held formal employment, those with an income of less than 450 soles (approximately 120 dollars), and those who did not receive any form of financial support were more likely to discontinue their antihypertensive treatment. These factors further support the idea that economic insecurity, combined with a lack of formal education, can hinder individuals' ability to effectively manage their health—whether due to difficulties in accessing medication or a lack of awareness about the importance of adhering to treatment.[24,46–48]

Furthermore, the combination of low income and lack of financial support may lead to greater reliance on social programs such as "Pension 65." While these programs are essential for improving the quality of life of older adults in extreme poverty, their benefits may be insufficient to fully cover the costs of long-term treatment for chronic conditions. This underscores the need to complement such programs with interventions that enhance both health education and access to medical resources, particularly among populations with low levels of formal education.

Type of Social Insurance

Finally, we found that older adults enrolled in the Comprehensive Health Insurance (SIS) were more likely to report non-compliance with antihypertensive treatment compared to those covered by the EsSalud system. This finding aligns with previous studies that have highlighted the limitations of the SIS in terms of coverage and access to healthcare services.[26,27] The SIS, primarily designed for individuals in extreme poverty, provides more limited coverage compared to EsSalud. This could impact treatment adherence, particularly when continuous access to medications and medical consultations is necessary.[23] In fact, despite its own challenges, EsSalud generally provides more comprehensive care, which may contribute to higher treatment adherence rates among its beneficiaries.[27]

These findings may be attributed to several factors. On one hand, SIS beneficiaries often encounter greater barriers to accessing healthcare, including limited availability of medications and inadequate infrastructure in rural areas, where many "Pension 65" program affiliates reside.[27,50] In comparison, EsSalud has a broader network of healthcare centers and a greater availability of essential medications, making it easier to ensure continuous monitoring of antihypertensive treatment.[26] The lack of timely access to medical resources within the SIS can lead to frustration and demotivation among patients, increasing the likelihood of non-compliance with treatment. Additionally, the care provided to SIS beneficiaries is often less personalized and more overcrowded, which can limit both the time and quality of doctor-patient interactions.[50] This situation may result in older adults receiving insufficient guidance on the importance of treatment adherence and the risks of uncontrolled hypertension, ultimately reducing their likelihood of compliance.[51]

Another possible explanation for this finding is that SIS beneficiaries, due to their more vulnerable socioeconomic status, may prioritize other essential expenses over purchasing medications or covering transportation costs to healthcare centers, particularly if these facilities are located far from their homes. This contrasts with EsSalud affiliates, who, while they may also experience financial difficulties, generally have a more stable support network and better access to healthcare resources.

Limitations and Future Perspectives

This study has certain limitations that should be considered when interpreting the results. First, the cross-sectional design prevents the establishment of definitive causal relationships between socioeconomic factors and non-adherence to antihypertensive treatment. This limitation restricts our ability to determine whether the identified factors directly cause non-compliance or if they are influenced by other unexamined variables. Therefore, future research could benefit from longitudinal designs to assess how these factors evolve over time and their impact on treatment adherence.

Another limitation is that the study relies on self-reported data on treatment adherence, which may be affected by recall bias and social desirability bias, particularly in an older adult population. Incorporating objective measures, such as tracking medication refills or assessing blood pressure control biomarkers, could enhance the accuracy and reliability of the findings. Additionally, the use of a non-probabilistic convenience sampling method may limit the representativeness of the findings and introduce potential selection bias. The results, therefore, may not be generalizable to the entire population of older adults in Peru. Future research should consider using probabilistic sampling methods to improve external validity and reduce the risk of bias.

Furthermore, this study focused exclusively on a sample of "Pension 65" program affiliates in Peru, which limits the generalizability of the findings to other older adult populations in the country. Future research could include broader and more diverse samples to determine whether these results hold across different demographic groups. Therefore, it would be valuable to explore how targeted interventions, such as health education programs and social support initiatives, could enhance adherence to antihypertensive treatment in this population. It is also recommended to explore the impact of additional factors, such as mental health status and access to community support networks, which may play a significant role in treatment adherence. Such research could contribute to the development of effective health policies tailored to the needs of older adults, aiming to reduce the burden of hypertension and its associated complications in the Peruvian population.

