

A systematic review of adherence to lifestyle modifications by hypertensive patients

Zainab Alanazi¹, Rayyanah Alanazi², Hayam Alanazi² and Jehan Alanazi²

¹Ministry of Health, Arar, Saudi Arabia. ²Northern Border University, Arar, Saudi Arabia (Correspondence to Rayyanah Alanazi: rayyanah2092@gmail.com).

Abstract

Background: Lifestyle modification is a non-pharmacological strategy that can help reduce blood pressure significantly and it is very valuable in hypertension control.

Aim: To review available literature on lifestyle modification practices among hypertensive patients globally.

Methods: We searched and analysed studies published between 2019 and 2024 on adherence to lifestyle modifications by hypertension patients globally.

Results: Adherence to lifestyle modification varied significantly by region ($I^2 = 85.2\%$, $P < 0.001$), with a pooled mean of 27.4% (95% CI: 19.8–35.1%): alcohol abstinence 86%, sodium restriction 54.6%, dietary adherence 47.7%, low-density lipoprotein cholesterol goal achievement 40%, and physical activity 34.3%. Barriers to lifestyle modification were low-level awareness, misconceptions about hypertension, financial constraints, difficulty adjusting to new habits, laziness, forgetfulness, stress, lack of motivation, social pressure, tasteless meals, use of traditional medicine, and time constraints.

Conclusion: Despite the well-established benefits of lifestyle modifications in the management of hypertension, adherence remains suboptimal globally. There is a need for targeted interventions to enhance adherence, including educational programmes, policy-driven initiatives and personalized support for patients.

Keywords: hypertension, hypertensive patient, lifestyle modification, adherence, non-pharmacological strategy, high blood pressure

Citation: Alanazi Z, Alanazi R, Alanazi H, Alanazi J. A systematic review of adherence to lifestyle modifications by hypertensive patients. *East Mediterr Health J.* 2025;31(9&10):590–596. <https://doi.org/10.26719/2025.31.10.590>.

Received: 01/12/2024; Accepted: 27/04/2025

Copyright © Authors 2025; Licensee: World Health Organization. EMHJ is an open-access journal. This paper is available under the Creative Commons Attribution Non-Commercial ShareAlike 3.0 IGO licence (CC BY-NC-SA 3.0 IGO; <https://creativecommons.org/licenses/by-nc-sa/3.0/igo>).

Introduction

Hypertension is a public health burden globally. It occurs when the systolic blood pressure (SBP) ≥ 130 mmHg and diastolic blood pressure (DBP) ≥ 80 mmHg, based on an average of ≥ 2 readings on ≥ 2 occasions (1). The number of people aged 30–79 years with hypertension has doubled in the last 30 years, reaching approximately 626 million females and 652 million males by 2019 (2). About 75% of these individuals reside in low- and middle-income countries.

Management of hypertension includes non-pharmacological strategies such as reducing dietary salt intake, maintaining a healthy weight, engaging in physical activity, limiting alcohol consumption, and following the dietary approaches to stop hypertension (DASH). Uncontrolled hypertension causes cardiovascular disorders, renal failure and death, and blood pressure levels are directly linked to coronary heart disease and stroke recurrence. The risk of cardiovascular events increases with higher blood pressure, independent of other risk factors. High blood pressure is linked to at least 7.6 million annual deaths globally, making it a top risk factor for cardiovascular diseases (3). Individual lifestyle factors such as dietary behaviour, physical activity, body mass index (BMI), smoking, and alcohol consumption significantly affect blood pressure levels. Maintaining healthy dietary habits, exercising regularly, maintaining

an average weight, avoiding smoking, and stopping alcohol consumption are valuable in hypertension control (2). Increased sedentary practices and sleep deprivation have been linked to higher prevalence of hypertension (4). Therefore, adherence to lifestyle modification and addressing the barriers to adherence are crucial in hypertension control (5).

A 2023 study in Ethiopia found 32.4% adherence to lifestyle modification among hypertension patients (6). The predictors included education above secondary school, strong knowledge of hypertension, high self-efficacy, strong social support, and a good patient-physician relationship. Another study in Ethiopia reported overall 42.5% adherence rate, with 50.9% for healthy diet, 48.7% for physical activity and 51.8% for sodium consumption (7). The key predictors were education level, duration of hypertension, and knowledge of hypertension. Varma et al reported 70.8% good medication adherence and 70.2% good lifestyle modification in India (8).

A study in Lebanon reported more common uncontrolled blood pressure among males and associated reduced rates of uncontrolled hypertension with younger ages, and linked previous cardiovascular events and low levels of education to probabilities of uncontrolled blood pressure (9). Other risk factors for men included being overweight, being obese, not exercising, not following a DASH diet, and drinking a lot of alcohol.

This study reviewed literature to understand the factors influencing adherence to lifestyle modification among hypertensive patients globally.

