

# Sleep during the early postpartum period as a factor of maternal mental and physical health

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## KEYWORDS

postpartum sleep, maternal fatigue, postpartum depression, sleep quality, early postpartum period

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## ABSTRACT

**INTRODUCTION:** Sleep disturbances are common during the postpartum period, significantly impacting maternal physical and mental health. Poor sleep quality is closely linked to elevated fatigue levels and postpartum depression, yet the specific mechanisms remain underexplored, particularly in the early postpartum weeks. This study aims to evaluate the prevalence and effects of sleep disturbances on maternal well-being in the early postpartum period.

**METHODS:** This cross-sectional observational study was conducted at Alexandra General Hospital in Athens, Greece, between May and August 2024, focusing on women 8–15 days postpartum. A total of 100 participants completed validated assessment tools, including the Athens Insomnia Scale (AIS), General Sleep Disturbance Scale (GSDS), Edinburgh Postnatal Depression Scale (EPDS), and the Visual Analog Scale for Fatigue (VAS-F). Statistical analyses were performed to evaluate correlations between sleep, fatigue, and depressive symptoms.

**RESULTS:** The median AIS score was 20 (range: 8–32), indicating widespread insomnia symptoms, with 31% of participants reporting poor sleep quality on all seven nights. Fatigue levels were high, with a median VAS-F fatigue subscale score of 74 (range: 20–111), and depressive symptoms were prevalent, with a median EPDS score of 28 (range: 5–55). Significant positive correlations were observed between AIS and VAS-F fatigue scores ( $r=0.290$ ,  $p=0.004$ ) and EPDS scores ( $r=0.280$ ,  $p=0.006$ ), highlighting the interplay between sleep disturbances, fatigue, and depression.

**CONCLUSIONS:** The findings underscore the urgent need for routine screening of sleep disturbances and postpartum depression in early postnatal care. Tailored interventions, such as sleep hygiene education and cognitive-behavioral therapy, could help mitigate these challenges and improve maternal health outcomes.

## INTRODUCTION

Sleep is a vital component of human physiology, essential for overall health and well-being<sup>1</sup>. During pregnancy, its importance is heightened due to the physiological and psychological changes inherent to this unique period. The second and third trimesters, in particular, pose significant challenges to maternal sleep patterns, influenced by hormonal shifts, physical discomfort, and psychological stressors<sup>2,3</sup>.

Hormonal fluctuations during pregnancy have profound effects on sleep. Elevated levels of progesterone can induce daytime sleepiness, while simultaneously contributing to frequent nighttime awakenings and disrupted sleep architecture as the pregnancy progresses<sup>4</sup>. Increased estrogen levels can exacerbate nasal congestion, potentially leading to obstructive sleep apnea<sup>5</sup>. Physical discomfort, such as back pain or difficulty finding a comfortable sleeping position due to a growing abdomen, further complicates sleep quality<sup>6</sup>. Additionally, conditions like restless leg syndrome are more

prevalent during pregnancy, significantly interfering with restful sleep<sup>7</sup>.

Psychological factors also play a critical role. Anxiety and stress related to impending childbirth, lifestyle changes, and concerns about the baby's health can lead to insomnia and other sleep disturbances<sup>8</sup>. Poor sleep quality, in turn, has been closely linked to higher rates of prenatal depression and anxiety, creating a cyclical relationship that exacerbates these conditions<sup>9</sup>.

Moreover, sleep disturbances during pregnancy have far-reaching implications for both maternal and neonatal health. Research has shown associations between poor sleep and adverse outcomes such as gestational diabetes, preeclampsia, and low birth weight. These complications underscore the necessity of understanding and addressing sleep issues during this period<sup>10-12</sup>.

The postpartum period adds another layer of complexity. Sleep deprivation due to infant care, coupled with hormonal and emotional changes, can impair a mother's physical and

mental health. The interrelationship between postpartum sleep quality and the onset of depressive symptoms has been particularly well-documented<sup>13</sup>.

Despite the critical role of sleep in maternal health, this area remains underexplored, particularly regarding the mechanisms linking sleep disturbances with physical and mental outcomes. This study aims to fill this gap by examining the impact of sleep patterns during the early postpartum period on maternal physical and psychological health. By identifying contributing factors and outcomes, this research seeks to inform interventions that promote better sleep hygiene and enhance maternal well-being.

## METHODS

### Study design and location

This study was conducted as a cross-sectional observational analysis at the “Alexandra General Hospital” in Athens, Greece, between May 1st, 2024, and August 31st, 2024. The research focused on postpartum women 8–15 days after delivery, including both natural births and cesarean sections.

### Study population

The target population included postpartum women admitted to the maternity ward. Inclusion criteria required participants to have delivered a singleton or multiple pregnancies and to be available for data collection during the specified postpartum period. Participants were required to provide written informed consent, ensuring anonymity and compliance with ethical guidelines.

### Data collection tools

Data were gathered using a structured, anonymous questionnaire. The questionnaire was designed to collect:

- a) Sociodemographic Information: Age, marital status, education level, occupation, household income, etc.
- b) Data from the Visual Analogue Scale to Evaluate Fatigue Severity (VAS-F): The VAS-F collects subjective fatigue severity data by asking participants to mark their fatigue level on a line, typically ranging from 0 (no fatigue) to 100 (extreme fatigue). The resulting score, measured in millimeters or percentages, quantifies fatigue severity. Data often includes participant IDs, VAS-F scores, and the time of measurement, especially in longitudinal studies. This tool allows for statistical analyses, such as comparing mean fatigue levels across groups, assessing correlations with related variables (e.g., sleep or stress), and tracking changes over time to evaluate intervention effects<sup>14</sup>. The scale has been validated in the Greek population, so we used the Greek version<sup>15</sup>.
- c) Data from the Athens Insomnia Scale (AIS): The AIS is a standardized self-assessment tool designed to measure the severity of insomnia based on the International Classification of Diseases (ICD)-10 criteria. It consists of 8 items assessing key aspects of sleep difficulty, including sleep induction, awakenings during the night,

early awakening, total sleep duration, sleep quality, daytime well-being, functioning, and sleepiness. Each item is scored from 0 (no problem) to 3 (severe problem), yielding a total score ranging from 0 to 24, with a score of 6 or more indicating clinically significant insomnia. The AIS is widely used in clinical and research settings to screen for insomnia, monitor its severity, and evaluate the effectiveness of treatments or interventions targeting sleep improvement<sup>16</sup>.

