

Sociodemographic factors associated with medication adherence among hypertensive patients in northern Peru: a cross-sectional study

Factores sociodemográficos asociados a la adherencia a la medicación en pacientes hipertensos del norte del Perú: un estudio transversal

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Abstract

Objective: To identify sociodemographic factors associated with adherence to antihypertensive medications among hypertensive patients in a public hospital in northern Peru. The factors studied are age, sex, level of education, family functioning, living arrangement, time of disease since diagnosis, stage of hypertension, number of prescribed medications, and comorbidities. **Methods:** We conducted a cross-sectional convenience sample study of 180 patients. Blood pressure was measured to determine the hypertensive state. The degree of adherence to medications and sociodemographic factors were determined by survey. **Results:** Independent Chi-square tests and multivariate analysis revealed that older age, longer disease duration, and good family functioning were associated with improved adherence, while the other factors did not reach statistical significance for being associated with adherence. The highest prevalence odds ratio (4.39) was associated with family functioning. **Conclusion:** Factors associated with adherence to antihypertensive medications were age, time of disease since diagnosis, and family functioning in the population studied. These results suggest that an integral approach is required: one that includes psychological help for families and patients who struggle with adherence.

Keywords: Family. Medication adherence. Hypertension. Social support. Peru.

Resumen

Objetivo: Identificar los factores sociodemográficos asociados con la adherencia a la medicación antihipertensiva en pacientes atendidos en un hospital público del norte de Perú. Los factores estudiados son edad, sexo, nivel educativo, funcionamiento familiar, situación de convivencia, tiempo de enfermedad, estadio de la hipertensión, número de medicamentos prescritos y comorbilidades. **Métodos:** Se realizó un estudio transversal de muestra por conveniencia de 180 pacientes. Se midió la presión arterial para determinar el estado de hipertensión. El grado de adherencia a la medicación y los factores sociodemográficos se determinaron mediante encuesta. **Resultados:** Las pruebas de chi-cuadrado independientes y el análisis multivariado revelaron que la edad avanzada, un mayor tiempo de enfermedad y un buen funcionamiento familiar se asociaron con una mejor adherencia, mientras que los demás factores no alcanzaron significación estadística para asociarse

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con la adherencia. La mayor razón de probabilidades de prevalencia (4,39) se asoció con la presencia de disfunción familiar. **Conclusiones:** Los factores asociados con la adherencia a la medicación antihipertensiva fueron la edad, el tiempo de enfermedad desde el diagnóstico y el funcionamiento familiar en la población estudiada. Estos resultados sugieren que se requiere un abordaje integral, que incluya ayuda psicológica para las familias y pacientes con dificultades en la adherencia.

Palabras clave: Familia. Adherencia terapéutica. Hipertensión. Apoyo social. Perú.

Introduction

Arterial hypertension is the main preventable cause of cardiovascular disease, which significantly decreases the life expectancy and quality of those who suffer from it^{1,2}. In Peru, a 2018 study found an age-standardized prevalence of arterial hypertension of 20.6% with 40-50% of people with hypertension aware of their condition. Approximately 40% of patients aware of their condition reported receiving treatment, with treatment being effective about 40% of the time. This translates into only about one in 20 Peruvians with hypertension achieving good blood pressure control^{3,4}. Therefore, arterial hypertension is a common condition that is not treated as well as it could in Peru. Getting more people treated requires a multidisciplinary approach that includes improving screening, access to medicine, treatment protocols, and encouraging patient medication adherence.

Given these low blood pressure control rates, investigating factors influencing adherence to hypertension therapies becomes crucial for improving patient outcomes. Poor adherence is a complex problem that has multiple causes that are related to socio-demographic factors, the type of therapy, patient attitudes, and the healthcare system^{5,6}. One important factor in adherence is family functionality, defined as the ability of the family unit to maintain cohesive relationships, fulfill roles, manage problems, adapt to new patterns, and have effective communication among members⁷. When a family member has a chronic disease, a readaptation process occurs, which involves alterations in family functioning and relationships, which can impact the patient's health behaviors⁸⁻¹¹.

To better understand how adherence is associated with family functioning and other sociodemographic factors such as age, sex, time since diagnosis, and type of treatment, we designed a cross-sectional study of patients seen in a public hospital in Peru. Given previous results^{3,4}, we hypothesize that poor family functioning and other sociodemographic factors are associated with poor adherence.

Materials and methods

Design and setting

This is a cross-sectional study of a non-probabilistic convenience sample of 180 patients seen in the outpatient clinic of the cardiometabolic clinical unit of Hospital I Florencia de Mora EsSalud in Florencia de Mora, La Libertad, Peru. Patient recruitment, interviews, and blood pressure measurement occurred between December 2022 and February 2023.