Methods

We searched the PubMed, Scopus, Web of Science, and Google Scholar databases using combined keywords and Boolean operators such as 'hypertension' AND 'lifestyle' AND 'adherence' OR 'compliance'. The search included peer-reviewed studies published from 2019 to 2024, available in English and discussing adherence, barriers or influencing factors. The PRISMA framework guided the study selection process (Figure 1).

The database search initially yielded 735 articles; 6 duplicates were removed, leaving 729 for title and abstract screening. Of these, 699 were excluded because they did not meet the study criteria, had different objectives, were not focused on adherence to lifestyle modifications, were case studies, involved children, had missing abstracts, or were not in English. After full-text assessments, 30

articles met the eligibility criteria and were included in this systematic review. Although 30 studies met the inclusion criteria, only 18 were analysed in-depth due to limitations in data completeness and relevance. The remaining studies provided partial data but lacked detailed adherence breakdowns, hence were summarized in supplementary materials.

Data extraction followed a methodical approach, beginning with importing articles into Rayyan software for screening and removing duplicates. Title and abstract screening helped identify studies aligned with the scope of the review, especially those exploring adherence to lifestyle modifications in hypertensive patients. Full text reviews further assessed studies against the eligibility criteria such as design, language and publication date. Studies that met these requirements underwent detailed data extraction using a template that recorded author details, study design, demographics, and key outcomes.

Data extracted from the selected studies were analysed using STATA version 16. Descriptive analyses were conducted and meta-analysis was conducted to

