



Is Satisfactory Blood Pressure Control Easily Achievable in an Iraqi Cohort of Essential Hypertension?

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Abstract: Background and Objectives: Hypertension (HTN) is among the major health problems worldwide, despite this, many studies have shown that the control of high blood pressure (BP) is inadequate. This study aims to obtain insight into this issue and to assess to which extent an optimal BP can be achieved in Erbil, Iraq (a low-middle income country). **Materials and Methods:** This observational prospective study enrolled 200 hypertensive patients who attended the medical consultation room at Hawler Teaching Hospital, Erbil, Iraq from 1st February 2023 to 31st January 2024. Baseline demographic data, comorbidities, and relevant lab investigations were obtained, recorded, and analyzed. All participants underwent office BP measurements on four scheduled visits 1 month apart, and appropriate interventions were done. **Results:** Out of 200 participants, only 44 (22%) initially had their BP at target, which was increased with intense follow-up and suitable intervention to 47%. The participants with HTN control were more likely to be; of older age, females, practicing active life, nonsmokers, and on single-pill combination therapy with a P value of (0.032, 0.041, 0.043, 0.046, 0.03) respectively. **Conclusion:** Hypertension control is suboptimal in our population. Intense follow-up and appropriate interventions resulted in better BP control. Older adults, women, nonsmokers, those practicing active life, and those on single-pill combination therapy were more likely to achieve adequate control. Our findings might prompt redesigning the hypertension control program in our region into a more sustainable expandable one.

Keywords: Blood Pressure, Iraq, Hypertension, Treatment, Control.

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INTRODUCTION

Hypertension (HTN) is a serious global medical condition that significantly increases the risk of diseases of the heart, brain, kidneys, and other organs. Around 1.4 billion people worldwide, and approximately one-third of American adults have high blood pressure (BP) [1, 2]. Hypertension represents a major modifiable risk factor for cardiovascular disease (CVD) and stroke, it is the

leading global risk for death accounting for 13% of mortality [3, 4]. Over three-quarters of CVD and stroke-related deaths occur in low-middle-income countries (LMIC) [5]. Despite global efforts to combat HTN, treatment, and control rates are low, and the management of the acute and chronic consequences remains poorly optimized across much of the LMIC with delays in presentation, limited access to diagnosis, and rudimentary follow-up care, however

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cost-effective treatment options do exist [3-6]. In addition to therapeutic lifestyle modifications as a primary intervention for BP control, high adherence to antihypertensive medications has been associated with greater odds of BP control [7]. The strategies for improving adherence can include prescribing generic medications, fixed-dose combinations, using longer days' supply per fill, and monitoring and assessing adherence [2-8].

According to data from the World Health Organization (WHO), which was based on the Iraqi Ministry of Health report 2019, it was estimated that 30% of Iraqis have high BP [9].

This study aimed to evaluate the degree of BP control and to what extent the control rate might be improved through intense follow-up and appropriate interventions in patients with essential hypertension in Erbil, Iraq (a low-middle-income country).

PATIENTS AND METHOD

This observational prospective study was conducted in Hawler Teaching Hospital, Erbil, Iraq, medical outpatient unit between 1st February 2023 and 31st January 2024. Patients with confirmed HTN, based on the WHO and European Society of Hypertension (ESH) guidelines of having a BP \geq 140/90 mmHg [5-10], were enrolled in this study unless they met any of the following exclusion criteria: Age < 18 years or > 79 years, patients with secondary HTN (like: coarctation of the aorta, endocrine disorders, kidney diseases, obstructive sleep apnea, and drug-induced), and those with advanced comorbidity like malignancy. The recruited subjects comprised 237 hypertensive patients who attended the medical outpatient unit; 37 were excluded because of unwillingness, incomplete, or missing data. From the remainder informed written consent was obtained. All participants underwent detailed history, physical examination, and data collection, which included age, gender, weight, height, body mass index (BMI) (kg/m^2), smoking status, comorbidities, family history of HTN, and the prescribed regular medications. Relevant laboratory tests were performed on standard methods or utilizing spectrophotometric techniques for chemical analysis accordingly, including; serum creatinine, estimated glomerular filtration rate, urine analysis, lipid profile, fasting blood sugar, and HbA1c, in addition to electrocardiogram, echocardiography, and abdominal ultrasound. At each of four, monthly scheduled visits, office BP was measured twice consecutively in the sitting position after a rest of 3-5 minutes using a standardized electronic and or mercury sphygmomanometer with a suitable size cuff, the cuff inflated to a pressure of approximately