Public Health Implications

The findings of this study underscore the need for targeted interventions to enhance adherence to antihypertensive treatment among low-income older adults in Peru. Socioeconomic factors associated with non-adherence to treatment—such as being male, single, having a low level of education, and lacking coverage under the SIS—underscore the need to tailor public health strategies to address both individual and structural barriers affecting this vulnerable population. Therefore, the implementation of health education programs aimed at enhancing awareness of hypertension and the importance of treatment adherence is recommended, particularly for individuals with lower levels of education. This could involve targeted awareness campaigns for beneficiaries of social programs like "Pension 65", using clear, accessible language and providing practical guidance on treatment adherence. Additionally, strengthening the role of primary care in delivering personalized and continuous education is essential, particularly for SIS affiliates, where resources and infrastructure may be more limited.

Similarly, the study highlights the need for social support policies that provide assistance and establish support networks for single older adults and those without family support, as these networks could play a decisive role in improving treatment adherence. Interventions such as home visits, telephone follow-ups, and community programs could enhance adherence in these groups by providing reminders, emotional support, and easier access to medical services. Finally, improving the infrastructure and resources available to SIS beneficiaries, particularly in rural areas, is essential to ensuring equitable access to healthcare and sustained treatment adherence. Strengthening the healthcare system in these areas would help reduce disparities in access to medications and medical services, thereby fostering sustained adherence to antihypertensive treatment.

Finally, it is essential to raise awareness among healthcare professionals who care for this vulnerable group of older adults so they can develop targeted strategies for monitoring treatment and enhancing therapeutic adherence in this population. This is particularly important because non-compliance with treatment can increase the demand for healthcare services, further straining Peru's already fragile health system.

In summary, we recommend the development and implementation of comprehensive, community-based interventions that integrate health education, social support, and improvements in healthcare accessibility—particularly for older adults with limited education, low income, and insufficient family or institutional support. These efforts will be crucial to reducing non-adherence and mitigating the burden of hypertension in Peru's most vulnerable populations.

Conclusion

This study highlights key socioeconomic factors linked to non-adherence to antihypertensive treatment among older adults enrolled in the "Pension 65" program in Peru. The findings indicate that being male, single, having an incomplete

primary education, and being enrolled in the SIS are associated with a higher likelihood of non-adherence to treatment. Additionally, individuals who had never held formal employment, those with an income of less than 450 soles (approximately 120 dollars), and those who did not receive any form of financial support were more likely to discontinue their treatment. These findings underscore the structural and personal barriers faced by older adults in vulnerable situations, emphasizing the need to improve health education and enhance access to medical services for this population.

Data Sharing Statement

The data supporting the findings of this study are available upon request from the corresponding author. However, they are not publicly accessible due to privacy and ethical restrictions.

Funding

APC funding for this manuscript was provided by Universidad Señor de Sipán.

Disclosure

The authors declare no potential conflicts of interest regarding the research, authorship, or publication of this article.

