International Journal of Science Academic Research
Vol. 07, Issue 11, pp.1739-1743, November 2026
Available online at http://www.scienceijsar.com

ISSN: 2582-6425

Case Report

ATTITUDES OF HYPERTENSIVE PATIENTS AND HERBALISTS TOWARD MEDICINAL PLANTS IN THE MANAGEMENT OF ARTERIAL HYPERTENSION IN TUNIS, TUNISIA

[1]Rahma Cherif, [2]Yosra Htira, [2]Faika Ben Mami, [1]Rachid Chemli and [3,*]Fethi Ben Slama

[1]Faculty of Pharmacy of Monastir, University of Monastir, Monastir, Tunisia
[2]Department "C" of Nutrition and Nutrition-Related Diseases, Zouheir Khalel National Institute of Nutrition and Food Technology, Tunis, Tunisia
[3]Higher School of Health Sciences and Techniques of Tunis (ESSTST), University of Tunis El Manar, Research Laboratory LR01ES05, Tunis, Tunisia

Received 12th September 2026; **Accepted** 14th October 2026; **Published online** 24th November 2026

Abstract

Arterial hypertension (AHT) is a major public-health problem, and the complementary use of diet and medicinal plants alongside allopathic treatment is common in North Africa. This study assessed the knowledge, attitudes and practices of hypertensive patients and traditional herbalists in Tunis, Tunisia, regarding the dietary and phytotherapeutic management of AHT, and inventoried the plants used. A two-stage cross-sectional survey was conducted with pre-established questionnaires. Sixty hypertensive patients (30 men, 30 women) hypertensive patients—specifically those who were also diabetic and/or obese who were being monitored or were hospitalized in Ward "C" (Nutrition and Diabetology) at the Zouheir Kallel National Institute of Nutrition between January and March 2018, followed by 20 herbalists trading at Souk El Blat. Data were analysed with IBM SPSS Statistics 23. Mean patient age was 55.9 ± 14.6 years; 76.7% reported no regular physical activity and 43.3% were smokers. Diabetes was the most frequent comorbidity (20%). Most patients (85%) considered diet useful for managing AHT, and 55% had used medicinal plants as an adjuvant, mostly on the advice of another hypertensive person (54.5%) rather than a physician (3%) or pharmacist (6%). Lemon and white wormwood (*Artemisia herba-alba*) were the plants most used by patients, whereas olive (*Olea europaea*), hibiscus (*Hibiscus sabdariffa*) and white wormwood were most often prescribed by herbalists, mainly as leaf or flower infusions. A quarter of herbalists never followed up their patients, and dosing was largely imprecise. Self-medication with medicinal plants is widespread among Tunisian hypertensive patients but is rarely supervised by a health professional, exposing them to interaction and dosing risks. Pharmacist-led education and closer collaboration between pharmacists and herbalists are needed.

Keywords: Arterial hypertension, Medicinal plants, Phytotherapy, Herbalists, Ethnobotanical survey, Tunisia

INTRODUCTION

Arterial hypertension (AHT) remains the single largest modifiable risk factor for cardiovascular disease worldwide. According to the first WHO Global report on hypertension, the number of adults aged 30–79 years living with hypertension doubled between 1990 and 2019, from 650 million to 1.3 billion; nearly half of those affected are unaware of their condition, and about four in five are not adequately treated (World Health Organization, 2023). In Tunisia, the national TAHINA survey estimated the prevalence of hypertension at 30.6% among adults aged 35–70 years, with higher prevalence among women, urban dwellers and less-educated individuals, and found that only 38.8% of hypertensive subjects were aware of their diagnosis (Ben Romdhane *et al.,* 2012; Marzouk-Aissi *et al.,* 2012). Lifestyle and dietary measures are recommended as first-line, low-cost interventions in the management of AHT and are complementary to pharmacological treatment. In parallel, the use of traditional medicinal plants for AHT is common across Africa, reflecting both cultural tradition and the perception accurate or not that herbal treatments carry fewer adverse effects than synthetic drugs (Engwa *et al.,* 2023; Nureye *et al.,* 2025). However, the traditional sector is heterogeneous: herbalists often lack formal pharmacological training, prescribe without regard to the patient's pathophysiological background and use imprecise dosages, which raises concerns about efficacy, drug–herb interactions and toxicity (Engwa *et al.,* 2023).