Figure 1 Selection of studies for the review

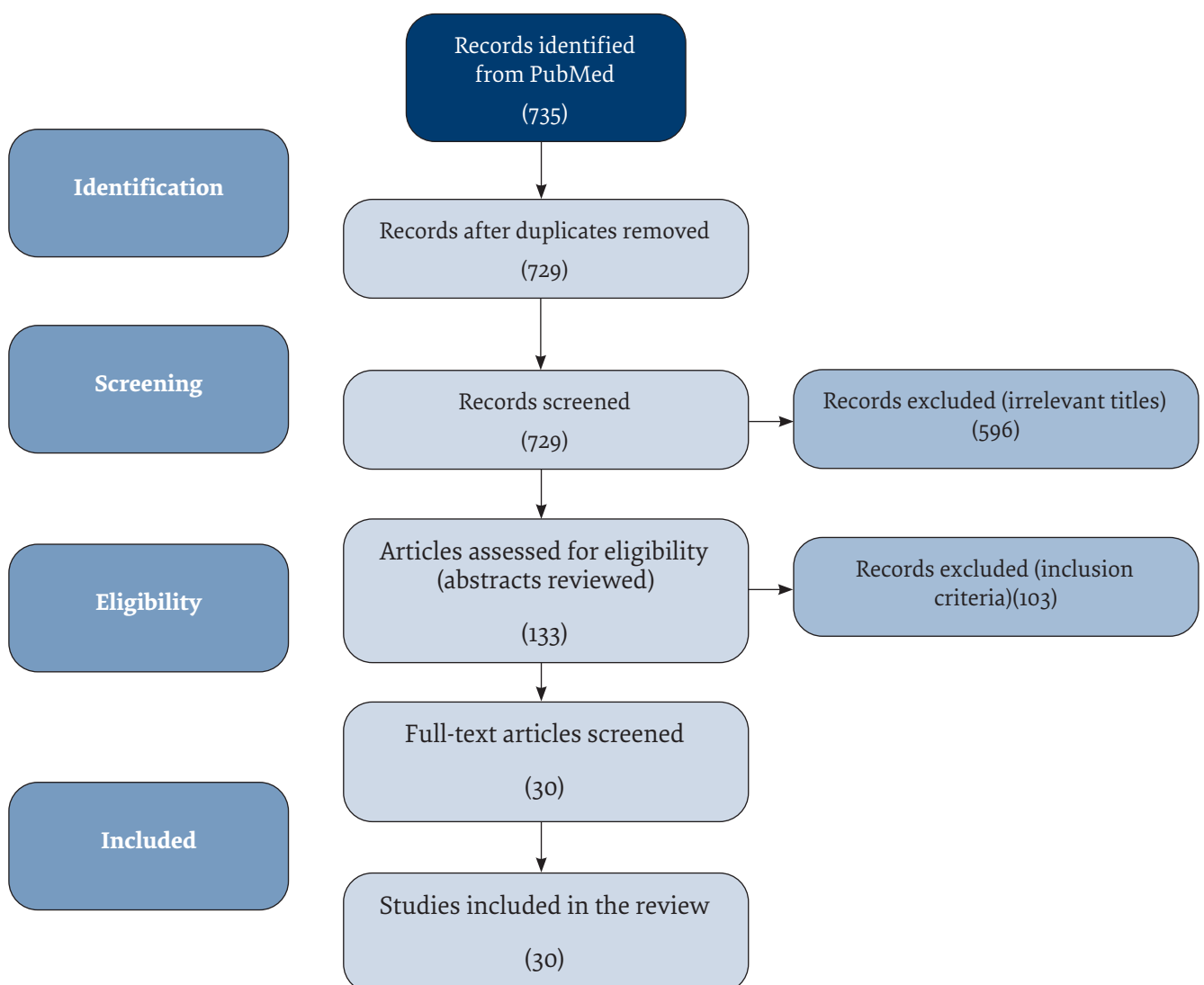


Table 1 Quality assessment of included studies

S/No.	Study	Study design	Key findings	Quality assessment	Effect size & statistical insights
1	Shamsi SA et al 2021 (10)	Randomised control trial	Sodium intake, systolic & diastolic blood pressure significantly reduced	Fair	Reduction in BP was statistically significant ($P = 0.021$, $P < 0.001$, $P = 0.011$).
2	Yang L et al 2024 (11)	Cross-sectional	40% achieved LDL goals, 30% met waist circumference targets	Fair	Older age and lower education levels were significant predictors of non-adherence ($OR = 2.1$, 95% CI: 1.5–3.0).
3	Aynalem GA et al 2021 (11)	Cross-sectional	53.6% had poor adherence; men adhered better than women	Good	Patients diagnosed within <5 years had 1.86 times higher odds of non-adherence ($AOR = 1.86$, 95% CI: 1.3–2.4).
4	Cabral AC et al 2022 (13)	Cross-sectional	80% had awareness of blood pressure goals, but misconceptions about treatment	Good	Misconceptions about medication discontinuation significantly impacted adherence ($P = 0.003$).
5	Abdalla AA, 2021 (14)	Cross-sectional	Salt restriction knowledge was 93.8%, but exercise adherence was low	Good	Lack of motivation was a primary barrier to exercise adherence ($P = 0.027$).
6	Shilole JN et al 2024 (15)	Cross-sectional	Adherence to physical activity: 37.9%, fruit/vegetable intake: 22.2%	Good	Knowledgeable patients were 2.32 times more likely to comply ($AOR = 2.32$, 95% CI: 1.9–3.0).
7	Cherfan M et al 2020 (9)	Cross-sectional	56.1% had uncontrolled hypertension; men at higher risk	Good	Obesity and alcohol consumption significantly increased BP risk ($P < 0.05$).
8	Abaynew Y, Hussien M, 2021 (16)	Cross-sectional	Barriers included low awareness, resource limitations, social eating, and traditional medicine use	Good	Lack of hypertension knowledge and financial constraints were key non-adherence factors ($P < 0.05$).
9	Fentaw Z, Adamu K, 2022 (17)	Cross-sectional	Poor adherence was 83.2%; self-employment and low social support were key predictors	Good	Self-employed individuals had 2.68 times higher odds of poor adherence ($AOR = 2.68$, 95% CI: 1.8–3.5).
10	Abdeslam EK et al 2023 (18)	Cross-sectional	Physical activity adherence (43.4%) was higher in males and younger individuals	Fair	Sedentary time averaged 37.19±18.92 hours/week, influencing poor adherence ($p < 0.05$).
11	Odunaye-Badmus SO et al 2024 (19)	Cross-sectional	BP control was 56.8%. Adherence rates: physical activity (45%), medication (71.5%)	Fair	No significant correlation between self-care practices and BP control ($P = 0.27$).
12	Shim JS et al 2020 (20)	Cross-sectional	Dietary adherence linked to awareness of lifestyle importance and self-efficacy	Fair	Strong association between self-efficacy and dietary adherence ($OR = 6.29$, 95% CI: 3.1–9.2).
13	Abza LF et al 2024 (21)	Cohort study	Good self-care adherence (50.8%) linked to normal BMI and strong social support	Good	Social support was a strong predictor of adherence ($AOR = 3.842$, 95% CI: 2.5–5.2).
14	Sun K et al 2023 (22)	Cross-sectional	80% of patients received physician advice, but obesity and smoking remained challenges	Fair	Physician advice improved adherence, but obesity was a significant risk factor ($P = 0.018$).
15	Espinel E et al 2023 (23)	Cross-sectional	Full adherence to lifestyle changes improved BP, BMI, and reduced medication burden	Good	BP reduction was significant with multidisciplinary lifestyle interventions ($P < 0.01$).
16	Alshuhri M et al 2024 (24)	Cross-sectional	62.4% had uncontrolled hypertension; smoking and stopping medication increased risks	Fair	Higher education reduced hypertension risks ($AOR = 0.795$, 95% CI: 0.6–1.0).
17	Gaffari-Fam S et al 2022 (25)	Cross-sectional	Health literacy explained 33.9% of the variance in healthy lifestyles	Fair	Better decision-making and access to health information improved adherence ($P = 0.005$).
18	Dhakal A et al 2022 (26)	Cross-sectional	Overall adherence to lifestyle modifications was 20.8%	Good	Younger patients and those with higher education had significantly better adherence ($P = 0.021$).

estimate pooled adherence rates. Subgroup analyses were performed to identify trends, heterogeneity among studies was assessed using the I^2 statistic, and effect sizes were computed using confidence intervals.