Participants

Participants were included if they were at least 18 years old, had been diagnosed with arterial hypertension (systolic pressure > 140 mmHg, diastolic pressure > 90 mmHg)¹², and had a medical prescription for antihypertensive drugs for at least 6 months. Patients with a diagnosis of cognitive impairment, neurodegenerative disease, stroke sequelae, were pregnant and/or had secondary arterial hypertension were excluded from the study. The authors evaluated medical records to determine eligibility and then contacted patients to ask them if they wanted to participate. All participants provided their informed written consent and were informed of their right to withdraw from the study at any time.

Variables

Social-clinical data collected during the interview included age, self-reported gender, educational level (none, primary, secondary, post-secondary), participants' living arrangement, time since the initial diagnosis of arterial hypertension, number of antihypertensive medications prescribed, and presence of other comorbidities.

Blood pressure measured at the time of the interview was classified as stage I hypertension (systolic: 140-159 mmHg and/or diastolic: 90-99 mmHg) or stage II hypertension (systolic: \geq 160 mmHg and/or diastolic: \geq 100 mmHg)¹².

Adherence to treatment was measured using the 8-item Morisky medication adherence scale (MMAS-8). The questionnaire contained 7 yes/no questions and one question assessed on a Likert-like scale. Each question is assigned a point, and a score of < 8 indicates non-adherence. The test has an internal consistency with Cronbach's α of 0.83^{13,14}.

Family functionality was evaluated with the family APGAR test, which was intended to measure the participant's perception of family functionality. This scale consists of five questions to evaluate family adaptability, participation, growth, affection, and resources. Each question was scored from 0 to 4 points, for a maximum of 20. A score of more than 17 points indicates the absence of family dysfunction. Scores between 13 and 16, 10 and 12, and < 9 indicated slight, moderate, or severe family dysfunction, respectively. In previous studies, the test showed a correlation coefficient of 0.86 and a Cronbach α of 0.84^{15,16}.

Data collection

During the study period, a medical doctor supervised by the authors interviewed the patients to determine socio-demographic characteristics. The doctor also measured the blood pressure of the participants using standard procedures and equipment. The participants then completed two questionnaires to measure adherence to treatment and family functionality. The results of these questions were recorded and used to determine the appropriate scores for statistical analysis. Bias was addressed by using the same method to complete the validated questionnaires and to supervise the data collection.

Study size

Population and sample size were determined using the sample size for frequency in a population test on Open Epi version 3 (<https://www.openepi.com/>), assuming a 95% confidence level and a difference in proportions based on a Chinese study of hypertension and family functioning, which found that 31.1% of patients with family support adhered to their treatment¹⁷.

This resulted in a sample size estimate of 166 participants. The authors decided to recruit 180 participants to account for incomplete data collection or ineligibility for approximately 10% of the participants.

Statistical methods

A descriptive analysis was carried out showing the absolute and percentage frequency of the variables

and their socioclinical characteristics. Chi-square statistical tests of independence with continuity correction were used to determine the association of study variables and covariates associated with adherence to treatment, considering that $p \leq 0.05$ are significant. These covariates were analyzed to address potential sources of bias and confusion in a multivariate analysis. Furthermore, the prevalence odds ratio product (ORP) and its 95% confidence intervals (95% CI) were calculated. Analysis was performed using RStudio version 4.2.2 (<https://cran.rstudio.com/>).

Ethical considerations

This study was approved by the Bioethics Committee of the Universidad Privada Antenor Orrego with approval number N°001-2023-UPAO.

The data generated during and/or analyzed during the present study are not publicly available nor are they available on request due to ethical considerations of the participants, as the data are linked to their personal information.

Results

All 180 participants completed the data collection process, so there were no missing data. Of the participants, 57.8% were 70 years or older, 59.4% were women, 40.6% were men, and 40.6% had a post-secondary education level. Most of the participants live with relatives (75.0%), were diagnosed at least 10 years before the interview (54.4%), have stage I arterial hypertension (84.4%), were prescribed an antihypertensive drug (70.6%), and had comorbidities (68.9%) (Table 1).

In Table 2, participants were divided into groups as to whether they adhered to treatment according to the MMAS-8 questionnaire. In total, 42.8% of the participants adhered to treatment. In the group of patients who adhered to treatment, 68.8% were over 70 years old, 83.1% did not have family dysfunction, and 66.2% were diagnosed at least 10 years before the interview. The non-adherent group tended to be younger, had a higher frequency of family dysfunction, and was diagnosed less time before the interview. According to the Chi-square analysis, statistically significant ($p < 0.05$) differences between groups were observed for age groups, family functioning, and time since first diagnosis. No statistically significant differences were found between the adherent and non-adherent groups for sex, educational level, living arrangement, whether the participant had stage I or stage II hypertension, the number

Table 1. Socioclinical characteristics of the participants. The right column presents the number of observations and percent in parentheses

