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*Original Article*

# Therapeutic Adherence of Hypertensive Patients Attended at the Outpatient Clinic of a Specialized Hospital in Luanda

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**Abstract:** Therapeutic adherence rates in arterial hypertension range from 15.2% to 90%, depending on the region studied. Poor adherence compromises clinical outcomes and quality of life, increasing morbidity, mortality, and healthcare costs. This study evaluated therapeutic adherence among hypertensive patients attending the outpatient clinic of a specialized hospital in Luanda during the fourth quarter of 2024. This was an observational, cross-sectional study with a convenience sample of 130 patients. Sociodemographic, behavioral, and clinical variables were analyzed, as well as adherence level according to the Morisky scale, whose internal consistency in this sample was confirmed by a Cronbach's alpha of 0.735. The Kolmogorov–Smirnov test was used to assess variable distribution; mean and standard deviation were used for normally distributed continuous variables, and relative frequencies for categorical variables. The correlation between adherence levels and other variables was evaluated using Spearman's coefficient, and ordinal logistic regression analysis was performed to identify predictors of adherence. The mean age was 59.25 ± 10.8 years; most participants (43.8%) were over 60 years old and female (66.9%). Participants were predominantly married (59.2%), had secondary education (24.6%), and a monthly income equivalent to 1–2 minimum wages (67.7%). When applying the Morisky adherence scale, which demonstrated good psychometric properties in this sample, the majority (89.2%) were classified as non-adherent. The main predictors of adherence were age (older age associated with better adherence) and monthly income, with lower-income patients showing lower adherence. Therapeutic adherence was low. Age and household income were the main predictors of therapeutic adherence.

**Keywords:** Systemic Arterial Hypertension; Therapeutic Adherence; Antihypertensive Treatment; Angola.

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## 1. Introduction

Systemic arterial hypertension (SAH) is characterized by sustained levels of systolic blood pressure ≥140 mmHg and/or diastolic blood pressure ≥90 mmHg and is classified into stages 1, 2, and 3 in adults [1]. It is one of the main risk factors for cardiovascular diseases (CVD), which were responsible for 17.9 million deaths worldwide in 2015, about 80% of which occurred in low- and middle-income countries [2]. SAH accounts for more than 10 million deaths annually, and its effective control remains uncommon, despite pharmacological advances, due to population aging and low rates of blood pressure control [3].

In Africa, the estimated prevalence of SAH is 30.8%, reaching 31.1% in Sub-Saharan Africa, where 75 million hypertensive individuals live, with projections of 125.5 million by 2025 [4,5]. In Angola, studies report prevalences ranging from 18% to 45.2%, varying according to the group and region studied [2,5–7,8–11]. According to the World Health Organization (WHO), adherence is the extent to which a patient's behavior in taking medication, following a diet, or making lifestyle changes corresponds to the recommendations of a healthcare professional [12]. The prevalence of therapeutic adherence in SAH ranges from 15% to 90% worldwide [13], with 20% to 50% of patients not correctly following prescriptions [3]. Poor adherence compromises clinical outcomes, increases morbidity and mortality, and raises healthcare costs [14].

In Sub-Saharan Africa, there is limited data on therapeutic adherence, and multiple factors influence treatment compliance. Understanding these factors is essential for establishing strategies to improve SAH control and reduce its impact. Thus, this study aimed to evaluate therapeutic adherence among hypertensive patients attending the outpatient clinic of a specialized hospital in Luanda during the fourth quarter of 2024.

## 2. Methodology

### 2.1 Study design and setting

A cross-sectional study was conducted between October and December 2024, involving hypertensive patients attending the outpatient clinic of the Cardiopulmonary Diseases Hospital Complex Cardeal Dom Alexandre do Nascimento, Luanda, Angola, with the aim of evaluating therapeutic adherence. A convenience sample of 130 hypertensive patients was selected. Patients aged ≥18 years with a diagnosis of ≥12 months were included.

### 2.2 Data collection

A questionnaire was administered to collect sociodemographic, clinical, and behavioral data. Adherence was assessed using the eight-item Morisky Medication Adherence Scale (MMAS-8), consisting of seven dichotomous questions and one Likert-scale item, with a total score ranging from 0 to 8. Adherence was classified as high (8 points), medium (6–7 points), and low (<6 points). For simplification, individuals with high adherence were classified as "adherent," while those with medium/low adherence were classified as "non-adherent." Although the instrument was not subjected to a formal and robust validation and/or cultural adaptation process for the study context, its construct validity and internal consistency were evaluated in this sample using Cronbach's alpha coefficient.

