Alqalam Journal of Medical and Applied Sciences. 2026;9(8):2508-2514
https://doi.org/10.54361/ajmas.269825

Original Article

Prevalence, Risk Factors, Awareness, Treatment, and Control of Hypertension among Adults Attending Jadu Hospital, Libya: A Hospital-Based Study

Sobhia Draibi*[1], Fatma Alatrag[2], Hala Araibi[2], Ebtehal Eshiak[2], Entesar Judam[3]

[1]*Department of Clinical Medicine (Cardiology), Faculty of Medicine, University of Zawia, Zawia, Libya*
[2]*Department of Physiology, Faculty of Medicine, University of Zawia, Zawia, Libya*
[3]*Department of Clinical Medicine (Hematology), Medical Subrata Oncology, Subrata, Libya*
Corresponding Email. *s.draibi@zu.edu.ly*

Abstract
Hypertension is the most critical modifiable risk factor for cardiovascular disease and a leading cause of premature mortality worldwide. Despite its increasing burden in Libya, data on hypertension prevalence, awareness, treatment, and control from hospital-based populations remain limited. This study aimed to determine the prevalence, awareness, treatment, control, and associated risk factors of hypertension among adults attending Jadu Hospital in western Libya. A cross-sectional study was conducted among 150 adults aged ≥35 years attending Jadu General Hospital over one year. Blood pressure was measured using standardized protocols. Hypertension was defined as systolic blood pressure ≥140 mmHg and/or diastolic blood pressure ≥90 mmHg, or current use of antihypertensive medication. Data on sociodemographic characteristics, medical history, and hypertension awareness were collected using a structured questionnaire. Multivariable logistic regression was performed to identify factors associated with hypertension awareness. The overall prevalence of hypertension was 84.7% (n=127). The mean age was 59.04 ± 12.14 years, with 60% female participants. Hypertensive participants were significantly older than non-hypertensive participants (60.54 ± 12.07 vs. 50.78 ± 8.87 years, p<0.001). Diabetes mellitus was significantly more prevalent among hypertensive participants (22.0% vs. 4.3%, p=0.048). Hypertension prevalence increased significantly with age, rising from 68.4% among participants aged 35-50 years to 97.7% among those aged >65 years (p<0.002). Among hypertensive participants, awareness and treatment rates were 63.0%, and blood pressure control was achieved in 41.3% of those treated. Older age was significantly associated with higher awareness and treatment rates (p=0.002). Multivariable analysis demonstrated that increasing age was independently associated with lower odds of lacking hypertension awareness (adjusted OR=0.962, 95% CI: 0.930-0.994; p=0.022). This study reveals a high prevalence of hypertension among adults attending Jadu Hospital, with advancing age being the strongest predictor. Although older participants demonstrated higher awareness and treatment rates, blood pressure control remained suboptimal. These findings highlight the urgent need for comprehensive public health strategies focusing on early detection, effective treatment, lifestyle modification, and regular follow-up, particularly among older adults and other high-risk populations in Libya.
Keywords. Hypertension, Prevalence, Awareness, Control, Risk Factors.

Introduction

Cardiovascular disease (CVD) is the most common non-communicable disease and remains the leading cause of death worldwide, accounting for approximately one-third of all deaths globally [1]. Hypertension is recognized as the most critical modifiable risk factor for CVDs, significantly contributing to the development of stroke, ischemic heart disease, heart failure, chronic kidney disease, and premature mortality [2]. Moreover, hypertension contributes to diminished quality of life while placing a significant financial burden on healthcare systems [3]. In 2024, an estimated 1.4 billion adults aged 30-79 years were living with hypertension worldwide, representing approximately around 33% of this population [4].

The prevalence of hypertension has increased substantially, particularly in low- and middle-income countries including Libya [5,6]. This shifting burden is heavily driven by rapid population growth, aging, urbanization, and lifestyle change [7]. Despite the serious health consequences of hypertension and the availability of effective treatment, a substantial proportion of individuals with hypertension remain untreated, unaware, or inadequately controlled, particularly in low- and middle-income countries [8,9]. Previous studies have shown that awareness, treatment, and control rates of hypertension remain suboptimal in many low- and middle-income countries, including countries within the WHO Eastern Mediterranean Region (EMR) [10].

