Infant Sleep Difficulties at the 6th Week and the 12th Month Postpartum: What Is their Relationship with Maternal Mental Health and Other Perinatal Factors?

Maria Dagla1,2, Calliope Dagla1, Irina Mrvoljak-Theodoropoulou1, Aikaterini-Taxiarchoula Kavakou1, Eleni Rigoutsou1, Evangelia Antoniou1,2

ABSTRACT

Introduction: Infant sleep difficulties are often a challenge for new parents and may be related to maternal mood. Aim: The aim of this study was to investigate whether the presence of reported infant sleep difficulties at the 6th week and at the 12th month postpartum is associated with maternal psychological well-being and the presence of a mental health disorder in the perinatal period or with other perinatal factors. Methods: It is a retrospective longitudinal study, examining a sample of 622 women who attended a 12-month innovative psychosocial intervention. Data were obtained through the EPDS and PHQ-9 psychometric tools, and the completion of a health history. Statistical analyses included Spearman rank correlation coefficients and Chi-square tests. Results: Reported infant sleep difficulties at the 6th week postpartum were associated with a) increased maternal scores on psychometric tools (EPDS and PHQ-9) during pregnancy and at the 6th week postpartum, b) the presence of pathological maternal mental health symptoms in the perinatal period (p=.034), c) high maternal educational level (p<.001), and d) reported maternal breastfeeding difficulties at the 6th week postpartum (p=.031). Reported infant sleep difficulties at the 12th month postpartum were associated with a) increased maternal scores on the EPDS at the 6th week after birth (p=.030), and at the 6th (p=.031) and the 12th month (p=.006) postpartum, b) reported infant sleep difficulties (p<.001) and frequent infant awakenings in the puerperium (p<.001), d) maternal fatigue at the 6th week postpartum (p<.001), e) infant gastro-esophageal reflux problems (p<.001), and f) high maternal educational level (p=.001). Conclusions: This study demonstrates a positive relationship between infant sleep difficulties at the 6th week and at the 12th months postpartum, with poor maternal mental health in the perinatal period. Keywords: infant sleep difficulties, postpartum, maternal mental health

1. INTRODUCTION

The neonatal period is characterized by frequent and short-term infant sleep. We know that the way newborns sleep differs greatly from that of adults (1). On average, adults sleep 8.5 hours a night (2), while the longest continuous sleep of a healthy full-term newborn lasts 4 to 5 hours (3). Neonatal sleep is, to a greater extent, active, and cycles frequently between quiet and indeterminate sleep stages (4, 5). Newborns, usually, do not distinguish day from night, may sleep for longer periods during the day and often wake up at night because of hunger. The course of the sleep-wake pattern, from multiple sleep episodes distributed around the 24-h period to the point where the child sleeps continuously during the night, is a complex developmental process that poses a challenge for new parents (6, 7). The frequency and duration of neonatal/infant awakenings depend on the infant’s age (8), as well as factors such as gender, breastfeeding, infant temperament, and maternal mental health (9). Male infants and those who are breastfed are more likely to wake up during the night than females and those who are fed with formula, due to the fact that...
Infant Sleep Difficulties at the 6th Week and the 12th Month Postpartum

breast milk is more digestible (10). Factors that can affect the amount and quality of infant sleep, also, include pre-maturity (11), colic, and co-sleeping (12). At the same time, it seems that the cultural context of the family (13) and the attitude, views and beliefs of parents have an influence on whether they perceive their child’s sleep as problematic (14).

Although night awakenings and disturbed sleep are normal during the neonatal and infant age, they often trouble parents (8, 15). Many mothers express that they have difficulty with their baby’s sleep. More specifically, 23% of parents complain of such difficulties in the first 1-3 months (16) and 36-46% of parents express similar difficulties during the second half of the baby’s life (17). Mothers who report problems with their baby’s sleep, often, have babies who wake up more often and for longer periods during the night, find it more difficult to calm them down, and have poorer mental health (18). Neonatal/infant sleep problems have been associated with the onset of maternal depressive symptoms, severe maternal stress, poor mental health, and feelings of maternal impotence (19-21). In addition, factors such as marital stress, family breakdown, child abuse, and child behavioral problems have been associated with both infant sleep problems and postpartum depression (22, 23).

