Original Article

UNCONTROLLED HYPERTENSION AND ASSOCIATED FACTORS AMONG ADULT HYPERTENSIVE PATIENTS

Dr. Abhi Patel[1], Dr. Sarita Mulkalwar[1], Dr. Harshavardhan Bhide[1], Dr. Sudeep David[1*], Dr. Shantanu Chitale[1], Dr. Abhijeet Tilak[1]

[1] Dr. D. Y. Patil Medical College, Hospital & Research Centre, Pimpri, Pune, Maharashtra, India.
Corresponding Author details: Dr. Sudeep David[1]*

DOI: 10.47750/pnr.2023.14.02.214

Abstract

Hypertension is the most challenging public health problems worldwide as the control of high blood pressure is often unsatisfactory. Blood pressure control may be influenced by a variety of factors, including patients' demographic characteristics, life style choices, underlying comorbidity, patient knowledge related to hypertension and its treatment adherence. The objectives of this study were to determine the prevalence of uncontrolled hypertension and associated factors among hypertensive patients. Hospital based cross sectional observational study was conducted among 217 adult hypertensive patients. Epi Info (version 7.2) was used for analysis of data from case record forms. The means of the parameters were compared between groups using chi square test and correlation between variables was assessed by utilizing odds ratios. p-value <0.05 was considered significant. Prevalence of uncontrolled hypertension was 53.46%, noted more in males (62.61%), patients of age > 50 years (62.62%), patients with secondary education (74.51%) and with low medication adherence (78.18%). Non-adherent to smoking abstinence (adjusted odds ratio: 4.30, 95% confidence interval: 2.30-8.05), non-adherent to alcohol abstinence (adjusted odds ratio: 2.07, 95% confidence interval:1.14-3.76), sedentary lifestyle (adjusted odds ratio: 5.37, 95% confidence interval: 2.59-11.13), non-adherent to low salt diet (adjusted odds ratio: 2.39, 95% confidence interval:1.20-4.75) and lack of awareness of hypertension related complications (adjusted odds ratio: 12.9, 95% confidence interval: 3.84-43.88) were significant factors causing uncontrolled hypertension. In order to achieve optimal blood pressure control, more attention should be focused on modifiable risk factors. Patients' awareness towards complications of hypertension and medication adherence are also crucial.

KEYWORDS: Uncontrolled hypertension, prevalence, risk factors, lifestyle factors.

INTRODUCTION:

Hypertension is the most challenging public health problems worldwide as the control of high blood pressure is often unsatisfactory. Hypertension in adult (age>18years) is defined as a person having systolic blood pressure (SBP) 140 mmHg or more and/or diastolic blood pressure (DBP) 90 mmHg or more or taking antihypertensive medication to lower it [1]. Hypertension is known as silent killer because most of the people having high blood pressure do not have any sign and symptom. That is why regular monitoring and keeping records of blood pressure is required.

Despite the availability and advancement of therapeutic and diagnostic procedures that have been shown to reduce cardiovascular morbidity and mortality, hypertension control rates are still insufficient. Being one of the most common non-communicable diseases, worldwide one out of three adults have raised blood pressure which cause

50% of deaths from stroke and heart disease [2]. Cardiovascular disease risk doubles for every 20-mmHg increase in systolic blood pressure and 10-mmHg increase in diastolic pressure.

Uncontrolled hypertension is defined as an average systolic blood pressure ≥ 140 mmHg or an average diastolic blood pressure ≥ 90 mmHg, in hypertensive patient [3]. For the better management of hypertension, the factors which affect control of blood pressure should be known. Blood pressure control may be influenced by a variety of factors, including the underlying pathophysiology, patient compliance behaviour, adherence to treatment, the presence of comorbid illnesses, patient knowledge about complication of hypertension. However, there are few additional factors that affect blood pressure, such as age, severity of the disease, lifestyle habits like salt intake, smoking and alcohol use. These factors can cause uncontrolled hypertension, if they are not adequately taken into consideration.

