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SCREENING FOR MASKED HYPERTENSION TO CONTROL CARDIOVASCULAR DISEASES

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ABSTRACT
Masked Hypertension (MH) is a type of hypertension in which office blood pressure measurement is normal but out of office BP measurement is high. There are two types of out of office measurement devices- Ambulatory blood pressure measurement (ABPM) and Home blood pressure measurement (HBPM). Due to these devices, hypertension can be divided into three types- Sustained hypertension in which both office reading and out of office readings are raised, White coat hypertension when only office reading is raised, and Masked hypertension as described above. The prevalence of masked hypertension is very high all over the world including India and the main determinants are smoking, male sex, old age, diabetes, obesity, pre-hypertension, stress and strain, and renal diseases.
Masked hypertension is a strong risk factor for cardiovascular diseases and target organ damage (TOD). Early diagnosis and treatment of masked hypertension can save a lot of money as well as many human lives and sufferings.
Almost all cases of masked hypertension remain undiagnosed and untreated because they are asymptomatic and do not seek medical help. Moreover, they are declared normal after a clinical examination of their blood pressure. Therefore, screening is the only way by which MH can be diagnosed and treated early to control cardiovascular diseases.

INTRODUCTION

Cardiovascular diseases are the biggest cause of mortality and morbidity these days, and Hypertension is attributable to most of the mortality due to CVD.10% rise in diastolic blood pressure and/or 20% increase in systolic pressure doubles the mortality due to stroke and coronary heart disease (CHD). 3mmHg reduction of systolic BP will reduce stroke mortality by 8% and CHD mortality by 5% [1]. Change in the lifestyle such as inactivity and modern diet has brought a storm of risk factors such as hypertension, obesity, insulin resistance, and dyslipidemia. Early diagnosis and treatment of these risk factors are necessary to control CVD [2].

Most persons suffering from hypertension are unaware, untreated, or uncontrolled and only a small fragment of hypertensive people are properly controlled. Masked hypertension makes the situation worse because almost all cases of masked hypertension remain undiagnosed and untreated.

Hypertension is not a static phenomenon; it varies during day and night depending upon the circadian rhythm, personal habits, addictions, and stress. The traditional way of measuring blood pressure i.e., office BP measurement which is done in the clinic cannot be a perfect way of measurement of blood pressure. That is why two types of out of office measurements were invented – 1) Ambulatory BP Measurement in which continuous measurement for 24 hours is done and 2) Home BP Measurement when the frequent measurement of BP especially in the early morning and in the night at bedtime is done. Usually, blood pressure rises in the early morning after awakening and late evening, therefore these two readings are important. Out of office measurement of BP has divided hypertension into three types:-
1. Sustained Hypertension- when BP is raised in both office measurement and out of office measurement.
2. White coat Hypertension- when BP is raised in-office measurement but it is normal in out of office measurement.
3. Masked Hypertension-when BP is normal in-office measurement but it is raised in out of office measurement. [3]

Among these three types of hypertensions, diagnosis of masked hypertension is most difficult because out of office measurement is not usual practice and in the clinic, the patient is declared as normal. Masked hypertension is a strong risk factor for cardiovascular events and target organ damage (TOD) as sustained hypertension. Therefore screening of mass population and high-risk groups is necessary to detect masked hypertension before it may cause damage to the target organs.
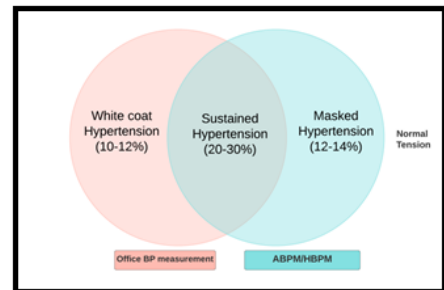

Fig 1: Types of Hypertension

LITERATURE REVIEW

Normal blood pressure- ESH/ESC 2013 Guidelines for the management of arterial hypertension has given different cut off lines for office BP, ambulatory BP, and home BP. [4]

Table 1: Cutoff Line For Hypertension

	Systolic BP	Diastolic BP
Office BP measurement	≥ 140 mmHg	≥ 90 mmHg
Ambulatory BP measurement (24 hours)	≥ 130 mmHg	≥ 80 mmHg
Home BP measurement	≥ 135 mmHg	≥ 85 mmHg

Source: ESH/ESC 2013 guidelines

Prevalence of masked hypertension-

Prevalence of masked hypertension varies from 8 to 38% in different studies in the different parts of the World. In a multicentre study done in 2016 covering 27 countries in five continents prevalence of sustained hypertension, white coat hypertension, and masked hypertension were 49%, 23% and 10% respectively. Masked hypertension was found to be more common in Asia, especially in male smokers. [5] In a meta-analysis of several studies in the USA prevalence of MH was 16.8%(7% in children and 19% in adults).25% of those who

were declared normotensives or treated and controlled hypertensive were found to have MH. Similar prevalence was found in Indian studies. Teincheu et al found the prevalence of WCH and MH was 3.3 and 17.8% respectively. [6]