Knowing that the difficulties a mother faces in relation to her newborn/infant’s sleep can affect her mood and mental health, further investigation of the relationship between these factors is of value.

2. AIM

The purpose of this study was to investigate whether the presence of infant sleep difficulties at the 6th week and the 12th month postpartum, as reported by mothers, is associated with maternal psychological well-being and the presence of a mental health disorder in the perinatal period, as well as with other perinatal factors.

3. MATERIALS AND METHODS

This is a retrospective longitudinal study that was conducted at the "Day Center for the Care of the Mental Health of Women (Perinatal Mental Health Disorders)”, a primary mental health facility in Athens (Greece). The study examined 622 women who had participated in a 12-month innovative psychosocial health intervention implemented in the Day Center, from January 2015 to May 2018. This Day Center is the first and only specialized Day Center in Greece that aims at the prevention, early detection and treatment of perinatal mental health disorders. It has been created by a Non-Profit Organization “FAINARETI” (Ref. Number 91/17, 9, 19). The data analyzed in this study emerged from two sources; the women’s health history and the administration of psychometric tools. Specifically, medical, obstetric, psycho-emotional, psychiatric and socio-demographic information was obtained during the completion of the woman's health history at the start of the intervention, i.e. between the 18th and the 22nd gestation week. Information concerning the labor and the puerperium was obtained during the completion of the peripartum and postpartum health and well-being history at the 6th week postpartum. Regarding the psychometric tools, they were completed before (at approximately 24th-28th gestation week and at approximately 34th-38th gestation week) and after childbirth (at the 6th week postpartum). A questionnaire was also completed after breastfeeding cessation in order to obtain information on infant feeding and infant behavior.

The screening tools that were used included: a) The Edinburgh Postnatal Depression Scale (EPDS)-Greek version, and b) The Patient Health Questionnaire-9 (PHQ-9). The first (24) is a 10-item self-report questionnaire which has been established as a useful screening instrument for detection of women at risk for depression in the perinatal period (25). We used the Greek EPDS-version which has been validated by Leonardou et al. (26). In this study, the average alpha coefficient was .86. The Patient Health Questionnaire-9 (PHQ-9) has been validated to screen for depression and it has been developed specifically for use in primary care settings (27). It is not yet culturally adapted to the Greek language; it has, only, been translated for the needs of the Day Center’s participants. In the present study the average Cronbach alpha coefficient was .85.

Statistical analysis

The data were analyzed using SPSS version 22.0. We used Chi-square Test to explore the association between infant sleep difficulties at the 6th week postpartum and a number of independent variables. Also, a set of independent continuous variables were investigated through Spearman rank correlations coefficient with “infant sleep difficulties at the 6th week postpartum” as the dependent variable, with another such analysis being applied in order to examine the relationship of “infant sleep difficulties at the 12th month postpartum” with the independent variables of interest.

4. RESULTS

In this study, data from 622 women with a mean age of 32.58 ± 6.15 (SD) years were analyzed. The significance of
difficulties at the 6th month appeared to encounter more infant sleep difficulties at the 12th month postpartum. A different Spearman and PHQ-9 at the 6th month were low and positive, with EPDS tum were also increased. All the correlations appeared to be low, with the exception of the independent variable "infant sleep difficulties at the 6th week postpartum" which demonstrated medium, positive correlation with dependent variable. Additionally, infant gastro-esophageal reflux problems (ρ=.179) are more likely to be associated with infant sleep difficulties at the 12th month postpartum, showing low, positive correlation (Table 3). In an additional analysis, the Chi-square test showed that mothers with higher education reported more infant sleep difficulties at the 6th week postpartum (ρ=.316) and awakening frequency (ρ=.181), and also maternal wake up fatigue at the 6th week postpartum (ρ=.151) showed positive correlations with infant sleep difficulties at the 12th month postpartum. These correlations appeared to be low, with the exception of the independent variable "infant sleep difficulties at the 6th week postpartum" which demonstrated medium, positive correlation with dependent variable. Additionally, infant gastro-esophageal reflux problems (ρ=.179) are more likely to be associated with infant sleep difficulties at the 12th month postpartum, showing low, positive correlation (Table 3). In an additional analysis, the Chi-square test showed that mothers with higher education reported more infant sleep difficulties at the 12th month postpartum (ρ=.001).

