PREVALENCE OF MASKED HYPERTENSION IN PATIENTS WITH METABOLIC SYNDROME COMPARED TO HEALTHY ADULTS- AN OBSERVATIONAL STUDY USING AMBULATORY BLOOD PRESSURE MONITORING

Dr Kritesh Mehta[1]*, **Dr Amitesh Nagarwal[2]**, **Dr Asharam Panda[3]**, **Dr Sundeep Mishra[4]**

[1]DM Resident, Dept. of Cardiology, NIMS & R, Jaipur, Email ID: Amritakritesh26@gmail.com
[2]Assistant Professor, Dept. of Cardiology, NIMS & R, Jaipur
[3]Assistant Professor, Dept. of Cardiology, NIMS & R, Jaipur
[4]HOD Cardiology, NIMS & R, Jaipur

***Corresponding Author:** Dr Kritesh Mehta
*DM Resident, Dept. of Cardiology, NIMS & R, Jaipur, Email ID: Amritakritesh26@gmail.com

Abstract

Introduction: Metabolic syndrome is characterized by high clinic blood pressure (BP), abdominal obesity, impaired fasting glucose, low high-density lipoprotein (HDL) cholesterol, and high triglycerides. In some of these individuals, office BP measurement may be normal with underlying masked hypertension which require correct diagnosis and management to reduce cardiovascular event. Current study aims to assess prevalence of masked hypertension in this population.

Material and Methods: We have recruited 180 Study subjects allocated in two groups- Group A (90 patients with Metabolic Syndrome) and Group B (90 healthy controls without Metabolic Syndrome), who had normal office blood pressure measurement. Ambulatory blood pressure monitoring was done for all to assess 24hr average BP, night time average BP and day time average BP. Details of other cardiovascular risk factors and laboratory investigations were also collected.

Results: Prevalence of Masked Hypertension among group A or with Metabolic Syndrome (Cases) was 52.2%. Cases had more than twofold (2.42) higher risk of masked hypertension and were found statistically significant(p-value=0.0044). More subjects who consumed alcohol (37.78%) and smoke habits (56.67%) in cases Group A had increased levels of Clinic BP, waist circumference, fasting glucose levels and deranged lipid profile than Group B

Conclusion: Masked hypertension is present significant numbers in patients with metabolic syndrome compared to healthy controls. Correct diagnosis using ABPM and treatment with antihypertensive may further reduce risk of cardiovascular events.

Keywords: Metabolic Syndrome, Masked Hypertension, Nocturnal Variation, Blood Pressure (BP), Ambulatory Blood Pressure Monitoring (ABPM)

INTRODUCTION:

The metabolic syndrome is characterized by high clinic blood pressure (BP), abdominal obesity, impaired fasting glucose, low high-density lipoprotein (HDL) cholesterol, and high triglycerides. Due to the sedentary lifestyle people with phenotype fitting into metabolic syndrome is on the rise. On some of these individuals, office BP measurement may be normal but strong

clinical suspicion of raised BP when measured with an Ambulatory BP Monitor (ABPM)(5). Undiagnosed and untreated masked hypertension in these individuals may further increase in risk of cardiovascular and cerebrovascular events.

Masked hypertension is defined as normal blood pressure in the clinic (<140/90 mmHg), but an elevated BP out of the clinic (ambulatory daytime BP or home BP>135/85 mmHg) (1,2,3). Masked hypertension has also been recognized as an independent risk factor for cardiovascular events. Possible characteristics of individuals with masked hypertension are relatively young age, male sex, stress or decreased physical activity during the daytime, and smoking or drinking habits. There is strong suspicion of masked hypertension in patients with metabolic syndrome. Current study aims to assess prevalence of masked hypertension in patients with metabolic syndrome compared to normal healthy controls.

MATERIALS & METHODS:
Comparative Case control study conducted over 1year (Jan 2021 to Dec 2021) in Department of Cardiology, NIMS hospital, Jaipur.

Study population:
We had recruited 180 Study subjects allocated in two groups- Group A (90 patients with Metabolic Syndrome) and Group B (90 healthy controls without Metabolic Syndrome), who had normal office blood pressure measurement (<140/90 mm Hg).

Inclusion criteria for cases- age group 18 to 65 years both males and females satisfying any of the following criteria;
- Patients with large waist line (men >102cm and female >88cm)
- Patients with high Triglyceride levels. (>150 mg/dl)
- Patients with low HDL levels (<50 mg/dl in females and <40mg/dl in males)
- Patients with high fasting Plasma glucose- Suspected to have Type 2 Diabetes mellitus (>100 mg/dl)
- Patients with Pre hypertensive range of Blood pressure. (130-139 mmHg and 85-80 mmHg

Inclusion criteria for controls- healthy normotensive individuals
Exclusion criteria: -
- Chronic hypertension with or without medical therapy
- Other medical comorbidity

After obtaining informed consent ambulatory blood pressure monitoring was done for all study participants to assess 24hr average BP, night time average BP and day time average BP. Threshold for diagnosis of hypertension based on ABPM as shown in table 1. Details of other cardiovascular risk factors and laboratory investigations were also collected.