If the blood pressure is not under control in hypertensive patient the risk of cardiovascular diseases increases. Widespread diagnosis and treatment have significantly reduced blood pressure and deaths from heart disease. Hypertension can be controlled by lifestyle modification and pharmacotherapy. To reduce the prevalence of uncontrolled hypertension, adherence to the treatment should be increased. For better control of hypertension, patients must adhere to not just their medication regimens but also their dietary instructions, follow their doctor's advice, and alter their lifestyles.

Awareness of the hypertension treatment and also sequelae of uncontrolled hypertension play an important role in treatment adherence. The aim of this study was to estimate the prevalence of uncontrolled hypertension in hypertensive patient and determine the factors affecting uncontrolled hypertension.

METHODS:

Study Area and Design:

Hospital based cross sectional study was conducted among adult hypertensive patients attending out-patient department in Dr. D.Y. Patil Medical College, Hospital and Research Centre in Pune during the period of January 2022 to September 2022.

Study Sample Size:

The study done by Meelab S et al [4] showed that prevalence of uncontrolled hypertension was 54.4%, entering this data in Win-Pepi software (version 11.38), taking allowable error of 7%, at 95% confidence level, the calculated sample size comes 194. Considering the nonresponse rate of 10%, the total sample size comes to 217. Medication adherence was noted using Morisky Green Levine medication adherence scale (MGLS) [5].

Inclusion Criteria:

All adult (≥ 18 years old) who came to hospital out-patient department, diagnosed as hypertensive patients for more than one month regardless of taking hypertensive medication and willing to participate in study were included in this study. However, hypertensive pregnant and lactating women were excluded from the study.

Data from case record forms were entered in Microsoft Excel and analysis was done using Epi Info (version 7.2) software. Using a Microsoft Excel sheet, graphs were created using the categorical variable's frequency and percentage expressions. The study was approved by the Institutional ethics committee (IEC) before its initiation.

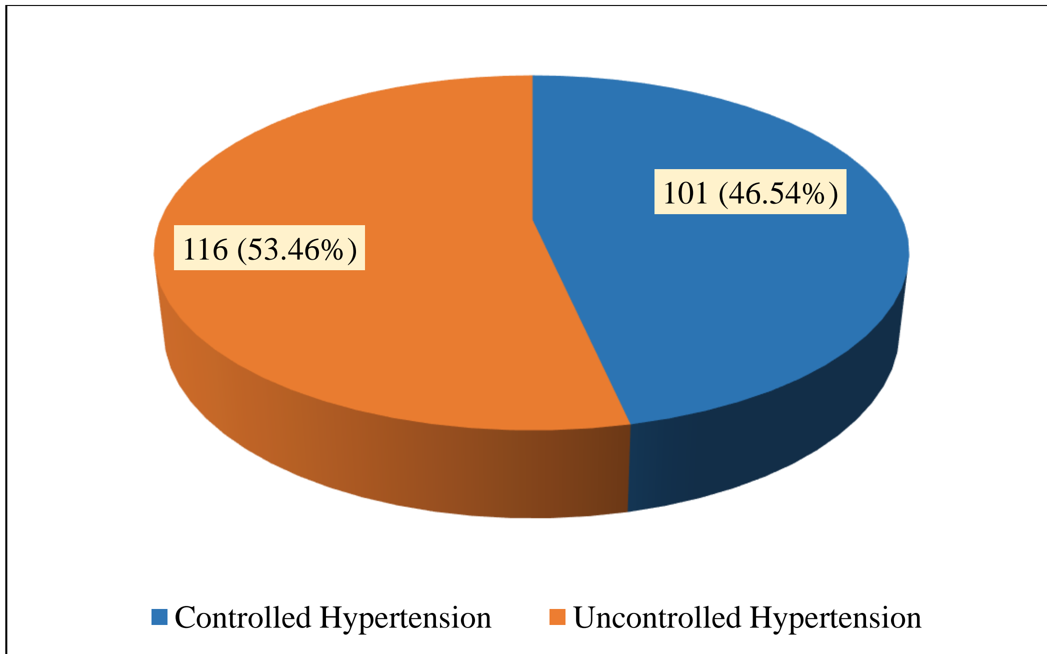
RESULTS:

A total of 217 patients with hypertension were recruited in the study. Their data was evaluated for factors affecting the control of hypertension. The observations of this study are as follows.