### Table 1. Infant Sleep Difficulties at the 6th Week Postpartum Correlated with the EPDS and PHQ-9 scores **. Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed).

| Variable                                      | r     | p      |
|-----------------------------------------------|-------|--------|
| Healthy/Without Pathological Symptoms         | 0.77  | 0.034  |
| With Risk Factors in Medical History          | 0.48  | 0.514  |
| With Pathological Symptoms (and/or increased scores on Psychometric Tools) | 0.43  | 0.566  |

### Table 2. Infant Sleep Difficulties at the 6th Week Postpartum Associated with Mother’s Mental Health Status, Education and Breastfeeding Difficulties

| Variable                                      | %     | p      |
|-----------------------------------------------|-------|--------|
| Mother’s Mental Health Status in Perinatal Period | 57.7  | 43.3   |
| Mother’s Education                            | 59.6  | 40.4   |
| Mother’s Education (p<.001)                    | 53.7  | 46.3   |
| Mother’s Education (p<.031)                    | 51.3  | 68.8   |
| Not at all                                     | 50.7  | 35.0   |
| A bit                                         | 55.7  | 44.3   |
| Moderately                                    | 54.0  | 46.0   |
| Quite much                                    | 52.4  | 47.6   |
| Very much                                     | 37.5  | 62.5   |

### Table 3. Infant Sleep Difficulties at the 12th Month Postpartum correlated with the EPDS and PHQ-9 scores, and other perinatal factors. ** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed).

| Variable                                      | r     | p      |
|-----------------------------------------------|-------|--------|
| EPDS - at the 6th Week Postpartum             | 0.114 | 0.300  |
| EPDS - at the 6th Month Postpartum            | 0.138 | 0.031  |
| Infan night Fatigue at the 6th Week Postpartum| 0.115 | 0.006  |
| Infant Awakening Frequency at the 6th Week Postpartum | 0.316 | p<.001 |
| Maternal Wake Up Fatigue at the 6th Week Postpartum | 0.181 | p<.001 |
| Infant Gastro-esophageal Reflux problems      | 0.179 | p<.001 |

### 5. DISCUSSION

This study investigated the association of specific maternal psychosocial and perinatal factors with the occurrence of infant sleep difficulties at the 6th week and at the 12th month postpartum. Statistical analyses showed that infant...
sleep difficulties at the 6th week postpartum, as reported by mothers, were associated with a) increased maternal scores on psychometric tools (EPDS and PHQ-9) during pregnancy and at the 6th week postpartum, b) the presence of pathological maternal mental health symptoms in the perinatal period (p<0.054), c) high maternal educational level (p<0.001), and d) reported maternal breastfeeding difficulties at the 6th week postpartum (p=0.051). In addition, reported infant sleep difficulties at the 12th month postpartum were associated with a) increased maternal scores on the EPDS in the puerperium (p=0.030), and at the 6th (p=0.031) and the 12th month (p=0.006) postpartum, which probably indicate the presence of a mother’s mental health disorder, b) reported infant sleep difficulties in the puerperium (p<0.001), c) frequent infant awakenings in the puerperium (p<0.001), d) maternal fatigue in the puerperium (p<0.001), e) infant problems with gastro-oesophageal reflux (p<0.001), and f) high maternal educational level (p=0.001).