Corresponding Author:** ***Fethi Ben Slama
Higher School of Health Sciences and Techniques of Tunis (ESSTST), University of Tunis El Manar, Research Laboratory LR01ES05, Tunis, Tunisia

This study aimed (i) to evaluate the knowledge and attitudes of Tunisian hypertensive patients toward the dietary and phytotherapeutic management of their disease; (ii) to document the medicinal plants and dietary practices used; and (iii) to characterise, through a parallel survey of traditional herbalists, the plants prescribed for AHT, the plant parts and preparation methods used, and the conditions of use, in order to identify the species of greatest interest for pharmacological validation and the practices that call for pharmacist-led education.

MATERIALS AND METHODS

Study design and setting

A descriptive cross-sectional study was conducted in two complementary stages in Tunis, Tunisia, as part of a doctoral thesis in pharmacy (Cherif, 2018). The first stage focused on hypertensive patients specifically those who were also diabetic and/or obese who were being monitored or were hospitalized in Ward "C" (Nutrition and Diabetology) at the Zouheir Kallel National Institute of Nutrition between January and March 2018. The second stage involved traditional herbalists (*attarine*) working in Souk El Blat, a historic herbal market located in the medina of Tunis.

Study population and sampling

Sixty hypertensive patients (30 men and 30 women) who consented to participate were recruited with the collaboration of the medical staff. For the second stage, 30 herbalists were approached at Souk El Blat, of whom 20 agreed to participate (response rate 66.7%).

Data collection

Two pre-established, interviewer-administered questionnaires were used. The patient questionnaire collected socio-demographic data, lifestyle habits (smoking, alcohol use, physical activity), anthropometric data (weight, height, body mass index), disease characteristics (age at diagnosis, blood pressure values, comorbidities, pharmacological treatment), dietary knowledge and practice, and knowledge and use of medicinal plants, including the plants used, the source of recommendation, preparation methods and adverse effects experienced. The herbalist questionnaire collected the plants prescribed for AHT, the plant part used, preparation methods, patient follow-up practices, the information sources used by the herbalist, and the perceived hypotensive activity of a pre-defined list of seven plants (olive leaf, garlic, grapefruit, lavender, parsley, cinnamon and cumin) common to both questionnaires.

Statistical analysis

Data were entered and analysed using IBM SPSS Statistics version 23 (IBM Corp., Armonk, NY, USA). Categorical variables are expressed as frequencies and percentages, and continuous variables as mean ± standard deviation, median and range. Cross-tabulations were used to explore associations between categorical variables.

Ethical considerations

Participation was voluntary, and informed verbal consent was obtained from all patients and herbalists before the interview. Data were collected anonymously. The study participants were recruited from among patients hospitalized in the Nutrition and Diabetology Department ("Unit C") after a clear and simple explanation of the study's objectives was provided by a medical specialist, with the aim of obtaining their informed consent.

RESULTS

Survey of hypertensive patients

Socio-demographic and lifestyle characteristics: Patients' age ranged from 28 to 88 years (mean 55.9 ± 14.6 years); the mean age did not differ significantly between men (57.7 ± 14.8 years) and women (54.0 ± 14.4 years; $p \geq 0.05$). Most patients (43.3%) had reached secondary-school level and 13.3% were illiterate. Two-thirds (65%) held a civil-service, professional or managerial position, reflecting a relatively favourable socio-economic profile, while 20% were unemployed. Regarding lifestyle, 43.3% of patients were smokers (mean 17 cigarettes/day among smokers), 10% consumed alcohol and 76.7% did not practise any regular physical activity. Based on calculated body mass index (BMI), 33.3% of patients were in the class I obesity range, with a different distribution between sexes: overweight predominated among men (40%), whereas class I obesity predominated among women (36.6%); all patients with morbid obesity (BMI > 40) were women.