Quality assessment of included studies was based on the critical appraisal tool of Hawker et al, which examines various components such as the clarity of

the abstract and title, aims, methods, and sampling techniques. Other assessed areas included data analysis, potential biases, results, applicability of findings, and the soundness of the conclusions. Each criterion received a rating from 1 (low quality) to 4 (excellent quality), providing a comprehensive measure of study reliability and usefulness.

Results

Meta-analysis showed that the pooled mean adherence rate to lifestyle modifications was 27.4% (range 5.1–56.2%) (95% CI; 19.8–35.1%), with significant variations by region ($I^2 = 85.2\%$, $P < 0.001$). Mean abstinence from harmful alcohol drinking was 86% (range 58–97.8%), recommended smoking goal achievement 81.5% (range 50.2–99%), adherence to sodium diet restriction 54.6% (range 1–83%), adherence to dietary approaches 47.7% (range 2.7–77.5%), achievement of low-density cholesterol goal 40%, recommended physical activity goal 34.3% (range 19–45%), recommended waist circumference 30%, weight management 27.4% (range 9.5–52.8%), and adherence to consumption of fruits and vegetables 26.3% (range 22.2–30.3%). Highest adherence was observed among participants with strong social support and higher education levels.

Overall knowledge of the blood pressure therapeutic goals was 54.6% (range 31.3–80%) and knowledge of the

importance of exercise was 69.7%, restricted sodium intake 91.8% and importance of dietary approaches to prevent hypertension 75.5%.

Factors that influenced adherence to lifestyle modification were age, gender, race, education, occupation, marital status, household income, living in rural area, family history, duration of hypertension diagnosis, good social support, good patient-physician relationship, ability to access health information and decision-making, receiving recommendations to adhere to medical care and engage in healthy behaviours, good knowledge about the disease and good self-efficacy, adherence to medications, having co-morbidities such as metabolic syndrome and diabetes mellitus, depressive symptoms, reduced knowledge, and disease management worries.

Barriers to following recommended lifestyle modifications were low-level awareness, misconceptions about hypertension, use of traditional medicine, financial

Table 2 Summary of results of the study

Authors/year	Study design	Key findings
Shamsi SA et al 2021 (10)	Randomized controlled trial	Sodium intake, systolic, and diastolic BP significantly reduced in the experimental group: sodium (3.12 ± 0.79 to 2.42 ± 0.73 mm Hg), systolic blood pressure (144.20 ± 13.12 to 128.4 ± 13.04 mm Hg), and diastolic blood pressure (89 ± 9.12 to 79.4 ± 8.93 mm Hg). ($P = 0.021$, $P < 0.001$, $P = 0.011$)
Yang L et al 2024 (11)	Cross-sectional	Of 21 770 participants (mean age 62 ± 15), 20% met BMI goals, 40% achieved LDL targets, and 30% met waist circumference recommendations. Predictors of non-adherence included age, gender, race, education, metabolic syndrome, and diabetes.
Aynalem GA et al 2021 (12)	Cross-sectional	Among hypertensive patients, 53.6% had poor adherence. Men had better adherence (AOR = 0.60), while recent diagnoses (<5 years) had poorer outcomes (AOR = 1.86).
Cabral AC et al 2022 (13)	Cross-sectional	Awareness of blood pressure goals was high (80%), but most patients misunderstood hypertension's asymptomatic nature and believed antihypertensive treatment was temporary.
Abdalla AA 2021 (14)	Cross-sectional	Salt's impact on blood pressure was well known (93.8%), but only 31.3% had above-average blood pressure knowledge. Regular exercise had the lowest adherence (59.8%), with lack of motivation cited as the main barrier.
Shilole JN et al 2024 (15)	Cross-sectional	Adherence rates: 37.9% for physical activity, 22.2% for fruit/vegetable consumption. Knowledgeable patients were more likely to comply (aOR = 2.32).
Cherfan M et al 2020 (9)	Cross-sectional	Of 10,710 participants, 56.1% had uncontrolled hypertension. Men with poor diet, excessive alcohol, or obesity had higher odds of uncontrolled blood pressure ($P < 0.05$).
Abaynew Y, Hussien M, 2021 (16)	Cross-sectional	Barriers included low awareness, resource limitations, social eating, traditional medicine use, and misconceptions about hypertension.
Fentaw Z, Adamu K, 2022 (17)	Cross-sectional	Poor compliance was 83.2%. Self-employment (AOR = 2.68) and low social support (AOR = 3.85) were significant predictors of poor adherence.
Abdeslam EK et al 2023 (18)	Cross-sectional	Physical activity adherence (43.4%) was higher in males and younger individuals. The average sedentary time was 37.19 ± 18.92 hours per week.
Odunaye-Badmus SO et al 2024 (19)	Cross-sectional	Blood pressure control was 56.8%. Adherence rates: physical activity (45%), medication (71.5%). No significant link was found between self-care practices and BP control.
Shim JS et al 2020 (20)	Cohort	Dietary adherence was linked to awareness of lifestyle importance (OR = 6.29), self-efficacy (OR = 4.06), and fewer perceived barriers (OR = 0.54).
Abza LF et al 2024 (21)	Cross-sectional	Good self-care adherence (50.8%) was associated with normal BMI (AOR = 2.049) and strong social support (AOR = 3.842).
Sun K et al 2023 (22)	Cross-sectional	Over 80% of patients received physician advice. While advice encouraged healthy behaviours, obesity, smoking, and excessive alcohol use remained challenges.
Espinel E et al 2023 (23)	Cross-sectional pilot	Full adherence to lifestyle changes improved systolic/diastolic blood pressure, BMI, and cardiovascular risk markers, while reducing medication burden ($P < 0.01$).
Alshuhri M et al 2024 (24)	Cross-sectional	Among 516 patients, 62.4% had uncontrolled hypertension. Smoking (AOR = 3.011) and stopping medication after symptom relief (AOR = 3.196) increased risks, while higher education reduced risks (AOR = 0.795).
Gaffari-Fam S et al 2022 (25)	Cross-sectional	Health literacy explained 33.9% of the variance in healthy lifestyles. Decision-making and access to health information were critical factors.
Dhakal A et al 2022 (26)	Cross-sectional	Overall adherence to lifestyle changes was 20.8%. Younger patients (AOR = 1.85) and those with higher education, income, or family history were more likely to adhere.