References

1. Villarreal-Zegarra D, Carrillo-Larco RM, Bernabe-Ortiz A. Short-term trends in the prevalence, awareness, treatment, and control of arterial hypertension in Peru. *J Hum Hypertens*. 2021;35(5):462–471. doi:10.1038/s41371-020-0361-1
2. Organización Mundial de la Salud. OMS. 2023. Global report onhypertension: the race against a silent killer.
3. Ministerio de Salud. En el Perú, existen 5.5 millones de personas mayores de 15 años que sufren de hipertensión arterial [Internet]. Gobierno del Perú. 2022. Available from: https://www.gob.pe/institucion/minsa/noticias/607500-en-el-peru-existen-5-5-millones-de-personas-mayores-de-15-anos-que-sufren-de-hipertension-arterial. Accessed February 15, 2025.
4. Hernández-Vásquez A, Carrillo Morote BN, Azurin Gonzales V Del C, Turpo Cayo EY, Azañedo D. Spatial analysis of hypertension in Peruvian adults, 2022. *Archivos Peruanos de Cardiología y Cirugía Cardiovascular*. 2023;4(2):48–54. doi:10.47487/apcyccv.v4i2.296
5. Gardezi SKM, Aitken WW, Jilani MH. The impact of non-adherence to antihypertensive drug therapy. *Healthcare*. 2023;11(22):2979.
6. ur RMM, Haque MM, Islam MS, Parvin MF, Kahhar A. Noncompliance to antihypertensive medication in patients with essential hypertension attending Dhaka medical college hospital. *TAJ J Teachers Assoc*. 2022;35(2):103–110.
7. Mahmood S, Jalal Z, Hadi MA, Khan TM, Haque MS, Shah KU. Prevalence of non-adherence to antihypertensive medication in Asia: a systematic review and meta-analysis. *Int J Clin Pharm*. 2021;43(3):486–501. doi:10.1007/s11096-021-01236-z.
8. Serda M, Becker FG, Cleary M, et al. Synteza i aktywność biologiczna nowych analogów tiosemikarbazonowych chelatorów żelaza. G. Balint, Antala B, Carty C, Mabieme JMA, Amar IB, Kaplanova A, editors. *Uniwersytet slaski*. 2013;7(1):343–354.
9. Qvarnström M, Kahan T, Kieler H, et al. Persistence to antihypertensive drug treatment in Swedish primary healthcare. *Eur J Clin Pharmacol*. 2013;69(11):1955–1964. doi:10.1007/s00228-013-1555-z
10. Holt E, Joyce C, Dornelles A, et al. Sex differences in barriers to antihypertensive medication adherence: findings from the cohort study of medication adherence among older adults. *J Am Geriatr Soc*. 2013;61(4):558–564. doi:10.1111/jgs.12171
11. Lee JS, Segura Escano R, Therrien NL, et al. Antihypertensive medication adherence and medical costs, health care use, and labor productivity among people with hypertension. *J Am Heart Assoc*. 2024. doi:10.1161/JAHA.124.037357
12. Williams LG, Peacock E, Joyce C, et al. Risk factors for low pharmacy refill adherence among older hypertensive men and women by race. *Am J Med Sci*. 2018;356(5):464–475. doi:10.1016/j.amjms.2018.07.007
13. Höhn A, Gampe J, Lindahl-Jacobsen R, Christensen K, Oksuyzan A. Do men avoid seeking medical advice? A register-based analysis of gender-specific changes in primary healthcare use after first hospitalisation at ages 60+ in Denmark. *J Epidemiol Comm Health*. 2020;74(7):573–579. doi:10.1136/jech-2019-213435
14. Ramírez-Morros A, Berenguera A, Millaruelo L, et al. Impact of gender on patient experiences of self-management in type 2 diabetes: a qualitative study. *Patient Prefer Adherence*. 2024;Volume 18:1885–1896. doi:10.2147/PPA.S466931.
15. Biffi A, Rea F, Iannaccone T, Filippelli A, Mancia G, Corrao G. Sex differences in the adherence of antihypertensive drugs: a systematic review with meta-analyses. *BMJ Open*. 2020;10(7):e036418. doi:10.1136/bmjopen-2019-036418
16. Liu Q, Wang H, Liu A, et al. Adherence to prescribed antihypertensive medication among patients with depression in the United States. *BMC Psychiatry*. 2022;22(1):764. doi:10.1186/s12888-022-04424-x
17. Atukunda EC, Musiimenta A, Musinguzi N, et al. Understanding patterns of social support and their relationship to an ART adherence intervention among adults in rural Southwestern Uganda. *AIDS Behav*. 2017;21(2):428–440. doi:10.1007/s10461-016-1559-7
18. Abbas H, Kurdi M, de Vries F, et al. Factors associated with antihypertensive medication non-adherence: a cross-sectional study among lebanese hypertensive adults. *Patient Prefer Adherence*. 2020;14:663–673. doi:10.2147/PPA.S238751
19. Gupta L, Khandelwal D, Rishi Lal P, Gupta Y, Kalra S, Dutta D. Factors determining the success of therapeutic lifestyle interventions in diabetes – role of partner and family support. *Eur Endocrinol*. 2019;15(1):18. doi:10.17925/EE.2019.15.1.18
20. Lu J, Zhang N, Mao D, Wang Y, Wang X. How social isolation and loneliness effect medication adherence among elderly with chronic diseases: an integrated theory and validated cross-sectional study. *Arch Gerontol Geriatr*. 2020;90:104154. doi:10.1016/j.archger.2020.104154
21. Farah R, Alawwa I, Khateeb D, et al. Factors affecting the level of adherence to hypertension medications: a cross-sectional study using the hill-bone questionnaire. *Patient Prefer Adherence*. 2024;18:893–904. doi:10.2147/PPA.S457026

