Assessment of treatment adherence in patients with arterial hypertension

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Abstract

According to the World Health Organization, approximately 1.28 billion individuals aged 30 to 79 years suffer from arterial hypertension. A critical factor in disease management and reducing the risk of complications is patient adherence to therapy; however, up to 66% of patients do not comply with the prescribed treatment regimen. The aim of this review is to identify the primary factors influencing non-adherence to treatment among patients with arterial hypertension.

A literature search was conducted using the PubMed, Google Scholar, Scopus, Web of Science, and The Lancet databases. Studies and reviews published in the last 10 years in both Russian and English were included.

The analysis revealed that adherence to hypertension treatment is a multifactorial process influenced by sex, age, the number of antihypertensive medications taken, presence of comorbid conditions, lifestyle, income level, place of residence, and social support. Women demonstrate higher adherence levels compared to men, and elderly patients more frequently comply with the prescribed therapeutic regimen. In low-income countries, socioeconomic factors play a significant role, including low awareness of the disease and its complications, as well as insufficient adherence to therapy. Patients in rural areas often face limited access to qualified medical care, which negatively impacts blood pressure control. Simplification of therapy

regimens—particularly through the use of fixed-dose combinations of antihypertensive drugs in a single tablet—was identified as one of the most effective methods to improve adherence. Lifestyle modifications, including dietary compliance, regular physical activity, and stress management, also contribute to improved treatment adherence and blood pressure control.

Thus, improving patient adherence to hypertension treatment requires a comprehensive approach encompassing individualized treatment regimens and patient-centered strategies such as educational programs, social support, and reduction of economic barriers. Future research should focus on developing effective interventions aimed at enhancing hypertension control and reducing the socioeconomic burden of this disease on healthcare systems worldwide.

Keywords: medication adherence, arterial hypertension, treatment adherence.

1. Introduction

Arterial hypertension is defined as a condition characterized by a sustained increase in systolic blood pressure (SBP) ≥140 mmHg and/or diastolic blood pressure (DBP) ≥90 mmHg (1,2). According to the World Health Organization (WHO) (3), approximately 1.28 billion individuals aged 30–79 years are affected by arterial hypertension. Nearly half (46%) of those diagnosed with hypertension are unaware of their condition (3–6). Currently, a significant proportion of hypertensive patients—about 67%—are detected in low- and middle-income countries, placing an additional burden on healthcare systems that must simultaneously address both communicable and non-communicable diseases (7–11).

Poor adherence to pharmacological treatment remains a critical issue in contemporary cardiology (12–16). According to the clinical guidelines of the European Society of Cardiology, therapeutic inertia—the failure of healthcare providers to intensify treatment in response to uncontrolled blood pressure—is a significant contributor to poor patient adherence (17).

Overall, 43% to 66% of patients with arterial hypertension fail to follow prescribed treatment regimens and monitoring protocols (18–23). These findings are supported by data obtained using the eight-item Morisky Medication Adherence Scale (MMAS-8) (24), a validated instrument used to assess patient adherence to antihypertensive therapy (18,25,26). This scale also enables patients to independently identify barriers to medication adherence with greater accuracy (27–32). Approximately 40% of patients discontinue antihypertensive medications within the first year of treatment (33), and about 10% do not take their medications daily (34). Furthermore, nearly 50% of patients do not adhere to the prescribed medication regimen (35–42). Multiple studies have shown that men are generally less adherent to treatment compared to women (16,43–49).

Objective

To identify the key factors contributing to non-adherence to therapy among patients with arterial hypertension.

2. Materials and Methods

This literature review employed a systematic approach to the search and analysis of scientific and clinical studies focused on treatment adherence among patients of different sexes, ages, and ethnic backgrounds.

Relevant publications were retrieved from established databases and journals, including PubMed, Google Scholar, Scopus, Web of Science, and *The Lancet*. The primary aim of the search was to identify studies that

describe the main causes of non-adherence to therapy and explore differences among various population groups. Priority was given to articles providing clinically and statistically significant findings, as well as comprehensive evaluations of the research topic.

The key search terms included: "medication adherence," "arterial hypertension," and "treatment adherence." Articles were selected based on the following inclusion criteria: publications in English or Russian, and availability of full-text access.

During the initial search stage, approximately 150 publications were identified. After removing duplicates and screening titles and abstracts, 120 studies were retained for in-depth analysis. Based on full-text evaluation and adherence to inclusion criteria, a total of 92 articles were ultimately included in the review. These studies provided the most reliable and relevant data pertaining to the stated research objective.