30 mmHg greater than systolic BP while the patient's arm was maintained at the level of the heart, the systolic BP was taken as equal to the pressure at which the sound is first heard by auscultation (Korotkoff phase 1), and the diastolic BP as equal to phase 5 (the point of disappearance of the sound) or phase 4 (muffled sound). The office BP value is the average of two measurements taken at each visit. However, if the difference between the two readings is greater than 5 mmHg, then another measurement is taken and the mean will be recorded. The BP value of < 130/80 mmHg for patients of 18-64 years and < 140/80 for those of 65-79 years is regarded as satisfactory control based on 2023 ESH [10]. An interview was performed with all participants focusing on awareness of HTN, its risk for human health, and appropriate instructions concerning lifestyle modification like weight reduction, eating a healthy diet through reducing salt and saturated fat intake, eating more fruit and vegetables, encouraging active exercise on a regular base, avoiding smoking, and the adherence to medications. According to WHO recommendations [5], we initiate treatment with any one of the following drug classes; Thiazide or thiazide-like agents, angiotensin-converting enzyme inhibitors (ACEIs) or angiotensin receptor blockers (ARBs), and calcium channel blockers (CCB), but if the baseline BP is \geq 20/10 mmHg above the target a single-pill combination therapy was used.

Ethical Approval

The study was conducted in accordance with the ethical principles that have their origin in the Declaration of Helsinki (revised 2013). The study protocol, subject information, and consent form were reviewed and approved by the College of Medicine, HMU ethics committee, according to document number (meeting code 9, paper code 27, 2023). Confidentiality and anonymity of the data were ensured.

Statistical Analysis

Continuous variables are presented as mean and standard deviation (SD), and categorical variables are presented as frequencies and percentages. A one-way ANOVA test was used for continuous variables, and the chi-squared or Fisher's exact test was used for categorical variables to compare proportions. The generated data were entered into MS Excel and analyzed using the Statistical Package for Social Sciences version 24 (SPSS, IBM company, USA). Statistical significance was set at $P < 0.05$.

RESULTS

The final sample size comprised 200 hypertensive patients, their mean age was 56 ± 15.7 years, 44% were males, and 68% ($n=136$) were aged

≥ 45 years. All participants were aware of their HTN status. (Table 1) lists the baseline characteristics of the study sample.

Table 1: Baseline characteristics of the study participants (total 200)

Characteristics	No (% or SD)
Gender	
Male	88 (44%)
Female	112 (56%)
Age (years)	56 ± 15.7
< 45	64 (32%)
≥ 45	136 (68%)
Body mass index (kg/m ²)	27.7 ± 5.1
Education	
Primary school or under	76 (38%)
Above primary school	124 (62%)
Physical activity	
Sedentary	66 (33%)
Non-sedentary	134 (67%)
Current smoking	
Yes	42 (21%)
No	158 (79%)
Diabetes mellitus	
Yes	34 (17%)
No	166 (83%)
Dyslipidemia	
Yes	68 (34%)
No	132 (66%)
Personal history of CVD* and stroke	
Yes	38 (19%)
No	162 (81%)
Family history of CVD and stroke	
Yes	44 (22%)
No	156 (78%)
Hypertension grades	
Grade 1 (BP 140/90-159/99)	48 (24%)
Grade 2 (BP 160/100-179/109)	116 (58%)
Grade 3 (BP ≥ 180/110)	36 (18%)
Serum creatinine mg/dL	0.8 ± 0.27
Treated hypertension	86 (43%)
Controlled hypertension	44 (22%)

CVD*: cardiovascular disease.

Regarding HTN treatment, it is notable that the treatment rate increased significantly at the last visit. Calcium channel blockers and angiotensin

receptor blockers were more likely to be used. The combination therapy was significantly increased at the last visit (Table 2).