constraints, difficulty adjusting to new habits, laziness, forgetfulness, stress, lack of motivation, everyday use of diets in social settings, busy work schedules, and limited time. Tasteless meals and the difficulty of cooking different meals for several household members were identified as barriers to reducing salt intake.

Discussion

This study reviewed published literature on factors affecting adherence to lifestyle modification among hypertensive patients. Our findings align with previous studies indicating low adherence to lifestyle modifications among hypertensive patients, although there were slight differences which may be due to differences in the objectives and protocols used in different countries. It further highlights the impact of socioeconomic factors, physician support and cultural attitudes toward hypertension management. For instance, Geremew et al (2023) found an adherence rate of 32.4%, similar to our pooled estimate of 27.4%, while Varma et al (2023) reported significantly higher adherence rates, likely due to stronger healthcare system support in their study region.

Dhakal et al found 20.8% overall adherence to lifestyle modifications and lowest adherence rate of 30.3% for adequate intake of fruits and vegetables (6), which aligns with our finding of 26.3%. They reported age ($P = 0.021$), education ($P = 0.001$), occupation ($P = 0.026$), household income ($P = 0.007$), and family history ($P = 0.011$) as factors with statistically significant association with the level of adherence, which also agrees with our results. Geremew et al reported approximately 32.4% overall adherence to lifestyle modification in Ethiopia, also comparable to our finding of 27.4% (7). They identified several independent factors as significant predictors of adherence to lifestyle modifications, including above-secondary education, good knowledge, good self-efficacy, good social support, and good patient-physician relationship, similar to our study. Abate et al reported 42.5% overall estimated adherence to healthy lifestyle habits among adult hypertensive individuals in Ethiopian (8). They found 50.9% adherence to healthy diet, 48.7% adherence to physical activity, 51.0% estimated adherence to sodium intake. As in their study, we found statistically significant predictors of adherence to overall healthy behaviour to include duration of hypertension, education level and knowledge of hypertension.

Varma et al found higher adherence rates in India (9). Mean age of their participants was 55 years, 58.3% were illiterate and 21% were retired. Approximately 87.5% incurred expenses for medicine, the mean weight was 66 kg, height 157 cm, hip circumference 108 cm, and waist circumference 100 cm, yielding an average BMI of 26.6. Adequate medication adherence was 70.8%, while 70.2% complied with lifestyle adjustments.

In Lebanon, the average age of participants was 59.4 years and prevalence of uncontrolled blood pressure was 51.4%, with men having higher incidence than women (adjusted odds ratio [aOR] = 1.80; 95% confidence interval, 1.67–1.94) (10). In both genders, younger age was associated with lower prevalence of uncontrolled hypertension, while low level of education was associated with increased risk, and history of cardiovascular disease with decreased risk, of uncontrolled hypertension. Other risk factors for men were overweight and obesity, lack of physical activity, low adherence to DASH diet, and heavy alcohol consumption. These factors continue through multiple rounds of uncontrolled blood pressure.

