



Ambulatory Blood Pressure Monitoring in Pregnancy; Does It Influence Our Practice?

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Abstract

Background: Maternal hypertensive disorder is a well-known medical problem during pregnancy and is associated with morbidity and mortality. Out-of-office blood pressure (BP) measurement has been widely used but the importance of detecting white coat hypertension (WCH) is still a topic for debate.

Objectives: The aim of this study was to determine the prevalence of WCH in high-risk pregnant women.

Methods: We included 56 pregnant women with in-office higher-than-normal BP without previous history of HTN to assess their BP using 24-hour ambulatory blood pressure monitoring (ABPM).

Results: The mean age of the participants was 31.61 ± 5.42 years ($n = 56$) and the majority in the second or third trimesters. Hypertension was detected in 55.4% using 24-hour ABPM. Twenty-five patients (44.6%) had WCH, 60% of whom were in the third trimester. There was a significant difference in the incidence of WCH between women younger than 30 and older individuals ($P = 0.041$). The mean age was 33.13 ± 5.16 years in patients with true HTN and 29.72 ± 5.22 years in WCH patients ($P = 0.018$).

Conclusions: The prevalence of WCH in pregnancy is noteworthy. Regarding its favorable outcome, this might be a heads-up to avoid unnecessary medication during pregnancy and be concise about defining HTN in this population.

Keywords: Hypertension, Pregnancy, ABPM, Office Hypertension, Blood Pressure Monitoring, White Coat Hypertension

1. Background

Hypertensive disorder of pregnancy affects 10% - 20% of women with a rising prevalence (1, 2). This condition is one of the leading causes of maternal morbidity and mortality worldwide and is associated with fetal and neonatal complications such as preterm birth, small for gestational age (SGA), intrauterine growth retardation (IUGR), intrauterine, and perinatal death (3, 4).

The definition of hypertension (HTN) during pregnancy is usually based on the office blood pressure (BP) measurements in the sitting position: systolic blood pressure (SBP) ≥ 140 mmHg or diastolic blood pressure (DBP) ≥ 90 mmHg (2). However, the accuracy of this method has been criticized with growing evidence suggesting that ambulatory blood pressure monitoring (ABPM) over 24 hours provides more representative information than office BP measurement (5, 6). It should be noted that clinicians must use only ABPM appliances that have been validated in pregnancy (6).

ABPM is a useful method for determining diagnosis and prognosis of HTN in pregnancy and identifying white coat hypertension (WCH) (7, 8). WCH is defined as a situation in which the patient has elevated BP in a clinical setting (office SBP ≥ 140 mmHg or DBP ≥ 90 mmHg), but normal BP during daily living (average 24-hour ABPM SBP < 130 mmHg and DBP < 80 mmHg) (9).

WCH has a prevalence of 30% - 70% during pregnancy (10, 11) and it is associated with better outcomes compared to sustained HTN (12). Therefore, the awareness of WCH in pregnancy is an important issue to avoid inappropriate use of antihypertensive medications (13).

2. Objectives

In this study, we used 24-hour ABPM to estimate the prevalence and trimester distribution of WCH in high-risk pregnant women referring to our clinic.

3. Methods

3.1. Ethics Statement

The study was performed in agreement with the Helsinki Declaration. All participants signed written informed consent forms before enrollment. The protocol was approved by the Local Ethics Committee of Tehran University of Medical Sciences (#3071237596).

3.2. Study Population

In this cross-sectional study, 69 pregnant women were assessed. We enrolled all pregnant women with recently discovered higher-than-normal (but less than 160/110 mmHg) in-office sitting BP, defined as SBP \geq 140 mmHg or DBP \geq 90 mmHg. Pregnant women with a previous history of chronic kidney disease, hypertension, heart disease, and smoking were excluded from the study. In this study, 13 out of 69 pregnant women were excluded due to the above-mentioned exclusion criteria.

3.3. Twenty-Four-Hour Ambulatory Blood Pressure Monitor

The ABPM was done using a WatchBP O3 device. This device is programmed to measure BP at regular intervals (every 30 minutes during the daytime and every 60 minutes during sleep) while patients do their usual activities. We defined sustained HTN according to the European Society of Cardiology (ESC) guidelines; the diagnostic threshold for HTN based on ABPM is the mean BP \geq 130/80 mmHg over 24 hours, daytime average BP \geq 135/85 mmHg, or mean nighttime BP \geq 120/70 mmHg. WCH points out the condition in which blood pressure is elevated in the office (\geq 140/90 mmHg) but normal in 24-hour ABPM (2).

3.4. Statistical Methods

Data were analyzed using SPSS (SPSS Inc., Chicago, IL, USA) version 22.0 software for descriptive statistics. The results are expressed as means \pm SD for continuous variables and percentages (%) for categorical variables. Continuous variables were compared using the Student's *t*-test. One-sample Kolmogorov-Smirnov test was used to evaluate the distribution characteristics of the variables. Statistical significance was set at below the 0.05 level ($P < 0.05$).