3. Results

1. Sex and Age Differences in Adherence to Hypertension Therapy

In a study by Mathilde Lefort et al. (43), women demonstrated higher adherence to antihypertensive therapy compared to men (69% vs. 58%, respectively). A similar trend was observed across various age groups (Table 1).

Table 1 - Characteristics of Antihypertensive Treatment Adherence Among Women and Men According to Lefort et al., % (43)

Category	Women (%)	Men (%)	P-value
Overall adherence	69.0	58.0	0,0001
Age group			
55-65 years	62.4	47.9	0.001
65-80 years	71.2	60.3	0.020
80+ years	69.7	62.9	0.001

Elderly patients with arterial hypertension tend to demonstrate higher levels of treatment adherence. For instance, the study by Gavrilova et al. showed that, on average, patients older than 67 years were more likely to follow their prescribed treatment regimen compared to those aged 60 years and younger (50).

2. The Impact of Socioeconomic Factors on Adherence to Hypertension Therapy

One of the largest studies in this field, the PURE study (51), which included 142,042 patients from 17 countries, investigated the role of awareness, income level, and education in treatment adherence. The study demonstrated that in low-income countries (e.g., Bangladesh, India), only 31.7% of patients with hypertension were taking antihypertensive medications—nearly 15% lower than in high-income countries (46.7%; e.g., Canada, Sweden).

In countries where patients had middle or low income levels, blood pressure control was poorer compared to high-income countries, despite the use of antihypertensive medications. The findings of this study were further supported by other scientific investigations (52–54).

A correlation was also identified between place of residence, income level, and treatment adherence (Table 2) (51,55). In lower-middle- and low-income countries, low adherence rates were observed among rural residents—28.4% and 19.9%, respectively. These

countries also reported poor blood pressure control despite ongoing therapy.

Table 2 - Characteristics of Patients with Hypertension by Income Level and Treatment Adherence According to Place of Residence, Based on PURE Study Data, % (51)

Category	Treatment Adherence		Blood Pressure Control	
	Urban Residents	**Rural Residents**	**Urban Residents**	**Rural Residents**
High income	45,6	44,2 (p=0,35)	17,6	16,1 (p=0,14)
Upper-middle income	46,1	46,9 (p=0,29)	15,8	14,7 (p=0,08)
Lower-middle income	41,5	28,4 (p<0,001)	12,4	5,4 (p<0,001)
Low income	36,1	19,9 (p<0,001)	12,8	6,9 (p<0,001)

Patients residing in rural areas were significantly less likely to use antihypertensive medications, which may be attributed to lower levels of education, financial income, and limited access to healthcare services (56). Adherence to therapy and blood pressure control are closely linked to patients' knowledge about arterial hypertension and its complications (57). Nevertheless, other studies have found no association between place of residence and adherence, leaving this issue open for further debate (2, 4).

3. Influence of Family and Social Environment on Adherence to Hypertension Therapy

The study by Jankowska-Polańska (25) aimed to investigate patient adherence to therapy using the widely employed eight-item Morisky Medication Adherence Scale (MMAS-8). This scale is a structured questionnaire designed for self-assessment of medication-taking behavior (59). The MMAS-8 categorizes patients into three adherence levels: high (score of 8), moderate (6–7), and low (<6) adherence (24). Alongside the MMAS-8, patients were also classified according to the Acceptance of Illness Scale (AIS), which groups patients similarly to MMAS-8. It was found that higher illness acceptance (AIS) correlates with greater adherence to therapy (25). The study included 620 patients, with a mean MMAS-8 score of 7, indicating a substantial proportion of patients with moderate adherence. Patients in relationships demonstrated higher adherence compared to those living alone (high adherence category: 123 vs. 70 individuals).

In the study by Uchmanowicz et al. (5), key factors affecting therapy adherence in elderly patients with arterial hypertension were analyzed. The study utilized the Hill-Bone Compliance to High Blood Pressure Therapy Scale (CHBPTS), a 14-item questionnaire assessing adherence across three subscales: antihypertensive medication intake, reduction of dietary sodium, and appointment keeping (60). The mean overall score was 20.19 (SD ± 4.05), indicating suboptimal adherence among the elderly cohort (5). The sample consisted of 150 patients (84 women and 66 men) with a mean age of 72.1 years. According to the scale, men scored on average 1.34 points higher than women, confirming lower adherence among male patients, consistent with other studies (61,62). Patients with secondary or higher education exhibited a 1.75-point reduction in the total score, while family social support was associated with a 1.91-point decrease.