Conclusion

This systematic review provides evidence on adherence to lifestyle modifications among hypertensive patients, highlighting the key factors influencing adherence and the barriers. Despite the well-established benefits of lifestyle changes in managing hypertension, adherence rates remain suboptimal, ranging from 5.1% to 56.2%. Key facilitators include knowledge, social support and patient-physician relationships, while barriers such as low awareness, financial constraints and social influences hinder adherence. This study contributes to an increase in the understanding of adherence trends among hypertensive patients and the influencing factors. The findings indicate the need for targeted interventions in form of educational programmes, policy-driven health initiatives and personalized support strategies to enhance adherence. Future research should focus on increasing knowledge about the sociocultural and psychological barriers to lifestyle modification adherence among hypertensive patients.

Funding: None.

Conflict of Interest: None declared.

Examen systématique de l'adhésion des patients hypertendus aux modifications de leur mode de vie

Résumé

Contexte : La modification du mode de vie est une stratégie non pharmacologique qui peut aider à réduire la pression artérielle de manière significative et elle est très utile dans le contrôle de l'hypertension.

Objectif : Passer en revue la littérature disponible sur les pratiques de modification du mode de vie chez les patients hypertendus à l'échelle mondiale.

Méthodes : Cette revue systématique a permis de rechercher et d'analyser les études publiées entre 2019 et 2024 sur l'adhésion des patients hypertendus aux modifications du mode de vie dans le monde.

Résultats : L'adhésion aux modifications du mode de vie variait significativement selon la région ($I^2 = 85,2 \%$, $p < 0,001$), avec une moyenne cumulée de 27,4 % (IC à 95 % : 19,8-35,1 %) : abstinence alcoolique 86 %, restriction de sodium 54,6 %, observance alimentaire 47,7 %, réalisation des objectifs liés au cholestérol à lipoprotéines de basse densité 40 % et activité physique 34,3 %. Les obstacles aux modifications du mode de vie étaient la faible sensibilisation, les idées fausses sur l'hypertension, les contraintes financières, la difficulté à s'adapter à de nouvelles habitudes, la paresse, l'oubli, le stress, le manque de motivation, la pression sociale, des repas sans goût, l'utilisation de la médecine traditionnelle et les contraintes de temps.

Conclusion : Malgré les avantages bien établis des modifications du mode de vie dans la prise en charge de l'hypertension, l'observance reste sous-optimale dans le monde entier. Des interventions ciblées telles que des programmes éducatifs, des initiatives axées sur les politiques et un soutien personnalisé sont nécessaires pour améliorer l'adhésion des patients.

استعراض منهجي لالتزام مرضى ارتفاع ضغط الدم بالتعديلات على نمط الحياة

زينب العنزي، ريانة العنزي، هيام العنزي، جيهان العنزي

الخلاصة

الخلفية: يُعد تعديل نمط الحياة استراتيجية غير دوائية يمكن أن تساعد على خفض ضغط الدم بصورة كبيرة، وهي مفيدة جدًا في السيطرة على ارتفاع ضغط الدم.

الأهداف: هدفت هذه الدراسة إلى استعراض المؤلفات المتاحة بشأن ممارسات تعديل نمط الحياة في أوساط مرضى ارتفاع ضغط الدم على الصعيد العالمي.

طرق البحث: بحث هذا الاستعراض المنهجي عن الدراسات المنشورة بين عامي 2019 و2024 بشأن التزام مرضى ارتفاع ضغط الدم بالتعديلات على نمط الحياة على الصعيد العالمي، وأجرى تحليلًا لتلك الدراسات.

النتائج: هناك تباين كبير في الالتزام بالتعديلات على نمط الحياة حسب المنطقة ($I^2 = 85,2 \%$ ، القيمة الاحتمالية $> 0,001$)، وبلغ المتوسط المجمع 27,4 % (فاصل الثقة 19,8–35,1 %). وكانت نسبة الالتزام بالامتناع عن الكحول 86 %، والحد من الصوديوم 54,6 %، والالتزام الغذائي 47,7 %، وتحقيق هدف كولسترول الليبوبروتين المنخفض الكثافة 40 %، والنشاط البدني 34,3 %. ومن العقبات التي ذكر أنها تحول دون تعديل نمط الحياة انخفاض مستوى الوعي، والمفاهيم الخاطئة عن ارتفاع ضغط الدم، والقيود المالية، وصعوبة التكيف مع العادات الجديدة، والكسل، والنسيان، والإجهاد، والافتقار إلى الحافز، والضغط الاجتماعي، والوجبات التي لا طعم لها، واستخدام الطب التقليدي، وضيق الوقت.

الاستنتاجات: على الرغم من الفوائد الراسخة لتعديلات نمط الحياة في علاج ارتفاع ضغط الدم، لا يزال الالتزام بتلك التعديلات دون المستوى الأمثل على الصعيد العالمي. وهناك حاجة إلى تدخلات محددة الهدف مثل البرامج التثقيفية، والمبادرات القائمة على السياسات، والدعم الشخصي من أجل تعزيز الالتزام.