- d) Data from the General Sleep Disturbance Scale (GSDS): The GSDS is a self-reported questionnaire assessing the frequency and severity of sleep disturbances over the past week. It consists of 21 items grouped into 7 subscales: difficulty falling asleep, staying asleep, waking early, sleep quality, sleep quantity, daytime functioning, and use of sleep medications. Each item is scored on a 0 to 7 scale, reflecting the number of days the disturbance occurred, with a total score range of 0 to 147. Higher scores indicate greater severity, and a cutoff of 43 or higher suggests clinically significant disturbances. Widely used in clinical and research contexts, the GSDS evaluates sleep issues in populations such as shift workers, patients with chronic conditions, or individuals experiencing lifestyle-related disruptions, and it is effective for tracking changes or assessing intervention outcomes. The scale has been validated in the Greek population, so we used the Greek version<sup>15</sup>.
- e) Data from the Edinburgh Postnatal Depression Scale (EPDS): The EPDS is a widely used self-report questionnaire designed to screen for symptoms of postpartum depression in new mothers. It consists of 10 items, each addressing specific aspects of mood and emotional well-being over the past seven days, such as feelings of sadness, anxiety, guilt, and enjoyment of life. Each item is scored on a 4-point scale (0 to 3), with a total score ranging from 0 to 30. Higher scores indicate a greater likelihood of depressive symptoms, with a common threshold of 10 to 13 suggesting possible depression and scores of 13 or higher warranting further clinical evaluation. The EPDS is validated for use in various cultural and clinical settings, making it a valuable tool for early identification and intervention in postnatal mental health issues<sup>17</sup>. The scale has been validated in the Greek population, so we used the Greek version<sup>18</sup>.
- f) A structured knowledge questionnaire: A structured knowledge questionnaire was also developed to assess participants' understanding of the relationship between sleep disorders and postpartum depression. The questionnaire included statements related to sleep and its impact during pregnancy and the postpartum period, requiring responses of “True” (T) or “False” (F). Key topics covered included the association of sleep disorders with postpartum depression, pregnancy complications, and physical changes affecting sleep. Other items evaluated the frequency of sleep disruptions during pregnancy and lactation, as well as the effects of sleep problems on

memory, reflexes, and the mother-newborn relationship. All the questionnaires used for this study are available as Supplementary file.

### Data collection process

Participants were approached during their hospitalization and invited to complete the questionnaire. Each participant received verbal and written explanations of the study's purpose. The questionnaires were self-administered, with assistance provided by trained researchers when necessary.

### Ethical considerations

The study protocol was approved by the Research Ethics Boards of the University of West Attica (protocol number 104/09-02-2024).

### Statistical analysis

The normality of the variables was assessed using the Kolmogorov-Smirnov test. Continuous variables exhibited non-normal distribution and were therefore analyzed using the Mann-Whitney U test for two groups. We used the Chi-squared and the Fisher's exact test to analyze the relationship between two or more categorical variables. Continuous variables are presented as median (range). Categorical variables are presented as absolute numbers (frequency in percentages).

The Spearman's correlation coefficient was used to evaluate the association between quantitative variables. The reliability of the questionnaires and their subscales was assessed using Cronbach's alpha reliability coefficient. P-values <0.05 were considered statistically significant. Statistical analysis was performed using IBM SPSS software, version 26.0 (IBM, Armonk, NY, USA).

## RESULTS

### Demographics, pregnancy-related, and postpartum data

The study population comprised 100 participants with a median age of 33 years (range: 19–42). Regarding educational attainment, the majority had completed high school (n=53, 53%) or held a bachelor's degree (n=43, 43%), with a smaller proportion reporting a master's degree (n=4, 4%). Most participants were Greek nationals (n=98, 98%) and married (n=72, 72%). The predominant occupation was private employment (n=73, 73%), followed by civil service (n=14, 14%).

Among the pregnancies, 95% (n=95) were planned, with 39% (n=39) reporting complications, the most common being diabetes mellitus (n=18, 18%). Smoking during pregnancy was reported by 20% (n=20), with a median consumption of one cigarette per day (range: 0–6). Delivery via cesarean section occurred in 52% of cases (n=52), and the most common gestational age at birth was 39 weeks (n=39, 39%). Male newborns constituted 53% of births (n=53).

Postpartum, 30% (n=30) reported trouble sleeping, while 34% (n=34) experienced stress. A majority (n=63, 63%)

reported that their sleep quality was better before pregnancy. Additionally, 63% (n=63) indicated that their newborn did not sleep soundly at night, and 79% (n=79) reported waking up earlier postpartum compared to during pregnancy.

In terms of infant care, exclusive breastfeeding was practiced by 68% (n=68). The majority of newborns slept in

**Table 1. Demographics, pregnancy-related, and postpartum data, a cross-sectional study of Women 8–15 Days Postpartum in Greece, 2024 (N=100)**

Parameter	Median (Range) or N (%)
<b>Age (years)</b>	33 (19-42)
<b>Education</b>	
High School	53 (53)
Bachelor's degree	43 (43)
Master's degree	4 (4)
Doctorate	0 (0)
<b>Nationality</b>	
Greek	98 (98)
Other	2 (2)
<b>Marital status</b>	
Single	19 (19)
Married	72 (72)
Divorced	3 (3)
Partnership	6 (6)
<b>Profession</b>	
Private employee	73 (73)
Civil servant	14 (14)
Self-employed	8 (8)
Housewife	0 (0)
Unemployed	5 (5)
Student	0 (0)
Other	0 (0)
<b>Partner's profession</b>	
Private employee	61 (61)
Civil servant	19 (19)
Self-employed	17 (17)
Unemployed	3 (3)
Household	0 (0)
Student	0 (0)
Other	0 (0)
<b>Family income (monthly)</b>	
<1000 euros	5 (5)
>1000 euros	95 (95)

(Continued)