Sociodemographic characteristic	Frequency	
	Number	%
Age, years		
40-49	5	2.8
50-59	20	11.1
60-69	51	28.3
≥ 70	104	57.8
Sex		
Male	73	40.6
Female	107	59.4
Education level		
None	5	2.8
Primary	48	26.7
Secondary	54	30.0
University	73	40.6
Family dysfunction		
None	117	65.0
Slight	33	18.3
Moderate	19	10.6
Severe	11	6.1
Treatment adherence		
Low	41	22.8
Medium	62	34.4
High	77	42.8
Living arrangement		
Alone without children	8	4.4
Alone with children nearby	14	7.8
With a spouse of similar age	23	12.8
With relatives	135	75.0
Time since diagnosis, year		
< 5	51	28.3
5-9	34	18.9
10-19	61	33.9
≥ 20	34	18.9
Hypertension stage		
Stage I	152	84.4
Stage II	28	15.6
Number of antihypertensives prescribed		
1	127	70.6
2	45	25.0
≥ 3	8	4.4
Other comorbidities		
No	56	31.1
Yes	124	68.9

of antihypertensives prescribed, or the presence of comorbidities.

Table 3 shows the multivariate analysis of the variables found to be significant in table 2. The degree of family functionality and whether the patient experienced any degree of family dysfunction are conceptually

identical; therefore, the degree of functionality was eliminated to avoid redundancy and multicollinearity in the analysis. We observed that the same three variables remained statistically associated with adherence. The ORP and the 95% CI of 4,39 (2,08-9,76) for the correlation between adherence and family functioning was slightly greater than the ORP for the time since diagnosis of more than 20 years. The ORP for other significant associations was lower.

Discussion

Our study focused on determining whether there is an association between selected sociodemographic factors and adherence to prescribed medication(s) in patients with arterial hypertension seen in the cardiometabolic clinical unit of the Hospital I Florencia de Mora EsSalud in Florencia de Mora, La Libertad, Peru. Adherence to treatment is a key component in controlling blood pressure and its complications. In this study, most of the participants were 70 years or older (57.8%) with a predominance of women (59.4%) and with a diagnosis time of at least 10 years (52.8%). This differs from the study by Asgedom et al., where the mean age was 55 ± 12.7 years, 53.2% were men and 57.9% had duration of < 5 years¹⁸. This could be due to patient sampling: the setting of the present study provides care mainly to older adult patients, which may be associated with a longer diagnosis time. On the other hand, our results are similar to a Mexican study by Becerra Partida and Villegas Galindo, where patients with high adherence had been diagnosed for more than 10 years before the study¹⁹. Our results also showed lower proportions of any family dysfunction than in three published studies¹⁸⁻²⁰.

Patient adherence in our study was within 12% of three other recent Latin American studies, demonstrating a persistently low degree of adherence to treatment²¹⁻²³. This level of adherence has been observed throughout the world⁶. These other studies conclude that older patients, women, monotherapy prescription and diagnosis at least 10 years before the study are associated with greater adherence. Of these associations, we observed that age and time since diagnosis were statistically associated with adherence, while the other variables often came close but did not reach statistical significance. Since age correlates with the time since diagnosis, both have a likely similar explanation. Frequent follow-ups with nursing staff, doctors, and

Table 2. Comparison of socioclinical characteristics and adherence to treatment according to the independent Chi-square test

Sociodemographic characteristic	Adherence to treatment				p
	Yes n = 77 (42.8%)		No n = 103 (57.2%)		
	n	%	n	%	
Age (years)					0.005
40-49	1	1.3	4	3.9	
50-59	2	2.6	18	17.5	
60-69	21	27.3	30	29.1	
≥ 70	53	68.8	51	49.5	
Sex					0.106
Female	40	51.9	67	65.0	
Male	37	48.1	36	35.0	
Education level					0.351
None	2	2.6	3	2.9	
Primary	17	22.1	31	30.1	
Secondary	21	27.3	33	32.0	
University	37	48.1	36	35.0	
Family dysfunction					0.000
None	64	83.1	53	51.5	
Slight	5	6.5	28	27.2	
Moderate	5	6.5	14	13.6	
Severe	3	3.9	8	7.8	
Living arrangement					0.918
Alone without children	4	5.2	4	3.9	
Alone with children nearby	6	7.8	8	7.8	
With a spouse of similar age	11	14.3	12	11.7	
With relatives	56	72.7	79	76.7	
Time since diagnosis (years)					0.003
< 5	11	14.3	40	38.8	
5-9	15	19.5	19	18.4	
10-19	32	41.6	29	28.2	
≥ 20	19	24.7	15	14.6	
Hypertension stage					0.527
Stage I	63	81.8	89	86.4	
Stage II	14	18.2	14	13.6	
Number of antihypertensives prescribed					0.082
1	49	63.6	78	75.7	
2	22	28.6	23	22.3	
≥ 3	6	7.8	2	1.9	
Other comorbidities					0.636
No	22	28.6	34	33.0	
Yes	55	71.4	69	67.0	

nutritionists are likely to reinforce the importance of adherence to treatment over time.