The level of physical activity was estimated using the International Physical Activity Questionnaire – Short Form (IPAQ-SF), which considers vigorous activities (high effort with very intense breathing) and moderate activities (moderate effort with slightly increased breathing). Classification was as follows: (1) Very active – ≥5 days/week of vigorous activity ≥30 min/session, or ≥3 days/week of vigorous activity ≥20 min plus moderate activity/walking ≥5 days/week ≥30 min; (2) Active – ≥3 days/week of vigorous activity ≥20 min, or moderate activity/walking ≥5 days/week ≥30 min, or any combination totaling ≥150 min/week; (3) Irregularly active – insufficient activity to be classified as active; (4) Sedentary – no activity lasting ≥10 continuous minutes. For statistical analysis and interpretation, sedentary and irregularly active groups were combined into group 1, and active and very active individuals into group 2.

### 2.3 Statistical analysis

Data was processed and analyzed using the Statistical Package for the Social Sciences (SPSS), version 30.0. The Kolmogorov–Smirnov test was used to assess the normality of variable distribution. Sample characterization was performed using descriptive statistics, with absolute and percentage frequencies for categorical variables, and mean

with standard deviation for continuous variables. The reliability of the MMAS-8 questionnaire was assessed through internal consistency using Cronbach's alpha coefficient and the mean inter-item correlation. Construct validity was evaluated using principal component analysis (PCA) with varimax rotation, and sample adequacy was confirmed using the Kaiser–Meyer–Olkin (KMO) test and Bartlett's test of sphericity.

Additionally, Spearman's correlation coefficient was used to assess convergent validity between adherence scores and variables potentially related to adherence. To identify independent determinants of therapeutic adherence, an ordinal logistic regression model was used, with therapeutic adherence as the dependent variable in three levels: low adherence (0), medium adherence (1), and high adherence (2). The backward stepwise method was applied to select variables for the final model. Results were expressed as odds ratios (OR) and their respective 95% confidence intervals (95% CI). Statistical significance was set at $p < 0.05$.

### 3. Results

The general characteristics of the sample are summarized in Table 1. The mean age of participants was 59.25 ± 10.8 years, with a predominance of individuals over 60 years old (43.8%). There was a predominance of females (66.9%). Regarding education, 24.6% of participants completed upper secondary education, while 12.3% had never attended school. Concerning marital status, most of the sample were married (59.2%), whereas 1.5% were divorced. In terms of occupation, the group consisted mainly of retirees (36.9%), followed by informal workers (26.2%). Unemployed individuals accounted for 6.9% of the sample. The family income of most participants (67.7%) was equivalent to one to two minimum wages (50,000 to 100,000 Kz).

**Table 1.** General characteristics of the study sample (n = 130).

| Characteristics | N (%) |
|---|---|
| Mean age (SD) | 59.25 (10.8) |
| Age group (years) | |
| 28–38 | 1 (0.8) |
| 39–49 | 23 (17.7) |
| 50–60 | 49 (37.7) |
| > 60 | 57 (43.8) |
| Sex | |
| Male | 43 (33.1) |
| Female | 87 (66.9) |
| Education level | |
| No formal education | 16 (12.3) |
| Primary education | 25 (19.2) |
| Lower secondary education | 29 (22.3) |
| Upper secondary education | 32 (24.6) |
| Higher education | 28 (21.5) |
| Marital status | |
| Married | 77 (59.2) |
| Single | 38 (29.9) |
| Divorced | 2 (1.5) |
| Widowed | 13 (10.0) |
| Religion | |

| | |
|---|---|
| Catholic | 50 (38.5) |
| Protestant | 45 (34.6) |
| No religion | 3 (2.3) |
| Other | 32 (24.6) |
| Occupation | |
| Unemployed | 9 (6.9) |
| Informal workers | 34 (26.2) |
| Public sector employees | 18 (13.8) |
| Private sector workers | 20 (15.4) |
| Retirees | 48 (36.9) |
| Students | 1 (0.8) |
| Family income | |
| Less than 1 minimum wage | 18 (13.8) |
| 1 to 2 minimum wages | 88 (67.7) |
| 3 minimum wages or more | 24 (18.5) |

The clinical and behavioral characteristics are detailed in Table 2. Regarding risk behaviors, 32.3% of participants reported alcohol consumption and 2.3% were smokers. In the past year, 26.2% had one hospitalization and 5.4% had two. The main comorbidities reported by participants were heart failure (40.8%) and diabetes mellitus (18.5%). Concerning duration of diagnosis, 43.8% had been hypertensive for more than 10 years. Regarding therapy, most participants (47.7%) were taking two tablets per day, followed by 32.3% taking three tablets per day; 16.2% were on monotherapy and 3.8% on polytherapy (Table 2).