Prevalence of Uncontrolled Hypertension

Among the 217 patients assessed for Hypertension control, 116 met the definition of uncontrolled hypertension with a prevalence of 53.46% (95%CI: 46.58- 60.24%); and only 101 (46.54%) participants had controlled Hypertension. (Figure 1)

Figure 1: Prevalence of uncontrolled hypertension.



Demographic Characteristics

The baseline demographic characteristics of study participants are presented in Table 1. The majority of the patients in the age group of >50 years (62.62%) had uncontrolled hypertension, followed by age groups 31-50 years (50%) and <30 years (30%) (p=0.004). Out of 115 males, 72 (62.61%) had uncontrolled hypertension whereas, out of 102 females, uncontrolled hypertension was noted in 44 (43.14%) (p=0.004). The odds of having uncontrolled hypertension were 2.2 times higher among the males compared to females (AOR = 2.20, 95%CI: 1.28,3.80).

Uncontrolled hypertension was noted in 25 (43.10%) patients with postgraduate education, in 53 (49.07%) patients with graduate education and in 38 (74.51%) patients with secondary education. The average systolic blood pressure in patients with uncontrolled hypertension was 146.43 ± 11.27mmHg and diastolic blood pressure was 89.59 ± 6.57mmHg. (Table 1)

Table 1: Demographic characteristics of hypertensive patients.

Factors	Total (217)	Controlled (101)	Uncontrolled (116)	*p*-value
Age group				
< 30 years	30 (13.82%)	21 (70.00%)	9 (30.00%)	0.004[a]
31 to 50 years	80 (36.87%)	40 (50.00%)	40 (50.00%)	

> 50 years	107 (49.31%)	40 (37.38%)	67 (62.62%)	
Sex				
Female	102 (47.00%)	58 (56.86%)	44 (43.14%)	0.004[a]
Male	115 (53.00%)	43 (37.39%)	72 (62.61%)	
Education				
Secondary	51 (32.76%)	13 (25.49%)	38 (74.51%)	0.002[a]
Graduate	108 (45.69%)	55 (50.93%)	53 (49.07%)	
Postgraduate	58 (21.55%)	33 (56.90%)	25 (43.10%)	
Blood pressure (mmHg)				
SBP (mean ± SD)	138.41 ± 12.69	129.21 ± 6.46	146.43 ± 11.27	< 0.001[b]
DBP (mean ± SD)	85.64 ± 7.13	80.46 ± 3.91	89.59 ± 6.57	< 0.001[b]

mmHg: millimetre of mercury; SBP: Systolic Blood Pressure; DBP: Diastolic Blood Pressure

[a] *Chi-square test*

[b] *Mann Whitney U test*

Lifestyle Factors

Non-adherence to smoking and alcohol abstinence, physical activity and amount of salt intake, were significantly associated with uncontrolled hypertension. Hypertensive patients who smoke tobacco were four times more likely to suffer from uncontrolled hypertension than those who do not smoke (AOR: 4.30, 95% CI:2.30-8.05). Similarly, the odds of having uncontrolled hypertension were twice as high in patients consume alcohol (AOR: 2.07, 95% CI:1.14-3.76). Patients who did not exercise were five times more likely to have uncontrolled hypertension than those who exercised regularly (AOR: 5.37, 95% CI: 2.59-11.13). In comparison to their counterparts, hypertensive patients who did not follow a low-salt diet guidelines were twice as likely to experience uncontrolled hypertension (AOR: 2.39, 95% CI:1.20-4.75). (Table 2).

Table 2: Lifestyle characteristics of hypertensive patients.