22. Rohatgi KW, Humble S, McQueen A, et al. Medication adherence and characteristics of patients who spend less on basic needs to afford medications. *J Ame Board Family Med*. 2021;34(3):561–570. doi:10.3122/jabfm.2021.03.200361
23. Petrera Pavone M, Jiménez Sánchez E. Determinantes del gasto de bolsillo en salud de la población pobre atendida en servicios de salud públicos en Perú, 2010–2014. *Rev Panam Salud Pública*. 2018;42.
24. Cusquisibán-Alcantara Y, Toledo-Garrido C, Calizaya-Milla Y, Carranza-Cubas S, Saintila J. Impact of a nutrition education intervention on knowledge, healthy eating index, and biochemical profile in a rural community in peru. *J Multidiscip Healthc*. 2024;17:1111–1125. doi:10.2147/JMDH.S440195
25. Friedline T, Chen Z, Morrow S. Families' financial stress & well-being: the importance of the economy and economic environments. *J Fam Econ Issues*. 2021;42(S1):34–51. doi:10.1007/s10834-020-09694-9
26. Mezones-Holguin E, Amaya E, Bellido-Boza L, et al. Cobertura de aseguramiento en salud: el caso peruano desde la Ley de Aseguramiento Universal. *Rev Peru Med Exp Salud Publica*. 2019;36(2):196. doi:10.17843/rpmesp.2019.362.3998
27. Rodrich Iglesias S, Ramírez Preciado M, Velásquez Carrasco L. Impact of the pensión 65 social program on meeting the needs of Peruvian older adults. *Revista InveCom*. 2024;4(2):1–12.
28. Resolución de Dirección Ejecutiva N.° 000028-2025-MIDIS-P65-DE - Normas y documentos legales - Programa Nacional de Asistencia Solidaria Pensión 65 - Plataforma del Estado Peruano [Internet]. Available from: https://www.gob.pe/institucion/pension65/normas-legales/6544864-000028-2025-midis-p65-de. Accessed 2025 April 7.
29. Soper DS. 2022 A-priori sample size calculator for multiple regression. Available from: https://www.danielsoper.com/statcalc/. Accessed January 4, 2022.
30. Morisky DE, Green LW, Levine DM. Concurrent and predictive validity of a self-reported measure of medication adherence. *Med Care*. 1986;24(1):67–74. doi:10.1097/00005650-198601000-00007
31. Chamorro MÁ R, García-Jiménez E, Amariles P, Rodríguez Chamorro A, José Faus M. Review of the test used for measuring therapeutic compliance in clinical practice. *Aten Primaria*. 2008;40(8):413–417. doi:10.1157/13125407
32. Carhuallanqui R, Diestra-Cabrera G, Tang-Herrera J, Málaga G. Adherence to pharmacotherapy in hypertensive outpatients attended at general hospital. *Revista Medica Herediana*. 2010;21(4):1–12.
33. Brouwers S, Sudano I, Kokubo Y, Sulaica EM. Arterial hypertension. *Lancet*. 2021;398(10296):249–261. doi:10.1016/S0140-6736(21)00221-X
34. Ramos-Vera C, Banos-Chaparro J, Ogundokun RO.The network structure of depressive symptomatology in Peruvian adults with arterial hypertension. *F1000Research*.2021;10:19. doi:10.12688/f1000research.27422.3
35. Ruksakulpiwat S, Schiltz N, Irani E, Josephson R, Adams J, Still C. Medication Adherence of older adults with hypertension: a systematic review. *Patient Prefer Adherence*. 2024;18:957–975. doi:10.2147/PPA.S459678
36. Inquilla Mamani J, Calatayud Mendoza AP. Impact of the Pensión 65 social program on spending on food, 2017-2018. *Apuntes: Revista de Ciencias Sociales*. 2020;47(86):215–232. doi:10.21678/apuntes.86.985