**Table 2.** Distribution of clinical and behavioral variables of hypertensive patients (n = 130).

| **Clinical and Behavioral Characteristics** | **N (%)** |
|---|---|
| Alcohol consumption | |
| Yes | 42 (32.3) |
| No | 88 (67.7) |
| Tobacco use | |
| Yes | 3 (2.3) |
| No | 127 (97.7) |
| Number of hospitalizations in the last year | |
| 1 | 34 (26.2) |
| 2 | 7 (5.4) |
| None | 89 (68.5) |
| Comorbidities | |
| Diabetes mellitus | 24 (18.5) |
| Heart failure | 53 (40.8) |
| Bone marrow tumor | 1 (0.8) |
| Asthma | 1 (0.8) |
| None | 51 (39.3) |
| Duration of hypertension (years) | |

| | |
|---|---|
| Less than 5 | 42 (32.3) |
| 5 to 10 | 31 (23.8) |
| More than 10 | 57 (43.8) |
| Number of antihypertensive medications | |
| Monotherapy | 21 (16.2) |
| Dual combination | 62 (47.7) |
| Triple combination | 42 (32.3) |
| Polytherapy (>3 tablets/day) | 5 (3.8) |
| Physical activity | |
| Group 1 | 92 (70.8) |
| Group 2 | 38 (29.2) |
| Adherence according to the Morisky scale | |
| Adherent | 14 (10.8) |
| Non-adherent | 116 (89.2) |

With respect to physical activity, assessed using IPAQ-SF, most of the sample (70.8%) was classified as sedentary or irregularly active (Group 1), while only 29.2% had an active or very active lifestyle (Group 2). Medication adherence was measured using the Morisky scale (MMAS-8). The reliability of the MMAS-8 in this sample was assessed through a mean inter-item correlation of 0.274 and a Cronbach's alpha of 0.735, indicating satisfactory internal consistency in this population.

The construct validity of MMAS-8 was evaluated using Principal Component Analysis (PCA) with Varimax rotation. Sample adequacy was confirmed by the Kaiser–Meyer–Olkin test (KMO = 0.758) and Bartlett's test of sphericity ($p < 0.001$). The analysis revealed a three-dimensional structure explaining 64.89% of the total variance. Most items showed high communalities and factor loadings (> 0.50), except for the items related to inconvenience with treatment (0.399). The results of medication adherence assessment revealed a critical scenario: when grouped into two categories, most participants (89.2%) were classified as non-adherent, with only 10.8% demonstrating satisfactory adherence to therapy.

Figure 1 illustrates the distribution of participants according to the three levels of therapeutic adherence established by the Morisky scale. Most patients (74%) showed low adherence, while 15% had medium adherence. Only a small proportion of the samples (11%) achieved high adherence to antihypertensive therapy.

A positive correlation of weak magnitude, yet statistically significant, was observed between therapeutic adherence and age (Table 3). Although not statistically significant, positive correlations were also identified between adherence and other variables, namely years of education, physical activity, and duration of hypertension. On the other hand, a negative, also non-significant, correlation was observed between adherence and factors traditionally associated with non-adherence, such as alcohol consumption, presence of comorbidities, and number of medications used, as presented in Table 3.

To identify independent predictors of therapeutic adherence (three levels according to MMAS), an ordinal logistic regression model was constructed using the backward stepwise selection method (Table 4). The initial model included a comprehensive set of theoretical and clinical variables, namely: age, sex, education level, occupation, monthly family income, alcohol consumption, religion, presence of comorbidities, physical activity, number of hospitalizations in the past year, duration of hypertension, and number of medications. After the successive elimination of non-significant variables ($p > 0.05$), the final model showed good fit ($-2LL = 132.595$; $p = 0.015$), explaining approximately 9.9% of the variability in therapeutic adherence (Nagelkerke pseudo-$R^2 = 0.099$), and demon-

strated a statistically significant association between age, family income, and levels of therapeutic adherence. Age was positively associated with adherence, with each additional year of life increasing the odds of transitioning to a higher level of adherence by 5.9% (aOR = 1.059; 95% CI: 1.015–1.104; p = 0.007) (Table 4).