References

1. Ballut OM, Alzahrani AA, Alzahrani RA, Alzahrani AT, Alzahrani RA, Alzahrani MF, et al. The impact of non-pharmacological interventions on blood pressure control in patients with hypertension: A systematic review. *Cureus* 2023;15(11):e48444. Doi: 10.7759/cureus.48444. PMID: 38074046; PMCID: PMC10702403.
2. Dong T, Zhou Q, Lin W, Wang C, Sun M, Li Y, et al. Association of healthy lifestyle score with control of hypertension among treated and untreated hypertensive patients: a large cross-sectional study. *PeerJ*. 2024;12:e17203. Doi: 10.7717/peerj.17203. PMID: 38618570; PMCID: PMC11015831.
3. An Oseni TI, Emonriken A, Ahmed SD, Dic-Ijiewere M. Determinants of blood pressure control among hypertensive patients attending a rural teaching hospital in Southern Nigeria. *Niger J Clin Pract*. 2023;26(3):260-266. Doi: 10.4103/njcp.njcp_1678_21. PMID: 37056097.
4. Mesas AE, Jimenez-López E, Martínez-Vizcaíno V, Fernández-Rodríguez R, Bizzozero-Peroni B, Garrido-Miguel M, et al. Is adherence to the Mediterranean diet and siesta individually or jointly associated with blood pressure in Spanish adolescents? Results from the EHDLA study. *Front Public Health* 2022;10:934854. Doi: 10.3389/fpubh.2022.934854. PMID: 36276362; PMCID: PMC9581154.
5. Elnaem MH, Mosaad M, Abdelaziz DH, Mansour NO, Usman A, Elrggal ME, Cheema E. Disparities in prevalence and barriers to hypertension control: A systematic review. *Int J Environ Res Public Health* 2022;19(21):14571. Doi: 10.3390/ijerph192114571. PMID: 36361453; PMCID: PMC9655663.