Because hypertension is frequently asymptomatic, many affected individuals do not seek medical attention until complications develop [11]. Consequently, delayed diagnosis and inadequate treatment remain major public health challenges [12,13]. The growing burden of hypertension poses a significant challenge to healthcare systems and public health worldwide. Therefore, an accurate assessment of the prevalence of hypertension is essential for identifying at-risk populations, guiding prevention strategies, allocating healthcare resources, and reducing the overarching burden of cardiovascular disease [14,15].

Despite the growing evidence on hypertension prevalence in Libya [16,17], data from different hospital-based populations and specific clinical settings remain limited. This study aimed to address this gap by examining the prevalence, awareness, control, and associated risk factors of hypertension among adults attending Jadu Hospital, Libya. By determining the

Received: *07-06-2026 -* ***Accepted:*** *04-08-2026 -* ***Published:*** *11-08-2026*

prevalence of hypertension and identifying associated risk factors, this study will provide evidence to inform local healthcare strategies and contribute to national efforts to prevent and control hypertension.

Material and Methods

Study design and participants

This cross-sectional study was conducted over a one-year period to determine the prevalence of hypertension and identify associated risk factors among adults attending Jadu Hospital, Libya. A total of 150 participants aged 35 years and older were included in the study. Of all participants included in the analysis, 40% (n = 60) were male, and 60% (n = 90) were female. Exclusion criteria included pregnant women and individuals who were unable to provide informed consent.

Data collection

Data were collected using a structured questionnaire designed to obtain information on participants' sociodemographic characteristics, including age, gender, occupation, and smoking status, as well as medical history, awareness of hypertension status, and current use of antihypertensive medications. The questionnaire was completed by all participants before blood pressure measurement.

Blood pressure was measured according to a standardized protocol using a calibrated mercury sphygmomanometer. Participants were seated comfortably and allowed to rest for at least 5 minutes before measurement. Two blood pressure readings were obtained at 5-minute intervals, and the average of the two measurements was recorded for analysis.

Hypertension was defined as a systolic blood pressure (SBP) ≥140 mmHg and/or a diastolic blood pressure (DBP) ≥90 mmHg, or current use of antihypertensive medication [18,19].

Statistical Analysis

Data were analyzed using IBM SPSS Statistics for Windows, Version 27.0 (IBM Corp., Armonk, NY, USA). Continuous variables were summarized as mean ± standard deviation (SD), whereas categorical variables were presented as frequencies and percentages. Comparisons of continuous variables between men and women were performed using the independent-samples t-test. Comparisons of categorical variables were performed using the chi-square test. Multiple logistic regression analysis was performed to identify factors independently associated with hypertension. Odds ratios (ORs) with 95% confidence intervals (CIs) were calculated. A two-tailed P value < 0.05 was considered statistically significant.

Ethical Considerations

Ethical approval for the study was obtained from the Libyan Medical Research Center Bioethics Committee (Approval No. NBC:018. H.26.119). The study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Written informed consent was obtained from all participants prior to enrollment. Participants were informed about the nature, purpose, and objectives of the study, and all collected data were kept confidential and stored securely to protect participants' privacy.

Results

A total of 150 adults participated in this cross-sectional study conducted at Jadu General Hospital, Western Libya. Of the participants, 90 (60.0%) were women and 60 (40.0%) were men. The overall mean age was 59.04 ± 12.14 years, while the mean SBP and DBP were 147.37 ± 20.88 mmHg and 83.31 ± 11.38 mmHg, respectively.

As shown in Table 1, there were no statistically significant differences between women and men with respect to age (P = 0.812), systolic blood pressure (P = 0.451), hypertension status (P = 0.195), diabetes mellitus (P = 0.151), or nationality (P = 0.671). However, men had a significantly higher mean diastolic blood pressure than women (P = 0.037). Significant sex differences were observed for smoking status and employment status (both P < 0.001). The study population was almost entirely Libyan, with only two non-Libyan participants.

Table 1. Demographic and clinical characteristics of the study participants by sex (N = 150).