Given that infant sleep difficulties have not been fully clarified in the literature, and the distinction between a normal and a problematic infant sleep pattern is not well-defined (28), in this study, infant sleep problems were assessed based on mothers’ reports. This research confirms the findings of previous studies suggesting that pre-existing depressive maternal behavior is associated with reported infant sleep problems (29-34). In addition, this study agrees with and confirms previous studies suggesting that depressive maternal symptoms in the first months postpartum are associated with poor neonatal/infant sleep (35, 36). In general, maternal mental health is known to partly explain how mothers perceive their environment and their relationships with their infants (37). We also know that maternal depression negatively affects her quality of life, her relationship with her child, and the development of infants (38, 39). Depressed mothers appear to have less positive and more negative interactions with their babies (40), and are more likely to have children with difficult temperaments (41). Also, women with poorer mental health report more infant night awakenings and bed-time distress, and appear more bothered by these behaviors (15, 42). All the above justify the association of poor mental health of women with infant sleep problems that was highlighted in this study. On the other hand, there is discussion in the literature as to whether parental depression precedes or follows infant sleep problems (15). Some researchers claim that the depression symptoms follow infant sleep disorders, so they are the result and not the cause. It often happens that new mothers are sleep-deprived due to the newborn’s many awakenings that normally occur in infancy. As a result, mothers’ sleep in the puerperium is intermittent and shorter in duration. We also know that persistent sleep difficulties are associated with maternal exhaustion in the early postpartum period (43, 44), and exhaustion has, in turn, been associated with depressive symptoms and the prediction of depression at 18 months postpartum (45-47). This reasoning justifies the occurrence of depressive symptoms as a result of the infant’s disturbed sleep. Conversely, the results of this study suggest that depressive symptoms, when present during pregnancy, may be the cause of infant sleep problems. Further research is needed to clarify these and other aspects of the issue of maternal mental health and the occurrence of infant sleep problems.

6. CONCLUSION

This study showed that the poor mental health of women during pregnancy and the 1st year postpartum is positively associated with the existence of infant sleep problems in the puerperium and at the end of the 1st year postpartum. Other perinatal factors that are associated with infant sleep problems include high maternal educational level, reported difficulties with breastfeeding and infant sleep in the puerperium, frequent infant awakenings, maternal fatigue and infant gastro-oesophageal reflux problems. Early detection of perinatal mental health disorders in women, from pregnancy and throughout the 1st year postpartum, and the timely treatment of these disorders would greatly contribute not only to the improvement of women’s mental health but, also, to the improvement of the quality and quantity of infant sleep.

- Author’s contribution: All authors were involved in the preparation of this article. All authors have read and approved the manuscript.
- Conflict of interest: The authors declare no conflict of interest.
- Financial support and sponsorship: None received.

REFERENCES

1. Shimko AN. Sleep in Infancy: A Concept Analysis. J Pediatr Nurs. 2019; 47: 100-105. doi: 10.1016/j.pedin.2019.05.001.
2. Bin YS, Marshall NS, Glozier NS. Secular changes in sleep duration among Australian adults. Med J Aust. 2011; 199(111e12): 670e2. doi: 10.5694/mja11.10302.
3. Kempler L, Sharpe L, Miller CB, Bartlett DJ. Do psychosocial sleep interventions improve infant sleep or maternal mood in the postnatal period? A systematic review and meta-analysis of randomised controlled trials. Sleep Med Rev. 2016; 29: 15-22. doi: 10.1016/j.smrv.2015.08.002.
4. Frasch M, Zwiener U, Hoyer D, Eiselt M. Autonomic organization of respirocardial function in healthy human neonates in quiet and active sleep. Early Hum Devel. 2007; 83(4): 269–277. doi: 10.1016/j.eahumdev.2006.05.023.
5. Terrill PI, Wilson SJ, Suresh S, Cooper DM, Dakin C. Attractor structure discriminates sleep states: Recurrence plot analysis applied to infant breathing patterns. IEEE Trans Biomed Eng. 2010; 57(5): 1108–1116. doi: 10.1109/TBME.2009.2058362.
6. Anders TF, Keener M. Developmental course of nighttime sleep—wake patterns in full-term and premature infants during the first year of life. Sleep. 1985; 8(5): 173–192. doi: 10.1093/sleep/8.3.173.
7. Burnham MM, Goodlin-Jones BL, Gaylor EE, Anders TF. Nighttime sleep—wake patterns and self-soothing from birth to one year of age: a longitudinal intervention study. J Child Psychol Psychiatry 2002; 43(6): 715–725. doi: 10.1111/j.1469-7610.2002.00076.
8. Goodlin-Jones BL, Burnham MM, Gaylor EE, Anders TF. Night waking, sleep—wake organization, and self-soothing in the first year of life. J Dev Behav Pediatr. 2001; 22(4): 226–233. doi: 10.1097/00004703-2001080000-00005.
9. Weinraub M, Bender R, Friedman S, Susman EJ, Knosk B, Bradley R. et al. The NICHD Early Child Care Research Network. 2010. Retrieved from: http://www.temple.edu/psychology/weinraub/documents/2011-1-InfantSleep_awakenings_fro_m6_to_36_months_of_age.pdf.
10. DeLeon CW, Karraker KH. Intrinsic and extrinsic factors associated with night waking in 9-month-old infants. Infant Behav Dev. 2007; 30(4): 596-605. doi: 10.1016/j.infbeh.2007.03.009.
11. Kennaway DJ, Stamp GE, Goble FC. Development of melatonin production in infants and the impact of prematurity. J Clin Endocrinol Metab Aug. 1992; 75(2): 567-569. doi: 10.1210/clin.75.2.1639597.