Table 1. Thresholds for Hypertension Diagnosis Based on ABPM

24-hour Average	≥130/80 mm Hg
Awake /daytime average	≥135/85 mm Hg
Asleep /night-time average	≥120/70 mm Hg

Clinical profile and laboratory investigations: Demographic details (age, gender), and details of other cardiovascular risk factors (systolic BP (SBP), diastolic BP (DBP), body mass index (BMI), history of smoking, diabetes, hypertension) were collected. The laboratory parameters included were hemoglobin, serum albumin, serum uric acid, serum calcium, serum phosphorus, iPTH, RBS, and fasting lipid profile.

Statistical analysis

The data collected in pre designed proforma has been recorded in the master chart prepared in the Microsoft excel format. The collected was analyzed with SPSS 23.0 version. To describe about the data descriptive statistics frequency analysis, percentage analysis was used for categorical variable and the mean were used for continuous variable. Unpaired t test was used to find significance of difference. p value less than 0.05 is considered as significant.

RESULTS & OBSERVATIONS:

Total of 180 participants enrolled in the study period in two groups. Baseline demographic details and risk factor profile summarized in table 2. Average office blood pressure was higher in participants with metabolic syndrome compared to healthy controls.

Table 2: Baseline characteristics of case and controls

Variable	Mean ± SD		t – test	P value
	Group A (Cases)	Group B (Controls)		
Age	46.6 ± 9.12	47.1 ±8.58	0.379	0.70
Weight	69.2 ± 9.27	70.1 ± 11.6	0.575	0.56
Height	167.7 ± 16.26	166 ± 14.72	-0.735	0.46
BMI	28.3 ± 5.06	25.2 ± 4.31	-4.425	0.00001
Clinic SBP	136.2± 4.61	127.4 ± 11.37	-6.434	0.000001
Clinic DBP	81.4 ± 10.49	80.5 ± 12.46	-3.436	0.0007
Waist circumference	99.5 ± 11.37	94.8 ± 7.64	-3.255	0.001
Fasting blood sugar	106.5 ± 12.95	99.3 ± 13.41	-3.664	0.0003
HDL	42.3 ± 4.86	46.1 ± 3.94	5.762	0.000001
TGL	203.7 ± 37.2	167.3 ± 21.6	-8.028	0.000001

Ambulatory Blood Pressure Monitoring (ABPM) findings summarized in table 3. The estimate prevalence of Masked Hypertension was higher in patients with metabolic syndrome (52.2% (47/90)) compared to in healthy controls (31.11% (28/90)). On comparing group (table 4), A (with Metabolic Syndrome) and Group B (without Metabolic Syndrome, controls), had more than twofold (2.42) higher risk of masked hypertension and its Z test value were found statistically significant(p-value=0.0044).

Table 3: Prevalence of Masked Hypertension in both groups

Variables		Group A (Cases)		Group B (Control)	
		n = 90	In %	n = 90	In %
Masked Hypertension	Yes	47	52.22%	28	31.11%
	No	43	47.78%	62	68.89%

Table 4: Relationship of masked hypertension & metabolic syndrome

Variables		Group A (Case)	Group B (Controls)	Odd's ratio	95% CI	Z-test	P - Value
Masked Hypertension	Yes	47	28	2.42	1.32 – 4.45	2.847	0.0044
	No	43	62				

DISSSCUSSION

Masked hypertension, has overall cardiovascular risk equivalence to Stage-1 hypertension and is frequently associated with target organ damage, such as LVH and proteinuria- often long before a

transition from the masked stage to sustained hypertension.(12,13) Conventional antihypertensive treatment-based office BP may have the effect of converting many patients with sustained hypertension into masked uncontrolled hypertension, rather than having the desired therapeutic goal of sustained normotension. Patients with metabolic syndrome are of high risk of having underlying masked hypertension. Using ABPM, current study showed significantly higher prevalence (52.2%) of masked hypertension in patients with metabolic syndrome compared to healthy adults who are normotensive during routine clinical visit. This study also highlights routine use of ABPM in this population to detect undiagnosed masked hypertension in patients with metabolic syndrome.

Several studies showed estimated prevalence of masked hypertension ranges from 8 to 30 percent (15,16,17). In our study showed prevalence of masked hypertension in 52.2% of metabolic syndrome and in 31.11% of healthy controls. This explains the need for assessing the prevalence of masked hypertension in patients with metabolic syndrome in our population. Most accepted data come from Jackson Heart study. In the Jackson Heart Study (19), the prevalence of masked hypertension was compared between African Americans with and without Metabolic syndrome, who all had an office BP of <140/90 mmHg. Among the 359 participants not taking antihypertensive medication, the prevalence of masked hypertension was 62.3% and 43.6% among participants with and without Metabolic syndrome, respectively. Our findings are also in line with prior evidence and reinforce importance of diagnosing masked hypertension using ABPM. Various other studies addressed the association between high ambulatory BP and Metabolic syndrome. (20), (21), (22).

High prevalence of masked hypertension in metabolic syndrome and also in healthy controls encourage more and more use of ABPM in patients with high clinical suspicion of hypertension with normal office BP measurement.

Strength and limitations of study: Current study uses ABMP for BP measurement which is considered ideal for average BP monitoring to detect masked hypertension. Also, this study excluded patients who are taking antihypertensives. To date, there have been very few published data on ABPM phenotypes in Indian population. Small sample size is the major limitation of this study. Also, no data regarding management and outcome of patients with masked hypertension provided.

Conclusions:

Prevalence of masked hypertension is significantly higher in patients with metabolic syndrome compared to healthy controls. Correct diagnosis using ABPM and treatment with antihypertensive might further reduce risk of cardiovascular events in this population.

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