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Review Article

**WHITE COAT HYPERTENSION – THE RISK FACTOR FOR
SUSTAINED HYPERTENSION AND CARDIOVASCULAR
DISEASE****J Vijay Kumar, Gera Jemimah, Yamuna Bonagiri, T Shravani Reddy, M Keerthana,
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Abstract:

White coat hypertension (WCH) is characterized by variations in the blood pressure of a person between physician's office and home environment. The presence of physician causes the elevation of blood pressure in patients with WCH, which is a clinical condition under white coat syndrome that also includes white coat effect and masked hypertension. Levels of BP values to categorize a patient as white coat hypertensive, is given by the 2013 European Society of Hypertension/European Society of Cardiology hypertension guidelines. Proper diagnosis using ambulatory blood pressure monitoring is crucial to avoid misdiagnosis and unwanted prescription of antihypertensive drugs. WCH phenomenon is associated with long-term risk of development of true hypertension, cardiovascular alterations and target organ damage. Aim of this review article is to provide information regarding epidemiology, etiology, mechanisms, diagnosis, management and clinical impact of white coat hypertension.

Key Words: White Coat Hypertension, antihypertensive drugs, White Coat Effect, Masked Hypertension, epidemiology.

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INTRODUCTION:

White coat hypertension is the term used to denote a condition in which persons not receiving antihypertensive medication, experience persistent high blood pressure levels ($\geq 140/90$ mm Hg) when measured in the presence of a physician or at a medical office, but have normal blood pressure levels during daily lives and in the home environment [1-6]. The term white coat comes from reference to the white coat traditionally worn by the doctors. White coat hypertension was first discovered by Riva-Rocci in 1896 and the term was coined by Thomas Pickering.

It is very common that BP levels are not fixed and they vary throughout the day. In certain portion of population, high BP levels were observed when obtained by a physician than that of the levels obtained by them. This difference revealed a clinical condition called "white coat syndrome." It is a common phenomenon noted in both hypertensive and normotensive individuals [7]. This syndrome comprises of 1) white coat effect (WCE), 2) white coat hypertension (WCH), and 3) white coat normotension or masked hypertension (MH) [8].

According to the 2013 European Society of Hypertension/ Society of Cardiology guidelines, white coat hypertension (WCH) is characterized when individuals without antihypertensive medication presents office systolic/diastolic blood pressure measurements of $\geq 140/90$ mm Hg on at least three occasions, but with normal ambulatory (24-hour ambulatory blood pressure $< 130/80$ mmHg) or home blood pressure (135/85 mmHg) readings [9-12]. Thus, if office reading alone was observed, patients may be wrongly characterized as hypertensives. WCH is considered as an intermediate stage between normotensive and hypertensive conditions [13].

White coat effect (WCE) is a condition where hypertensive patients treated with antihypertensives show elevated office blood pressure levels of > 20 mmHg of systolic BP and > 10 mmHg of diastolic BP in the presence of physician or health care professional, when compared to normal ambulatory or home blood pressure measurements [5, 10]. This condition may give false impression of a person being uncontrolled hypertensive and need for alteration of drug therapy, hence should be carefully evaluated. Higher heart rate and non-dipping nocturnal BP was observed with this effect [14].

Masked hypertension (MH) is considered as an inverse condition of WCH and is characterized by

adequate office blood pressure levels of $< 140/90$ mmHg, but high outside office blood pressure levels by ambulatory ($\geq 130/80$ mmHg) or home ($\geq 135/85$ mmHg) blood pressure monitoring devices [11]. MH is strongly associated with increased risk of cardiovascular diseases and target organ damage when compared to WCH [15-20].

Incorrect identification of both WCH and WCE may lead to unnecessary initiation or intensification of the antihypertensive therapy. Attention should also be given to MH as it is associated with all-cause mortality [10]. Purpose of this article is to provide information about the prevalence, etiology, mechanisms, diagnosis and clinical impact of the white coat syndrome.