Disease characteristics: The mean age at diagnosis was 46.6 years, and three-quarters of patients had been diagnosed before the age of 54; one in three patients (33.3%) had been diagnosed between 40 and 49 years. More than half of the patients (56.7%) had systolic blood pressure between 140 and 159 mmHg, consistent with predominantly grade I (mild) hypertension. Diabetes was the most frequent associated condition (20% of patients), followed by dyslipidaemia (10%). Most patients (80%) were on antihypertensive monotherapy; losartan, captopril and amlodipine were the three most frequently prescribed molecules. Nearly two-thirds of patients were unaware of the potential value of oligo-element supplementation (potassium, magnesium, calcium, arginine, coenzyme Q10) as an adjuvant to AHT management.

Dietary knowledge and practices: Patients were more knowledgeable about foods that raise blood pressure than about foods that lower it (68.3% vs 51.7%). Fatty foods (41.7%) and salt (40%) were the foods most frequently cited as hypertensive, while fruit and vegetables (45%), lemon (40%) and olive oil (16.7%) were most frequently cited as hypotensive. Most patients (85%) considered diet useful for AHT management, yet only 30% reported always following an adapted diet, 43.3% rarely did so and 26.7% never did. Among patients who followed a diet, it was most often recommended by a physician (36.4%) or by family (27.3%) (Table-1).

Use of medicinal plants: More than half of the patients (55%) had used medicinal plants as an adjuvant treatment for AHT. The main source of advice on herbal use was another hypertensive person in the patient's social network (54.5%), while physicians (3%) and pharmacists (6%) played a marginal role (Table-1). Among plant users (n = 33), 64% used more than one plant concurrently. Lemon (*Citrus limon*, 25%) and white wormwood (*Artemisia herba-alba*, 21.7%) were the most frequently used plants, followed in equal proportion (11.7% each) by garlic, olive, hawthorn, ginger and grapefruit (Table-2). White wormwood was most often prepared as an infusion (53.8%). Among plant users, the most frequently reported adverse or troublesome effects were unpleasant taste (51.5%) and epigastralgia (42.4%).

Table 1. Source of advice for the use of medicinal plants and for dietary measures among hypertensive patients

Source of advice	Medicinal plants (%)	Diet (%)
Physician	3.0	36.4
Pharmacist	6.0	—
Dietitian	—	13.6
Family / relative	—	27.3
Another hypertensive person (peer)	54.5	4.5
Self / other sources*	36.5	18.2

— : not an answer option in the questionnaire. *Self / other sources: for medicinal plants, the remainder to 100% (herbalist, self-directed use, media or internet); for diet, patients acting on their own.

Table 2. Medicinal plants most frequently used by patients and prescribed by herbalists for arterial hypertension

Plant (scientific name)	Vernacular name	Used by patients (%)	Prescribed by herbalists (%)
Citrus limon (lemon)	Citronnier	25.0	2
Artemisia herba-alba (white wormwood)	Chih	21.7	15
Olea europaea (olive)	Zitouna	11.7	19
Allium sativum (garlic)	Thoum	11.7	7
Crataegus oxyacantha (hawthorn)	Al Zaerour	11.7	4
Zingiber officinale (ginger)	Skenjbir	11.7	6
Citrus paradisi (grapefruit)	Bomelli	11.7	2
Hibiscus sabdariffa (roselle)	Karkadé	—	15

Percentages for herbalists refer to the share of the prescriptions recorded.

Table 3. Plants prescribed by herbalists for arterial hypertension: parts used and methods of preparation (n = 54 prescriptions)

