ORIGINAL ARTICLE

DOI: 10.4274/e-cvsi.2026.2026-4-4
Cardiovasc Surg Int 2026;13(1):72-76

CARDIOVASCULAR SURGERY AND INTERVENTIONS

Sleep quality, daytime dysfunction, and health-related quality of life in normotensive versus hypertensive pregnant women: A cross-sectional analytical study

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Received: April 27, 2026 **Accepted:** May 31, 2026 **Epub:** June 03, 2026 **Publication Date:** June 12, 2026

ABSTRACT

Objectives: Sleep disturbances are common during pregnancy and are increasingly associated with adverse maternal outcomes, including hypertensive disorders. However, direct comparisons of sleep quality and quality of life between normotensive and hypertensive pregnant women remain limited. The aim of this study is to compare sleep quality, daytime dysfunction, quality of life (QOL), and clinical parameters between normotensive and hypertensive pregnant women.

Patients and methods: This cross-sectional analytical study included 100 pregnant women attending an obstetrics outpatient clinic. Participants were divided into two groups of 50 each: Normotensive and hypertensive. Socio-demographic and clinical data were recorded. Sleep quality was assessed using the Pittsburgh sleep quality index (PSQI), and QOL was evaluated using the QOL-gravidarum scale. Laboratory parameters, including hemoglobin, platelet count, urea, creatinine, and glomerular filtration rate (GFR), were analyzed. Statistical analyses were performed using the independent-samples t-test, the Mann-Whitney U test, and the chi-square test; $p<0.05$ was considered significant.

Results: Hypertensive pregnant women had significantly higher systolic and diastolic blood pressure ($p<0.001$). They exhibited longer sleep latency, shorter sleep duration, and lower sleep efficiency (all $p<0.001$). PSQI total scores were significantly higher in the hypertensive group ($p<0.001$), indicating poorer sleep quality. Sleep disturbances and daytime dysfunction were more frequent ($p<0.001$), and QOL scores were significantly worse ($p<0.001$). In hypertensive pregnancies, urea and creatinine levels were higher, while GFR was lower ($p<0.001$).

Conclusion: Hypertensive pregnant women demonstrate significantly poorer sleep quality, increased daytime dysfunction, and reduced QOL. These findings highlight the importance of incorporating sleep assessment into routine clinical evaluation of hypertensive pregnancies.

Keywords: Pregnancy, hypertension, sleep quality, quality of life, daytime dysfunction.

Sleep is a core biological requirement that sustains physiological stability and orchestrates neuroendocrine balance. Disruptions in sleep architecture have been strongly associated with a broad spectrum of pathological conditions, including cardiovascular disorders, metabolic abnormalities, diabetes, and mental health disturbances.[1,2] Contemporary research increasingly recognizes that altered sleep patterns may not merely reflect underlying disease states but can actively contribute to their initiation and progression.[3]

Gestation is characterized by profound systemic adaptations involving endocrine, anatomical, and psychological domains. Although progesterone is known to promote sedation, several pregnancy-specific factors—such as mechanical pressure from the enlarging uterus, reflux symptoms, fetal movements, and nocturnal urinary frequency—may interfere with normal sleep physiology, particularly in advanced gestational stages.[4,5] Epidemiological findings suggest that impaired sleep quality affects nearly half of pregnant women, with reported

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Cite this article as: Kanbak AR, Yapan Emren Z. Sleep quality, daytime dysfunction, and health-related quality of life in normotensive versus hypertensive pregnant women: a cross-sectional analytical study. Cardiovasc Surg Int. 2026;13(1):72-76

rates ranging from 40% to 60%.[6] Despite this, such disturbances are frequently regarded as physiological variations rather than clinically significant abnormalities.