**Table 1.** (Continued)

Parameter	Median (Range) or N (%)
<b>How many children do you have in total</b>	
1	50 (50)
2	28 (28)
3	18 (18)
4	4 (4)
<b>Was there a problem before pregnancy that caused you concern?</b>	
Spontaneous miscarriages	15 (15)
Ectopic pregnancy	9 (9)
No	76 (76)
<b>Was pregnancy desired?</b>	
Yes	95 (95)
No	5 (5)
<b>The pregnancy was</b>	
Singleton (one fetus) Pregnancy	95 (95)
Twin Pregnancy	5 (5)
Multiple Pregnancy	0 (0)
<b>There were pregnancy complications such as</b>	
Abnormal fetal shape	0 (0)
Placental abnormalities	3 (3)
Bleeding	12 (12)
Cervical insufficiency	4 (4)
Hypertension	2 (2)
Diabetes mellitus	18 (18)
No	61 (61)
<b>Did you smoke during pregnancy?</b>	
Yes	20 (20)
No	80 (80)
If yes how much? (cigarettes/day)	1 (0-6)
<b>Did you drink alcohol during your pregnancy?</b>	
Yes	0 (0)
No	100 (100)
<b>Did you drink caffeinated beverages during pregnancy?</b>	
Yes	29 (29)
No	71 (71)
If yes how many glasses per week?	1 (0-7)

(Continued)

**Table 1.** (Continued)

Parameter	Median (Range) or N (%)
<b>Did you drink coffee or tea during your pregnancy?</b>	
Yes	73 (73)
No	27 (27)
If yes how many glasses per week?	3 (0-7)
How much weight did you gain during pregnancy?	11 (5-25)
<b>Did you wake up several times during the night during pregnancy?</b>	
Yes	87 (87)
No	13 (13)
Did you snore during pregnancy?	
Yes	43 (43)
No	57 (57)
<b>Did you do any physical activity during pregnancy?</b>	
Yes	28 (28)
No	72 (72)
<b>Childbirth</b>	
Normal	48 (48)
Cesarean	52 (52)
VBAC (Natural Birth after Cesarean Section)	0 (0)
<b>Analgesia during labor</b>	
None	3 (3)
Epidural	15 (15)
General	82 (82)
<b>During the natural delivery, it was performed</b>	
Perineotomy	22 (45.8)
Embryostomy	4 (8.3)
Aspiration embryostomy	2 (4.2)
None of the above	20 (41.7)
<b>What was your gestational age when you gave birth? (week)</b>	
29	2 (2)
33	1 (1)
34	3 (3)
35	5 (5)
36	4 (4)
37	2 (2)
38	24 (24)

(Continued)

**Table 1.** (Continued)

Parameter	Median (Range) or N (%)
39	39 (39)
40	17 (17)
41	3 (3)
<b>Gender of newborn</b>	
Male	53 (53)
Female	47 (47)
<b>Are you satisfied/ pleased with your delivery?</b>	
Yes	84 (84)
No	16 (16)
<b>If No does it bother you/ affect you so that it does not allow you to sleep?</b>	
Yes	5 (31.3)
No	11 (68.7)
<b>Before giving birth, you were informed about</b>	
Sleep	47 (47)
Breastfeeding	80 (80)
Changes in the body	55 (55)
Nutrition	65 (65)
Childbirth	76 (76)
Cesarean section	27 (27)
<b>Who did you hear from?</b>	
Books	55 (55)
Family	41 (41)
Acquaintances/Friends	49 (49)
Doctor	70 (70)
Midwife	63 (63)
Parenthood Preparation Courses	20 (20)
<b>Newborn nutrition</b>	
Exclusive Breastfeeding	68 (68)
Foreign Milk	5 (5)
Mixed feeding	18 (18)
More breast milk/ less foreign milk	7 (7)
More foreign milk/ less breast milk	2 (2)
<b>Where will the newborn sleep?</b>	
In bed with you	34 (34)
In a cot in your room	65 (65)
In a cot in a separate room	1 (1)

(Continued)

**Table 1.** (Continued)

Parameter	Median (Range) or N (%)
<b>Will you have postpartum help at home?</b>	
Yes	75 (75)
No	25 (25)
<b>From whom?</b>	
Spouse/Partner	71 (71)
Mother	23 (23)
Sister/Brother	4 (4)
Friend	0 (0)
Other	2 (2)
<b>What hours of the 24 hours do you sleep?</b>	
When the newborn also sleeps	5 (5)
Morning	64 (64)
Noon	0 (0)
Afternoon	3 (3)
Evening	28 (28)
<b>Do you snore after giving birth?</b>	
Yes	33 (33)
No	67 (67)
<b>Are you having trouble sleeping?</b>	
Yes	30 (30)
No	69 (69)
<b>Do you feel stressed/stressed after giving birth?</b>	
Yes	34 (34)
No	66 (64)
<b>Was the sleep you had before pregnancy of better quality?</b>	
Yes	63 (63)
No	37 (37)
<b>Have you noticed changes in your sleep after giving birth?</b>	
Yes	32 (32)
No	68 (68)
<b>Do you wake up earlier or later in the morning after giving birth than during pregnancy?</b>	
Earlier	79 (79)
Later	21 (21)

(Continued)

**Table 1.** (Continued)

Parameter	Median (Range) or N (%)
<b>Does the newborn sleep soundly at night?</b>	
Yes	37 (37)
No	63 (63)
<b>Is there a difference in your sleep between your first and other children?</b>	
Yes	58 (58)
No	42 (42)
<b>Do you feel rested after sleeping?</b>	
Yes	50 (50)
No	50 (50)

a cot in the parents' room (n=65, 65%). Postpartum support was available to 75% (n=75) of participants, primarily from their spouse/partner (n=71, 71%).

Demographics, pregnancy-related, and postpartum data are displayed in Table 1.

#### Perceptions of sleep disturbances and their impacts on maternal health during pregnancy and postpartum

A majority of participants (n=61, 61%) agreed that sleep disorders are related to the occurrence of postpartum depression. Similarly, 58% (n=58) recognized a relationship between sleep disorders and problems during pregnancy.