**Figure 1.** Distribution of clinical and behavioral variables of hypertensive patients (n = 130).

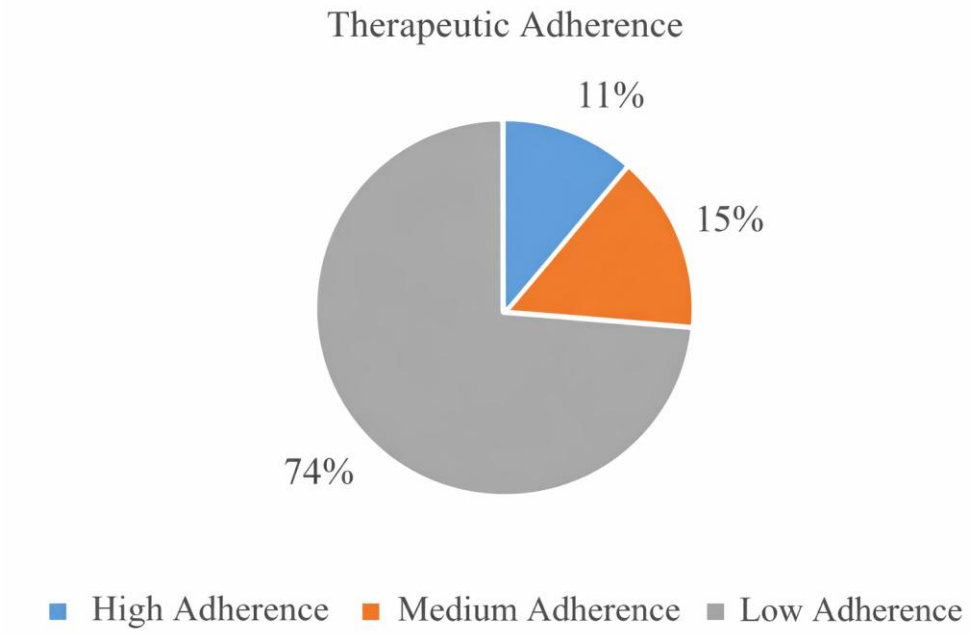


**Table 3.** Correlation between therapeutic adherence and factors related to adherence (n = 130).

| Variables | r | p |
|---|---|---|
| Age | 0.177 | 0.04 |
| Sex | -0.07 | 0.41 |
| Education level | 0.03 | 0.73 |
| Occupation | 0.116 | 0.19 |
| Marital status | 0.061 | 0.49 |
| Monthly income | -0.05 | 0.57 |
| Alcohol consumption | -0.02 | 0.84 |
| Tobacco use | -0.04 | 0.65 |
| Comorbidity | -0.14 | 0.12 |
| Physical activity | 0.021 | 0.81 |
| Duration of hypertension (years) | 0.016 | 0.85 |
| Number of medications | -0.03 | 0.75 |

r: Spearman correlation coefficient.

Regarding family income, this variable showed a strong negative impact on adherence, as individuals in lower-income categories had lower odds of achieving higher levels of therapeutic adherence compared to the reference category. Participants with income below one minimum wage had an aOR = 0.142 (95% CI: 0.028–0.711; p = 0.018), indicating approximately 7 times lower odds of therapeutic adherence compared to those with three or more minimum wages (Table 4).

**Table 4.** Ordinal Logistic Regression Model for Predictors of Therapeutic Adherence according to the Morisky Scale (MMAS-8) in 3 levels.

| Variable | β | Standard Error of β | aOR (95% CI) | p-value |
|---|---|---|---|---|
| Age (years) | 0.057 | 0.021 | 1.059 (1.015 – 1.104) | 0.007 |
| Monthly Income (Kz) | | | | |
| < 1 Minimum Wage | -1.95 | 0.823 | 0.142 (0.028 – 0.711) | 0.018 |
| 1 to 2 Minimum Wages | -1.36 | 0.537 | 0.256 (0.089 – 0.734) | 0.011 |
| ≥ 3 Minimum Wages | Ref. | – | 1 | – |

Adjusted ordinal logistic regression model with logit link function. The final model was obtained using the backward stepwise method. The dependent variable corresponds to therapeutic adherence according to MMAS-8, categorized into three levels: low adherence, moderate adherence, and high adherence. β: logistic regression coefficient; aOR: adjusted odds ratio; CI: 95% confidence interval; Ref.: reference category.

