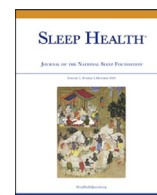


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A qualitative study of the sleep ecology of infants under 2 years old and their mothers in South Korea

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ABSTRACT

Objectives/Design: Infancy is a crucial period for establishing an individual's sleep pattern, and it is a common period during which infants and mothers experience sleep problems. The aim of this qualitative study was to explore the sleep ecology of infants under 2 years of age and their mothers.

Setting/Participants: The study participants were 20 mothers with infants aged 3–19 months living in South Korea.

Methods: Data were collected through in-depth interviews and analyzed using the thematic analysis.

Results: Five themes related to the sleep of infants and their mothers emerged from the data: (1) changes in sleep patterns, (2) room-sharing, (3) environmental factors affecting sleep, (4) efforts to improve sleep quality, and (5) infant sleep and the mother's health. The sleep patterns of infants and their mothers were mutually interrelated, and were strongly affected by various environmental factors, including infants' biological maturity (a microsystem) as well as cultural factors (a macrosystem). Culture had an especially profound effect on sleep patterns of infants, similar to the effects of microsystem-level factors.

Conclusions: To improve the sleep quality of infants and mothers, an ecological approach considering the biological characteristics and cultural contexts of infants is required based on an understanding of sleep as a phenomenon that evolves in a relationship of mutual influence between infants and mothers.

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Introduction

Infancy is a critical period for establishing sleep patterns. Sleep-wake regulation rapidly develops during the first year of life, and individual sleep patterns stabilize after 2 years of age.¹ The circadian rhythm is established 10–12 weeks after birth, making infants' sleep patterns more regular.² The factors that influence infant sleep include the infant's age,³ temperament,⁴ feeding method,⁵ and parental attachment.⁶ Ecological models view children's development as the outcome of interactions between children and their environment.⁷ Correspondingly, infants' sleep patterns develop through interactions with ecological factors on individual, social, and societal levels, including genetics, learned behaviors, physiology, family, and culture.⁸

Mothers have a particularly strong impact on infants' sleep; conversely, infants' sleep can affect mothers' sleep and health. This effect is especially pronounced for mothers with younger children.⁹ Infant sleep has implications for children's future health,¹⁰ and infant sleep problems can also harm mothers' physical and mental health.¹¹ Poor-quality maternal sleep could reduce mothers' sensitivity toward

infants, with potential negative effects on infant development.^{12,13} Hence, maternal and infant sleep must be investigated together within an ecological context to address these interrelationships, but few studies have explored the sleep patterns of mothers and infants under 2 years old from an ecological perspective. Therefore, this study aimed to provide an integrative understanding of sleep in infants under 2 years old and their mothers in South Korea through a qualitative exploration.

Methods

Study design

This descriptive qualitative study explored sleep ecology in infants and their mothers. Qualitative data were obtained using face-to-face interviews and thematic analysis was conducted.

Participants

Participants were recruited using purposive sampling by posting an invitation in an online parenting community. The eligibility criteria were mothers aged 20 years or older with 3- to 24-month-old

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Table 1.
Characteristics of the study participants (N = 20)

Characteristic	n	Characteristic	n
Infants' age (months)		Mothers' age (years)	
3-12	10	32-35	11
13-19	10	36-40	9
Infants' gender		Mothers' employment status	
Female	12	Yes	9
Male	8	None	11
Infants' birth order		Parental leave status	
First	12	Yes	8
Second	6	No	12
Third	2		
Infants' sleep hours		Mothers' sleep hours	
9	1	<5	2
10-14	16	5-9	16
15-19	3	10	2
Infants' sleep quality		Mothers' sleep quality	
Low	2	Low	10
Intermediate	12	Intermediate	10
High	6		
Infants' health status at birth		Infants' feeding type	
Very good	14	Breastfeeding	4
Fair	5	Formula feeding	4
Poor	1	Breastfeeding with formula	5
		Baby food	7

infants living in Seoul or Gyeonggi-do, South Korea. Mothers with physical or mental health problems were excluded. Twenty mothers participated in this study. The general characteristics of the participants are listed in Table 1.

All participants in the study were Korean mothers, with an average age of 35.45 years (range, 32–40 years). The infants' average age was 11.45 months (range, 3–19 months). There were 12 girls (60%) and 8 boys (40%), of whom 12 (60%) were the mother's first-born child, 6 (30%) were the second-born, and 2 (10%) were the third-born. Seven infants (35%) ate solid food, and 5 (25%) were mixed fed. Approximately half of the mothers (n = 9, 45%) were employed, and almost all (n = 8, 88.8%) were on parental leave. Most of the participants (n = 19, 95%) reported that they were in good or very good health at the time of the infant's birth. Mothers reported an average sleeping time of 6.8 hours per day for them and 12.36 hours per day for their infants. All mothers perceived their quality of sleep as intermediate or low, whereas 10% (n = 2) reported that their infant's quality of sleep was low.