4. Results

In this prospective cohort study, 69 hypertensive pregnant women were enrolled. However, the data of 56 pregnant women were evaluated. The mean age of the participants was 31.61 ± 5.42 years. The median gravidity number of these women was 2 (1 - 8). Thirteen patients (23.2%) experienced proteinuria (24-hours urine protein of more

than 300 mg). Most of the participants were in the third trimester (57.1%); 20 of them were in the second trimester and four were in the first trimester (35.7% and 7.1%, respectively).

In this study, 55.4% ($n=31$) of the pregnant women were hypertensive based on 24-hour ABPM. Twenty-five patients (44.6%) had WCH, 60% of whom were in the third trimester and the rest was in the second trimester. Mean SBP in hypertensive patients was 128.29 ± 14.5 mmHg and mean DBP was 83.93 ± 8.8 mmHg. Mean SBP and DBP in participants with WCH were 109.26 ± 8.4 and 66.91 ± 4.9 mmHg, respectively.

There was a significant difference in the incidence of WCH between women younger than 30 than older individuals ($P = 0.041$). The mean age of patients with sustained HTN was 33.13 ± 5.16 years and it was 29.72 ± 5.22 years in WCH patients ($P = 0.018$). The incidence of WCH was higher in pregnant women with ≤ 2 gravidity numbers than those with above two gravidity numbers but without any statistically significant difference ($P = 0.061$). We did not find any association between proteinuria and WCH.

5. Discussion

In this prospective cohort of 56 hypertensive pregnant women, WCH had a prevalence of 44.6%. Only 55.4% of these women had high blood pressure (BP) with 24 hour ABPM (sustained HTN). Moreover, WCH was more prevalent in the second and third trimesters (40% and 60%, respectively) and we did not detect any WCH in pregnant patients with less than 12 weeks of gestation.

There was a statistically significant difference in WCH incidence between younger participants (≤ 30 years old) than older individuals ($P = 0.041$). Moreover, WCH patients were younger than hypertensive participants, which was statistically significant ($P = 0.018$).

Pregnancy-induced HTN is an important cause of maternal mortality and perinatal complications such as SGA, premature birth, and IUGR (14). Hypertensive disorders of pregnancy classified as chronic HTN, gestational HTN, preeclampsia/eclampsia, and preeclampsia superimposed on chronic HTN are common, affecting up to 20% of pregnancies. They are associated with maternal and perinatal adverse outcomes that could be preventable by detecting and controlling BP during pregnancy (15-17).

The clinical importance of out-of-office BP monitoring and ABPM is well recognized in the management of HTN during pregnancy (1, 8, 18) and its' correlation with obstetrical adverse outcomes have been established (19-22). A trial of 24-hour ABPM is feasible during pregnancy and is tolerated fairly well by most patients (8). The advocated

ABPM devices are more accurate than devices used for office or home BP monitoring in pregnancy (2). In a prospective study by Eguchi et al., ABPM was more associated with SGA outcome than office BP (23).

Although there are inconclusive data that ABPM can predict pre-eclampsia, one recommended practice is to detect masked HTN and confirm WCH before initiating drug therapy.

The prevalence of WCH in pregnancy is about 30% - 70% (10, 11) and it is associated with better outcomes than sustained HTN (12). In a study by Brown et al., the overall prevalence of WCH was 32% among 241 pregnant participants and there was no significant difference in age or parity between WCH participants and true hypertensive patients (9). In our study, WCH patients were younger than true hypertensive participants ($P = 0.018$) but there was no significant difference in parity between the two groups. Bellomo et al. performed ABPM in 148 pregnant women with 26 - 32 weeks of gestation that had office HTN (BP > 140/90 mmHg) and reported an about 30% prevalence of WCH in participants with higher birth weight babies in this subgroup compared to hypertensive pregnant patients detected by ABPM (22).

In another study by Bar et al. in 60 pregnant women (17 - 20 weeks of gestation) without a prior history of HTN but with office HTN, almost 67% of the participants had WCH. Pre-eclampsia developed in 8% of this subgroup compared to 57% in the confirmed true hypertensive participants (12).

In our study, the prevalence of WCH was 44.6% in pregnant patients without a history of HTN who had an obstetric office BP of > 140/90 mmHg.

Ten (32.3%) of hypertensive patients were only diagnosed based on average night time ABPM measurements. This could be a limitation of our study but also may represent the superiority of ABPM to home BP monitoring for detecting hypertensive patients during pregnancy. We did not have follow-up visits to record outcomes, and recruited a small number of study participants; they were important limitations to our study.

As the outcome of pregnancy is favorable in pregnant patients with WCH (except for perhaps a slight increase in pre-eclampsia incidence), it is prudent to assess BP in high-risk patients by 24-hour ABPM to identify true HTN and avoid unnecessary anti-hypertensive medications or termination of pregnancy.

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Footnotes

Authors' Contribution: Mohammad Taghi Najafi contributed to the concept and study design, Samira Salehi participated in data collection and analysis, Neda Naderi and Azam Alamdari contributed to manuscript preparation and editing.

Conflict of Interests: All authors declare no conflicts of interest.

Ethical Approval: The study was performed in agreement with the Helsinki Declaration. The protocol was approved by the Local Ethics Committee of Tehran University of Medical Sciences (#3071237596).

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