37. Bardales-Mendoza O. Domestic load, dependent care and home violence during the COVID-19 lockdown. *Revista Medica Herediana*. 2022;33(4):1–12.
38. Vahedparast HMohammadi E, Ahmadi FFarhadi A. The Role of Social Support in Adherence to Treatment Regimens: Experiences of Patients with Chronic Diseases. In: *Medical - Surgical Nursing Journal*.2017;7(1):e69646. doi:10.5812/msnj.69646
39. Castro R, Cama M, Fernández F. Family support and adherence to treatment in people affected by tuberculosis. *MediSur*. 2020;18(1):1–10.
40. Aldana Curay KL, Carrasco Choque F, Villegas Yarleque M, Sánchez Pacheco E, Timaná Alvarez M. Analysis of beneficiaries of the pension 65 program and its effect on food in the northern coast of Peru. *Comuni@cción: Revista de Investigación en Comunicación y Desarrollo*. 2022;13(3):179–188. doi:10.33595/2226-1478.13.4.725
41. Intimayta-Escalante C, Quintana-Garcia LA. Socioeconomic inequalities in non-adherence to antihypertensive medication in peru. *Medicina Clínica y Social*. 2024;8(3):333–343. doi:10.52379/mcs.v8i3.460
42. Oates GR, Juarez LD, Hansen B, Kiefe CI, Shikany JM. Social risk factors for medication nonadherence: findings from the CARDIA study. *Am J Health Behav*. 2020;44(2):232–243. doi:10.5993/AJHB.44.2.10
43. Perelli-Harris B, Styrc M. Mental well-being differences in cohabitation and marriage: the role of childhood selection. *J Marr Family*. 2018;80(1):239–255. doi:10.1111/jomf.12431
44. Paczkowska A, Hoffmann K, Kus K, et al. Impact of patient knowledge on hypertension treatment adherence and efficacy: a single-centre study in Poland. *Int J Med Sci*. 2021;18(3):852–860. doi:10.7150/ijms.48139
45. Guo A, Jin H, Mao J, et al. Impact of health literacy and social support on medication adherence in patients with hypertension: a cross-sectional community-based study. *BMC Cardiovasc Disord*. 2023;23(1):93. doi:10.1186/s12872-023-03117-x
46. Lleras-Muney A. Education and income gradients in longevity: the role of policy. *Canadian J Econo*. 2022;55(1):5–37. doi:10.1111/caje.12582
47. Győrffy Z, Boros J, Döbrössy B, Girasek E. Older adults in the digital health era: insights on the digital health related knowledge, habits and attitudes of the 65 year and older population. *BMC Geriatr*. 2023;23(1):779. doi:10.1186/s12877-023-04437-5
48. Orom H, Schofield E, Kiviniemi MT, et al. Low health literacy and health information avoidance but not satisficing help explain "don't know" responses to questions assessing perceived risk. *Med Decis Mak*. 2018;38(8):1006–1017. doi:10.1177/0272989X18799999
49. Cutler RL, Fernandez-Llimos F, Frommer M, Benrimoj C, Garcia-Cardenas V. Economic impact of medication non-adherence by disease groups: a systematic review. *BMJ Open*. 2018;8(1):e016982. doi:10.1136/bmjopen-2017-016982
50. Espinoza-Marchan H, Alvarez-Risco A, Solís-Tarazona Z, et al. Access to medications in patients of the Seguro integral de Salud (SIS) with diabetes mellitus and/or arterial hypertension in Peru. *Revista de la OFIL*. 2021;31(1):1–15.
51. Horvat M, Eržen I, Vrbnjak D. Barriers and facilitators to medication adherence among the vulnerable elderly: a focus group study. *Healthcare*. 2024;12(17):1723. doi:10.3390/healthcare12171723