Hypertension continues to be a leading determinant of adverse health outcomes both globally and in pregnancy.[7] Hypertensive disorders of pregnancy, most notably preeclampsia, involve complex mechanisms including endothelial injury and systemic inflammatory activation.[8] Evidence suggests that sleep disturbances may amplify sympathetic nervous system activity, thereby increasing blood pressure and facilitating the emergence of hypertensive conditions.[9] Furthermore, insufficient sleep duration and compromised sleep quality have been identified as independent contributors to elevated blood pressure.[10]

The Pittsburgh sleep quality index (PSQI) is a standardized and widely accepted instrument used to quantify sleep quality across multiple domains, including sleep initiation, duration, efficiency, disturbances, medication use, and daytime impairment.[11,12] Quality of life (QOL), encompassing physical, emotional, and social dimensions, was evaluated in the present study using the QOL-gravidarum (GRAV) scale.[13]

Although both sleep disturbances and hypertensive conditions in pregnancy have been extensively examined individually, direct comparative analyses between normotensive and hypertensive pregnant populations remain scarce. Therefore, this study was designed to explore differences in sleep parameters, QOL, and clinical characteristics between these two groups.

PATIENTS AND METHODS

This cross-sectional study enrolled 100 pregnant women who presented to an obstetrics outpatient clinic. Participants were stratified into two groups of 50 each: Normotensive and hypertensive. The hypertensive cohort included individuals diagnosed with chronic hypertension, gestational hypertension, or preeclampsia.

Ethical approval was granted by the Clinical Research Ethics Committee İzmir Bakırçay University (approval no: 2258, date: 14.05.2025), and written informed consent was obtained from all participants. The study protocol adhered to the principles outlined in the Declaration of Helsinki.

Demographic and clinical data were collected, including age, education level, employment status, smoking habits, family structure, and obstetric history. Blood pressure measurements were obtained, and laboratory analyses included hemoglobin, platelet count, leukocyte count, urea, creatinine, and glomerular filtration rate (GFR).

Sleep quality was assessed using the PSQI, which evaluates sleep characteristics over the preceding month, with higher scores reflecting poorer sleep quality.[11,12] QOL was measured using the QOL-GRAV scale.[13]

Statistical Analysis

Statistical analyses were performed using SPSS software. Data distribution was assessed with the Shapiro-Wilk test. Parametric data were analyzed using the independent samples t-test, while non-parametric data were analyzed using the Mann-Whitney U test. Categorical variables were compared using the chi-square test. Statistical significance was defined as $p<0.05$.

RESULTS

Anthropometric characteristics were comparable between the two groups, with no statistically significant differences in body weight, height or body mass index ($p>0.05$), indicating homogeneous baseline physical parameters.

Socio-demographic analysis revealed significant disparities. Lower educational attainment, higher unemployment rates, greater prevalence of extended-family living arrangements, and higher smoking rates were observed in the hypertensive group ($p<0.05$). Residence and marital status did not differ significantly (Table 1).

Obstetric variables, including gestational age, gravidity, and parity, were similar across groups ($p>0.05$) (Table 2).

Biochemical analysis demonstrated that hypertensive pregnant women had significantly elevated urea and creatinine levels and a reduced GFR ($p<0.001$). Platelet counts were also lower in this group ($p<0.001$), while hemoglobin and leukocyte counts did not differ significantly. Thyroid-stimulating hormone levels were lower in the hypertensive group ($p=0.033$).

Sleep assessment revealed that hypertensive pregnant women had significantly prolonged sleep latency, reduced sleep duration, and decreased sleep efficiency ($p<0.001$). Total PSQI scores were significantly higher, indicating poorer sleep quality.

Subcomponent analysis confirmed increased sleep disturbances and daytime dysfunction in the hypertensive group ($p<0.001$). Subjective sleep quality was also significantly impaired.

QOL scores were significantly lower in hypertensive pregnant women ($p<0.001$) (Table 3).

DISCUSSION

The present findings indicate that hypertensive disorders during pregnancy are associated with substantial deterioration in both sleep quality and overall QOL. These results support the concept that hypertension in pregnancy represents a multifaceted condition involving not only vascular dysregulation but also neuroendocrine imbalance, metabolic alterations, and psychosocial stressors.

The significantly higher PSQI scores observed in hypertensive pregnant women confirm the presence of pronounced sleep impairment. This aligns with previous literature demonstrating a bidirectional relationship between sleep disturbances and hypertension.[9,14] Sleep plays a critical role in cardiovascular homeostasis, and its disruption may contribute to sustained elevations in blood pressure through autonomic imbalance.