Plant (scientific name)	Prescriptions, n (%)	Part used (%)	Preparation method (%)
Olive (*Olea europaea*)	10 (19%)	Leaf (100)	Infusion 70; decoction 30
Hibiscus (roselle) (*Hibiscus sabdariffa*)	8 (15%)	Flower (62.5)	Infusion 100
		Leaf (25)	Infusion 100
		Stem (12.5)	Infusion 100
White wormwood (*Artemisia herba-alba*)	8 (15%)	Leaf (87.5)	Decoction 57; infusion 29; maceration 14
		Stem (12.5)	Infusion 100
Garlic (*Allium sativum*)	4 (7%)	Bulb† (100)	Other 100
Strawberry tree (*Arbutus unedo*)	3 (6%)	Root (100)	Infusion 75; decoction 25
Ginger (*Zingiber officinale*)	3 (6%)	Root (100)	Dissolution 75; maceration 25
Musky bugle (ivette) (*Ajuga iva*)	3 (6%)	Leaf (75)	Infusion 100
		Stem (25)	Infusion 100
Hawthorn (*Crataegus oxyacantha*)	2 (4%)	Leaf (100)	Infusion 100
Black mulberry (*Morus nigra*)	2 (4%)	Bark (100)	Infusion 50; decoction 50
Mastic tree (*Pistacia lentiscus*)	2 (4%)	Leaf (100)	Other 100
Watermelon (*Citrullus lanatus*)	2 (4%)	Seed (100)	Other 100
Rice (*Oryza sativa*)	2 (4%)	Seed (100)	Other 100
Lemon (*Citrus limon*)	1 (2%)	Fruit (100)	Other 100
Mint (*Mentha sp.*)	1 (2%)	Leaf (100)	Infusion 100
Grapefruit (*Citrus paradisi*)	1 (2%)	Fruit (100)	Other 100
Periploca (*Periploca laevigata*)	1 (2%)	Leaf (100)	Infusion 100
Pear (*Pyrus communis*)	1 (2%)	Fruit (100)	Other 100

Table 4. Perceived hypotensive activity of selected plants among patients and herbalists ("Yes" responses)

Plant	Patients answering "Yes" (%)	Herbalists answering "Yes" (%)
Olive leaf	58.3	85
Garlic	61.7	45
Grapefruit	66.7	65
Lavender	30.0	20
Parsley	26.7	5
Cinnamon	21.7	0
Cumin	30.0	0

Survey of herbalists

The mean age of the 20 herbalists surveyed was 53.8 ± 13.3 years (range 30–74), reflecting all generations. Knowledge was mainly transmitted within the family (40%); books and continuing training accounted for 55% of information sources, and only 5% of herbalists used the internet. Regarding patient follow-up, 45% of herbalists followed up patients occasionally and 25% never did so; follow-up increased with herbalist age (80% of herbalists aged 50 years or more reported following up patients, versus none of those under 50). Three-quarters (75%) of herbalists considered that traditional medicine was expanding in Tunisia and occupied an important place in patient care, generally as an adjuvant to allopathic treatment. Olive, hibiscus and white wormwood were the three plants most frequently prescribed for AHT (19%, 15% and 15% of prescriptions, respectively), followed by garlic (7%) (Table-2). Seventeen species were prescribed in total (Table-3). Leaves were the part most often used (100% of olive prescriptions and 87.5% of white wormwood prescriptions), whereas hibiscus was mainly prescribed as the flower (62.5%). Infusion was the predominant method of preparation (70% of olive prescriptions and all hibiscus prescriptions), whereas decoction predominated for white wormwood leaf (57%). For garlic and for the fruit and seed preparations (lemon, grapefruit, pear, watermelon and rice), as well as for mastic tree leaf, the method of preparation was recorded only as "other". Dosing was described qualitatively ("a handful", "a small glass", "two spoons") rather than by precise weight or volume in the large majority of cases, and no herbalist used Latin binomial nomenclature.Plants are ranked by number of prescriptions; the percentage in brackets is the share of all prescriptions. Percentages for part used refer to the prescriptions of the plant concerned, and percentages for preparation method to the prescriptions of the part concerned.

†Recorded as "fruit" in the survey records; the botanical part used is the bulb. "Other": method of preparation not specified. Herbalists did not use Latin binomials; scientific names were assigned by the authors from the common names recorded. For both patients and herbalists, olive leaf, garlic and grapefruit were the plants most consistently recognised as having hypotensive properties among the pre-defined list, whereas parsley and cinnamon were predominantly considered to have no such effect (Table-4).