Table 2: Antihypertensive medications and therapy type used by the participants (n 200)

Class of antihypertensive drugs	1 st visit	Last visit	P
Total treated participants	86 (43%)	188 (94%)	0.046
Thiazide and thiazide like diuretics	18 (20.9%)	52 (27.7%)	0.36
Angiotensin-converting enzyme inhibitors	13 (15.1%)	34 (18%)	0.68
Calcium channel blockers	38 (44.2%)	146 (77.6%)	0.04
Angiotensin receptor blockers	34 (39.5%)	128 (68%)	0.048

Class of antihypertensive drugs	1 st visit	Last visit	P
Beta-blockers	14 (16.3%)	38 (20.2%)	0.43
Centrally acting antihypertensive agents	4 (4.7%)	11 (5.8%)	0.46
Therapy type	(n=86)	(n=188)	
Monotherapy	42 (48.8%)	48 (27.7%)	0.24
Dual therapy	34 (39.6%)	122 (64.9%)	0.045
Triple therapy or more	10 (11.6%)	18 (7.5%)	0.58

The participants with HTN control were more likely to be; of older age, female, practicing

active life, non-smokers, and on combination antihypertensive therapy (Table 3).

Table 3: Characteristics of the participants, stratified by hypertension control status at last visit

Characteristics	Controlled	Uncontrolled	Total	P value
Participants	94 (47%)	106 (53%)	200	
Age (years)				
<45	22 (34.4%)	42 (65.6%)	64	0.032
≥45	72 (52.9%)	64 (47.1%)	136	
Gender				
Male	38 (43.1%)	50 (56.8%)	88	0.041
Female	56 (50%)	56 (50%)	112	
Body mass index (kg/m ²)	26.8±4.2	28.8±5.0	27.7±5.1	0.321
Education				
Primary school or under	36 (47.4%)	40 (52.6%)	76	0.682
Above primary school	58 (46.7%)	66 (52.3%)	124	
Physical activity				
Sedentary	28 (42.4%)	38 (57.6%)	66	0.043
Non-sedentary	66 (49.2%)	68 (50.8%)	134	
Personal history of CVD*				
Yes	18 (47.4%)	20 (52.6%)	38	0.53
No	76 (46.9%)	86 (53.1%)	162	
Family history of CVD				
Yes	20 (45.5%)	24 (54.5%)	44	0.36
No	74 (47.4%)	82 (52.6%)	156	
Current smoking				
Yes	18 (42.9%)	24 (57.1%)	42	0.046
No	76 (48.1%)	82 (51.9%)	158	
Diabetes Mellitus				
Yes	16 (47.1%)	18 (52.9%)	34	0.836
No	78 (47%)	88 (53%)	166	
Dyslipidemia				
Yes	33 (48.5%)	35 (51.5%)	68	0.213
No	61 (46.2%)	71 (53.8%)	132	
Therapy type (n=188)				
Monotherapy	18 (37.5%)	30 (69.2%)	48/188	0.03
Combination therapy	76 (54.3%)	64 (45.7%)	140/188	

CVD*: cardiovascular disease

DISCUSSION

Globally, elevated BP is a major risk factor for CVD, stroke, chronic kidney disease, and dementia [11]. Inadequate HTN control appears to be a prevalent problem worldwide, especially in LMIC, and novel approaches for improving HTN control are urgently required [6]. In this study, among 200 adults with HTN awareness, 43% were on treatment and just 22% achieved adequate control at baseline. However after intense follow-up and suitable

interventions through frequent scheduled visits, the HTN treatment and control rates were increased at the last visit to 94% and 47% respectively. Our findings at baseline align with data from several LMICs. In a survey from Lebanon an adjacent country, the treatment and control rates were 48.9% and 27% respectively [12]. The WHO records (70% of data from LMIC), showed that around 42% of hypertensives are diagnosed and treated, and nearly 21% had their BP under control [1].The National

