

A STUDY ON THE PREVALENCE OF METABOLIC SYNDROME AMONG HYPERTENSIVE ADULTS (20-45 YEARS) AND THEIR COMPLIANCE TO TREATMENT IN A TERTIARY CARE HOSPITAL – A HOSPITAL-BASED MIXED METHOD STUDY

A. R Balamurugan¹, Mohammed Hassan Maricar¹, A.R.Kathiravan¹, A R Sree Balaji²

Received : 10/10/2023
Received in revised form : 25/11/2023
Accepted : 08/12/2023

Keywords:

Metabolic syndrome, Hypertensive adults, Lifestyle modifications, Antihypertensive therapy, Triglyceride, HDL.

Corresponding Author:

Dr. A R Sree Balaji,

Email: sreebalaji6969@gmail.com

DOI: 10.47009/jamp.2023.5.6.196

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2023; 5 (6); 953-958



¹Assistant Professor, Department of General Medicine, Government Stanley Medical College and Hospital, Tamilnadu, India

²Junior Resident, Department of General Medicine, Government Erode Medical College and Hospital, Tamilnadu, India

Abstract

Background: Hypertension, a silent killer, accelerates endotheliopathy, leading to complications such as obesity and insulin resistance. Early detection is crucial to prevent life-threatening vascular complications. This study aimed to assess the prevalence of metabolic syndrome among hypertensive adults (20-45 years) and their compliance with treatment at a tertiary care hospital in Chennai. **Materials and Methods:** This cross-sectional study included 365 patients with systemic hypertension at the Department of Medicine, Govt Stanley Medical College and Hospital, from April 2021 to March 2022. A structured questionnaire obtained information regarding sociodemographic factors, clinical history, physical examination findings, and medication adherence. In addition, compliance with lifestyle modifications and follow-up adherence were recorded. **Result:** Of 365 participants, 52.6% were female and 47.4% were male. The prevalence of hypertension was slightly higher in women than in men. Most participants were between 31 and 40 (65.5%), followed by 41 and 45 (31.8%). Two hundred fifty-one participants (68.8%) had low adherence to antihypertensive therapy. Eighty-four participants had medium adherence. Twenty-eight patients complied with the antihypertensive drugs, while 86 did not. The triglyceride values showed that 134 patients had normal levels, while 80 had abnormal levels. The HDL values revealed that 155 patients had normal levels, while 84 had abnormal levels. There was a significant difference in compliance with hypertensive drugs and lifestyle modifications between the patients with metabolic syndrome ($p < 0.0001$). **Conclusion:** Metabolic syndrome is prevalent in adults with hypertension and is often unnoticed until major thrombotic events occur. Early identification and screening improve patient productivity and reduce health expenditure.

INTRODUCTION

Hypertension (HTN) is a dreaded silent killer worldwide. In this industrialised world, stress is invariably present across age groups in all parts of the world. Hypertension accelerates endotheliopathy, leading to various microvascular and macrovascular complications combined with obesity and insulin resistance. This prepones the incidence of various morbidities, thus reducing the productivity of the affected individual and eventually leading to mortality. This drastically affects a family's economy and morale. Thus, the early detection of hypertension and the constellation of factors contributing to metabolic syndrome are important in preventing life-

threatening vascular complications. Although these conditions are diagnosed at the healthcare facility level, treatment compliance is poor. Once identified, the reasons for non-compliance and the solutions to rectify them can be applied in our day-to-day practice, thus improving the effective delivery of health interventions to the last mile.^[1-5]

Aim

This study aimed to assess the prevalence of metabolic syndrome among hypertensive adults (20-45 years) and their compliance with treatment at a tertiary care hospital in Chennai.

MATERIALS AND METHODS

This cross-sectional study included 365 patients with systemic hypertension at the Department of Medicine, Govt Stanley Medical College and Hospital, from April 2021 to March 2022. Permission was obtained from the Institutional Ethical Committee (IEC).

Inclusion Criteria

Individuals aged 20-45 years with systemic hypertension (BP>140/90 as per the 2020 ACC-AHA guidelines) reported to the Department of General Medicine were included.

Exclusion Criteria

Patients aged < 20 years and > 45 years, patients with previously diagnosed diabetes mellitus, patients with secondary hypertension, patients with secondary causes of obesity, patients on steroidal or other medications likely to cause elevated plasma glucose, any acute illness, pregnant women, patients unwilling to participate in the study, and patients who did not give consent for the study were excluded.