Factors associated with MH- Various factors are recognized as determinants of MH. Angeli F et al found that Smoking, alcohol addiction, physical inactivity, and job or psychological stress is related to the high prevalence of MH. [7] Masked hypertension is also found in those persons whose office BP is well controlled by antihypertensive drug treatment. This is called masked uncontrolled hypertension(MUCH).[8] Yueseff G et al of Egypt found that 33% of people who had controlled office hypertension were suffering from MUCH and in most people elevation of BP was at night. Smoking and Diabetes were found to be the most important predictors of MUCH.[9] Middeke m et al found the strong relation of stress with MH.[10] Similarly Dolon E et al found a significant association of MH with fast resting heart rate, high blood cholesterol level, smoking, and obesity.[11] APA Otero et al found that MH/MUCH (especially nighttime hypertension) was present in 66% of chronic renal disease patients who were treated with BP-lowering medicines.[12] Willem J et al showed that smoking is more strongly related to MH than sustained hypertension and WCH.[13]

Effects of MH -

Masked hypertension is a strong risk factor for cardiovascular events, stroke and target organ damage as sustained hypertension and stronger risk factor than WCH. Morbid and fetal events have a stronger relation with 24-hour average BP than office BP.[14,15] Boggia J et al found that ambulatory BP in general is a more sensitive risk predictor of clinical cardiovascular outcome (CHD, Stroke) than office BP. This superiority of ABPM was shown in all types of the population-young and old, men and women, treated and untreated hypertension, people with high and low-risk factors, and people with or without renal and heart diseases. Hansan TV showed that night time non-dipping or elevation of BP is a stronger predictor of stroke and TOD than daytime BP. [16] Even extreme dipper may have an increased risk of stroke. [17] Stergiuo et al found that organ damage especially left ventricular hypertrophy and prediction of cardiovascular mortality and morbidity is significantly better in-home BP than office BP. [18]

DISCUSSION

Mass screening or Selective screening-

Mass screening for masked hypertension can be done because

- It is a very common condition. About 6 to 10% of cases may be found in mass screening of the general population.
- It is an important risk factor for cardiovascular diseases and organ damage.
- Most cases of masked hypertension are asymptomatic and they do not seek any medical examination.
- Effective (highly sensitive and specific) and noninvasive (acceptable) methods of screening are available.
- Early diagnosis and treatment will save a lot of lives and human sufferings.

Selective screening is done in high-risk groups and it gives more yield than mass screening because prevalence in high-risk groups may go up to 20 to 35%. High risks for MH are old age, male sex, diabetes, obesity, smoking, pre-hypertension, treated hypertension, kidney diseases, altered sleeping habits, stress, and strain. Youssef G found a 33% prevalence of MH in high-risk groups of smokers and diabetics.[9]

A randomized control trial was done in Canada in the above 65 years of the older population to see the effect of regular screening for MH on the annual hospital admission rate. It was seen that the hospital admission rate due to MI was significantly lower in the screened group than in the non-screened group. Moreover, rescreening at the lower interval gives better results.[19]

ABPM or HBPM-

Both out of office BP measurement methods are sensitive methods for detecting masked hypertension and are a better predictor of clinical CV outcome than office BP measurement. ESH/ESC has advised to use ABPM or HBPM as a complementary method of conventional measurement rather than a competitive or alternative method.[20] They show a better relationship with morbid and fatal events.[14,15] ABPM is costly and slightly inconvenient whereas HBPM is easy and cheap but self-reading may have some errors in reading.[21] The results of both ABPM and HBPM are comparable and reliable. ABPM is slightly better because it also covers nocturnal reading which is a stronger predictor.[22]

Cost-effectiveness -

WHO World health report 2002 says that 62% of cardiovascular diseases and 49% of ischemic heart diseases are attributable to suboptimal blood pressure control. Moreover, 7.1 million deaths (13% of total) annually are caused by hypertension. Most of health care expenditures are related to cardiovascular diseases.[1,4,23]World health report 2018 says that cardiovascular diseases are cause of 17.9 million of deaths annually (44% of NCD deaths and 31% of total deaths).[24]

In Finland, a 60% decline in mortality rate from cardiovascular diseases in 25 years was seen after applying a national strategy that combined prevention, health promotion, and access to treatment of hypertension. In another study, it was found that treatment of systolic BP more than160 mm Hg is the most cost-effective strategy. [23]

CONCLUSION

Masked Hypertension and masked uncontrolled hypertension are very common in World including our country. Determinants of MH are old age, male sex, smoking, obesity, diabetes, stress, and strain. Patients of masked hypertension are not only asymptomatic but also normal in their office BP measurement. Therefore almost all patients of MH remain undiagnosed unless out of office BP measurement is done. There are two types of out of office BP measurements- Ambulatory BP measurement and Home BP measurement. Both are sensitive and specific methods of screening tests for MH. Early diagnosis and treatment of masked hypertension can prevent a large number of cardiovascular diseases, stroke, renal diseases, and target organ damage. Screening for masked hypertension is a very cost-effective strategy to control cardiovascular diseases and it may help in saving a lot of human lives, money, and suffering.

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