Vietnamese study reported that approximately half of the aware had received treatment and no more than one-fifth had been adequately controlled [13]. A systemic review and meta-analysis from India revealed a HTN control rate of 22.5% [14]. On the other hand, the increase in the HTN treatment and control rates at the end of this study is consistent with that reported in several high-income countries. In a multinational study, using surveys from 12 high-income countries, the treatment and control rates were highest in Canada, South Korea, Germany, and the USA (awareness >75%, treatment >70%, control >50%), whereas the lowest rates recorded in Finland, Ireland, Japan, and Spain (awareness > 65%, treatment > 50%, control < 30%) [15]. Beyond guidelines and advanced health systems, the countries with the best HTN control have national programs for HNT education or health check-ups [15]. The current study showed that awareness is insufficient for optimal BP control, if not followed by a robust therapeutic approach and follow-up. In our context, the improved treatment and control rates might be attributed to intense follow-up, easily accessible healthcare facilities, full coverage of medications, and better drug adherence. The Kaiser Permanent healthcare system in the USA has successfully increased the HTN control rate by up to 90%, using evidence-based guidelines, comprehensive HTN registry, single-pill combination therapy, timely follow-up periods, and progress monitoring [16]. A recent Indian study that analyzed data from four states under the IHCI (Indian Hypertension Control Initiative) reported a significant increase in BP control rates (59.8% in follow-up versus 26.3% at baseline) [17]. In the present study; older adults, women, those practicing active life, nonsmokers, and those on combination antihypertensive therapy were more likely to achieve adequate HTN control, whereas no such associations identified with BMI, level of education, comorbidities like cardiovascular disease, diabetes mellitus, and dyslipidemia, which concur with the findings of some studies and are inconsistent with others that may be related to sample size, and several demographic and socioeconomic factors. Hien *et al.*, reported higher control rates among women, old adults, noncurrent smokers, and urban residents, whereas no association was detected with physical inactivity, obesity, and DM [18]. Tripathy *et al.*, reported that patients with uncontrolled HTN were more frequently male, obese, and diabetic, with a sedentary lifestyle [19]. Maniyara *et al.*, revealed a higher control rate among older adults, having DM, and medium education level, whereas it is not associated with sex, residence, and obesity [20]. The greater control of HTN among older adults could be due to better compliance [21]. The control among women might be related to better health-seeking behavior

[22]. Physical activity had a positive effect on HTN, regular physical exercise would reduce the risk of many adverse health outcomes [23]. A strong association between smoking and HTN had been reported in a previous study [24]. A single-pill combination therapy is the first-line strategy for many patients, which reduces pill burden, improves adherence, and achieves better control [3-10].

Limitations

The study covers a single governorate in Iraq, a relatively small size sample, and all participants were urban residents, so as it is a regional study may not apply to the rest of Iraq.

CONCLUSION

Our study showed a suboptimal Hypertension control rate. Intense follow-up and appropriate interventions improved the control rate. Older adults, women, those practicing active life, nonsmokers, and those on single-pill combination therapy were more likely to achieve adequate control. Our findings might prompt redesigning the hypertension control program in our region into a more sustainable expandable one.

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REFERENCE

1. Hypertension. Key facts. 13 September 2019. <http://www.who.int/news-room/fact-sheets/detail/hypertension>.
2. Chang, T. E., Ritchey, M. D., Ayala, C., Durthaler, J. M., & Loustalot, F. (2018). Use of strategies to improve antihypertensive medication adherence within United States outpatient health care practices, DocStyles 2015-2016. *The Journal of Clinical Hypertension*, 20(2), 225-232.
3. Seeley, A., Prynne, J., Perara, R., Street, R., Davis, D., & Etyang, A. O. (2020). Pharmacotherapy for hypertension in Sub-Saharan Africa: a systematic review and network meta-analysis. *BMC Med*, 18(1), 75. <http://doi.org/10.1186/s12916-020-01530-z>.
4. Fuchs, F. D., & Whelton, P. K. (2020). High blood pressure and cardiovascular disease. *Hypertension*, 75(2), 285-292.
5. Guideline for pharmacological treatment of hypertension in adults. Geneva: World Health