The study was initiated after approval by the IEC. After obtaining written informed consent from adults with hypertension, a structured questionnaire was used to obtain information regarding sociodemographic factors, clinical history, physical examination findings, and medication adherence. An in-depth interview (IDI) was conducted among purposively selected non-compliant participants for the qualitative study component.

Medication adherence was assessed using the Morisky Medication Adherence Questionnaire for universal standardisation. A perceived stress scale scoring system was used to categorise participants' stress. The IPAQ questionnaire categorised participants according to their weekly physical activities. In addition, compliance with lifestyle modifications and follow-up adherence were recorded.

Statistical Analysis

The data were entered into MS Excel, and the mean and standard deviation for the continuous independent variables (age, height, weight, waist circumference, triglyceride levels, HDL levels, fasting blood sugar, and postprandial blood sugar) and present the data using frequency tables or frequency distributions for the categorical independent variables (stress, compliance to drug, physical activity, diet, tobacco use, and alcohol consumption).

An unpaired t-test was performed to compare the means of two independent groups, including patients with and without metabolic syndrome. The chi-square test was used to analyse the association between categorical variables such as the compliance status of the participants and the presence of metabolic syndrome. The Mann-Whitney U test was used to compare the medians of two independent samples, such as the compliance of patients with and without metabolic syndrome. The UCLA Center for

Health Policy Research provided the data analysis guidelines, ensuring accurate and complete study reporting. The compliance of patients with and without metabolic syndrome was compared, and the reasons for poor treatment compliance were identified.

RESULTS

Of the 365 participants, 52.6% were female and 47.4% were male. The prevalence of hypertension was slightly higher in women than in men. Most participants were between 31 and 40 (65.5%), followed by 41 and 45 (31.8%). The majority of them have completed middle school and primary schooling alone. Sixty-seven participants had no formal education, and 69 were graduates. Three hundred-one were married, 43 were unmarried, eight were divorced, and 13 were widowed. One hundred and twenty-nine participants were unemployed, 119 were employed, and 117 were homemakers with their spouses working. One hundred and eighty-one were from the rural side, and 184 were from the urban side. Around 132 participants had a hospital within 5 km of their home, while 113 participants had their homes within a 5-15 km radius of the hospital. In addition, 120 patients had the hospital from which they were receiving drugs, approximately 15 km from their residence. Approximately 131 people had a family income between 10000 and 20000. One hundred and thirteen patients had a family income of less than 10000, and 121 had a family income above 20000. One hundred and twenty-five participants had never smoked in their lifetime, and 240 were exposed to either active or passive smoking. Among them, 120 had abstained from smoking for the past month. 68.5% of the participants were consuming alcohol now or then. 32% of participants have never been exposed to alcohol [Table 1].

One hundred seventy-eight patients were prescribed a single pill, and 187 were prescribed multiple pills for antihypertensive therapy. Multiple pill intakes were found to reduce treatment compliance. One hundred twenty-three study participants did not adhere to any recommended lifestyle modifications. A total of 120 participants were rarely adherent to the study. Only 122 of the 365 participants frequently adhered to lifestyle modifications.

Among the participants, 52.6% believed dietary modifications did not change their health conditions. One hundred ninety-five participants said that no proper advice was given to them regarding dietary modification. In contrast, 164 participants said they forgot dietary advice, which was not written. One hundred eighty-eight participants admitted that they could not follow dietary advice due to lack of discipline. Two hundred fifty-one participants (68.8%) had low adherence to antihypertensive therapy. Eighty-four participants had medium adherence. Only 30 of the 365 participants were highly adherent to antihypertensive medications.

Of the 210 people with low stress, 116 participants had moderate stress, and approximately 10.7% (n = 39) had high stress. Psychiatry counselling was provided for people with moderate and high levels of stress. One hundred seventy-eight participants adhered to the treatment follow-up schedule advised by the doctor. One hundred eighty-seven participants came for review less frequently than was advised by doctors. Despite poor drug adherence at home, a high proportion of patients come to review on time because the next visit date is mentioned in the treatment record note given to the patients.