	Total (217)	**Controlled (101)**	**Uncontrolled (116)**	**Odds ratio**	***p*-value**
Adherence to smoking abstinence				4.30	
Yes	143 (65.90%)	83 (58.04%)	60 (41.96%)		< 0.001[a]
No	74 (34.10%)	18 (24.32%)	56 (75.68%)		

Adherence to alcohol abstinence				2.07	
Yes	150 (69.12%)	78 (52.00%)	72 (48.00%)		0.015[a]
No	67 (30.88%)	23 (34.33%)	44 (65.67%)		
Adherence to physical activity				5.37	
Yes	160 (73.73%)	90 (56.25%)	70 (43.75%)		< 0.001[a]
No	57 (26.27%)	11 (19.30%)	46 (80.70%)		
Adherence to low salt diet				2.39	
Yes	44 (20.28%)	28 (63.64%)	16 (36.36%)		0.010 [a]
No	173 (79.72%)	70 (42.20%)	100 (57.80%)		
[a] *Chi-square test*					

Comorbidities

Amongst the patients with comorbidities, uncontrolled hypertension was present in 90 (69.23%) patients whereas 40 (30.77%) patients had controlled hypertension. However, in patients without any comorbidities, 61(70.11%) patients had hypertension under control (Figure 2). The most common comorbidity present in patients with hypertension was Obesity (65, 29.95%) followed by Diabetes mellitus (51, 23.50%) and Thyroid disorders (21, 9.67%). (Table 3)

Figure 2: Effect of comorbidities on hypertension.