Variable	Women	Men	P value
Age (yr)	59.23 ± 11.606	58.75 ± 12.99	0.812
DBP (mmHg)	81.72±12.16	85.67±9.72	0.037
SBP (mmHg)	148.56 ± 20.75	145.58 ± 21.13	0.451
Hypertension			
No	11 (12.2%)	12(20.0%)	
Yes	79 (87.8%)	48(80.0%)	0.195
Diabetes mellitus			
No	76 (84.4%)	45 (75.0%)	
Yes	14 (15.6%)	15 (25.0%)	0.151
Smoking			

Received: *07-06-2026 -* ***Accepted:*** *04-08-2026 -* ***Published:*** *11-08-2026*

https://doi.org/10.54361/ajmas.269825

No	90 (100.0%)	37 (61.7%)	
Yes	0 (0.0%)	23 (38.3%)	<0.001
Occupation			
Employed	20 (22.2%)	41 (68.3%)	
Unemployed	70 (77.8%)	19 (31.7%)	<0.001
Nationality			
Libyan	89 (98.9%)	59 (98.3%)	
Non-Libyan	1 (1.1%)	1 (1.7%)	0.671

Table 2. Comparison of selected cardiovascular disease risk factors between hypertensive and non-hypertensive participants.

Hypertension status	**Non- Hypertensive (n=23)**	**Hypertensive (n=127)**	**p-value**
Age (yr)	50.78±8.87	60.54±12.07	< 0.001
Gender			0.195
Women	11	79	
Men	12	48	
Diabetes			0.048
No	22	99	
yes	1	28	
Current Smoking			0.120
No	17	110	
Yes	6	17	

As shown in (Table 2), hypertensive participants were significantly older than non-hypertensive participants (60.54 ± 12.07 vs. 50.78 ± 8.87 years, P < 0.001). Diabetes mellitus was significantly more prevalent among hypertensive participants than among non-hypertensive participants (22.0% vs. 4.3%, P = 0.048). In contrast, no significant associations were observed between hypertension status and smoking status (P = 0.120) or sex (P = 0.195). Smokers comprised 13.4% of the hypertensive group and 26.1% of the non-hypertensive group.

Table 3: Distribution of hypertension according to age group and gender

Age	**Total**	**Hypertension**			
		Total	Women	Men	P-value
Total	150	127	79	48	0.195
35-50	38	26	15	11	0.358
51-65	68	58	40	18	0.575
>65	44	43	24	19	0.268
P-value 2		<0.002	0.04	0.032	

Hypertension prevalence increased significantly with age, rising from 68.4% (26/38) among participants aged 35–50 years to 97.7% (43/44) among those aged >65 years (p = 0.002). When analyzed separately by gender, this significant age-related trend remained evident in both women (p = 0.040) and men (p = 0.032). However, no significant differences in hypertension prevalence were observed between women and men overall (p = 0.195) or within any individual age group (all p > 0.05) (Table 3).

Received*: 07-06-2026 -* ***Accepted****: 04-08-2026 -* ***Published****: 11-08-2026*

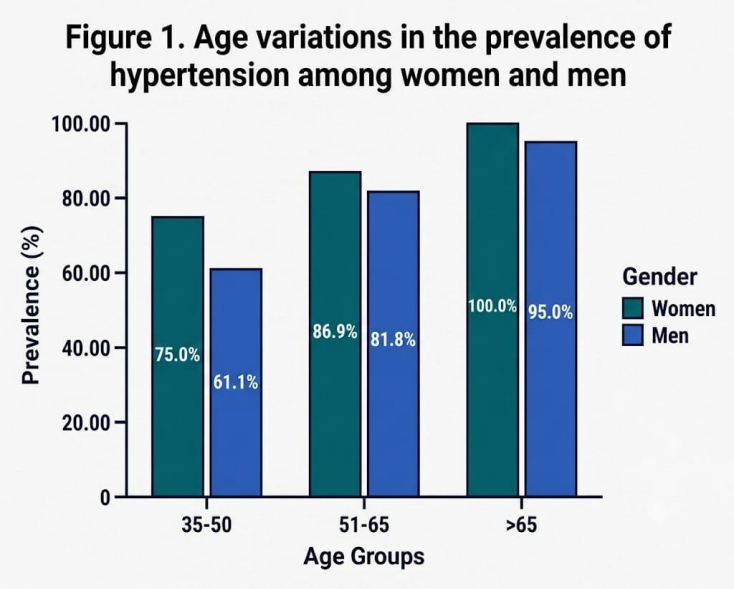

Table 4. Hypertension awareness, treatment, and blood pressure control among hypertensive participants