More than half of the study participants (51.2%) attended follow-up less frequently than was advised by the doctor. In addition, patients who frequently adhere to the treatment schedule sometimes miss regular follow-up dates. While enquiring about the reasons for poor follow-up, we found that the long distance to the hospital was the primary reason. More than half the participants had time constraints. The main reason for this was the lack of personnel to accompany them. Cost constraints were also a significant cause of poor follow-up outcomes. Most participants (88.8%) and 324 of the 365 participants performed moderate physical activity. Sixteen participants had low physical activity, whereas 25 (6.8%) had high physical activity [Table 2].

Of 365 participants with hypertension, 229 (62.8%) had hypertension. Twenty-eight patients complied with the antihypertensive drugs, while 86 did not. This indicates that 28 patients successfully managed their hypertension with medication. One hundred seventy-eight patients had a normal waist circumference, whereas 103 had an abnormal waist circumference. For males, 51 had an abnormal waist circumference, and for females, 33 did. This suggests that many patients had central obesity, a key component of Metabolic Syndrome.

The triglyceride values showed that 134 patients had normal levels, while 80 had abnormal levels. This indicated that 80 patients had elevated triglyceride levels, which is another risk factor for Metabolic Syndrome. The HDL values revealed that 155 patients had normal levels, while 84 had abnormal levels. Among males, 74 had an abnormal HDL level, and 52 had an abnormal HDL level. This suggests many patients have low HDL levels, another risk factor for Metabolic Syndrome. The fasting blood sugar values showed that 141 patients had normal levels, while 88 had abnormal levels. This indicates that 88 patients had elevated blood sugar levels, a risk factor for developing type 2 diabetes [Table 3].

Table 1: Demographic data of the study

		Frequency	Percentage (%)
Sex	Male	173	47.4
	Female	192	52.6
Age group	21-30 years	10	2.7
	31-40 years	239	65.5
	> 40 years	116	31.8
Education	No formal education	67	18.4
	Primary school	77	21.1
	Middle school	82	22.5
	High school	70	19.2
	Graduate and above	69	18.9
Marital status	Married	301	82.5
	Unmarried	43	11.8
	Divorced/Separated	8	2.2
	Widower	13	3.6
Occupation	Unemployed	129	35.3
	Employed	119	32.6
	Home Maker	117	32.1
Place of residence	Rural	181	49.6
	Urban	184	50.4
Distance	< 5 km	132	36.2
	5-15 km	113	31
	> 15 km	120	32.8
Income per month	< 10,000	113	31
	10,000-20,000	131	35.9
	> 20,000	121	33.1
Smoking	Never	125	34.2
	Past smoker	120	32.9
	Current smoker	120	32.9
Alcohol use	Never used	117	32.1
	Past user	133	36.4
	Current user	115	31.5

Table 2: Distribution of lifestyle and other factors of the study patients

		Frequency	Percentage (%)
Type of medication	Single pill	178	48.8
	Multiple pills	187	51.2
	No adherence	123	33.7

Compliance with lifestyle modification	Rarely adherent	120	32.9
	Frequently adherent	122	33.4
Reasons for poor adherence to dietary advice	Lack of discipline	188	51.5
	The doctor gave no proper advice	195	53.4
	Forgot to follow as advice was not given in written	164	44.9
	Think it does not change the health condition	192	52.6
Adherence to medication (MMAS Score)	Low (<6)	251	68.8
	Medium (6 & 7)	84	23
	High (equal to 8)	30	8.2
Perceived stress level (PSS score)	Low (0-13)	210	57.5
	Moderate (14-26)	116	31.8
	High (27-40)	39	10.7
Adherence to follow-up	As advised	178	48.8
	Less frequently than advised	187	51.2
Reasons for poor adherence to follow-up	Non-availability of personnel to accompany	188	51.5
	Time constraint	187	51.2
	Long distance from the hospital	191	52.3
	Cost constraints	181	49.6
	Feels better	199	54.5
Level of physical activity	Low (0-599 METs)	16	4.4
	Moderate (600-2999 METs)	324	88.8
	High (\geq 3000 METs)	25	6.8

Table 3: Comprehensive analysis of metabolic syndrome and its impact on cardiovascular health

		Metabolic Syndrome	
		Yes (229)	No (136)
Sex	Male	85	88
	Female	144	48
Compliance with Antihypertensive drugs	Yes	28	86
	No	201	50
Waist Circumference	Normal (Male \leq 102 cm and Female \leq 88 cm)	178	103
	Abnormal (Male $>$ 102 cm and Female $>$ 88 cm)	51	33
Triglyceride Value	Normal ($<$ 150 mg/dl)	134	80
	Abnormal (\geq 150 mg/dl)	95	56
HDL Value	Normal (Male $<$ 40 mg/dl and Female $<$ 50 mg/dl)	155	84
	Abnormal (Male \geq 40 mg/dl and Female \geq 50 mg/dl)	74	52
Fasting Blood Sugar Value	Normal ($<$ 100 mg/dl)	141	103
	Abnormal (\geq 100 mg/dl)	88	33