EPIDEMIOLOGY

White coat hypertension accounts for 15-30% of the individuals with increased office blood pressure levels [21, 22]. 30-40% patients who are diagnosed with hypertension on the basis of office BP levels are actually white coat hypertensives [5, 23]. Prevalence of MH varies between 15-30%. The prevalence of WCH is higher in females, obese people, smokers, older adults (15-25%) and it increases with age. It also occurs more frequently in pregnant women, patients who are recently diagnosed with hypertension and in those without evidence of target organ damage [24-29].

Prevalence in India and the state of Telangana

Recently, Indian Heart Study (IHS) commissioned by Eris Life Sciences conducted study on hypertension in 15 states of India and the findings of the study were declared on August 21, 2019. The study was conducted for 9 months, nationwide in 18,918 people (64% male and 36% female) including 1168 people from the state of Telangana. Blood pressure values are recorded 4 times a day continuously for 7 days. Overall, 41% of the subjects were unaware of the fact that they had hypertension and 18% exhibited masked hypertension. The prevalence of hypertension is increasing in the state of Telangana as 36% people have white coat hypertension, 22% with hypertension and 14% have masked hypertension, due to unhealthy food habits and sedentary lifestyle [30].

ETIOLOGY

White coat hypertension is a phenomenon where increase in the blood pressure was experienced only during visit by a physician. Patient's blood pressure spiked 2-4 minutes after the start of the visit and remained high throughout the duration of the visit. Researchers indicated that the emotional factors like

stress or anxiety may be responsible for this phenomenon. White coat hypertensives have been shown to be more prone to higher anxiety levels than normotensive and persistent hypertensive individuals [31, 32]. According to previous literature, WCH is also associated with metabolic syndrome [33]. Where and by whom blood pressure is taken, also plays a role in the development of WCH [34]. MH is seen in youngsters with left ventricular hypertrophy, diabetes, and/or obesity, family history of hypertension, cardiovascular factors, and a high office BP at any moment [21].

Other reasons that can trigger white coat hypertension include recent ingestion of pressor agents, stress and emergency, sedentary lifestyle, high intake of salt and spicy food, consumption of increased amounts of caffeine, perception of having hypertension, and technical inaccuracies [30, 35].

MECHANISMS

By measuring the muscles and skin of the sympathetic nerve traffic, it was found that the anxiety or stress that led to white coat hypertension is due to pronounced activation of the skin nerves and associated sympathetic inhibition of muscle nerve-traffic [36, 37]. According to some authors, this elevation of BP is due to neuro-endocrine reflex mediated by sympathetic nervous system, which is conditioned by the anticipation of having illness during the measurement of BP [38, 39]. Sympathetic activity in WCH is determined by the levels of circulating and urinary catecholamines and renin activity.

In treated hypertensive individuals, WCH is associated with arterial stiffness. According to a study, people with WCH has worse vascular function, greater cardiovascular mortality, lower pulse wave velocity and high levels of left ventricular mass index when compared to normotensives [40-43]. White coat effect is mediated by the increased activity of sympathetic nervous system and this phenomenon may be associated with worse prognosis. Arterial ageing and impaired arterial compliance are associated with WCE [44-46]. When compared to normotensives, people with MH have thickening and lower complacency of the carotid artery. High risk of left ventricular structural alterations is associated with untreated MH individuals [47, 48].

DIAGNOSIS

Blood pressure can be assessed by many methods. For proper diagnosis of the hypertension or to modify the antihypertensive treatment, it is very important to correctly measure the blood pressure. To detect white

coat syndrome, currently two well accepted methods are available – HBPM (Home Blood Pressure Monitoring) and ABPM (Ambulatory Blood Pressure Monitoring) [8].

In HBPM method, BP can be easily measured by the individuals and is well accepted by the patients, but fluctuations in the BP during sleep period cannot be observed [3]. The best method to detect BP fluctuations is the ABPM method, which offers monitoring of BP for a period of 24 hours. This method gives more accurate diurnal and nocturnal BP measurements, determines nocturnal hypertension, evaluates the efficacy of antihypertensive therapy and is a strong predictor of cardiovascular mortality [21].