Age (yr)	Awareness		Treatment		Control	
	Yes	No	Yes	No	Yes	No
Total	80 (63.0%)	47 (37.0%)	80 (63.0%)	47 (37.0%)	33 (41.3%)	47 (58.7%)
35-50 (n=26)	15 (57.7%)	11 (42.3%)	15 (57.7%)	11 (42.3%)	9 (60.0%)	6 (40.0%)
51-65 (n=58)	29 (50%)	29 (50.0%)	29 (50%)	29 (50.0%)	12 (41.4%)	17 (58.6%)
>65 (n=43)	36 (83.7%)	7 (16.3%)	36 (83.7%)	7 (16.3%)	12 (33.3%)	24 (66.7%)
P-value	0.002		0.002		0.212	

The rates of hypertension awareness, pharmacological treatment, and blood pressure control according to age group are presented in (Table 4). Among the 127 hypertensive participants, both hypertension awareness and pharmacological treatment rates were 63.0%. Age was significantly associated with both awareness and treatment (p = 0.002), with the highest rates observed among participants aged > 65 years (83.7%), compared with 57.7% among those aged 35–50 years and 50.0% among those aged 51–65 years.

Among the 80 participants who were aware of their hypertension and receiving pharmacological treatment, 41.3% achieved blood pressure control (SBP <140 mmHg and DBP <90 mmHg). The highest control rate was observed among participants aged 35–50 years (60.0%), followed by those aged 51–65 years (41.4%) and >65 years (33.3%). Although blood pressure control decreased with increasing age, the difference was not statistically significant (p = 0.212).

Table 5. Multivariable logistic regression analysis of factors associated with lack of hypertension awareness among hypertensive participants (N = 127)

Variable	Adjusted OR (95% CI)	P-value
Age (ys)	0.962 (0.930–0.994)	0.022
Female vs. Male	0.839 (0.337–2.087)	0.706
Diabetes mellitus (Yes vs. No)	0.605 (0.223–1.641)	0.323
Smoking (Yes vs. No)	1.276 (0.356–4.575)	0.708
Pulse rate (beats/min)	0.990 (0.960–1.021)	0.513

A multivariable logistic regression analysis was performed among the 127 hypertensive participants to identify factors associated with lack of hypertension awareness. As shown in (Table 5), age was the only factor independently associated with lack of hypertension awareness (adjusted OR = 0.962, 95% CI: 0.930–0.994; p = 0.022). Specifically, each one-year increase in age was associated with a 3.8% reduction in the odds of being unaware of hypertension. Sex, diabetes mellitus, smoking status, and pulse rate were not significantly associated with lack of hypertension awareness (all p > 0.05).

Discussion

The present study investigated the prevalence, awareness, treatment, control, and associated risk factors of hypertension among adults attending Jadu General Hospital in western Libya. No significant sex differences were observed in age or systolic blood pressure, whereas men had significantly higher diastolic blood pressure than women. In addition, the employment rate was significantly higher among men than women. These findings are consistent with previous studies conducted in different populations [20,21].

Received: *07-06-2026 -* ***Accepted:*** *04-08-2026 -* ***Published:*** *11-08-2026*

This study shows that the prevalence of hypertension was higher among women than men, although the difference was not statistically significant. This trend is consistent with previous studies conducted in Libya and other countries, which also demonstrated a higher prevalence of hypertension among women [20,21]. In contrast, other studies have reported a higher prevalence among men [22]. These inconsistencies may reflect differences in study populations, demographic characteristics, lifestyle factors, and healthcare utilization. Furthermore, biological sex differences, hormonal changes, and age-related vascular remodeling may contribute to the observed variation in blood pressure between men and women [23,24].