We also found that family function is associated with adherence, with greater adherence observed among participants without family dysfunction. From the literature, this appears to be a cross-cultural phenomenon. Studies in Nigeria⁸ and China¹⁷ showed that family functioning or social support is associated with adherence to treatment. The Nigerian cross-sectional study calculated

an odds ratio and a 95% CI of 2.6 (1.6-4.1), which overlaps with the 95% CI for family functioning determined here. An additional review from India suggested family involvement as one way to improve adherence⁵. Given the similarity of the results in different cultures, it is likely that family function is a more important determining factor than culture for adherence.

Interestingly, the number of medications prescribed came close but did not correlate significantly with

Table 3. Multivariate analysis of the variables associated with adherence among study participants, where ORP is the prevalence odds ratio and CI 95% is the 95% confidence interval

Sociodemographic characteristic	p	ORP	CI 95%
Family dysfunction			
None	0.000	4.39	2.08-9.76
Present			Reference
Age (years)			
40-49	0.989	0.00	N/A
50-59	0.036	0.18	0.03-0.75
60-69	0.796	0.91	0.43-1.92
≥ 70			Reference
Time since diagnosis (years)			
< 5	0.030	3.20	Reference
5-9	0.003	3.88	1.14-9.41
10-19	0.006	4.30	1.61-9.84
≥ 20			1.14-9.41

ORP: odds ratio product; CI: confidence intervals.

adherence, which is in contrast to other research on the subject^{6,24}. The proportions of adherent to non-adherent patients were almost identical when one or two medications were prescribed, but when three or more medications were prescribed, the proportion of adherence decreases to approximately 1 in 4. It is likely that a small sample number among patients with 3 or more prescribed drugs has made it difficult to draw clear conclusions in this study.

Education level has also been shown to be positively correlated with adherence²⁵; the shifting proportions in the education level row of [table 2](#) tend to corroborate this, with more highly educated participants having higher proportions of adherence. However, this did not reach statistical significance, likely again due to a small sample size. Therefore, to better measure the correlation between the number of medications prescribed and the level of education and adherence, a larger and more balanced sample size is recommended.

Limitations

Limitations of this study included the use of a non-probability sampling method, which could limit generalization. The cross-sectional nature of the study does not show causality between the variables. An additional problem is that the time since diagnosis is correlated with age. This could have overestimated the ORP calculated here. Furthermore, patient-recorded data on adherence or sociodemographic factors could have generated recall bias. Some variables, such as cardiovascular risk and

the presence of clinical depression, have been shown to affect adherence²⁶ but were not included in this study. Therefore, it would be advisable to conduct future research that includes a larger number of hypertensive patients from multiple health centers and include additional variables known to be associated with adherence. In addition, measuring adherence with a blood test could decrease recall bias and performing a matched study could reveal confounding effects.

Conclusion

The objective of this study was to find sociodemographic factors associated with antihypertensive medicine adherence within a study population of hypertensive patients from Northern Peru. This study found that increased age and time of diagnosis, as well as good family functioning associated with increased adherence. The factor most strongly correlated with adherence was family functioning. This could be because patients experiencing family dysfunction may have a lack of emotional support, inadequate communication, and interpersonal conflicts in their family unit, making adherence to a treatment protocol less important. In contrast, functioning families could encourage a patient to continue treatment and provide the necessary resources for adherence.

From this study and others, it is becoming clear that there are multiple factors associated with adherence to treatment. Given this body of data, it is reasonable to suggest screening for family functioning among hypertensive patients, as well as focusing adherence-related interventions in more recently diagnosed patients to improve adherence.

Author contributions

G.L. Cordova-Ruiz: Conceptualization, investigation, and writing-original draft. L.J. Fernández-Rodríguez: Investigation, writing-review and editing. V.H. Baradales-Zuta: Conceptualization, investigation, writing-original draft, and supervision.

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Conflicts of interest

The authors declare no conflicts of interest.

Ethical considerations

Protection of humans and animals. The authors declare that the procedures followed complied with the ethical standards of the responsible human experimentation committee and adhered to the World Medical Association and the Declaration of Helsinki. The procedures were approved by the institutional Ethics Committee.

Confidentiality, informed consent, and ethical approval. The authors have followed their institution's confidentiality protocols, obtained informed consent from patients, and received approval from the Ethics Committee. The SAGER guidelines were followed according to the nature of the study.

Declaration on the use of artificial intelligence. The authors declare that artificial intelligence was used in the writing of this manuscript, specifically Google Translate, in the translation of the Abstract into Spanish.

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