According to the Task Force of the Eighth International Consensus Conference on Blood Pressure Monitoring, white coat hypertension can be confirmed in untreated persons on the basis of ambulatory readings when office BP on three or more separate visits is $\geq 140/90$ mmHg, two or more BP readings taken outside the office are $< 140/90$ mmHg and when there is no evidence of target organ damage [49, 50].

MANAGEMENT

In short period of time, white coat hypertension can progress into sustained hypertension, especially in middle-aged and elderly people, and cardiovascular risk is increased when compared to people with normal BP values [51]. So, once white coat hypertension was confirmed by ABPM, the European Society of Hypertension recommends reconfirmation in 3-6 months and yearly follow-up to detect any evidence of sustained hypertension/ true hypertension, as there is a risk of developing it [21, 52].

Resistant hypertensives demonstrated white coat hypertension, so it is recommended that the medication should not be given to patients who start to develop mild or moderate high blood pressure unless there is target organ damage and BP remains high even after 3-6 visits [53, 54]. According to 2013 European Society of Hypertension/European Society of Cardiology hypertension guidelines, WCH patients with no additional cardiovascular risk factors are to be treated with lifestyle changes and should have a close follow-up. Also, WCH patients with increased cardiovascular risk due to metabolic abnormalities or asymptomatic target organ damage are to be considered for antihypertensive treatment in addition to changes in the lifestyle [55].

As anxiety plays an important role in WCH, effective

communication between a physician and the patient can reduce their anxiety about the illness. It is considered as a cornerstone of good medical practice. Empathy and trust also play a crucial role in reducing the anxiety [36].

PROGNOSIS

The prognosis of the white coat hypertension is controversial. Correct diagnosis and clinical guidance are essential to improve prognosis of the patients with WCH. Even though treatment is not required, they are to be closely monitored. After a follow-up of 20 years, WCH patients are associated with impaired insulin sensitivity, increase in blood glucose, serum insulin and heart rate when compared to people with normal blood pressure. It was also found that the requirement of antihypertensive drug treatment was more frequent in patients with WCH. Incidence of cardiovascular events, mortality, aortic pulsed wave velocity, cystatin C and urinary albumin-to-creatinine ratio also increased after follow-up [56-59].

CLINICAL IMPACT

Patients with WCH have 2.5 times more chances to develop a sustained hypertension compared to normal individuals. Hence, untreated WCH is no longer considered as a harmless clinical state due to increased risk for the development of target organ damage and consequent cardiovascular damage [13]. In the group of white coat syndrome, white coat effect is considered less damaging. Development of target organ damage in patients with MH is close to the risk associated with hypertensive patients.

According to 2012 IDACO study, untreated white coat hypertension was associated with increase risk in men and persons with diabetes mellitus [60]. Risk of target organ damage increases from white coat effect to hypertension i.e., white coat effect < white coat hypertension < masked hypertension < hypertension [8]. In summary, some people with WCH progresses over time to sustained hypertension, but according to majority of studies there is no significant increase in the cardiovascular risk when compared to normotensive individuals [49].

Individuals with WCE, WCH, MH or hypertension should be carefully pursued and diagnosed to decide appropriate therapeutic intervention, as these conditions are associated with possible worsening of cardiovascular prognosis and development of target organ damage.

CONCLUSION

WCH is a common medical problem now-a-days, which occurs mostly due to anxiety in the presence of

a physician or sedentary lifestyle. This should be no longer considered as clinically innocent because of its association with metabolic abnormalities, progression to sustained hypertension in untreated individuals, increased risk of cardiovascular events and the target organ damage. At present, correct diagnosis of the WCH subjects seems to be the key step, as it can avoid unnecessary treatment with antihypertensive drugs. Clinicians should be aware that the untreated WCH patients may be at a risk of increased cardiovascular diseases. Efforts are to be made to improve patient-physician communication to reduce the anxiety. To optimize the clinical management of WCH, further studies are to be carried out to evaluate the phenomena associated with it and to provide scientific data that helps in deciding therapy needed in WCH. Correct diagnosis of white coat syndrome through ABPM and HBPM is fundamental for the therapeutic efficacy and better prognosis of the individuals with this syndrome.

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