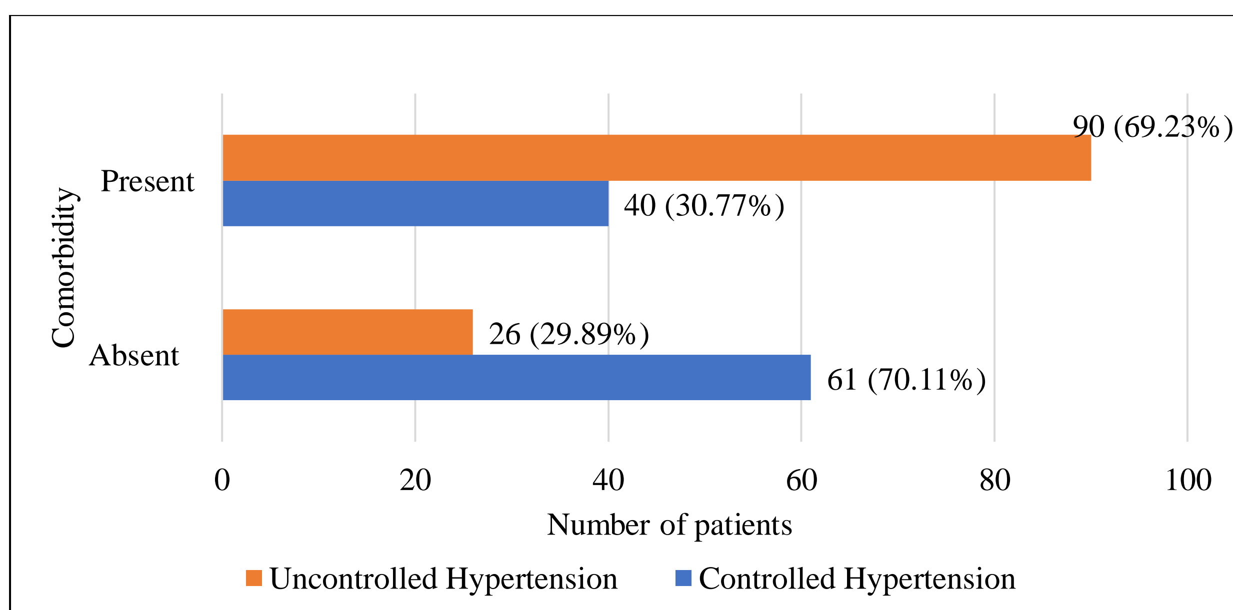


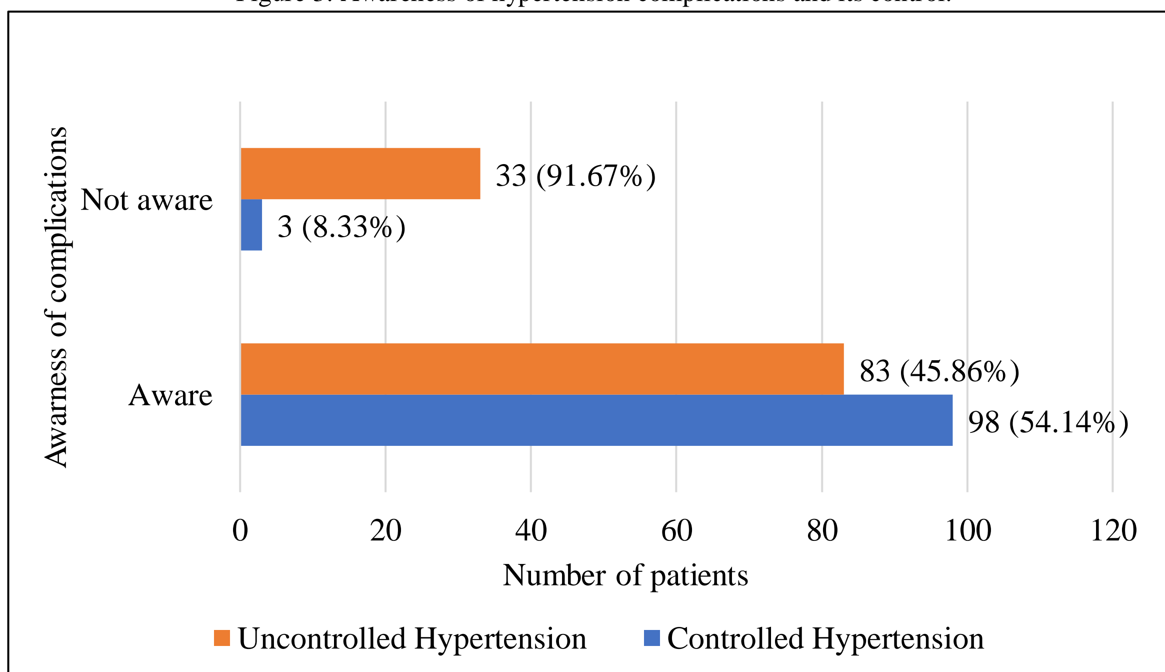
Table 3: Effect of different comorbidities on hypertension.

	Total (217)	Controlled (101)	Uncontrolled (116)
Comorbidities			
Obesity	65 (29.95%)	20 (30.77%)	45 (69.23%)
Diabetes	51 (23.50%)	12 (23.53%)	39 (76.47%)
Thyroid diseases	21 (9.67%)	9 (42.86%)	12 (57.14%)
Cardiac disorders	15 (6.91%)	1 (6.66%)	14 (93.33%)
Renal diseases	8 (3.68%)	1 (12.50%)	7 (87.50%)

Knowledge About the Complications

Uncontrolled hypertension is found to be significantly associated with the level of awareness of the patients to the complications of hypertension. Most of the patients were aware about the complications of hypertension 181 (83.41%), in these patients uncontrolled hypertension was noted in 83 (45.86%). Patients who were not aware about the complications showed high rate of uncontrolled hypertension (91.67%). (Figure 3)

Figure 3: Awareness of hypertension complications and its control.