Similarly, individuals earning 1 to 2 minimum wages had an aOR = 0.256 (95% CI: 0.089–0.734; p = 0.011), corresponding to approximately 3.8 times lower odds of adherence to treatment compared to the highest income category. This finding highlights that economic barriers outweighed clinical factors such as disease duration or number of medications used, which were not statistically significant and therefore were not included in the final model (Table 4).

## 4. Discussion

The present study included a sample of 130 hypertensive individuals recruited from the outpatient clinic of the Cardiopulmonary Diseases Hospital Complex Cardeal Dom Alexandre do Nascimento in Luanda, Angola. The main findings were: (a) a high rate of non-adherence to treatment and (b) identification of age and monthly income as the main predictors of adherence. The analyzed sample was predominantly female (66.9%), with a mean age of 59.25 ± 10.8 years. Similar results were observed in a study conducted in São Francisco do Conde, Bahia, which assessed adherence to pharmacological treatment and blood pressure control in hypertensive patients followed in the Family Health Strategy, also showing a predominance of females and a mean age of 66.89 ± 8.27 years [15]. The higher proportion of women seeking healthcare services may be associated with greater self-care behavior and a higher perception of the importance of medical follow-up [16].

Regarding age, the findings are consistent with literature, which describes hypertension as more prevalent among adults and older individuals. Several authors highlight age as an important risk factor for the development of hypertension, due to structural and functional changes in blood vessels, including alterations in smooth muscle and connective tissue associated with aging [17,18]. Most participants in the present study were married (59.2%), a result like findings from another study in which 58.3% of participants lived with a partner [15,19]. Studies suggest that stable marital or family relationships may facilitate access to healthcare services and contribute to better diagnosis and control of hypertension. A meta-analysis on social support and hypertension showed that social and family support is associated with better treatment adherence and improved blood pressure control [20].

Regarding income, most participants reported a monthly income between 1 and 2 minimum wages. This finding is comparable to a Brazilian study in which most participants also had low income, earning between 1 and 3 minimum wages [19]. Low income has been identified as an important predictor of non-adherence, as the direct costs associated with purchasing medications represent a significant economic barrier, particularly in contexts where universal and free access is not fully available [21]. Tobacco and alcohol use were reported by 2.3% and 32.3% of participants, respectively. Similar results were found by other authors who, when investigating the relationship between the eight-item Morisky Medication Adherence Scale (MMAS-8) and blood pressure control, reported rates of 10.3% for smoking and 18.8% for alcohol consumption [22]. Alcohol in-

fluences blood pressure through complex physiological mechanisms, affecting both its acute and chronic regulation [23].

The predominant comorbidities were heart failure (40.8%) and diabetes mellitus (18.5%). These findings are consistent with those reported in a study conducted in Pakistan on determinants of adherence among hypertensive patients, where diabetes and cardiovascular diseases also emerged as the main associated comorbidities [24]. The coexistence of multiple chronic conditions tends to compromise adherence, as the simultaneous treatment of these conditions often requires more complex therapeutic regimens, which may represent a considerable barrier to effective hypertension management [25]. Regarding pharmacological treatment, 16.2% reported using one antihypertensive tablet daily, 47.7% two tablets, 32.3% three tablets, and 3.8% were on polytherapy, proportions like those found in other studies [22]. More complex therapeutic regimens, involving a higher number of daily doses, are associated with lower adherence [26,27].

Regular physical activity, recognized as a protective factor, was infrequent in this sample: 70.8% of participants did not engage in regular exercise. Some authors report that physical activity can reduce blood pressure levels and, consequently, the need for higher doses of medication [28]. A recent meta-analysis conducted by Leeyio et al. demonstrated that regular aerobic exercise, combined with pharmacological treatment, is associated with better blood pressure control in hypertensive African adults [29].

The adherence rate observed in the present sample was critically low, with only 10.8% of participants classified as adherent and the vast majority (89.2%) as non-adherent. These findings are consistent with data reported in other regions of Sub-Saharan Africa, such as Ghana, where adherence rates of only 11.1% were observed, compared to 88.9% non-adherence [30]. In the South American context, specifically in Brazil, a non-adherence prevalence of 72% was reported using the same instrument (MMAS-8) [31]. In contrast, studies conducted in Pakistan, South Asia, described significantly higher adherence rates, reaching 77% [24]. This marked discrepancy highlights the variability in literature, which may be attributed to methodological and population heterogeneity, as well as differing geographical and socioeconomic contexts that influence access to and continuity of treatment [13,31].