6. Geremew G, Ambaw F, Bogale EK, Yigzaw ZA. Adherence to lifestyle modification practices and its associated factors among hypertensive patients in Bahir Dar City hospitals, Northwest Ethiopia. *Integr Blood Press Control* 2023;16:111-122. Doi: 10.2147/IBPC.S436815. PMID: 38050636; PMCID: PMC10693782.
7. Abate TW, Gedamu H, Ayalew E, Genanew A, Ergetie T, Tesfa G. A systematic review and meta-analysis of the Ethiopian cohort of adult hypertensive people's adherence to healthy behaviors. *Heliyon*. 2022;8(11):e11555. Doi: 10.1016/j.heliyon.2022.e11555. PMID: 36406700; PMCID: PMC9668678.
8. Varma P, Mohandas A, Ravulapalli P, Pattnaik S, Varaprasad KS. A cross-sectional study on adherence to treatment and life-style modifications in hypertensive patients attending the urban health center of a teaching hospital in Hyderabad. *J Family Med Prim Care* 2023;12(12):3129-3134. Doi: 10.4103/jfmpc.jfmpc_588_23. Epub 2023 Dec 21. PMID: 38361900; PMCID: PMC10866269.
9. Cherfane M, Vallée A, Kab S, Salameh P, Goldberg M, Zins M, Blacher J. Risk factors for uncontrolled blood pressure among individuals with hypertension on treatment: the CONSTANCES population-based study. *Int J Epidemiol*. 2024;53(2): dyae027. Doi: 10.1093/ije/dyae027. PMID: 38412540.
10. Shamsi SA, Salehzadeh M, Ghavami H, Asl RG, Vatani KK. Impact of lifestyle interventions on reducing dietary sodium intake and blood pressure in patients with hypertension: A randomized controlled trial. *Turk Kardiyol Dern Ars*. 2021;49(2):143-150. Doi: 10.5543/tkda.2021.81669. PMID: 33709920
11. Yang L, Zhang Z, Du C, Tang L, Liu X. Risk factor control and adherence to recommended Lifestyle among US hypertension patients. *BMC Public Health* 2024;24(1):2853. Doi: 10.1186/s12889-024-20401-3. PMID: 39415152; PMCID: PMC11483988.
12. Aynalem GA, Bekele TA, Berhe TT, Endazew G. Factors affecting adherence to lifestyle modification among patients with hypertension at Yekatit 12 Hospital Medical College, Addis Ababa, Ethiopia, 2019. *SAGE Open Med*. 2021;9:20503121211012523. Doi: 10.1177/20503121211012523. PMID: 33996085; PMCID: PMC8107667.
13. Cabral AC, Lavrador M, Fernandez-Llimos F, Castel-Branco M, Figueiredo IV. Evaluation of a sample of Portuguese hypertensive patients' knowledge about hypertension and its influence on their beliefs and adherence to therapy. *Rev Port Cardiol*. 2022;41(5):361-367. DOI: 10.1016/j.repc.2021.02.020. Epub 2021 Dec 10. PMID: 36062634.
14. Abdalla AA. Knowledge, attitude, and practice towards therapeutic lifestyle changes in the management of hypertension in Khartoum State. *Cardiovasc J Afr*. 2021;32(4):198-203. DOI: 10.5830/CVJA-2021-011. Epub 2021 Apr 15. PMID: 33950069; PMCID: PMC8756036.
15. Shilole JN, Omari RB, Ruhighira JJ, Khamis AG, Ntwenya JE. Adherence to Lifestyle Recommendations among Adults Attending Hypertension Clinics in Selected Hospitals in Tanzania: A Cross-Sectional Study. *East Afr Health Res J*. 2024;8(1):25-31. DOI: 10.24248/eahrj.v8i1.745. Epub 2024 Mar 28. PMID: 39234338; PMCID: PMC11371004.
16. Abaynew Y, Hussien M. A Qualitative study on barriers to treatment and control of hypertension among patients at Dessie Referral Hospital, Northeast Ethiopia, Ethiopia: Healthcare workers' perspective. *Integr Blood Press Control* 2021;14:173-178. DOI: 10.2147/IBPC.S339773. PMID: 34887681; PMCID: PMC8650830.
17. Fentaw Z, Adamu K. Hypertensive patients' compliance for clinician counseling in Dessie city, Ethiopia. *Heliyon*. 2022;8(11): e11645. DOI: 10.1016/j.heliyon. 2022.e11645. PMID: 36425417; PMCID: PMC9678700.
18. Abdeslam EK, Ahmed C, Kamal K, Rachid L, Keltoum B, Soufiane E, et al. Physical activity level and sedentary time determinants among Moroccan hypertensive patients. *Ann Cardiol Angeiol (Paris)*. 2023;72(4):101607. DOI: 10.1016/j.ancard.2023.101607. Epub 2023 Jun 1. PMID: 37269806.
19. Odunaye-Badmus SO, Sodipo OO, Malomo SO, Oluwatuyi OE, Odiana RN. Relationship between blood pressure control and self-care practices among hypertensive patients attending family medicine clinic of Lagos State University Teaching Hospital, Lagos, Nigeria. *West Afr J Med*. 2024;41(6):659-667. PMID: 39340787.
20. Shim JS, Heo JE, Kim HC. Factors associated with dietary adherence to the guidelines for prevention and treatment of hypertension among Korean adults with and without hypertension. *Clin Hypertens*. 2020;26:5. DOI: 10.1186/s40885-020-00138-y. PMID: 32190348; PMCID: PMC7073010.
21. Abza LF, Yesuf MA, Emrie AA, Belay AS, Bekele TG, Tetema MD, et al. Self-care adherence and associated factors among hypertensive patients at Guraghe Zone, 2023. *Heliyon*. 2024;10(17):e36985. DOI: 10.1016/j.heliyon. 2024.e36985. PMID: 39281466; PMCID: PMC11402238.
22. Sun K, Chen XS, Muzhylko T, Andrade FCD. Doctors' recommendations and healthy lifestyle behaviors among individuals with hypertension in Brazil. *Prev Med Rep*. 2023 Jul 12;35:102315. DOI: 10.1016/j.pmedr.2023.102315. PMID: 37576845; PMCID: PMC10413139.
23. Espinel E, Azancot MA, Gomez A, Beneria A, Caraben A, Andurell L, et al. Compliance to multidisciplinary lifestyle intervention decreases blood pressure in patients with resistant hypertension: A cross-sectional pilot study. *J Clin Med*. 2023;12(2):679. DOI: 10.3390/jcm12020679. PMID: 36675608; PMCID: PMC9867179.
24. Alshuhri M, Alshehry B, Alotaibi T, Alhalal D. Prevalence and associated factors of uncontrolled hypertension among patients attending primary healthcare centers in Riyadh, Saudi Arabia. *Cureus*. 2024;16(7):e64783. DOI: 10.7759/cureus.64783. PMID: 39156327; PMCID: PMC11329856.
25. Gaffari-Fam S, Babazadeh T, Oliaei S, Behboodi L, Daemi A. Adherence to a health literacy and healthy lifestyle with improved blood pressure control in Iran. *Patient Prefer Adherence* 2020;14:499-506. DOI: 10.2147/PPA.S244820. PMID: 32184576; PMCID: PMC7061438.
26. Dhakal A, KCT, Neupane M. Adherence to lifestyle modifications and its associated factors in hypertensive patients. *J Clin Nurs*. 2022;31(15-16):2181-2188. DOI: 10.1111/jocn.16033. Epub 2021 Sep 8. PMID: 34498336.