Treatment Factors

Among the patients taking medication for less than one-year, uncontrolled hypertension was noted in 22 (84.62%) patients. In patients who were taking antihypertensive medication for more than five years, uncontrolled

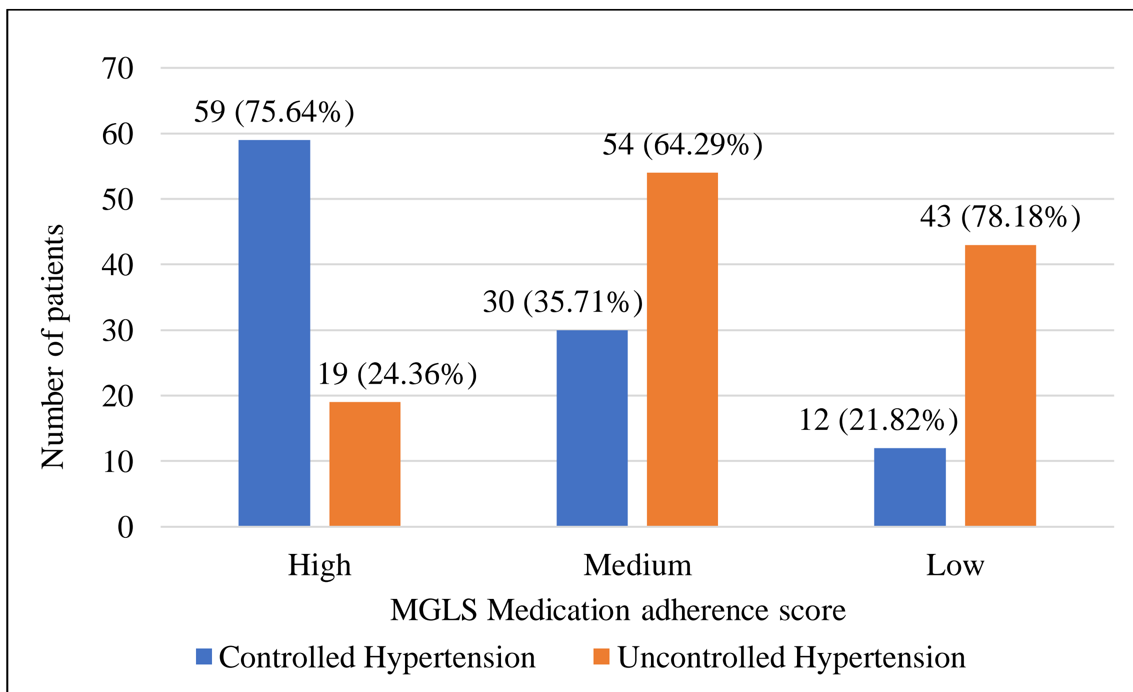
hypertension was noted in 46 (45.10%) patients. Whereas, in patients who were not taking any hypertensive medication, uncontrolled hypertension was noted in 10 (55.56%) patients. (Table 4)

Table 4: Effect of duration of treatment on hypertension.

	Total (217)	Controlled (101)	Uncontrolled (116)
Duration of treatment			
Stop taking treatment	18 (8.29%)	8 (44.44%)	10 (55.56%)
<1 year	26 (11.98%)	4 (15.38%)	22 (84.62%)
1-5 years	71 (32.72%)	33 (46.48%)	38 (53.52%)
>5 years	102 (47.00%)	56 (54.90%)	46 (45.10%)

There was statistically significant association between hypertension control and medication adherence (p <0.001). In patients with a low adherence score, uncontrolled hypertension was noted in 43 (78.18%) patients, compared to patients who had a high adherence score, 19 (24.36%) patients had uncontrolled hypertension (Figure 4).

Figure 4: Impact of medication adherence on hypertension.



DISCUSSION:

Despite the availability of numerous preventive measures and revolutionary advancements in pharmacological management in patients with hypertension, the rate of control of blood pressure remains poor and achieving treatment goals cannot be accomplished. In the present study, 53.46% patients had uncontrolled hypertension.

Many studies have found a similar trend of the high prevalence of uncontrolled hypertension all over the world [4], [6-13].

In the present study, 62.61% male patients and 43.14% female patients had uncontrolled hypertension. High level of medication adherence and low level of smoking and alcohol consumption could be the major factors for better control of blood pressure in females. The prevalence of uncontrolled hypertension was noted highest in the age group of more than 50 years. In older adults, loss of elastin fibres and accumulation of stiffer collagen increases the risk of hypertension. In addition to this decreased physical activity, poor medication adherence and comorbid conditions like hyperlipidaemia, diabetes mellitus etc. also contribute to uncontrolled hypertension. In the current study, higher levels of education were associated with a steady decrease in the prevalence of uncontrolled hypertension. Similar results were found by Tesfaye et al [11] and contradictory results were noted by Meelab S et al [4]. People with higher education tend to be more aware of health conditions and associated complications, leading to healthy behaviours.