Prolonged sleep latency may reflect heightened sympathetic nervous system activation. Under normal physiological conditions, sleep onset is facilitated by parasympathetic dominance; however, this regulatory mechanism appears to be impaired in hypertensive individuals.[15] This shift toward sympathetic predominance may also contribute to increased cardiovascular reactivity.

Reduced sleep duration observed in hypertensive pregnant women may further exacerbate neuroendocrine dysregulation. Sleep restriction has been associated with elevated cortisol levels and increased catecholamine secretion, both of which contribute to hypertension.[3,10]

Table 1. Socio-demographic characteristics

Parameter	Normal	Hypertensive	p-value
Age (year)	30.92±4.07	32.02±2.96	0.207
Weight (kg)	80.20±8.10	79.10±8.45	0.58
Height (m)	1.64±0.05	1.63±0.05	0.44
BMI (kg/m²)	29.80±3.10	29.50±3.25	0.67
Educational level			0.002
Primary school	6 (12%)	18 (36%)	
Secondary school	10 (20%)	14 (28%)	
High school	20 (40%)	12 (24%)	
University	14 (28%)	6 (12%)	
Place of residence			0.544
Rural	18 (36%)	20 (40%)	
Urban	32 (64%)	30 (60%)	
Employment status			0.006
Unemployed	30 (60%)	42 (84%)	
Employed	20 (40%)	8 (16%)	
Family structure			0.003
Nuclear family	38 (76%)	26 (52%)	
Extended family	12 (24%)	24 (48%)	
Smoking status			0.013
No	42 (84%)	30 (60%)	
Yes	8 (16%)	20 (40%)	
Marital status			>0.05
Single	10 (20%)	8 (16%)	
Married	40 (80%)	42 (84%)	

BMI: Body mass index.

Table 2. Obstetric and clinical characteristics

Parameter	Normal	Hypertensive	p-value
Number of pregnancies	2.20±1.28	2.42±1.51	0.724
Number of children	0.92±0.67	1.14±1.21	0.733
Gestational week			0.661
20-35 week	34 (68%)	32 (64%)	
36-38 week	16 (32%)	18 (36%)	
Blood pressure status			**<0.001**
Normal	40 (80%)	0 (0%)	
Chronic hypertension	0 (0%)	30 (60%)	
Gestational hypertension	8 (16%)	0 (0%)	
Preeclampsia	2 (4%)	20 (40%)	
Antihypertensive medication use			**<0.001**
No	46 (92%)	10 (20%)	
Yes	4 (8%)	40 (80%)	

Additionally, insufficient sleep has been linked to insulin resistance, oxidative stress, and systemic inflammation, suggesting a broader metabolic impact.

Decreased sleep efficiency indicates fragmented sleep architecture and frequent nocturnal awakenings. Such disruptions may impair restorative sleep processes, thereby contributing to both physical and psychological dysfunction. Prior studies have demonstrated that poor sleep quality is associated with hypertensive disorders of pregnancy, particularly preeclampsia,[16,17] suggesting a potential role in disease progression.

Table 3. Laboratory parameters, quality of life, and sleep characteristics

Parameter	Normal	Hypertensive	p-value
Hb (g/dL)	10.64±1.16	10.50±1.21	0.113
PLT (10^3/μL)	215.52±35.70	172.28±49.19	**<0.001**
WBC (10^3/μL)	9.79±1.10	9.16±0.88	0.324
Urea (mg/dL)	15.40±2.10	19.39±2.28	**<0.001**
Creatinine (mg/dL)	0.34±0.36	0.94±0.16	**<0.001**
GFR (mL/min)	111.02±4.44	102.74±6.01	**<0.001**
TSH (μIU/mL)	2.12±0.29	1.98±0.24	**0.033**
QOL-GRAV score	16.86±5.57	32.34±8.08	**<0.001**
QOL-GRAV category			**<0.001**
Excellent	12 (24%)	2 (4%)	
Very good	20 (40%)	8 (16%)	
Good	14 (28%)	18 (36%)	
Poor	4 (8%)	22 (44%)	
Sleep latency (min)	17.40±8.76	27.10±10.98	**<0.001**
Sleep duration (hours)	8.84±1.04	6.94±0.96	**<0.001**
Sleep efficiency (%)	85.10±5.30	72.60±7.77	**<0.001**
Subjective sleep quality			**<0.001**
Very good	16 (32%)	2 (4%)	
Good	22 (44%)	10 (20%)	
Poor	10 (20%)	22 (44%)	
Very poor	2 (4%)	16 (32%)	
Sleep disturbances			**<0.001**
None	20 (40%)	4 (8%)	
<1/week	18 (36%)	10 (20%)	
1-2/week	10 (20%)	18 (36%)	
≥3/week	2 (4%)	18 (36%)	
Daytime dysfunction			**<0.001**
None	24 (48%)	6 (12%)	
<1/week	16 (32%)	12 (24%)	
1-2/week	8 (16%)	18 (36%)	
≥3/week	2 (4%)	14 (28%)	
Pittsburgh score	1.98±1.55	6.36±2.21	**<0.001**