Advancing age was significantly associated with a higher prevalence of hypertension, with participants aged over 65 years demonstrating the highest prevalence. This finding is consistent with previous studies showing that advancing age is one of the strongest predictors of hypertension [20,22,25]. The association between advancing age and hypertension may be explained by age-related arterial stiffness, reduced vascular compliance, endothelial dysfunction, and progressive structural changes in the vasculature [26].

Diabetes mellitus was significantly more prevalent among hypertensive participants than among non-hypertensive participants. This result is in agreement with previous reports demonstrating a strong association between hypertension and diabetes mellitus [27–29]. The coexistence of these two conditions is largely explained by shared pathophysiological mechanisms, including insulin resistance, chronic low-grade inflammation, oxidative stress, and endothelial dysfunction [30]. Together, hypertension and diabetes synergistically accelerate both macrovascular and microvascular complications, substantially increasing the risk of cardiovascular disease, stroke, and chronic kidney disease [31,32].

In contrast, no statistically significant association was observed between smoking and hypertension in the present study. This finding is consistent with previous studies that also reported no significant relationship between smoking status and hypertension [33,34]. However, it differs from the findings of Al-Hamdan et al.[25], who demonstrated a positive association between smoking and elevated blood pressure. The lack of a significant association in the present study may be explained by the relatively small number of smokers in the study population, variations in smoking intensity and duration, or the influence of unmeasured confounding factors. Additionally, the cross-sectional design of the study precludes the establishment of causal relationships between smoking and hypertension.

The data revealed a clear age-related gradient among hypertensive participants: older individuals, particularly those past 65, exhibited significantly elevated levels of disease awareness and medication uptake. This pattern is consistent with the broader literature, which has long established that elderly patients typically have closer and more continuous contact with the healthcare system. Consequently, they benefit from a greater number of clinical touchpoints that enable timely blood pressure monitoring, diagnostic labeling, and early pharmacological intervention.[16,22,35].

In addition, healthcare providers may be more likely to initiate antihypertensive therapy in older patients because of their greater risk of cardiovascular complications, including myocardial infarction, heart failure, and stroke, as recommended by current hypertension management guidelines [8,15]. Older adults may also demonstrate better adherence to medical follow-up because of increased health awareness and the presence of other chronic conditions requiring regular healthcare visits, which may further contribute to the higher rates of hypertension awareness and treatment observed in this age group.

Multiple logistic regression analysis further demonstrated that increasing age was independently associated with a lower likelihood of lacking hypertension awareness. Specifically, each one-year increase in age was associated with a 3.8% reduction in the odds of being unaware of hypertension (adjusted OR = 0.962, 95% CI: 0.930–0.994; p = 0.022). In contrast, sex, diabetes mellitus, smoking status, and pulse rate were not independently associated with lack of hypertension awareness after adjustment for potential confounding factors. These findings indicate that age was an independent predictor of hypertension awareness.

Despite higher levels of awareness and treatment among older participants, age was not significantly associated with hypertension control. Although the proportion of participants with controlled blood pressure appeared to decline with increasing age (60.0%, 41.4%, and 33.3% across the age groups), these differences were not statistically significant (p = 0.212). These findings suggest that greater awareness and treatment do not necessarily translate into adequate blood pressure control. Similar observations have been reported in previous studies, indicating that blood pressure control is influenced by multiple factors beyond medication prescription, including medication adherence, therapeutic inertia, treatment intensity, adverse drug effects, lifestyle modification, dietary sodium intake, physical activity, obesity, and the presence of multiple comorbidities ([36–38]). Therefore, improving blood pressure control requires comprehensive management strategies that extend beyond increasing awareness and treatment alone.