12. France KG, Blampied NM. Infant sleep disturbance: Description of a problem behaviour process. Sleep Med Rev.1999; 3(4): 265-280.

13. Mindell JA, Sadeh A, Wiegang B, How TH, Goh DY. Cross-cultural differences in infant and toddler sleep. Sleep Med. 2010; 11(5): 274-280. doi: 10.1016/j.sleep.2009.04.012.

14. Giannotti F, Cortesi F. Family and cultural influences on sleep development. Adolesc Child Psychiatr Clin N Am. 2009; 18(4): 849-861. doi:10.1016/j.chc.2009.04.005.

15. Goldberg WA, Lucas-Thompson RG, Gerno GR, Keller MA, Davis EP. Sleep in infancy and childhood. Med J Aust 1994; 161(8): 471-472. doi: 10.5694/j.1326-5377.1994.tb127558.x.

16. Adams L, Rickert V. Reducing bedtime tantrums: comparison between positive routines and graduated extinction. Pediatrics. 1989; 84(5): 756-760.

17. Hiscock H, Wake M. Infant sleep problems and postnatal depression: a community based study. Pediatrics 2001; 107(6): 1317-1322. doi: 10.1542/peds.107.6.1317.

18. Dagher RK, McGovern PM, Dowd BE, Lundberg U. Postpartum depression symptoms and the combined load of paid and unpaid work: a longitudinal analysis. Int Arch Occup Environ Health. 2011; 84(7): 735-745. doi:10.1007/s00420-011-0626-7.

19. Martin J, Hiscock H, Hardy P, Davey B, Wake M. Adverse associations of infant and child sleep problems and parent health: an Australian population study. Pediatrics. 2007; 119(5): 947-955. doi: 10.1542/peds.2006-2569.

20. Thunström M. Sever sleep problems among infants: family and infant characteristics. Ambulatory Child Health. 1999; 5: 27-41.

21. Boyce PM, Stubbs JM. The importance of postnatal depression. Med J Aust 1994; 161(5): 202-206. doi: 10.5694/j.mja2.1532-5377.1994.tb27383.x.

22. Kerr SM, Jowett SA. Sleep problems in pre-school children: a review of the literature. Child Care Health Dev. 1994; 20(6): 379-391. doi: 10.1111/j.1365-2214.1994.tb00400.x.

23. Cox JL, Holden JM, Sagovsky R. Detection of postnatal depression: Development of the 10-item Edinburgh depression scale. Br J Psychiatry. 1987, 150: 782-788. doi: 10.1192/bjp.150.6.782.