The role of social relationships between patients and their family members, friends, and others in influencing adherence to hypertension treatment was explored in the study by Magrin M. E. (63). Marital status (married or cohabitating) did not have a significant impact on disease control (Cohen's d = 0.06, p > 0.05) (64–67). Social support notably affected patients, manifested for example in family members assisting with monitoring remaining pills, dietary habits, and nutrition (p < 0.05) (32,63,68–72). However, among ethnic minority groups,

the effect of moral support was significantly weaker (p < 0.05) (73–75).

4. Adherence to Non-Pharmacological Therapy (DASH Diet)

One of the evidence-based approaches for controlling and reducing blood pressure in patients is the DASH diet (Dietary Approaches to Stop Hypertension) (76,77). This diet emphasizes a high intake of vegetables, fruits, whole grains, lean meats, fish, poultry, dairy products, nuts, seeds, and legumes.

It restricts consumption of sodium, saturated fats, trans fats, sugars, sugary beverages, and red meat. The pathophysiological mechanisms underlying blood pressure reduction are supported by several factors (78). First, high potassium intake reduces the tone of vascular smooth muscle, decreases insulin resistance and oxidative stress, and increases renal sodium excretion. Since high sodium intake leads to fluid retention, increased circulating blood volume, cardiac output, and arterial stiffness—contributing to hypertension—the DASH diet helps prevent and manage this condition.

High dietary fiber intake improves cellular insulin sensitivity, reduces inflammatory and oxidative processes, and promotes weight loss. It has been shown that adherence to the DASH diet reduces the risk of hypertension-related complications by 19–25% (79). Potassium, magnesium, and fiber intake play significant roles in the antihypertensive effect (80). On average, systolic blood pressure decreases by 6–11 mmHg and diastolic blood pressure by 3–6 mmHg (77).

In the study by Filippou et al. (81), various patient groups with hypertension were assessed to evaluate the impact of the DASH diet on blood pressure reduction. Among patients with baseline hypertension, systolic blood pressure decreased by an average of 11 mmHg, and diastolic by 6 mmHg. In the subgroup consuming a high sodium diet (>2400 mg/day), blood pressure reduction ranged from 7 to 10 mmHg. Among patients under 50 years old, systolic blood pressure decreased by 9 mmHg and diastolic by 5 mmHg.

Despite the proven efficacy of the DASH diet in blood pressure control, several factors reduce patient adherence. First, socioeconomic barriers such as low education levels, low income, and rural residence contribute to insufficient awareness of the diet's benefits (82,83). Second, established dietary habits and taste preferences—including high sodium intake and insufficient fiber consumption—impede adherence (79). Finally, psycho-emotional barriers such as lack of motivation, insufficient social support, and stress also play a role (79). These factors collectively reduce adherence by approximately 20–30% (79,82,83).

5. Complexity of Therapy Regimens and the Impact of Comorbidities on Adherence to Hypertension Treatment

According to the data presented in Table 3, an increase in the number of medications in patients' regimens is associated with decreased adherence. When taking a single pill, adherence rates between women and men showed no significant differences (70.3% and 65.2%, respectively). However, adherence among men sharply declined to 45% when taking two pills. For patients taking three or more antihypertensive medications, adherence decreased markedly in both sexes, with rates of 47.1% in women and 37.4% in men. Similar trends have been reported in other studies (84–86). It has also been noted that elderly patients are more likely to adhere to medication regimens when dosing schedules are simple rather than complex (87,88).

Table 3 - Adherence to Therapy According to the Number of Antihypertensive Medications Taken by Women and Men, Based on Lefort et al., % (43)

Category	Women (%)	Men (%)	P-value
# of AHDs			
1 drug	70.3	65.2	0,0001
2 drugs	68.5	45.0	0,0001
3+ drugs	47.1	37.4	0,0001

AHDs – antihypertensive drugs

The presence of two or more comorbid conditions was associated with reduced patient adherence to medication compared to those without comorbidities (16,89,90). For example, patients with hypertension and ischemic heart disease (IHD) demonstrated poorer adherence to medication use, salt intake reduction, and regular follow-up visits (91). Conversely, patients with a longer duration of illness showed a higher tendency to adhere to treatment (P = 0.009; OR = 0.909; 95% CI: 0.846–0.976), which can be explained by increased awareness of hypertension-related risks (34,44,92). These patients were more likely to engage in preventive measures, such as reducing salt consumption, maintaining regular physical activity, controlling body weight, managing stress, and monitoring blood pressure.