DISCUSSION

This survey confirms that recourse to medicinal plants as an adjuvant to allopathic treatment of AHT is widespread among Tunisian patients (55%), consistent with the frequent use of herbal remedies by hypertensive patients reported in other African settings (Engwa *et al.,* 2023; Traore *et al.,* 2022). A comparable pattern of frequent, largely unsupervised herbal use for hypertension has recently been documented among hypertensive patients in Khartoum, Sudan (Mohammed *et al.,* 2023), and ethnobotanical inventories conducted since 2022 in Nigeria, Guinea, Ghana and Ethiopia continue to record dozens of plant species used traditionally against AHT, indicating that this practice remains an active component of primary healthcare in the region (Traore *et al.,* 2022; Asafo-Agyei *et al.,* 2023; Patrick *et al.,* 2024; Nureye *et al.,* 2025; Sylver-Francis, 2022). The demographic and clinical profile of our sample is consistent with the national TAHINA survey, which similarly found a higher hypertension burden among women, an association with urban residence and a low level of disease awareness (Ben Romdhane *et al.,* 2012; Marzouk-Aissi *et al.,* 2012). In this context, the low proportion of patients (3%) who reported being advised on plant use by a physician, against 54.5% relying on peer advice, is a significant safety concern: it indicates that phytotherapeutic self-medication occurs largely

outside professional supervision, mirroring the herbalists' own admission that a quarter of them never follow up their patients and that dosing is rarely standardised. Regarding the pharmacological plausibility of the plants most cited, recent evidence supports some traditional claims and qualifies others. For *Hibiscus sabdariffa*, prescribed by 15% of the herbalists surveyed, meta-analyses of randomised controlled trials published in 2022 indicate that it lowers systolic and diastolic blood pressure relative to placebo in patients with mild-to-moderate hypertension, without being superior to standard antihypertensive drugs (Ellis *et al.,* 2022; Mohamed Abdelmonem *et al.,* 2022). For garlic (*Allium sativum*), updated meta-analyses published in 2025 confirm a significant blood-pressure-lowering effect in hypertensive patients, although the magnitude of benefit varies between population subgroups (Ma *et al.,* 2025; Tang *et al.,* 2025). These syntheses support the biological plausibility of the traditional use of hibiscus and garlic reported by our participants, while cautioning against assuming a uniform effect in all hypertensive patients. For lemon, the plant most frequently used by patients (25%), evidence of a genuine antihypertensive effect remains weak: a controlled trial found no significant blood pressure reduction with daily lemon juice intake compared with controls (Sari *et al.,* 2012), suggesting that its popularity derives more from palatability and cultural familiarity than from a demonstrated pharmacological effect. This reinforces the need for pharmacist-led counselling to correct widely held but poorly substantiated beliefs. Conversely, experimental work has shown a sustained reduction in systolic blood pressure in spontaneously hypertensive rats after repeated oral administration of an aqueous leaf extract of *Artemisia herba-alba*, through a mechanism apparently independent of the renin–angiotensin system (Zeggwagh *et al.,* 2008). Robust human clinical trials are lacking, however, and the species is reported to be neurotoxic and haemorrhagic at high doses (Isérin *et al.,* 2002), a hazard that herbalists in our survey did not mention.