- Organization; 2021. License: <http://www.who.CC BY-NC-SA 3.0 IGO>
6. Vedanthan, R., Bernabe-Ortiz, A., Herasme, O. I., Joshi, R., Lopez-Jaramillo, P., Thrift, A. G., ... & Fuster, V. (2017). Innovative approaches to hypertension control in low-and middle-income countries. *Cardiology clinics*, 35(1), 99-115.
 7. Piercefield, E. W., Howard, M. E., Robinson, M. H., Kirk, C. E., Ragan, A. P., & Reese, S. D. (2017). Antihypertensive medication adherence and blood pressure control among central Alabama veterans. *J Clin Hypertens*, 19, 543-549. <http://doi.org/10.1111/jgh.12953>.
 8. Choudhry, N. K., Denberg, T. D., Qaseem, A., & Clinical Guidelines Committee of the American College of Physicians. (2016). Improving adherence to therapy and clinical outcomes while containing costs: opportunities from the greater use of generic medications: best practice advice from the Clinical Guidelines Committee of the American College of Physicians. *Annals of internal medicine*, 164(1), 41-49.
 9. World Health Organization. Global status report on non-communicable disease 2023. <https://www.emro.who.int/iraq/priority-areas/noncommunicable-diseases.html>
 10. Mancia Chairperson, G., Brunström, M., Burnier, M., Grassi, G., Januszewicz, A., Muiesan, M. L., ... & Kjeldsen, S. (2023). 2023 ESH Guidelines for the management of arterial hypertension The Task Force for the management of arterial hypertension of the European Society of Hypertension Endorsed by the European Renal Association (ERA) and the International Society of Hypertension (ISH). *Journal of hypertension*, 41(12), 1874-2071.
 11. Unger, T., Borghi, C., Charchar, F., Khan, N. A., Poulter, N. R., Prabhakaran, D., ... & Schutte, A. E. (2020). 2020 International Society of Hypertension global hypertension practice guidelines. *Hypertension*, 75(6), 1334-1357.
 12. Matar, D., Frangieh, A. H., Abouassi, S., Bteich, F., Saleh, A., Salame, E., ... & Azar, R. R. (2015). Prevalence, Awareness, Treatment, and Control of Hypertension in Lebanon. *The Journal of Clinical Hypertension*, 17(5), 381-388.
 13. Do, H. T., Geleijnse, J. M., Le, M. B., Kok, F. J., & Feskens, E. J. (2015). National prevalence and associated risk factors of hypertension and prehypertension among Vietnamese adults. *American journal of hypertension*, 28(1), 89-97.
 14. Koya, F. S., Pilakkadavath, Z., Chandran, P., Wilson, T., Kuriakose, S., & Akbar, S. K. (2022). Hypertension control rate in India: systematic review and meta-analysis of population-level non-interventional studies 2001-2022. *Lancet Reg Health Southeast Asia*, 23(9), 100113. <https://doi.org/10.1016/j.lansea.2022.100113>
 15. NCD Risk Factor Collaboration. (2019). Long-term and recent trends in hypertension awareness, treatment and control in 12 high-income countries: an analysis of 123 nationally representative surveys. *Lancet*, 394, 639-51. [http://doi.org/10.1016/S0140-6736\(19\)31145-6](http://doi.org/10.1016/S0140-6736(19)31145-6).
 16. Jaffe, M. G., & Young, J. D. (2016). The Kaiser Permanente Northern California story: improving hypertension control from 44% to 90% in 13 years (2000 to 2013). *The Journal of Clinical Hypertension*, 18(4), 260.
 17. Kaur, P., Kunwar, A., Sharma, M., Mitra, J., Das, C., Swasticharan, L., ... & Bhargava, B. (2021). India hypertension control initiative—hypertension treatment and blood pressure control in a cohort in 24 sentinel site clinics. *The Journal of Clinical Hypertension*, 23(4), 720-729.
 18. Hien, H. A., Tam, N. M., Tam, V., Derese, A., & Devroey, D. (2018). Prevalence, awareness, treatment, and control of hypertension and its risk factors in (Central) Vietnam. *International journal of hypertension*, 2018(1), 6326984.
 19. Tripathy, J. P., Thakur, J. S., Jeet, G., Chawla, S., & Jain, S. (2017). Alarming high prevalence of hypertension and pre-hypertension in North India-results from a large cross-sectional STEPS survey. *PloS one*, 12(12), e0188619.
 20. Maniyara, K., Kodali, P. B., & Thankappan, K. R. (2023). Prevalence, awareness, treatment, control and correlates of prevalence and control of hypertension among older adults in Kerala: A mixed methods study. *Indian Heart Journal*, 75(3), 185-189.
 21. Mutneja, E., Yadav, R., Dey, A. B., & Gupta, P. (2020). Frequency and predictors of compliance among patients taking antihypertensive medicines. *Indian Heart Journal*, 72(2), 136-139.
 22. Zhang, Y., & Moran, A. E. (2017). Trends in the prevalence, awareness, treatment, and control of hypertension among young adults in the United States, 1999 to 2014. *Hypertension*, 70(4), 736-742.
 23. Piepoli, M. F., Hoes, A. W., Agewall, S., Albus, C., Brotons, C., Catapano, A. L., ... & Members, T. F. (2016). Guidelines: Editor's choice: 2016 European Guidelines on cardiovascular disease prevention in clinical practice: The Sixth Joint Task Force of the European Society of Cardiology and Other Societies on Cardiovascular Disease Prevention in Clinical Practice (constituted by representatives of 10 societies and by invited experts) Developed with the special contribution of the European Association for Cardiovascular Prevention & Rehabilitation (EACPR). *European heart journal*, 37(29), 2315.
 24. Gao, K., Shi, X., & Wang, W. (2017). The life-course impact of smoking on hypertension, myocardial infarction and respiratory diseases. *Scientific reports*, 7(1), 4330.