The present study has several strengths. It simultaneously evaluated the prevalence, awareness, treatment, control, and associated risk factors of hypertension using standardized blood pressure measurements in an adult population from western Libya, where epidemiological data remain limited. In addition, the use of multivariable logistic regression analysis allowed the independent assessment of factors associated with hypertension awareness while adjusting for potential confounding variables. Nevertheless, several limitations should be acknowledged. First, the cross-sectional design precludes establishing causal relationships between hypertension and the identified risk factors. Second, the relatively small sample size and recruitment from a single healthcare center may limit the generalizability of the findings to the broader Libyan population. Third, several important determinants of hypertension, including obesity, dietary habits, salt intake, physical activity, medication adherence, and socioeconomic status, were not evaluated, which may have resulted in residual confounding. Finally, blood pressure was measured during a single study visit, which may have resulted in

Received*: 07-06-2026 -* ***Accepted****: 04-08-2026 -* ***Published****: 11-08-2026*

misclassification because repeated measurements over time were not available. Future multicenter studies involving larger and more representative populations are needed to confirm these findings and further identify the determinants of hypertension in Libya.

Conclusion

This study demonstrates a high burden of hypertension among adults attending Jadu General Hospital, with prevalence increasing significantly with age. Although older participants had significantly higher levels of hypertension awareness and treatment, blood pressure control remained suboptimal. Increasing age was independently associated with a lower likelihood of lacking hypertension awareness, whereas sex, diabetes mellitus, smoking status, and pulse rate were not independently associated with hypertension awareness after adjustment for potential confounding factors. Nevertheless, this study provides valuable baseline data on the epidemiology of hypertension in western Libya. These findings underscore the need for comprehensive public health strategies that promote early detection, effective treatment, lifestyle modification, and regular follow-up, particularly among older adults and other high-risk groups, to improve blood pressure control and reduce the burden of hypertension and its cardiovascular complications in Libya.