When stratifying the sample according to the three categories of the Morisky scale, 74% of individuals showed low adherence, 15% medium adherence, and only 11% high adherence. These results indicate a more severe scenario than that described in Maceió (Alagoas, northeastern Brazil), where a study among hypertensive patients in primary care reported 47.1% low adherence, 33.2% medium adherence, and 19.5% high adherence—almost double the rate found in the present study [22]. On the other hand, the findings of this study are closer to those observed in a tertiary hospital in Uganda, where low adherence rates of 85%, medium adherence of 12%, and critically low levels of high adherence (3%) were reported [32]. This convergence of findings reinforces the magnitude and severity of the problem in the Sub-Saharan region, suggesting that shared structural and socioeconomic barriers in these countries play a determining role in therapeutic behavior among African populations.

A significant positive correlation was observed between therapeutic adherence and age, suggesting that adherence tends to increase with advancing age. Similarly, in the ordinal logistic regression analysis, increasing age was associated with higher odds of adherence, although with borderline statistical significance. This trend is widely supported by international literature. In addition to similar findings in other Sub-Saharan African countries, such as Uganda and Nigeria [32,33], studies in different contexts—including Brazil [22,34], Pakistan [24], Turkey [35], Hispanic populations in the United States [36], and Asia [37,38], indicate that older patients often demonstrate greater maturity and resilience in managing chronic treatment. This generational disparity suggests that younger adults may require tailored health education strategies, as they are more likely to be non-adherent, possibly due to the absence of immediate symptoms and the interference of the disease with active social and work-related dynamics. According

to these authors, greater adherence among older patients may be attributed to accumulated experience with the disease and the integration of medication into daily routines.

On the other hand, it is important to note that the literature also indicates that biological aging may affect cognitive functions, leading to forgetfulness, reduced self-care, and difficulties in treatment management [39]. In this regard, other studies have reported lower adherence with increasing age [30,40–42], demonstrating that the relationship between age and adherence is complex, non-linear, and dependent on socioeconomic context and available family support. Another predictor of adherence identified was family income, with lower income associated with lower odds of adherence. These findings are consistent with numerous studies showing that low-income compromises adherence, particularly in developing countries, where medication costs and lack of health insurance represent significant barriers [43–46]. Even in a high-income country such as Saudi Arabia, one study found that patients with higher income had twice the odds of adherence according to the Morisky scale [38].

Contrary to the findings presented above, some studies in the African context have reported higher adherence among low-income individuals [42]. Considering the multifactorial nature of non-adherence, strategies to improve it include patient education; simplification of therapeutic regimens; strengthening physician–patient communication; and expanding accessibility to healthcare services by reducing waiting times, as access to subsidized or free medications may improve adherence [34,46–47]. Adequate knowledge about the disease and its risks is strongly associated with better adherence levels [47].

Despite the relevance of the findings, some limitations of the present study should be considered when interpreting the results. First, the sample size, combined with the use of convenience sampling and the fact that the study was conducted in a single referral hospital, may limit the generalizability of the findings to the Angolan population. Although internal consistency and validity of the instrument were assessed in this sample, the absence of a formal cross-cultural adaptation and robust psychometric validation of the MMAS-8 for the Angolan context may have affected the accuracy of the adherence measurement.

Additionally, the cross-sectional design of the study prevents causal inferences between the analyzed variables and treatment adherence. Therefore, future studies, ideally with longitudinal designs, more representative samples, and the use of properly adapted and validated instruments for the Angolan context, will be important to deepen the understanding of the determinants of therapeutic adherence in this setting.

## 6. Conclusion

This study demonstrated low therapeutic adherence among hypertensive patients followed in a referral hospital in Luanda, with age and monthly income identified as significant predictors of treatment adherence. These findings highlight the influence of socioeconomic determinants on adherence behavior and underscore the need for targeted interventions within the Angolan healthcare system. Strategies integrating health education, simplification of therapeutic regimens, and improved access to medications may contribute to increasing treatment adherence, improving blood pressure control, and reducing the impact of hypertension on cardiovascular complications and disease burden in Angola.

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**Conflicts of Interest:** The authors declare no conflict of interest.

**Supplementary Materials:** None.

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