Table 4: Compliance with drugs and lifestyle modification among metabolic syndrome

		Metabolic syndrome		P value
		Yes (229)	No (136)	
Compliance with hypertensive drugs	No	201	50	$<$ 0.0001*
	Yes	28	86	
Compliance with lifestyle modification	No	188	55	$<$ 0.0001*
	Yes	41	81	

Patients with low compliance to hypertension medication were considered non-compliant, and the odds of being non-compliant to hypertension drugs were 12.34 times higher among those with metabolic syndrome when compared to those without metabolic syndrome ($p < 0.0001$). In addition, patients who did not follow lifestyle modifications or followed them rarely were considered non-compliant, and the odds of being non-compliant to lifestyle modifications were 6.75 times higher among those with metabolic syndrome than among those without metabolic syndrome ($p < 0.0001$).

DISCUSSION

In our study, we observed a high prevalence of Metabolic Syndrome (62.8%) in patients with hypertension. These individuals are prone to accelerated vascular diseases, which drastically reduce their productivity and life expectancy.

Importantly, the mean fasting blood glucose value is 98.8, which signifies most participants are on the verge of diabetes mellitus. In addition, the mean waist circumference of the study population was 91.9, which indicates a high prevalence of obesity.^[6,7] We educated all patients with metabolic syndrome regarding lifestyle modifications and pharmacotherapy. Psychiatric counselling is also provided to those who require it. The most important lacunae identified in our study was the lack of involvement of the family members in the treatment plan. During the one-year course of the study, we observed that the drug adherence rate increased dramatically if any family member was involved, especially the spouse. Although most of our study participants were manual labourers with moderate physical activity (88.8%), the prevalence of obesity was high. This is because of the high glycaemic index of foods, especially fried rice and parotta. These items are readily available in shops near their work

and contribute to obesity and impaired glucose tolerance. To avoid this, home-cooked foods are a healthy and economical alternative.^[8,9]

Even though the study population was relatively young, most forgot to take medicines regularly. Keeping a reminder with an alarm on the cell phone greatly improves compliance. Additionally, prescribing a single combination of pills reduces aversion to drug intake. For those with poor compliance to regular aerobic exercises due to poor discipline, forming a group with peers in the same locality would greatly help. It provides peer motivation to perform aerobic exercises, especially in the morning.^[10,11]

Smoking and Alcoholism were widely prevalent in our study population. Not only is the money spent on the substrates lost, but the productivity of life on the next day is also lost, leading to reduced monthly income and spending of money already saved. Most substance abuse is concealed from the family. Even when they try to quit, it is impossible or very difficult for them to avoid these substances. This was mainly due to a lack of knowledge about quitting them. These people fear stigmatisation to reveal their substance abuse habits in the family, and the vicious cycle continues. The education of family members on substance abuse greatly reduces stigma. The involvement of family members in alcohol consumption and smoking cessation is greatly helpful. Whenever the person becomes demotivated, family members, especially the spouse, come to the rescue. Therefore, the education and involvement of family members are critical bottlenecks in rehabilitation.^[12,13]

The inertia to approach healthcare facilities remains in most of the study population. Surprisingly, none of the study participants were older than 45 years. The study participants were advised to involve their family members in their treatment plans. The inclusion of family members, especially spouses, greatly increased compliance. A multimodal approach to the treatment of metabolic syndrome is highly successful. This is a win-win situation for both patients and treating physicians. Patient education and the involvement of family members are the cornerstones in treating the disease, especially chronic diseases.^[14,15]

CONCLUSION

In conclusion, contrary to our belief, the prevalence of metabolic syndrome in the hypertensive adult population was high. This condition remains unnoticed until a major thrombotic event occurs. Early identification by screening greatly improves a patient's productive life and reduces health expenditures. According to our interviews with the patients, unawareness of the disease, its complications, and available treatment options constituted the major reasons for non-compliance. Patient education plays a key role in treating diseases,

especially chronic diseases that require lifelong treatment. One key factor that drastically improved lifelong therapy compliance was spousal education and involvement in treatment planning. The government has already addressed affordability by providing free health services and drugs. Additionally, the Mobile Medical Unit and Makkalai Thedi Maruthuvam schemes contribute to the screening and treatment of chronic diseases at the community level. A multimodal approach involving planning at the government level, healthcare provider level, patient education, and family involvement in treating these chronic illnesses greatly improves a client's life's health and financial aspects.