4. Discussion

Importantly, our analysis highlights the multifactorial nature of adherence to antihypertensive treatment. Sociodemographic variables—including sex, age, marital status, and the broader social environment—exert measurable influence on patient compliance. For instance, older patients and women were more likely to adhere to treatment recommendations, possibly due to higher health-seeking behavior and perception of risk. In contrast, patients in rural areas and those of lower socioeconomic status demonstrated poorer adherence, likely due to limited access to healthcare services, lower health literacy, and financial constraints.

The complexity of these factors necessitates a patient-centered approach to hypertension management. Tailoring interventions to individual patient profiles—including comorbidities, lifestyle, and psychosocial context—may improve engagement and therapeutic outcomes. Moreover, simplification of treatment regimens through the use of fixed-dose combinations can reduce pill burden and improve adherence.

To address systemic barriers, effective strategies should integrate patient education programs, community-based outreach, and digital health tools aimed at reinforcing long-term engagement with treatment. These approaches are particularly critical in resource-limited settings, where healthcare access and continuity remain suboptimal.

Taken together, our findings advocate for a multidimensional intervention model that incorporates pharmacologic, behavioral, and system-level components to enhance treatment adherence and achieve sustained blood pressure control in diverse patient populations.

5. Conclusion

A crucial factor influencing disease control and the reduction of complications related to arterial hypertension is patient adherence to therapy. Our literature analysis demonstrated that adherence is a

multifactorial process involving sex, age, number of antihypertensive medications taken, presence or absence of comorbid conditions, lifestyle, income level, place of residence, and social support.

It was found that, overall, female patients exhibit higher adherence levels compared to male patients, and elderly patients are more likely to follow the prescribed therapeutic regimen. Moreover, an increase in the number of antihypertensive medications is associated with a negative trend in adherence, particularly among men.

In low-income countries, socioeconomic factors play a significant role, with lower awareness of the disease itself, its complications in the absence of control, and insufficient adherence to therapy. Patients residing in rural areas more frequently face limited access to qualified healthcare, adversely affecting blood pressure control.

Thus, improving adherence to hypertension treatment requires a multifaceted and comprehensive approach, including individualized treatment regimens, patient-centered strategies such as educational interventions, social support, and the reduction of economic barriers. We conclude that future research should focus on developing and implementing effective interventions that enhance blood pressure control and reduce the socioeconomic burden of hypertension on healthcare systems worldwide.

Simplification of therapy regimens, including the prescription of fixed-dose combinations of antihypertensive drugs in a single pill, was identified as one of the most effective methods to improve adherence. Patient knowledge about their illness and its complications also has a considerable impact, underscoring the importance of implementing educational programs and preventive measures at the outpatient level.

Lifestyle modification, such as adherence to the DASH diet combined with regular physical activity and stress management, positively influences treatment adherence and improves blood pressure control. However, adherence to these recommendations may be hindered by factors such as low income, education level, and social barriers.

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Түйіндеме

Дүниежүзілік денсаулық сақтау ұйымының деректеріне сәйкес, 30 бен 79 жас аралығындағы шамамен 1,28 миллиард адам артериялық гипертониядан зардап шегеді. Ауруды бақылауда ұстау және асқынулардың алдын алу үшін пациенттердің емге бейілділігі (яғни, ем-домды дұрыс және тұрақты қабылдауы) аса маңызды фактор болып табылады. Алайда, гипертониямен ауыратын науқастардың 66%-ға дейінгісі тағайындалған ем режимін сақтамайды. Осы шолудың мақсаты — артериялық гипертониямен ауыратын науқастардың емге бейілділігінің төмен болуына әсер ететін негізгі факторларды анықтау.

Әдебиеттерді іздеу PubMed, Google Scholar, Scopus, Web of Science және The Lancet дерекқорларында жүргізілді. Соңғы 10 жылда орыс және ағылшын тілдерінде жарияланған зерттеулер мен шолулар қамтылды.