Lifestyle changes, such as regular exercise and dietary changes, are frequently advised as an initial step and for the better blood pressure control with pharmacotherapy. It has been demonstrated that the Dietary Approaches to Stop Hypertension diet lowers blood pressure in hypertensive patients who are not receiving pharmacotherapy [14]. In the current study, patients who did not follow a low-salt diet were twice as likely to have uncontrolled hypertension. According to different studies and meta-analysis, moderate reduction in salt intake significantly lower blood pressure in hypertensive patients, which can also be very cost-effective [4], [11], [13], [15]. Uncontrolled hypertension was noted in 43.75% of patients who were adherent to physical activity, similar results were noted in other studies [4], [11]. This study was analogous to metanalysis that found exercise dramatically lowers 24-hour ambulatory SBP and DBP [16]. In the current study, 75.68% patients had uncontrolled hypertension who were currently smoking. It is already known that both heart rate and blood pressure increase during smoking, due to increased cardiac output and increased peripheral vascular resistance [17]. In the current study, 65.67% of patients who were currently consuming alcohol had uncontrolled hypertension. Studies have also established an association between hypertension and high alcohol consumption [4], [11], [13]. Several possible mechanisms such as impairment of the baroreceptors enhanced sympathetic activity, increased cortisol levels, stimulation of the endothelium to release vasoconstrictors, stimulation of the renin-angiotensin-aldosterone system, and lack of relaxation due to oxidative injury and inflammation of the endothelium have been proposed [18].

The present study revealed that 69.23% of patients with one or more comorbidities had uncontrolled hypertension. Comorbidities complicate hypertensive patients' efforts to manage their blood pressure because they also contribute to secondary hypertension. In this study, 91.67% patients had uncontrolled hypertension who were not aware of the complications. Awareness of complications increases medication adherence and health-seeking behaviour which improves blood pressure control [11]. The severity of the disease knowledge and medication adherence rise as treatment time increases, which aids in better blood pressure control. Uncontrolled hypertension was more prevalent in patients taking medication for less than a year (84.62) and in patients with a low adherence score (78.18%). The fact that the result from the present study is in line with that of other studies reaffirms the significance of medication adherence for maintaining good blood pressure control [19], [20].

CONCLUSION:

Uncontrolled hypertension is evidently more prevalent in elderly males who are 50 years and older. Nevertheless, younger hypertensive patients are also at risk. High levels of education prevent the development of uncontrolled hypertension. Smoking and sedentary life style were most common preventable factors associated with uncontrolled hypertension, in addition to alcohol intake and high salt diet. Presence of any comorbidities had deleterious effect on hypertension control while patients' knowledge about the complications and high medication adherence are beneficial for better control of blood pressure levels. Hypertensive patients should be properly educated about complications of hypertension and factors affecting its control for better management.

CONFLICTS OF INTREST: None.

REFERENCES:

