

PERSPECTIVES IN HYPERTENSION

Thresholds for ambulatory blood pressure in high-risk pregnancies: Time for a change?

WALTER G. ESPECHE,^{1,2} JULIÁN MINETTO,^{1,2} MARTIN R. SALAZAR¹

¹ Facultad de Ciencias Médicas, Universidad Nacional de La Plata, Argentina

² Unidad de Enfermedades Cardiometabólicas, Hospital Sal Martín, La Plata, Argentina



Preeclampsia (PE) remains one of the most serious hypertensive disorders of pregnancy and a leading cause of maternal and perinatal morbidity and mortality worldwide. The development of elevated blood pressure (BP) after mid-gestation constitutes the cornerstone of PE diagnosis, as emphasized by both the International Society for the Study of Hypertension in Pregnancy (ISSHP) and the American Heart Association (AHA).^{1,2} Despite advances in obstetric care, early identification of women at increased risk remains a clinical priority.

In routine practice, hypertension in pregnancy is primarily diagnosed using office BP measurements. However, 24-hour ambulatory blood pressure monitoring (ABPM) has demonstrated clear advantages in selected populations. In pregnant women, ABPM enables the identification of white coat hypertension – thus preventing unnecessary pharmacological treatment – as well as masked and nocturnal hypertension, both of which are associated with increased maternal-fetal risk. In high-risk pregnancies in particular, nocturnal BP abnormalities appear to carry significant prognostic information.

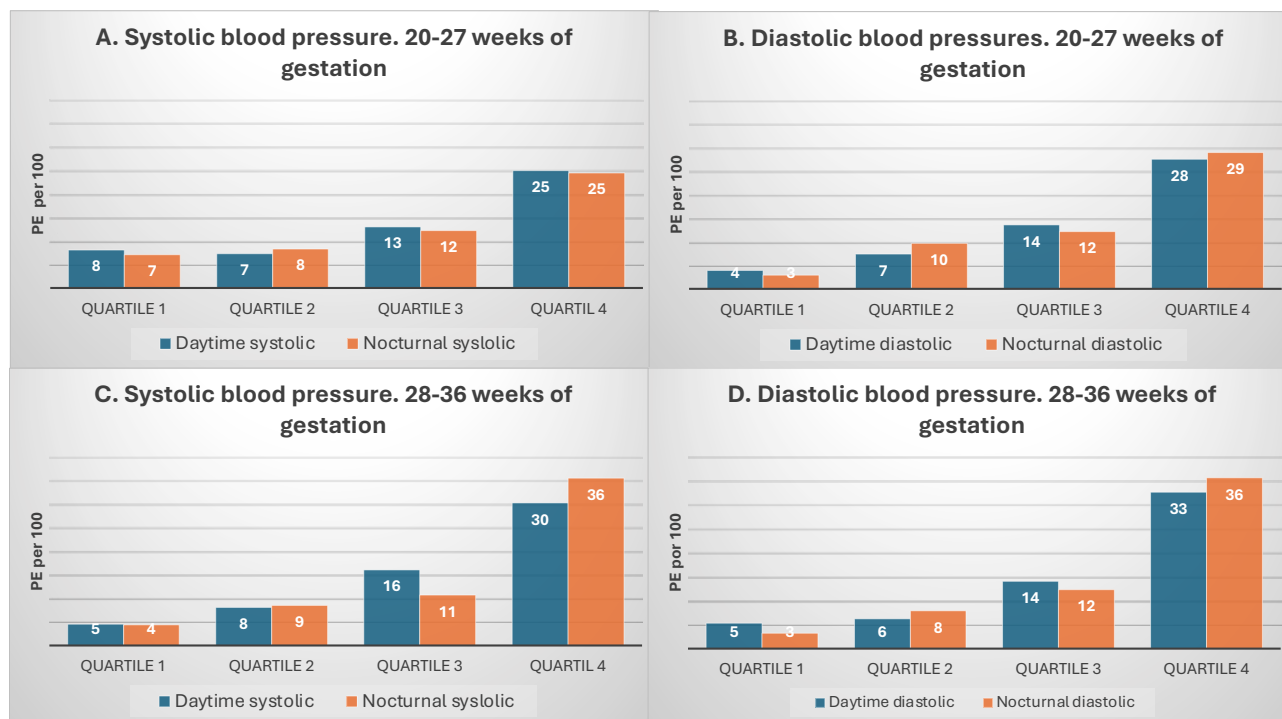
A central unresolved issue concerns the BP thresholds used to define hypertension by ABPM during pregnancy. Current daytime and nocturnal cut-off values (135/85 mmHg and 120/70 mmHg, respectively) were originally defined based

on long-term cardiovascular outcomes in non-pregnant populations. While appropriate for long-term cardiovascular risk prediction in the general adult population, these criteria may not reflect the specific hemodynamic physiology or risk patterns of pregnancy.

Earlier efforts to define pregnancy-specific ABPM reference values, such as those proposed by Brown et al., were based on normotensive pregnant women and relied on statistical definitions (mean + 2 SD) rather than outcome-based thresholds. Consequently, they were not designed to predict PE or other adverse pregnancy outcomes. This distinction is critical: physiologic reference values do not necessarily correspond to clinically meaningful risk thresholds.