Талдау нәтижелері көрсеткендей, гипертонияны емдеу кезіндегі бейілділік — бұл көп факторлы үдеріс. Ол жынысқа, жасқа, қабылданатын антигипертензивтік препараттардың санына, қосалқы аурулардың болуына, өмір салтына, табыс деңгейіне, тұрғылықты жеріне және әлеуметтік қолдауға байланысты. Әйелдер ерлерге қарағанда емге анағұрлым бейілді келеді, ал егде жастағы науқастар ем тағайындамаларын жиірек орындайды. Табысы төмен елдерде әлеуметтік-экономикалық факторлар елеулі рөл атқарады: ауру және оның асқынулары туралы хабардарлықтың төмендігі, емге бейілділіктің жеткіліксіздігі байқалады. Ауылдық жерлерде тұратын науқастар білікті медициналық көмекке қол жеткізудің шектеулі болуына жиі ұшырайды, бұл артериялық қысымды бақылауға теріс әсер етеді. Емдеу режимін оңайлату, атап айтқанда бірнеше гипотензивтік препараттарды бір таблеткада біріктіріп қабылдау – бейілділікті арттырудың ең тиімді тәсілдерінің бірі болып табылады. Өмір салтын өзгерту, диетаны сақтау, тұрақты физикалық белсенділік және күйзелісті басқару да емге бейілділік пен артериялық қысымды бақылауға оң әсерін тигізеді.

Осылайша, гипертонияны емдеуге бейілділікті арттыру үшін кешенді көзқарас қажет. Бұл емдеу тәсілін даралаандыруды, науқасқа бағытталған стратегияларды, соның ішінде білім беру бағдарламаларын, әлеуметтік қолдауды және экономикалық кедергілерді азайтуды қамтуы тиіс. Болашақ зерттеулер артериялық гипертонияны тиімді бақылауға және бұл аурудың әртүрлі елдердің денсаулық сақтау жүйесіне түсіретін әлеуметтік-экономикалық жүгін азайтуға бағытталған тиімді шараларды әзірлеуге негізделуі тиіс.

Түйін сөздер: дәрілік препараттарды ұстану, артериялық гипертензия, емдеуді ұстану.

Оценка приверженности к лечению у пациентов с артериальной гипертензией

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Резюме

Согласно данным Всемирной организации здравоохранения, около 1,28 миллиарда человек в возрасте 30–79 лет страдают артериальной гипертензией. Важным фактором контроля заболевания и снижения риска осложнений является приверженность пациентов к терапии, однако до 66% больных не соблюдают назначенный режим лечения. Цель данного обзора — определение основных факторов, влияющих на отсутствие приверженности к лечению у пациентов с артериальной гипертензией.

Поиск литературы проводился в базах данных PubMed, Google Scholar, Scopus, Web of Science и the Lancet. Включены исследования и обзоры, опубликованные за последние 10 лет на русском и английском языках.

Анализ показал, что приверженность к лечению гипертонии — это многофакторный процесс, который зависит от пола, возраста, количества принимаемых антигипертензивных препаратов, наличия коморбидных состояний, образа жизни, уровня дохода, места проживания и социальной поддержки. Женщины демонстрируют более высокий уровень приверженности по сравнению с мужчинами, а пациенты пожилого возраста чаще следуют назначенному режиму терапии. В странах с низким уровнем дохода значительную роль играют социально-экономические факторы: низкая осведомленность о заболевании и его осложнениях, недостаточная приверженность к терапии. Пациенты из сельской местности чаще сталкиваются с ограниченным доступом к квалифицированной медицинской помощи, что негативно влияет на контроль артериального давления. Выявлено, что упрощение режима терапии, в частности использование фиксированных комбинаций гипотензивных препаратов в одной таблетке, является одним из наиболее эффективных методов повышения приверженности. Модификация образа жизни, соблюдение диеты, регулярная физическая активность и контроль уровня стресса, способствует улучшению приверженности к лечению и контролю артериального давления.

Таким образом, улучшение приверженности пациентов к лечению гипертонии требует комплексного подхода, включающего индивидуализированные схемы лечения, пациенториентированные стратегии, такие как образовательные программы, социальную поддержку и снижение экономических барьеров. Будущие исследования должны быть направлены на разработку эффективных вмешательств, способствующих повышению контроля артериальной гипертензии и снижению социально-экономического бремени этого заболевания для систем здравоохранения различных стран мира.

Ключевые слова: приверженность приему лекарств, артериальная гипертония, приверженность лечению.