Limitations

The study was restricted to a small geographical area, and vascular complications were not observed. The secondary causes of hypertension were not documented in the present study. The follow-up period was less than two years for the study participants, which is a small period, as long-term follow-up is necessary to evaluate the effects of lifestyle modifications and drug therapy in these patients.

REFERENCES

1. European Society of Cardiology and European Society of Hypertension (ESC/ESH). 2018 ESC/ESH Guidelines for the management of arterial hypertension. *Eur Heart J*. 2018;39(33):3021-5079.
2. Clark CE, Taylor RS, Shore AC, Ukoumunne OC, Campbell JL. Association of a difference in systolic blood pressure between arms with vascular disease and mortality: A systematic review and meta-analysis. *Lancet*. 2012;379(9815):905-914.
3. Grassi G, Seravalle G, Trevano FQ, Dell'oro R, Bolla G, Cuspidi C, Arenare F, Mancia G. Neurogenic abnormalities in masked hypertension. *Hypertension*. 2007;50(3):537-542.
4. Huang Y, Huang W, Mai W, Cai X, An D, Liu Z, Huang H, Zeng J, Hu Y, Xu D. White-coat hypertension is a risk factor for cardiovascular diseases and total mortality. *J Hypertens*. 2017;35(4):677-688.
5. Briasoulis A, Androulakis E, Palla M, Papageorgiou N, Tousoulis D. White-coat hypertension and cardiovascular events: A meta-analysis. *J Hypertens*. 2016;34(4):593-599.
6. Mancia G, Fagard R, Narkiewicz K, Redon J, Zanchetti A, Bohm M, et al. 2013 ESH/ESC Guidelines for the management of arterial hypertension. *Eur Heart J*. 2013;34(21):2159-2219.
7. Myers MG. A short history of automated office blood pressure - 15 years to SPRINT. *J Clin Hypertens (Greenwich)*. 2016;18(9):721-724.
8. Parati G, Pomidossi G, Casadei R, Mancia G. Lack of alerting reactions to intermittent cuff inflations during noninvasive blood pressure monitoring. *Hypertension*. 1985;7(4 Pt 2):597-601.
9. Parati G, Stergiou GS, Asmar R, Bilò G, de Leeuw P, Imai Y, et al. European Society of Hypertension Guidelines for Blood Pressure Monitoring at Home: A Summary Report. *J Hypertens*. 2008;26(9):1505-1526.
10. Gaborieau V, Delarche N, Gosse P. Ambulatory Blood Pressure Monitoring Versus Self-measurement of Blood Pressure at Home: Correlation with Target Organ Damage. *J Hypertens*. 2008;26(10):1919-1927.
11. Clement DL, De Buyzere ML, De Bacquer DA, et al. Prognostic Value of Ambulatory Blood-Pressure Recordings in Patients with Treated Hypertension. *N Engl J Med*. 2003;348(25):2407-2415.

12. Sega R, Facchetti R, Bombelli M, Cesana G, Corrao G, Grassi G, Mancia G. Prognostic Value of Ambulatory and Home Blood Pressures Compared with Office Blood Pressure in the General Population: Follow-up Results from the PAMELA Study. *Circulation*. 2005;111(13):1777-1783.
13. Banegas JR, Ruilope LM, de la Sierra A, et al. Relationship Between Clinic and Ambulatory Blood-Pressure Measurements and Mortality. *N Engl J Med*. 2018;378(21):1509-1520.
14. Roush GC, Fagard RH, Thijs L, et al. Prognostic Impact from Clinic, Daytime, and Night-time Systolic Blood Pressure in Nine Cohorts of 13,844 Patients with Hypertension: Investigators ABC-H. *J Hypertens*. 2014;32(12):2332-2340.
15. Fagard RH, Celis H, Thijs L, Staessen JA, Clement DL, De Buyzere ML, De Bacquer DA. Daytime and nighttime blood pressure as predictors of death and cause-specific cardiovascular events in hypertension. *Hypertension*. 2008 Jan;51(1):55-61.