Physical changes during pregnancy were identified as a barrier to quality sleep by 85% of respondents (n=85), while nearly all participants (n=94, 94%) reported that pregnant and lactating women frequently wake up during sleep. Additionally, 64% (n=64) believed that sleep problems negatively impact the relationship between the mother and her newborn, and 96% (n=96) acknowledged stress and anxiety as contributors to sleep disturbances.

Regarding sleep patterns, 70% (n=70) reported that drowsiness is typical during pregnancy but not postpartum, while breastfeeding was perceived as a cause of sleep disturbances by 47% (n=47). A minority of participants (n=32, 32%) agreed that postpartum women cannot achieve good-quality sleep.

Finally, a significant majority (n=88, 88%) acknowledged that sleep disorders and lack of sleep adversely affect memory and reflexes. These findings underscore the widespread recognition of sleep-related challenges and their implications for maternal mental and physical well-being during the perinatal period.

Perceptions of sleep disturbances and their impacts on maternal health during pregnancy and postpartum are displayed in Table 2.

**Table 2. Perceptions of sleep disturbances and their impacts on maternal health during pregnancy and postpartum, a cross-sectional study of Women 8–15 Days Postpartum in Greece, 2024 (N=100)**

Question	N (%)
<b>Sleep disorders are related to the occurrence of postpartum depression</b>	
F	39 (39)
T	61 (61)
<b>Sleep disorders are related to the occurrence of problems in pregnancy</b>	
F	42 (42)
T	58 (58)
<b>The physical changes that occur to a woman during pregnancy make it difficult for her to be able to sleep</b>	
F	15 (15)
T	85 (85)
<b>Pregnant and lactating women often wake up during sleep</b>	
F	6 (6)
T	94 (94)
<b>Sleep problems negatively affect the relationship between mother and newborn</b>	
F	36 (36)
T	64 (64)
<b>Stress and anxiety cause sleep disturbances</b>	
F	4 (4)
T	96 (96)
<b>Drowsiness is normal in pregnancy, but not in postpartum</b>	
F	30 (30)
T	70 (70)
<b>Breastfeeding creates sleep disturbances</b>	
F	53 (53)
T	47 (47)
<b>Lying-in women cannot get sleep of good quality</b>	
F	68 (68)
T	32 (32)
<b>Disorders and lack of sleep affect memory and reflexes</b>	
F	12 (12)
T	88 (88)

\*F: false; T: true

### Visual Analogue Scale to Evaluate Fatigue Severity (VAS-F)

VAS-F was used to assess the distribution of scores for fatigue-related symptoms, with participants rating each item on a scale from 0 (least severe) to 10 (most severe). The median value of VAS-F score was 98 (61-143). The median value of VAS-F fatigue subscale score was 74 (20-111). The median value of VAS-F energy subscale score was 30 (4-45). Cronbach  $\alpha$  was 0.787 for VAS-F scale (Supplementary File).

High severity scores ( $\geq 7$ ) were predominantly observed for “desire to close my eyes” (26% at score 8), “desire to lie down” (21% at score 8), and “tired” (24% at score 6). Moderate scores (4–6) were commonly reported for “drowsy” (30% at score 5), “worn out” (16% at scores 6 and 8), and “energetic” (22% at score 5). In contrast, low scores (0–3) were more frequent for “keeping my eyes open” (12% at score 1) and “carrying on a conversation” (20% at score 0).

The data reveal significant fatigue-related challenges, particularly in symptoms associated with physical exhaustion and a strong desire for rest, such as the need to close one’s eyes or lie down. Lower levels of fatigue were more common for tasks requiring focus and alertness, such as maintaining

conversations or staying awake. These findings underscore the pervasive impact of fatigue on daily functioning, with notable variability in severity across different domains.

Responses regarding VAS-F scale are displayed in Table 3.

### Athens Insomnia Scale (AIS)

The median value of AIS score was 20 (8-32). Cronbach  $\alpha$  was 0.935 for this scale (Supplementary File).

Regarding sleep induction, 38% (n=38) reported no problem falling asleep, while 20% (n=20) experienced slight delays, and 32% (n=32) reported marked or very delayed sleep induction. Nighttime awakenings were reported as a considerable problem by 35% (n=35), with 33% (n=33) experiencing serious issues or reporting that they did not sleep at all. Final awakening earlier than desired was reported as “not earlier” by 23% (n=23), while 32% (n=32) reported markedly earlier awakenings, and 15% (n=15) reported much earlier awakenings or no sleep at all.

Regarding total sleep duration, 34% (n=34) found it sufficient, whereas 34% (n=34) described it as markedly insufficient, and 11% (n=11) reported it as very insufficient or no sleep at all. Overall sleep quality was considered

**Table 3. Responses to the Visual Analogue Scale for Evaluating Fatigue Severity (VAS-F) ,a cross-sectional study of Women 8–15 Days Postpartum in Greece, 2024 (N=100)**