Conflict of interest. Nil

References

1. Mensah GA, Roth GA, Fuster V. The Global Burden of Cardiovascular Diseases and Risk Factors: 2020 and Beyond. J Am Coll Cardiol. 2019 Nov 19;74(20):2529-2532. doi: 10.1016/j.jacc.2019.10.009. PMID: 31727292.
2. Mace HP, Clark D. Attributable risk of hypertension for cardiovascular disease. Curr Hypertens Rep. 2026. doi: 10.1007/s11906-026-01363-w PMID: 41886200.
3. Kandasamy G, Almanasef M, Orayj K, Alshahrani AM, Alahmari SM. Assessing the impact of hypertension on health-related quality of life: insights from sociodemographic, economic, and clinical features using SF-36. Healthcare (Basel). 2025 Apr 1;13(7). doi: 10.3390/healthcare13070838.
4. World Health Organization. Hypertension [Internet]. Geneva: World Health Organization; 2025 Sep 25 [cited 2026 Jul 25]. Available from: https://www.who.int/news-room/fact-sheets/detail/hypertension
5. Schutte AE, Srinivasapura Venkateshmurthy N, Mohan S, Prabhakaran D. Hypertension in low- and middle-income countries. Circ Res. 2021;808-26. doi: 10.1161/CIRCRESAHA.120.318729 PMID: 33793340.
6. Ben Fadel R. Predictors of uncontrolled hypertension among Libyan patients: a cross-sectional study at Tripoli University Hospital. AlQalam J Med Appl Sci. 2025 Sep 30;1879-89. doi: 10.54361/ajmas.258387.
7. Shah SM, Almarzouqi LM, Govender RD, Nauman J, Khan MAB. Hypertension prevalence, awareness, and control among parents of school-aged children in the United Arab Emirates. Patient Prefer Adherence. 2022;16:1381-93. doi: 10.2147/PPA.S357046.
8. Parati G, Lackland DT, Campbell NRC, Ojo Owolabi M, Bavuma C, Mamoun Beheiry H, et al. How to improve awareness, treatment, and control of hypertension in Africa, and how to reduce its consequences: a call to action from the World Hypertension League. Hypertension. 2022;1949-61. doi: 10.1161/HYPERTENSIONAHA.121.18884 PMID: 35638381.
9. Abba MS, Nduka CU, Anjorin S, Zanna FH, Uthman OA. Socioeconomic macro-level determinants of hypertension: ecological analysis of 138 low- and middle-income countries. J Cardiovasc Dev Dis. 2023 Feb 1;10(2). doi: 10.3390/jcdd10020057.
10. Yusufali AM, Khatib R, Islam S, Alhabib KF, Bahonar A, Swidan HM, et al. Prevalence, awareness, treatment and control of hypertension in four Middle East countries. J Hypertens. 2017;1457-64. doi: 10.1097/HJH.0000000000001326 PMID: 28486270.
11. World Health Organization. Global report on hypertension: the race against a silent killer [Internet]. Geneva: World Health Organization; 2023 Sep [cited 2026 Jul 28]. Available from: https://www.who.int/publications/i/item/9789240081062
12. World Health Organization. High stakes - turning evidence into action: global report on hypertension 2025 [Internet]. Geneva: World Health Organization; 2025 Sep [cited 2026 Jul 28]. Available from: https://www.who.int/publications/i/item/9789240115569
13. Chaturvedi A, Zhu A, Gadela NV, Prabhakaran D, Jafar TH. Social determinants of health and disparities in hypertension and cardiovascular diseases. Hypertension. 2024;387-99. doi: 10.1161/HYPERTENSIONAHA.123.21354 PMID: 38152897.
14. Zhou B, Perel P, Mensah GA, Ezzati M. Global epidemiology, health burden and effective interventions for elevated blood pressure and hypertension. Nat Rev Cardiol. 2021;785-802. doi: 10.1038/s41569-021-00559-8 PMID: 34050340.
15. O'Connell SS, Whelton PK, Li F, Allouch F, Shapiro L, Vandenburg M, et al. Global hypertension 2000 to 2020: trends, disparities, and progress in awareness, treatment, and control. J Am Coll Cardiol. 2026 May 12;87(18):2338-51. doi: 10.1016/j.jacc.2025.12.091 PMID: 41879582.
16. Ben Masaud HA, Aborawi A, Daghiz MM, Abusriwel MS, Fhail Al-Alboum MO, Beaney T, et al. May Measurement Month 2022: an analysis of blood pressure screening results from Libya. Eur Heart J Suppl. 2025 Aug 1;27:vii48-50. doi: 10.1093/eurheartjsupp/suaf044.
17. Ben Fadel R. Predictors of uncontrolled hypertension among Libyan patients: a cross-sectional study at Tripoli University Hospital. AlQalam J Med Appl Sci. 2025 Sep 30;1879-89. doi: 10.54361/ajmas.258387.
18. World Health Organization. Guideline for the pharmacological treatment of hypertension in adults [Internet]. Geneva: World Health Organization; 2021 Aug [cited 2026 Jul 29]. Available from: https://www.who.int/publications/i/item/9789240033986
19. European Society of Cardiology. ESC declaration of interests report 2024: ESC guidelines for the management of elevated blood pressure and hypertension [Internet]. Sophia Antipolis: European Society of Cardiology; 2024 Aug [cited 2026 Jul 29]. Available from: www.escardio.org/DOI
20. Elkout H, Ben Fadel R. Secondary hypertension in the Libyan population: a descriptive analysis of underlying causes and patient outcomes. Libyan Med J. 2025;17(1):61-5. doi: 10.69667/lmj.25171.

Received: *07-06-2026 -* ***Accepted:*** *04-08-2026 -* ***Published:*** *11-08-2026*