The inventory of parts used and preparation methods (Table-3) adds a further dimension. First, olive leaf, the most prescribed plant, was prepared as an infusion in 70% of prescriptions, whereas the pharmacy literature describes tisanes prepared by a five-minute decoction (about 30 g/L, three cups daily) and notes that the leaf's secoiridoid constituents are fragile and lose activity on drying (Raynaud and Blanchet, 2005); the extraction conditions used in practice may therefore differ from those underlying traditional claims. Second, the calyx is the part of *Hibiscus sabdariffa* used in the clinical trials reviewed (Hopkins *et al.,* 2013); whether the "flower" reported by 62.5% of herbalists corresponds to the calyx was not verified, and the 37.5% of prescriptions based on leaf or stem concern material to which the trial evidence summarised above does not directly apply. Third, white wormwood leaf was mostly prepared by decoction, and combined with qualitative dosing this raises the question of exposure to a plant with a recognised toxicity at high doses. Finally, for several plants the method of preparation was recorded only as "other", which limits reproducibility. The methodological weaknesses identified among herbalists qualitative, non-reproducible dosing, absence of scientific nomenclature, limited awareness of drug–herb interactions and infrequent patient follow-up are consistent with observations from other traditional-medicine surveys in the region (Traore *et al.,* 2022; Patrick *et al.,* 2024) and represent the principal lever for risk mitigation. Given that 64% of plant users in our sample took more than one plant simultaneously without professional guidance, and that garlic, hibiscus and *Artemisia* extracts, as well as several antihypertensive drug classes, act at least partly through vasodilatory or renin–angiotensin-related pathways, additive hypotensive effects or interactions with prescribed antihypertensives cannot be excluded and warrant specific pharmacovigilance attention. This study has several limitations. The sample size (60 patients, 20 herbalists) and the single-centre, single-market recruitment in Tunis limit generalisability to the wider Tunisian hypertensive population, and the cross-sectional design precludes any causal inference between plant use and blood pressure control. Self-reported dietary and herbal-use data are subject to recall and social-desirability bias, and the plant species were not botanically authenticated. Larger, multicentre studies with a longitudinal component and, where feasible, blood-pressure follow-up would strengthen future work in this field.

Conclusion

Dietary measures and traditional medicinal plants are widely perceived by Tunisian patients as useful adjuvants to the pharmacological management of arterial hypertension, and a majority of the surveyed patients had already used medicinal plants for this purpose. However, this use occurs largely outside professional supervision, relying primarily on peer advice rather than physician or pharmacist guidance, while traditional herbalists themselves apply imprecise dosing and infrequent follow-up. Recent pharmacological evidence supports the traditional use of some of the plants most frequently cited, particularly *Hibiscus sabdariffa* and *Allium sativum*, while highlighting the need for clinical validation of others, such as *Artemisia herba-alba*, and tempering expectations for lemon. Strengthening the role of the pharmacist as an accessible source of evidence-based counselling on phytotherapy, and fostering structured collaboration between pharmacists, physicians and traditional herbalists, would help secure the safe, adjuvant use of medicinal plants in the management of hypertension in Tunisia and comparable settings.

Acknowledgement

The authors thank The medical and paramedical staff of Department "C" for Nutritional Diseases and Diabetology at the Zouheier Khalel National Institute of Nutrition (Tunis), and the herbalists of Souk El Blat (Tunis) for their cooperation. This article is based on the doctoral thesis in pharmacy of Rahma Cherif, Faculty of Pharmacy of Monastir, University of Monastir (2018), supervised by Pr. Fethi Ben Slama and Pr. Rachid Chemli. This research received no external funding

Conflict of interest

The authors declare no conflict of interest.

REFERENCES

1. Asafo-Agyei, T., Appau, Y., Barimah, K.B., Asase, A., 2023. Medicinal plants used for management of diabetes and hypertension in Ghana. Heliyon 9(12), e22977.
2. Ben Romdhane, H., Ben Ali, S., Skhiri, H., Traissac, P., Bougatef, S., Maire, B., *et al.,* 2012. Hypertension among Tunisian adults: results of the TAHINA project. Hypertens. Res. 35(3), 341–347.