ITEM	SCORE										
	0	1	2	3	4	5	6	7	8	9	10
	N (%)										
<b>Tired</b>	0 (0)	5 (5)	0 (0)	3 (3)	12 (12)	13 (13)	24 (24)	18 (18)	11 (11)	11 (11)	3 (3)
<b>Sleepy</b>	0 (0)	4 (4)	1 (1)	6 (6)	8 (8)	24 (24)	7 (7)	11 (11)	16 (16)	11 (11)	12 (12)
<b>Drowsy</b>	6 (6)	4 (4)	10 (10)	7 (7)	14 (14)	30 (30)	4 (4)	15 (15)	8 (8)	0 (0)	2 (2)
<b>Fatigued</b>	0 (0)	10 (10)	4 (4)	7 (7)	15 (15)	7 (7)	24 (24)	15 (15)	5 (5)	3 (3)	10 (10)
<b>Worn out</b>	0 (0)	7 (7)	4 (4)	14 (14)	10 (10)	12 (12)	16 (16)	11 (11)	16 (16)	0 (0)	10 (10)
<b>Energetic</b>	2 (2)	0 (0)	7 (7)	8 (8)	16 (16)	22 (22)	9 (9)	19 (19)	13 (13)	4 (4)	0 (0)
<b>Active</b>	2 (2)	0 (0)	12 (12)	14 (14)	5 (5)	12 (12)	11 (11)	29 (29)	11 (11)	4 (4)	0 (0)
<b>Rigorous</b>	4 (4)	0 (0)	3 (3)	3 (3)	14 (14)	19 (19)	11 (11)	23 (23)	17 (17)	6 (6)	0 (0)
<b>Efficient</b>	2 (2)	3 (3)	5 (5)	2 (2)	7 (7)	13 (13)	17 (17)	19 (19)	19 (19)	11 (11)	2 (2)
<b>Lively</b>	2 (2)	6 (6)	5 (5)	6 (6)	13 (13)	10 (10)	26 (26)	6 (6)	17 (17)	8 (8)	0 (0)
<b>Bushed</b>	0 (0)	0 (0)	7 (7)	10 (10)	5 (5)	17 (17)	13 (13)	14 (14)	20 (20)	5 (5)	9 (9)
<b>Exhausted</b>	0 (0)	3 (3)	3 (3)	11 (11)	15 (15)	23 (23)	12 (12)	7 (7)	15 (15)	4 (4)	7 (7)
<b>Keeping my eyes open</b>	10 (10)	12 (12)	9 (9)	9 (9)	15 (15)	15 (15)	7 (7)	14 (14)	3 (3)	6 (6)	0 (0)
<b>Moving my body</b>	2 (2)	6 (6)	6 (6)	14 (14)	13 (13)	6 (6)	13 (13)	9 (9)	17 (17)	2 (2)	12 (12)
<b>Concentrating</b>	10 (10)	13 (13)	13 (13)	4 (4)	17 (17)	23 (23)	10 (10)	7 (7)	3 (3)	0 (0)	0 (0)
<b>Carrying on a conversation</b>	20 (20)	16 (16)	4 (4)	2 (2)	16 (16)	19 (19)	17 (17)	6 (6)	0 (0)	0 (0)	0 (0)
<b>Desire to close my eyes</b>	5 (5)	10 (10)	0 (0)	2 (2)	3 (3)	15 (15)	13 (13)	17 (17)	26 (26)	4 (4)	5 (5)
<b>Desire to lie down</b>	3 (3)	0 (0)	4 (4)	5 (5)	3 (3)	12 (12)	8 (8)	16 (16)	21 (21)	17 (17)	11 (11)

satisfactory by only 11% (n=11), with 58% (n=58) rating it as slightly unsatisfactory and 31% (n=31) describing it as markedly or very unsatisfactory.

In terms of daytime well-being, 33% (n=33) reported a normal sense of well-being, while 43% (n=43) experienced marked or very decreased well-being. Physical and mental functioning were rated as normal by 12% (n=12), while 48% (n=48) reported slight decreases and 40% (n=40) reported marked or very decreased functioning. Daytime sleepiness was reported as mild by 23% (n=23), considerable by 47% (n=47), and intense by 19% (n=19). Participants experienced

these issues a median of 2 times per week (range: 1–7).

These findings highlight significant disruptions in sleep quality, duration, and associated daytime functioning, with marked effects on well-being and increased sleepiness during the day.

Responses regarding AIS are displayed in Table 4.

#### General Sleep Disturbance Scale (GSDS)

The median value of GSDS score was 55 (23-101). Cronbach a was 0.873 for this scale (Supplementary File).

Difficulty initiating sleep was reported by 19% (n=19) on

**Table 4. Responses to the Athens Insomnia Scale (AIS), a cross-sectional study of Women 8–15 Days Postpartum in Greece, 2024 (N=100)**

ITEM	Answers			
	No problem	Slightly delayed	Markedly delayed	Very delayed or did not sleep at all
Sleep induction	N (%)			
	38 (38)	20 (20)	19 (19)	13 (13)
Awakenings during the night	No problem	Minor problem	Considerable problem	Serious problem or did not sleep at all
	N (%)			
	8 (8)	24 (24)	35 (35)	33 (33)
Final awakening earlier than desired	Not earlier	A little earlier	Markedly earlier	Much earlier or did not sleep at all
	N (%)			
	23 (23)	30 (30)	32 (32)	15 (15)
Total sleep duration	Sufficient	Slightly insufficient	Markedly insufficient	Very insufficient or did not sleep at all
	N (%)			
	34 (34)	21 (21)	34 (34)	11 (11)
Overall quality of sleep	Satisfactory	Slightly unsatisfactory	Markedly unsatisfactory	Very unsatisfactory or did not sleep at all
	N (%)			
	11 (11)	58 (58)	19 (19)	12 (12)
Sense of well-being during the day	Normal	Slightly decreased	Markedly decreased	Very decreased
	N (%)			
	33 (33)	24 (24)	22 (22)	21 (21)
Functioning (physical and mental) during the day	Normal	Slightly decreased	Markedly decreased	Very decreased
	N (%)			
	12 (12)	48 (48)	31 (31)	9 (9)
Sleepiness during the day	None	Mild	Considerable	Intense
	N (%)			
	10 (10)	23 (23)	47 (47)	19 (19)
Parameter	Median (Range)			
The above happens to me _____ a week	2 (1-7)			



three or seven nights. Frequent awakenings during sleep were common, with 37% (n=37) experiencing this on seven nights. Early awakenings at the end of the sleep period were reported on seven nights by 44% (n=44). Despite these disturbances, feeling rested upon awakening was infrequent, with only 14% (n=14) reporting this on seven nights.

Poor sleep quality was experienced by 31% (n=31) on seven nights, while 35% (n=35) reported daytime sleepiness on the same frequency. Fatigue or tiredness during the day was experienced on seven nights by 21% (n=21). However, satisfaction with sleep quality was notably low, with only 3% (n=3) expressing satisfaction on all seven nights.

Daytime alertness and energy levels were consistently low, with 1% (n=1) reporting feeling alert and energetic on all

seven days. Excessive sleep was infrequent, with 2% (n=2) reporting this on seven days, while insufficient sleep was common, with 23% (n=23) experiencing it on seven days. Unscheduled sleep episodes occurred frequently, with 13% (n=13) reporting such episodes on seven days.