24. Sheeder J, Kabir K, Stafford B. Screening for postpartum depression at wellchild visits: is once enough during the first 6 months of life? Pediatrics. 2009; 123(6): 982-988. doi: 10.1542/peds.2008-1160.

25. Leonardou AA, Zervas YM, Papageorgiou CC, Marks MN, et al. Validation of the Edinburgh Postnatal Depression Scale and prevalence of postnatal depression at two months postpartum in a sample of Greek mothers. J Reprod Infant Psychol. 2009; 27: 28-39. doi. org/https://doi.org/10.1080/0266780870804094.

26. Kroeske K, Spitzer RL, Williams JBW. The PHQ-9: validity of a brief depression severity measure. J Gen Intern Med. 2001; 16(9): 606-615. doi: 10.1046/j.1525-1497.2001.00609.x.

27. Davis KE, Parker KP, Montgomery GL. Sleep in infants and young children: part two: common sleep problems. J Paediatr Child Health. 2004; 40(3-4): 150-157. doi: 10.1111/j.1440-1773.2004.00468.x.

28. Pinheiro KA, Pinheiro RT, Coelho FM, Quevado L, Godoy R, et al. Chronicity and severity of maternal postpartum depression and infant sleep disorders: A population-based cohort study in southern Brazil. Infant Beh Dev. 2011; 34(2): 371-373. doi: 10.1016/j.ibid.2010.12.006.

29. O’Connor TG, Caprariello P, Blackmore ER, Gregory AM, Glover V, Fleming P; ALSPAC Study Team. Prenatal mood disturbance predicts sleep problems in infancy and toddlerhood. Early Hum Dev. 2007; 83(7): 451-458. doi: 10.1016/j.earlhuma.2006.08.006.

30. Dias CC, Figueiredo B. Mother’s prenatal and postpartum depression symptoms and infant’s sleep problems at 6 months. Infant Ment Health J. 2020; 41(5): 614-627. doi: 10.1002/imhj.21869.

31. Field T, Diego M, Hernandez-Reif M, Figueiredo B, Schanberg S, Kuhn C. Sleep disturbances in depressed pregnant women and their newborns. Infant Behav Dev. 2007; 30(1): 127-133. doi: 10.1016/j.ibid.2006.08.002.

32. Neaves MD, Ribas-Shiman SL, Kleinman KP, Gillman MW, Taveras EM. Associations of early life risk factors with infant sleep duration. Acad Pediatr. 2010; 10(3): 187-195. doi: 10.1016/j.acap.2010.01.007.

33. Field T, Diego M, Hernandez-Reif M. Prenatal depression effects on the infant and child sleep problems and parent health: an Australian population based cohort study. Matern Child Health J. 2015; 19(8): 1881-1889. doi: 10.1007/s10995-015-1701-6.

34. Sadeh A, Tikotzky L, Scher A. Parenting and infant sleep. Sleep Med Rev. 2010; 14(2): 9-96. doi: 10.1016/j.smrv.2009.05.003.

35. Murray L, Cooper PJ. Postpartum depression and child development. New York: Guilford Press, 1997.

36. Beck CT. The effects of postpartum depression on child development: a meta-analysis. Arch Psychiat Nurr. 1998; 12(1): 12-20. doi. 10.1001/s0883-9417(98)80004-6.

37. Corwin EJ, Brownstead J, Barton N, Heckard S, Morin K. The impact of maternal postpartum depression on sleep quality. J Child Psychol Psychiatry. 2011; 52(6): 765-773. doi: 10.1111/j.1469-7610.2010.02430.x.

38. Coyl DD, Roggman LA, Newland LA. Stress, maternal depression, and negative mother-infant interactions in relation to infant attachment. Infant Mental Health Jnl. 2003; 24: 539-565. doi:10.1177/024883890202400401.

39. O'Connor TG, Caprariello P, Blackmore ER, Gregory AM, Glover V, Fleming P; ALSPAC Study Team. Prenatal mood disturbance predicts sleep problems in infancy and toddlerhood. Early Hum Dev. 2007; 83(7): 451-458. doi: 10.1016/j.earlhuma.2006.08.006.