Another complexity arises from the dynamic changes in BP throughout gestation. During normal pregnancy, BP typically declines by approximately 10–20 mmHg in the first half of gestation, reaching a nadir around mid-pregnancy, and then progressively increases in the third trimester, returning toward pre-pregnancy levels. This biphasic pattern strongly suggests that fixed ABPM thresholds applied uniformly across gestation may be suboptimal. A gestational-age-specific approach may provide more accurate risk stratification.

Figure 1. Rates of preeclampsia across quartiles of systolic and diastolic ambulatory blood pressure monitoring in two gestational periods: 20–27 weeks (A, B) and 28–36 weeks (C, D)



In this context, our recent cohort study evaluated outcome-based ABPM thresholds for predicting PE in 1,374 high-risk pregnant women who were not receiving antihypertensive treatment at the time of monitoring.⁵ Analyses were conducted separately at 20–27 weeks and 28–36 weeks of gestation to account for physiological BP variation (n = 588 and n = 854, respectively).

In the absence of a standardized methodology for defining ABPM cut-offs in pregnancy, we applied two independent approaches. First, receiver operating characteristic (ROC) curves were constructed, and optimal thresholds were determined using Youden’s index (maximizing sensitivity and specificity). Second, we examined the relationship between ambulatory systolic and diastolic BP values and the frequency of PE across quartiles of distribution within each gestational window. Women in the highest quartile exhibited a markedly increased risk of PE, and the boundary between the third and fourth quartiles was defined as the cut-off (**Figure 1**). Importantly, both methods yielded highly concordant results, strengthening the robustness of the findings.

Three observations emerge with potential clinical implications. First, around 30 weeks of gestation, the currently recommended nocturnal hypertension threshold of 120/70 mmHg appears appropriate for identifying PE risk. Estimated cut-offs derived from both analytical approaches were highly consistent with this value (**Table 1**). These findings provide outcome-based support for maintaining the current nocturnal threshold at this stage of pregnancy.

Second, the conventional daytime ABPM threshold of 135/85 mmHg appears excessively high in pregnant women (**Table 1**). These findings suggest that a substantial proportion of women at increased risk of PE may remain unidentified if traditional daytime thresholds are applied.

Third, gestational timing matters. Before 30 weeks, both daytime and nocturnal thresholds that best predicted PE were lower than those observed later in pregnancy (**Table 1**) and may warrant downward adjustment during earlier gestational stages.

Table 1. Outcome-Based Cut-Off Points for Ambulatory Blood Pressure According to Gestational Period, Estimated Using Youden's Index and the Upper Quartile of the ABPM Distribution

Gestational age	ABPM period	Populational	Youden index	Top quartile
20-27 weeks	Daytime	135/85 mmHg	121/74 mmHg	126/77 mmHg
	Nocturnal	120/70 mmHg	112/64 mmHg	114/66 mmHg
28-36 weeks	Daytime	135/85 mmHg	124/77 mmHg	128/80 mmHg
	Nocturnal	120/70 mmHg	118/69 mmHg	118/70 mmHg

Our findings are consistent with recent data from Asian cohorts in which ABPM thresholds were defined according to maternal and neonatal outcomes. These studies similarly reported lower optimal daytime thresholds than those currently recommended.^{6,7} Although population differences must be considered, the convergence of evidence across independent cohorts strengthens the argument for reassessing current thresholds.

An additional noteworthy observation is the particularly strong predictive performance of nocturnal BP, especially diastolic BP, which demonstrated the highest area under the curve (AUC) values. This aligns with our previous studies showing that nocturnal hypertension is the most powerful predictor of subsequent PE, particularly early-onset PE.^{8,9} From a pathophysiological perspective, impaired nocturnal BP decline may reflect endothelial dysfunction or altered autonomic regulation – mechanisms closely linked to PE development. Therefore, accurate identification of nocturnal hypertension thresholds is not merely a methodological refinement but a clinically relevant objective.

Several limitations deserve mention. The study was observational and included only high-risk pregnant women; therefore, extrapolation to low-risk populations should be cautious. Cut-offs were derived specifically for PE prediction and did not incorporate other fetal outcomes, such as intrauterine growth restriction. Optimal BP thresholds for maternal risk stratification may not fully align with those required to optimize fetal health. Furthermore, the study population represented a single ethnic group, underscoring the need for external validation in diverse populations.

Nonetheless, the question is no longer merely theoretical: should ABPM thresholds in pregnancy continue to be extrapolated from non-pregnant cardiovascular research, or should they be grounded in pregnancy-specific outcomes? Outcome-based data indicate that the nocturnal ABPM threshold of 120/70 mmHg remains appropriate after 30 weeks of gestation. In contrast, daytime thresholds appear to warrant downward revision, with values in the range of 125–130/80 mmHg offering more accurate risk stratification in high-risk pregnancies.

A gestational-age-specific, outcome-driven approach to ABPM interpretation may represent a necessary evolution in the management of hypertensive disorders of pregnancy. Reconsideration of current diagnostic standards is therefore justified.

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Martin R. Salazar – mrsalazar@med.unlp.edu.ar

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