Few participants resorted to substances to aid sleep. The use of alcohol, tobacco, or herbal products to induce sleep was negligible, with over 90% reporting no usage throughout the week. Similarly, the use of over-the-counter (94%, n=94) or prescription sleeping pills (94%, n=94) was rare. Aspirin or other pain medications were used occasionally, with 9% (n=9) reporting usage on three or more nights.

The findings underscore significant challenges in maintaining sleep quality and coping with sleep disturbances,

**Table 5. Responses to the General Sleep Disturbance Scale (GSDS), a cross-sectional study of Women 8–15 Days Postpartum in Greece, 2024 (N=100)**

ITEM How often in the past week did you?	SCORE							
	0	1	2	3	4	5	6	7
	N (%)							
have difficulty getting to sleep	16 (16)	17 (17)	6 (6)	19 (19)	12 (12)	5 (5)	19 (19)	6 (6)
wake up during your sleep period	2 (2)	6 (6)	13 (13)	6 (6)	6 (14)	14 (14)	16 (16)	37 (37)
wake up too early at the end of a sleep period	14 (14)	2 (2)	7 (7)	12 (12)	2 (2)	6 (6)	13 (13)	44 (44)
feel rested upon awakening at the end of a sleep period	10 (10)	25 (25)	3 (3)	14 (14)	9 (9)	16 (16)	9 (9)	14 (14)
sleep poorly	5 (5)	0 (0)	12 (12)	5 (5)	16 (16)	11 (11)	20 (20)	31 (31)
feel sleepy during the day	0 (0)	0 (0)	13 (13)	10 (10)	12 (12)	9 (9)	23 (23)	35 (35)
struggle to stay awake during the day	6 (6)	22 (22)	8 (8)	11 (11)	18 (18)	8 (8)	11 (11)	16 (16)
feel irritable during the day	26 (26)	19 (19)	17 (17)	4 (4)	9 (9)	11 (11)	4 (4)	10 (10)
feel tired or fatigued during the day	0 (0)	7 (7)	10 (10)	19 (19)	9 (9)	20 (20)	14 (14)	21 (21)
feel satisfied with the quality of your sleep	17 (17)	19 (19)	30 (30)	15 (15)	6 (6)	6 (6)	4 (4)	3 (3)
feel alert and energetic during the day	8 (8)	25 (25)	24 (24)	11 (11)	19 (19)	8 (8)	4 (4)	1 (1)
get too much sleep	22 (22)	30 (30)	17 (17)	5 (5)	14 (14)	4 (4)	6 (6)	2 (2)
get too little sleep	9 (9)	19 (19)	3 (3)	6 (6)	5 (5)	9 (9)	26 (26)	23 (23)
take a nap at a scheduled time	33 (33)	22 (22)	4 (4)	12 (12)	11 (11)	7 (7)	6 (6)	5 (5)
fall asleep at an unscheduled time	20 (20)	24 (24)	10 (10)	9 (9)	14 (14)	4 (4)	6 (6)	13 (13)
drink an alcoholic beverage to help you get to sleep	92 (92)	0 (0)	0 (0)	2 (2)	2 (2)	3 (3)	1 (1)	0 (0)
use tobacco to help you get to sleep	92 (92)	0 (0)	0 (0)	2 (2)	2 (2)	3 (3)	1 (1)	0 (0)
use herbal product to help you get to sleep	92 (92)	0 (0)	0 (0)	2 (2)	2 (2)	3 (3)	1 (1)	0 (0)
use an over-the-counter sleeping pill to help you get to sleep	94 (94)	0 (0)	0 (0)	0 (0)	2 (2)	0 (0)	3 (3)	1 (1)
use a prescription sleeping pill to help you get to sleep	94 (94)	0 (0)	0 (0)	0 (0)	5 (5)	1 (1)	0 (0)	0 (0)
use aspirin or other pain medication to help you get to sleep	65 (65)							

as well as limited reliance on pharmacological interventions for sleep management.

Responses regarding GSDS are displayed in Table 5.

**Edinburgh Postnatal Depression Scale (EPDS)**

The median value of EPDS score was 28 (5-55). Cronbach  $\alpha$  was 0.821 for this scale (Supplementary File).

**Table 6. Responses to the Edinburgh Postnatal Depression Scale (EPDS), a cross-sectional study of Women 8–15 Days Postpartum in Greece, 2024 (N=100)**

ITEM	SCORE			
<b>In the past 7 days</b>				
<b>I have been able to laugh and see the funny side of things</b>	<b>As much as I always could</b>	<b>Not quite as much now</b>	<b>Definitely not so much now</b>	<b>Not at all</b>
	<b>N (%)</b>			
	65 (65)	28 (28)	5 (5)	2 (2)
<b>I have looked forward with enjoyment to things</b>	<b>As much as I ever did</b>	<b>Rather less than I used to</b>	<b>Definitely less than I used to</b>	<b>Hardly at all</b>
	<b>N (%)</b>			
	76 (76)	18 (18)	4 (4)	2 (2)
<b>I have blamed myself unnecessarily when things went wrong</b>	<b>Yes, most of the time</b>	<b>Yes, some of the time</b>	<b>Not very often</b>	<b>No, never</b>
	<b>N (%)</b>			
	18 (18)	19 (19)	29 (29)	34 (34)
<b>I have been anxious or worried for no good reason</b>	<b>No, not at all</b>	<b>Hardly ever</b>	<b>Yes, sometimes</b>	<b>Yes, very often</b>
	<b>N (%)</b>			
	28 (28)	26 (26)	34 (34)	12 (12)
<b>I have felt scared or panicky for no very good reason</b>	<b>Yes, quite a lot</b>	<b>Yes, sometimes</b>	<b>No, not much</b>	<b>No, not at all</b>
	<b>N (%)</b>			
	13 (13)	30 (30)	29 (29)	28 (28)
<b>Things have been getting on top of me</b>	<b>Yes, most of the time I haven't been able to cope at all</b>	<b>Yes, sometimes I haven't been coping as well as usual</b>	<b>No, most of the time I have coped quite well</b>	<b>No, I have been coping as well as ever</b>
	<b>N (%)</b>			
	9 (9)	16 (16)	54 (54)	21 (21)
<b>I have been so unhappy that I have had difficulty sleeping</b>	<b>Yes, most of the time</b>	<b>Yes, sometimes</b>	<b>Not very often</b>	<b>No, not at all</b>
	<b>N (%)</b>			
	4 (4)	11 (11)	37 (37)	48 (48)
<b>I have felt sad or miserable</b>	<b>Yes, most of the time</b>	<b>Yes, quite often</b>	<b>Not very often</b>	<b>No, not at all</b>
	<b>N (%)</b>			
	4 (4)	16 (16)	31 (31)	47 (47)
<b>I have been so unhappy that I have been crying</b>	<b>Yes, most of the time</b>	<b>Yes, quite often</b>	<b>Only occasionally</b>	<b>No, never</b>
	<b>N (%)</b>			
	7 (7)	8 (8)	42 (42)	43 (43)
<b>The thought of harming myself has occurred to me</b>	<b>Yes, quite often</b>	<b>Sometimes</b>	<b>Hardly</b>	<b>Never</b>
	<b>N (%)</b>			
	8 (8)	5 (5)	84 (84)	3 (3)