1. International Institute for Population Sciences (IIPS) and ICF. 2017.National Family Health Survey (NFHS-4), 2015-16: India. Mumbai: IIPS.
2. World Health Organization. Hypertension September 2019. https://www.who.int/news-room/fact-sheets/detail/hypertension.
3. U.S Department of health & Human Services. Morbidity and Mortality Weekly Report (MMWR). September 7,2012 / 61(35);703-709.
4. Meelab S, Bunupuradah I, Suttiruang J, Sakulrojanawong S, Thongkua N, Chantawiboonchai C, et al. (2019) Prevalence and associated factors of uncontrolled blood pressure among hypertensive patients in the rural communities in the central areas in Thailand: A cross-sectional study. PLoS ONE 14(2): e0212572.
5. Morisky DE, Green LW, Levine DM. Concurrent and predictive validity of a self-reported measure of medication adherence. *Med Care*. 1986;24(1):67–74.
6. O' Mailia J, Sander G, Giles T. Nifedipine associated myocardial ischemic or infarction in the treatment of hypertensive emergencies. Ann Int Med 1987;107:185-186.
7. The Heart outcomes Prevention Evaluation Study Investigators. Effects of an angiotensin converting enzyme inhibitor, Ramipril on cardiovascular events in high risk patients. N Engl J Med 2000;342:145-53.
8. The ALLHAT Officers and Coordinators for the ALLHAT Collaborative research Group. Major outcomes in high-risk hypertensive patients randomized to angiotensin-converting enzyme inhibitor or calcium channel blocker vs diuretic: the Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial (ALLHAT). JAMA 2002;288:2981-2997.
9. ALLHAT Officers and Coordinators for the ALLHAT Collaborative Research Group Diuretic Versus -Blocker as First-Step Antihypertensive Therapy Final Results From the Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial (ALLHAT). Hypertension 2003;42:239-46.
10. Staessen JA, Fagard R, Thijs L, Celis H, Arabidze GG, Birkenhager WH, et al. Randomised double-blind comparison of placebo and active treatment for older patients with isolated systolic hypertension. The Systolic Hypertension in Europe (Syst-Eur) Trial Investigators. Lancet 1997;350:757-764.
11. Tesfaye B, Haile D, Lake B, Belachew T, Tesfaye T, Abera H. Uncontrolled hypertension and associated factors among adult hypertensive patients on follow-up at Jimma University Teaching and Specialized Hospital: cross-sectional study. Research Reports in Clinical Cardiology. 2017;8:21-29.
12. Centers for Disease Control and Prevention (CDC). Hypertension Cascade: Hypertension Prevalence, Treatment and Control Estimates Among US Adults Aged 18 Years and Older Applying the Criteria from the American College of Cardiology and American Heart Association's 2017 Hypertension Guideline—NHANES 2013–2016. Atlanta, GA: US Department of Health and Human Services; 2019.
13. Gebremichael G.B., Berhe K.K. & Zemichael, T.M. Uncontrolled hypertension and associated factors among adult hypertensive patients in Ayder comprehensive specialized hospital, Tigray, Ethiopia, 2018. BMC Cardiovasc Disord 19, 121 (2019).
14. Sacks FM, Svetkey LP, Vollmer WM, et al. Effects on blood pressure of reduced dietary sodium and the Dietary Approaches to Stop Hypertension (DASH) diet. DASH-Sodium Collaborative Research Group. New England Journal of Medicine. 2001 Jan 4;344(1):3–10.
15. He FJ, Li J, Macgregor GA. Effect of longer-term modest salt reduction on blood pressure. Cochrane Database Syst Rev 2013;4:CD004937.
16. Saco-Ledo G, Valenzuela PL, Ruiz-Hurtado G, Ruilope LM, Lucia A. Exercise Reduces Ambulatory Blood Pressure in Patients With Hypertension: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. J Am Heart Assoc. 2020;9(24):e018487.
17. Groppelli A, Giorgi DM, Omboni S, et al. Persistent blood pressure increase induced by heavy smoking. J Hypertens. 1992;10(5):495–499.
18. Dhar, L., Dantas, J. and Ali, M. (2017) A Systematic Review of Factors Influencing Medication Adherence to Hypertension Treatment in Developing Countries. Open Journal of Epidemiology, 7, 211-250.
19. Chia YC, Devaraj NK, Ching SM, et al. Relationship of an adherence score with blood pressure control status among patients with hypertension and their determinants: Findings from a nationwide blood pressure screening program. J Clin Hypertens (Greenwich). 2021;23(3):638-645.
20. Adisa R, Ilesanmi OA, Fakeye TO. Treatment adherence and blood pressure outcome among hypertensive out-patients in two tertiary hospitals in Sokoto, Northwestern Nigeria. BMC Cardiovasc Disord. 2018;18:194.