Hb: Hemoglobin; PLT: Platelet count; WBC: White blood cell count; GFR: Glomerular filtration rate; TSH: Thyroid-stimulating hormone; QOL-GRAV: Quality of life in pregnancy scale; PSQI: Pittsburgh sleep quality index.

The increased prevalence of daytime dysfunction highlights the functional consequences of impaired sleep. Cognitive domains such as attention, executive function, and decision-making are particularly vulnerable to sleep deprivation.[18] In pregnant women, these impairments may have additional implications for maternal well-being and daily functioning.

The observed reduction in QOL among hypertensive pregnant women underscores the multidimensional burden of the condition. Chronic disease, psychological stress, and the risk of adverse maternal and fetal outcomes likely contribute to this decline.[19,20] These findings emphasize the importance of addressing both physical and psychosocial aspects of care.

Renal function parameters further illustrate the systemic impact of hypertension. Elevated urea and creatinine levels, along with reduced GFR, suggest impaired renal perfusion and altered hemodynamics.[8] These changes may also reflect broader vascular dysfunction affecting multiple organ systems.

Inflammation appears to be a central mechanism linking sleep disturbances and hypertension. Sleep disruption has been shown to increase proinflammatory cytokine production, which may contribute to endothelial dysfunction and vascular injury.[15,21] This inflammatory cascade provides a plausible explanation for the observed associations between sleep impairment, hypertension, and adverse clinical outcomes.

Taken together, these findings support the hypothesis that sleep disturbances are not merely secondary symptoms but may play an active role in the pathophysiology of hypertensive disorders in pregnancy. Addressing sleep quality may, therefore, represent a therapeutic target.

This study has several limitations. First, due to its cross-sectional design, causal relationships between hypertensive disorders of pregnancy and sleep disturbances could not be established. In addition, the single-center setting and relatively limited sample size may reduce the generalizability of the findings. Sleep quality was assessed using self-reported questionnaires rather than objective methods, which may have introduced subjective bias into the assessment. Furthermore, psychological factors such as anxiety and stress were not comprehensively evaluated and may have acted as confounding variables. Despite these limitations, our study provides valuable evidence regarding the relationship between hypertensive disorders of pregnancy, impaired sleep quality, and reduced QOL.

Hypertensive pregnant women exhibit marked impairments in sleep quality, increased daytime dysfunction, and reduced QOL compared to normotensive individuals. These findings suggest that sleep disturbances are closely intertwined with the underlying mechanisms of hypertensive disorders in pregnancy rather than representing incidental observations. Integrating sleep assessment into routine clinical practice may enhance patient management and improve maternal outcomes. Future longitudinal and interventional studies are required to further elucidate causal pathways and evaluate the effectiveness of sleep-targeted interventions.

Ethics

Ethics Committee Approval: Ethical approval was granted by the Clinical Research Ethics Committee İzmir Bakırçay University (approval no: 2258, date: 14.05.2025).

Informed Consent: Written informed consent was obtained from all participants.

Footnotes

Authorship Contributions

Concept: Z.Y.E.; Design: A.R.K.; Data Collection or Processing: Z.Y.E.; Analysis or Interpretation: A.R.K.; Literature Search: Z.Y.E.; Writing: A.R.K.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

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