**Table 7. Correlations between various scales: Athens Insomnia Scale (AIS), Edinburgh Postnatal Depression Scale (EPDS), General Sleep Disturbance Scale (GSDS), and components of the Visual Analogue Scale for Fatigue (VAS-F), a cross-sectional study of Women 8–15 Days Postpartum in Greece, 2024 (N=100)**

SCALE		AIS	EPDS	GSDS	VAS-F fatigue subscale	VAS-F energy subscale	VAS-F
AIS	rho	1.000	-0.181	0.100	0.290	-0.098	0.254
	p	.	0.074	0.330	<b>0.004</b>	0.336	0.013
EPDS	rho	-0.181	1.000	-0.044	0.385	0.220	0.280
	p	0.074	.	0.666	<b>0.001</b>	0.028	<b>0.006</b>
GSDS	rho	0.100	0.044	1.000	0.250	-0.248	0.193
	p	0.330	0.666	.	<b>0.016</b>	<b>0.015</b>	0.066
VAS-F fatigue subscale	rho	0.290	0.385	0.250	1.000	-0.468	0.873
	p	<b>0.004</b>	<b>0.001</b>	<b>0.016</b>	.	<b>0.001</b>	<b>0.001</b>
VAS-F energy subscale	rho	-0.098	0.220	-0.248	-0.468	1.000	-0.080
	p	0.336	<b>0.028</b>	<b>0.015</b>	0.001	.	0.441
VAS-F	rho	0.254	0.280	0.193	0.873	-0.080	1.000
	p	<b>0.013</b>	<b>0.006</b>	0.066	0.001	0.441	.

\*AIS: Athens Insomnia Scale; EPDS: Edinburgh Postnatal Depression Scale; GSDS: General Sleep Disturbance Scale; VAS-F: Visual Analogue Scale for Fatigue

Regarding emotional outlook, 65% (n=65) were able to laugh and see the funny side of things as much as they always could, while 28% (n=28) reported a slight decrease. Additionally, 76% (n=76) looked forward to things with the same enjoyment as before, though 18% (n=18) noted a slight decline.

Self-blame was infrequent, with 34% (n=34) never blaming themselves unnecessarily and 29% (n=29) doing so rarely. Anxiety or worry without clear reason was experienced sometimes or very often by 46% (n=46), while 28% (n=28) reported no such feelings. Similarly, feeling scared or panicky for no good reason was reported sometimes or often by 43% (n=43), while 57% (n=57) rarely or never experienced these emotions.

Most participants coped well with challenges, with 54% (n=54) indicating they coped quite well and 21% (n=21) as well as ever. Only 25% (n=25) reported difficulty coping. Sleep disturbances due to unhappiness were rare, with 48% (n=48) reporting no such difficulty and 37% (n=37) rarely experiencing it.

Sadness or misery was reported often by 20% (n=20), while 47% (n=47) experienced no such feelings. Crying episodes were infrequent, with 42% (n=42) reporting these occasionally and 43% (n=43) never experiencing them. Thoughts of self-harm were rare, with 84% (n=84) indicating such thoughts occurred hardly ever and 3% (n=3) stating they never occurred.

These findings suggest that most participants maintained emotional stability and effective coping mechanisms, though

a subset reported heightened anxiety, sadness, or challenges in coping with stressors.

Responses regarding EPDS are displayed in Table 6.

#### Correlations between various scales: Athens Insomnia Scale (AIS), Edinburgh Postnatal Depression Scale (EPDS), General Sleep Disturbance Scale (GSDS), and components of the Visual Analogue Scale for Fatigue (VAS-F)

We observed a statistically significant positive correlation between the AIS score and the VAS-F score ( $r=0.254$ ,  $p=0.013$ ) and a statistically significant positive correlation between the AIS score and the VAS-F fatigue subscale score ( $r=0.290$ ,  $p=0.004$ ).

In addition, we observed a statistically significant positive correlation between the EPDS score and VAS-F score ( $r=0.280$ ,  $p=0.006$ ) and a statistically significant correlation between the EPDS score and the VAS-F fatigue subscale score ( $r=0.385$ ,  $p=0.001$ ).

Correlations between various scales are displayed in Table 7.

We also examined the association between the different scales with demographics, pregnancy and postpartum data and we found no statistically significant association (data non-shown).

In addition, we examined the association between the perceptions of sleep disturbances and their impacts on maternal health during pregnancy and postpartum with demographics, pregnancy and postpartum data and we did not find any statistically significant association (data non-shown).

## DISCUSSION

In this study, no significant demographic or pregnancy-related predictors were identified for sleep disturbances, suggesting the universality of these issues. Participants widely recognized sleep problems as impacting maternal health and mother-infant relationships but reported limited use of sleep interventions. A significant portion of postpartum women reported poor sleep quality, difficulty initiating and maintaining sleep, and insufficient restorative sleep, as measured by standardized tools (AIS, GSDS). Elevated fatigue scores were observed, with strong correlations between sleep disturbances and markers of postpartum depression. Notably, disruptions in sleep were linked to decreased daytime functioning and increased depressive symptoms.