21. Singh S, Shankar R, Singh GP. Prevalence and associated risk factors of hypertension: a cross-sectional study in urban Varanasi. Int J Hypertens. 2017;2017:5491838. doi: 10.1155/2017/5491838 PMID: 29348933.
22. Eghbali M, Khosravi A, Feizi A, Mansouri A, Mahaki B, Sarrafzadegan N. Prevalence, awareness, treatment, control, and risk factors of hypertension among adults: a cross-sectional study in Iran. Epidemiol Health. 2018;40:e2018020. doi: 10.4178/EPIH.E2018020 PMID: 29807408.
23. Drury ER, Wu J, Gigliotti JC, Le TH. Sex differences in blood pressure regulation and hypertension: renal, hemodynamic, and hormonal mechanisms. Physiol Rev. 2024;199-251. doi: 10.1152/physrev.00041.2022 PMID: 37477622.
24. Zhang H, Singal PK, Ravandi A, Rabinovich-Nikitin I. Sex-specific differences in the pathophysiology of hypertension. Biomolecules. 2025. doi: 10.3390/biom15010143 PMID: 39858537.
25. Al-Hamdan N, Saeed A, Kutbi A, Choudhry AJ, Nooh R. Characteristics, risk factors, and treatment practices of known adult hypertensive patients in Saudi Arabia. Int J Hypertens. 2010;2010:168739. doi: 10.4061/2010/168739.
26. Çelik MC, Kalçık M, Birgün A, Yetim M, Bekar L, Karavelioğlu Y. Endothelial dysfunction and vascular stiffness: molecular drivers of cardiovascular aging. Explor Cardiol. 2025 Nov 6;3. doi: 10.37349/ec.2025.101279.
27. Naseri MW, Esmat HA, Bahee MD. Prevalence of hypertension in type-2 diabetes mellitus. Ann Med Surg (Lond). 2022 Jun 1;78:103758. doi: 10.1016/j.amsu.2022.103758.
28. Al-Hamdan N, Saeed A, Kutbi A, Choudhry AJ, Nooh R. Characteristics, risk factors, and treatment practices of known adult hypertensive patients in Saudi Arabia. Int J Hypertens. 2010;2010:168739. doi: 10.4061/2010/168739.
29. Ahmed NM. Prevalence of risk factors for diabetes mellitus and hypertension among adult in Tabuk- Kingdom of Saudi Arabia. Arch Clin Med Case Rep. 2018;2(6). doi: 10.26502/acmcr.96550044.
30. Strain WD, Paldánius PM. Diabetes, cardiovascular disease and the microcirculation. Cardiovasc Diabetol. 2018;17:57. doi: 10.1186/s12933-018-0703-2 PMID: 29669543.
31. Hezam AAM, Shaghdar HBM, Chen L. The connection between hypertension and diabetes and their role in heart and kidney disease development. J Res Med Sci. 2024. doi: 10.4103/jrms.jrms_470_23 PMID: 38855561.
32. Yen FS, Wei JCC, Chiu LT, Hsu CC, Hwu CM. Diabetes, hypertension, and cardiovascular disease development. J Transl Med. 2022 Dec 1;20(1):9. doi: 10.1186/s12967-021-03217-2 PMID: 34980154.
33. Awoke A, Awoke T, Alemu S, Megabiaw B. Prevalence and associated factors of hypertension among adults in Gondar, Northwest Ethiopia: a community based cross-sectional study. BMC Cardiovasc Disord. 2012 Nov 28;12:113. doi: 10.1186/1471-2261-12-113 PMID: 23186560.
34. Ombada M, Ombada M. Association between healthy lifestyle and management of hypertension: a descriptive study undertaking Sudanese adult. Glob J Health Sci. 2019 Dec 29;12(1):106. doi: 10.5539/gjhs.v12n1p106.
35. Cutler JA, Sorlie PD, Wolz M, Thom T, Fields LE, Roccella EJ. Trends in hypertension prevalence, awareness, treatment, and control rates in United States adults between 1988-1994 and 1999-2004. Hypertension. 2008 Nov;52(5):818-27. doi: 10.1161/HYPERTENSIONAHA.108.113357 PMID: 18852389.
36. Egan BM, Zhao Y, Li J, Brzezinski WA, Todoran TM, Brook RD, Calhoun DA. Prevalence of optimal treatment regimens in patients with apparent treatment-resistant hypertension based on office blood pressure in a community-based practice network. Hypertension. 2013 Oct;62(4):691-7. doi: 10.1161/HYPERTENSIONAHA.113.01448. Epub 2013 Aug 5. PMID: 23918752; PMCID: PMC4066303.
37. Ong KL, Cheung BMY, Man YB, Lau CP, Lam KSL. Prevalence, awareness, treatment, and control of hypertension among United States adults 1999-2004. Hypertension. 2007 Jan;49(1):69-75. doi: 10.1161/01.HYP.0000252676.46043.18 PMID: 17159087.
38. Ingale AS, Deshmukh JV. Prevalence of hypertension and its associated risk factors in adult: a unique study at field practice area of urban health training center. Int J Community Med Public Health. 2017 Feb 23;4(2):572-81. doi: 10.18203/2394-6040.ijcmph20170293.

Received*: 07-06-2026 -* ***Accepted****: 04-08-2026 -* ***Published****: 11-08-2026*