3. Cherif, R., 2018. Attitude des sujets hypertendus vis-à-vis de l'utilisation des plantes médicinales traditionnelles pour le traitement de l'hypertension artérielle. Doctoral thesis in Pharmacy, Faculty of Pharmacy of Monastir, University of Monastir, Monastir, Tunisia.
4. Mohamed Abdelmonem, Mahmoud Ahmed Ebada, Sherein Diab, Mariam Mohamed Ahmed, Mohamed Sayed Zaazouee, Tarek Mohamed Essa, Zainab Salah ElBaz, Hazem S Ghaith, Walid Shaban Abdella, Mohamed Ebada, Ahmed Negida [2]2022. Efficacy of *Hibiscus sabdariffa* on reducing blood pressure in patients with mild-to-moderate hypertension: a systematic review and meta-analysis of published randomized controlled trials. J. Cardiovasc. Pharmacol. 79(1), e64–e74.
5. Ellis, L.R., Zulfiqar, S., Holmes, M., Marshall, L., Dye, L., Boesch, C., 2022. A systematic review and meta-analysis of the effects of *Hibiscus sabdariffa* on blood pressure and cardiometabolic markers. Nutr. Rev. 80(6), 1723–1737.
6. Engwa, G.A., Matjuda, E.N., Nkeh-Chungag, B.N., 2023. Hypertension in Africa and medicinal plants with anti-hypertensive properties. Res. J. Pharmacogn. 10(2), 57–73.
7. Hopkins, A.L., Lamm, M.G., Funk, J.L., Ritenbaugh, C., 2013. *Hibiscus sabdariffa* L. in the treatment of hypertension and hyperlipidemia: a comprehensive review of animal and human studies. Fitoterapia 85, 84–94.
8. Isérin, P., Masson, M., Restellini, J.P., 2002. Encyclopédie des plantes médicinales: identification, préparations, soins. Larousse, Paris.
9. Ma, X., Zhang, H., Jia, J., 2025. The effect of garlic on the lowering of blood pressure in the patients with hypertension: an updated meta-analysis and trial sequential analysis. Adv. Biomed. Res. (doi:10.2478/abm-2025-0016).
10. Marzouk-Aissi, W., Ben Alaya-Bouafif, N., Bougatef, S., Traissac, P., Delpeuch, F., Ben Romdhane, H., 2012. Prévalence et déterminants de l'hypertension artérielle chez les adultes tunisiens, Tunisie. Rev. Epidemiol. Sante Publique 60, 101–111.
11. Mohammed, H.H., Jaber, M.H., Alhaj, W.M., Abdelgadir, H.S., 2023. Assessment of traditional herbal remedies use and medical treatment among hypertensive patients attending primary health care centers in Khartoum State, Sudan 2022–2023. Int. J. Med. Stud. 11.
12. Nureye, D., Tadege, G., Dubale, S., Kebebe, D., Suleman, S., Nguelefack-Mbuyo, E.P., 2025. Medicinal plants administered to control hypertension in Ethiopia: ethnomedicine, pharmacology, nutraceutical, phytochemistry, toxicology, and policy perspectives. Front. Cardiovasc. Med. 12, 1514911.
13. Patrick, E.B., Otimenyin, S.O., Bukar, B.B., 2024. Ethnobotanical survey of plants used for the management of hypertension in Zango Kataf, Kaduna State, Nigeria. Afr. J. Pharm. Res. Dev. 15(2).
14. Raynaud, J., Blanchet, J.M., 2005. Prescription et conseil en phytothérapie. Lavoisier, Paris.
15. Sari, A., Selim, N., Dilek, M., 2012. Effect of lemon juice on blood pressure. J. Exp. Clin. Med. 29(1), 38–41.
16. Sylver-Francis, R.A., 2022. Medicinal plants use in Nigeria for the management of hypertension and diabetes. MPhil thesis, University College London, London.
17. Tang, Y., Lei, Y., Xu, M., Tu, Q., Mao, X., Huang, N., Jiang, Q., 2025. Meta-analysis on the safety and efficacy of long-term garlic consumption as an adjunctive treatment for hypertension. Front. Nutr. 12, 1656809.
18. Traore, M.S., Camara, A., Balde, M.A., Diallo, M.S.T., Barry, N.S., Balde, E.S., *et al.,* 2022. Ethnobotanical survey of medicinal plants used to manage hypertension in the Republic of Guinea. J. Pharm. Pharmacogn. Res. 10(5), 938–951.
19. World Health Organization, 2023. Global report on hypertension: the race against a silent killer. WHO, Geneva.
20. Zeggwagh, N.A., Farid, O., Michel, J.B., Eddouks, M., 2008. Cardiovascular effect of *Artemisia herba alba* aqueous extract in spontaneously hypertensive rats. Methods Find. Exp. Clin. Pharmacol. 30(5), 375–381.

****