A previous study in Greece found that 37.2% of postpartum women experienced symptoms of insomnia as measured by the AIS, and 31% reported frequent awakenings throughout the week. This is in line with our findings that poor sleep quality and insomnia were prevalent, as indicated by elevated AIS and GSDS scores among postpartum women. Additionally, Lazopoulos et al.<sup>15</sup> noted that insomnia significantly impacted well-being, which aligns with our observation of strong correlations between poor sleep quality, increased VAS-F, and higher EPDS scores indicating postpartum depression. Unlike Lazopoulos et al.<sup>15</sup>, who associated factors such as smoking, coffee consumption, and snoring with sleep disturbances, our study did not identify specific external factors contributing to sleep issues, emphasizing instead the general prevalence and impact of sleep disturbances during the early postpartum period.

Wilson et al.<sup>19</sup> reported widespread fatigue in postpartum mothers, with depressive symptoms varying across studies. Similarly, our study documented elevated fatigue levels and high EPDS scores indicative of depression. The strong correlation between fatigue and depressive symptoms in Wilson et al.'s meta-analysis supports our findings of significant positive correlations between VAS-F and EPDS scores ( $r = 0.28-0.38$ )<sup>19</sup>.

Baattaiah et al.<sup>20</sup> examined the interplay between fatigue, sleep quality, resilience, and postpartum depression, identifying significant positive correlations between fatigue, poor sleep quality, and postpartum depression risk, while resilience acted as a protective factor. In Baattaiah et al.<sup>20</sup>, 61% of participants reported fatigue, which correlated positively with postpartum depression, similar to our findings of elevated VAS-F strongly linked with higher EPDS scores. Baattaiah et al.<sup>20</sup> reported that 97% of mothers experienced sleep issues, with Pittsburgh Sleep Quality Index (PSQI) scores showing a moderate positive correlation with EPDS scores ( $r = 0.447$ ). This is consistent with our results, where poor sleep quality (GSDS, AIS) was a significant contributor to depressive symptoms.

In a recent study, Wang et al.<sup>21</sup> explored the relationship between postpartum depression, fatigue, sleep quality, and infant development using latent profile analysis to classify

maternal symptoms into mild, moderate, and severe categories. Their findings have some overlaps and contrasts with ours. Wang et al.<sup>21</sup> identified three distinct symptom profiles (mild: 58.04%, moderate: 34.37%, and severe: 7.59%), demonstrating a range of postpartum experiences. Our study, while not categorizing participants into profiles, similarly noted a high prevalence of sleep disturbances (e.g., insomnia) and fatigue, correlating with depressive symptoms. Wang et al.<sup>21</sup> noted that fatigue, poor sleep, and postpartum depression interact and increase in severity synchronously, which aligns with our findings showing elevated fatigue and poor sleep (GSDS, AIS) significantly linked to higher EPDS scores.

The findings emphasize the critical need for routine screening of sleep disturbances and postpartum depression during postnatal visits, as these issues are strongly interrelated and can significantly impact maternal well-being. Standard assessments, including tools like the EPDS and sleep quality measures, should be integrated into postpartum care protocols, enabling early identification and intervention. Healthcare providers should be trained to recognize and address these challenges, incorporating non-pharmacological approaches such as cognitive-behavioral therapy for insomnia (CBT-I), sleep hygiene education, and relaxation techniques. Prioritizing high-risk individuals for specialized support and conducting further research on the effectiveness of tailored interventions can help reduce the burden of postpartum depression and improve overall maternal and infant health outcomes.

This study has several strengths that enhance its significance and contribution to the field. The use of validated tools, including the AIS, GSDS, EPDS, and VAS-F, ensures the collection of robust and reliable data, adding methodological rigor. Additionally, by focusing on a Greek postpartum population, the research provides valuable cultural context while maintaining relevance to global maternal health discussions. The emphasis on the critical early postpartum period, specifically 8–15 days after childbirth, addresses a time frame often overlooked in broader studies, offering unique insights into the immediate challenges faced by new mothers.

This study also has several limitations that should be considered when interpreting the findings. The cross-sectional design restricts the ability to establish causal relationships between sleep disturbances and health outcomes, limiting the depth of analysis on potential underlying mechanisms. Additionally, the lack of data on specific interventions for improving sleep quality reduces the study's practical applicability for healthcare providers aiming to address these issues. The homogeneity of the participant sample, predominantly Greek, married, and educated women, further narrows the generalizability of the results, as it may not fully represent the diverse socioeconomic factors influencing postpartum sleep disturbances.

Future research should prioritize longitudinal studies to

investigate the causal pathways linking sleep disturbances and postpartum health outcomes. These studies should also evaluate the effectiveness of targeted interventions, such as sleep hygiene education and cognitive-behavioral therapy for insomnia, to develop evidence-based strategies for improving maternal well-being and reducing the risk of postpartum depression.

## CONCLUSIONS

This study highlights the prevalence and significant impact of sleep disturbances during the early postpartum period on maternal mental and physical health. The findings underscore the strong correlation between poor sleep quality, elevated fatigue levels, and postpartum depression, as demonstrated through validated assessment tools. Despite the lack of significant demographic or pregnancy-related predictors, the results reveal a universal challenge faced by postpartum women. These insights emphasize the critical need for integrating routine screening of sleep quality and depressive symptoms into postnatal care, alongside tailored interventions to address these issues. Further longitudinal studies are warranted to explore causal pathways and evaluate the effectiveness of targeted strategies for improving maternal well-being during this critical period.

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#### **CONFLICTS OF INTEREST**

The authors have completed and submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest and none was reported.

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#### **ETHICAL APPROVAL AND INFORMED CONSENT**

The study protocol was approved by the Research Ethics Boards of the University of West Attica (Approval number: 104/09-02-2024; Date: 9 February 2024).

#### **DATA AVAILABILITY**

The data supporting this research are available from the authors on reasonable request.

#### **AUTHORS' CONTRIBUTIONS**

KG and VV conceptualized the study. KG, AD, AB, and CT contributed to data interpretation, analysis, and the drafting of the manuscript. AD and AB analyzed the data and provided critical feedback. VV supervised the research. All authors contributed to manuscript revision, read and approved the final version of the manuscript.

#### **PROVENANCE AND PEER REVIEW**

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