Data collection

Data were collected in in-depth interviews conducted from July to December 2018. Only those who voluntarily agreed to participate in the study were invited. Before the interview, the researchers fully explained the purpose of the study and obtained written informed consent. Each interview lasted 26–51 minutes and took place in the participant's home or in a quiet place. One interview was conducted per participant using open, semistructured questions. The main interview questions were as follows:

- How is your/your baby's sleep?
- When was the most difficult time in terms of your/your baby's sleep?
- What do you do for yourself/your baby before bedtime?
- What promotes your/your baby's sleep?
- What disturbs your/your baby's sleep? What have you done to ensure quality of sleep for you/your baby?

Data analysis

Thematic analysis was performed according to the 6-step method proposed by Braun for the analysis of qualitative data.¹⁴ Thematic

analysis is widely used in qualitative research to organize data and identify patterns. To organize and structure the codes, NVivo version 11.0 was used.¹⁵ First, 2 researchers read the interview transcripts while listening to the audio to ensure accuracy. Then, the initial codes were applied and collated. The process of identifying potential themes was repeated while constructing the codes. Potential themes were reviewed, and data extraction within themes was conducted to ensure consistency and adjust the themes if necessary. The entire process was then reviewed by a third researcher to confirm the appropriateness of the data set. The themes and their names were discussed until consensus was reached. To ensure the credibility of the results, 2 participants confirmed the themes derived from the data analysis. All researchers with qualitative research experience participated directly in the data collection and analysis process.

Credibility

To ensure the rigor of the study, we complied with the following evaluation criteria.¹⁶ First, to enhance the credibility of the research, we conducted member checking to verify the authenticity of researchers' interpretations of the data. Field notes were also taken during each interview to enhance the reliability of the data. Second, to ensure the applicability of the research, participants who could express vivid and rich experiences concerning the research question were selected and data collection continued until theoretical saturation. Third, to increase the accountability of the research, the entire research process was described in detail. By ensuring the reliability, applicability, and accountability of the research, the confirmability of this study was established. To ensure the neutrality of the study, peer researchers with qualitative research experience gave feedback on the results of the study.

Ethical considerations

This study was approved by the researchers' Institutional Review Board (IRB No. 1806/001-002). Participants received a full explanation of the study and provided written informed consent. To protect participants' privacy, personal information and interview data were kept in locked cabinets and encrypted computer files.

Results

In total, 146 codes were extracted from the collected data and categorized into the following 5 themes: (1) changes in sleep patterns, (2) room-sharing, (3) environmental factors affecting sleep, (4) efforts to improve sleep quality, and (5) infant sleep and mother's health.

Changes in sleep patterns

As the infants grew, both the infants and their mothers experienced changes in their sleep patterns. The amount and quality of mothers' sleep decreased, especially shortly after giving birth. They stated that the sleep patterns of their infants were unpredictable, and that the infants cried throughout the day and night. Mothers reported being unable to sleep deeply, waking up every 2–3 hours. As their infants began to distinguish between day and night, mothers' sleep quality improved.

My baby has slept a little longer since the third month of life. Sleeping hours increased a little, and my baby finally started to sleep for 4 hours at a time, so I could also take a nap for about 2 hours... Before that, I nearly had a mental breakdown. I mostly took catnaps or slept for 2 hours at a time. After 2 or 3 months, my baby started to sleep for longer. Now I feel more comfortable since I can really sleep. (Participant 11, 4 months old)

Fourteen mothers reported that the most difficult period in terms of sleep lasted from birth until 100 days of age. They stated that their sleep deprivation was due to their newborns' behavior (eg, short sleeping intervals, crying for unknown reasons, and frequent feedings).

It was hard. The baby didn't seem to be sleeping deeply, and he kept waking up. The baby wanted to breastfeed, and... He cried a lot. He woke up and cried. And I had to hold him in my arms to make him sleep deeply. . . When I put him down, he woke up... I couldn't do anything in the meantime. I think that was hard. (Participant 7, 9 months old)

After a short period of relief, the mothers again experienced sleep deprivation and decreased quality of sleep when their infants were sick or reached developmental milestones, such as teeth eruption, rolling over, and starting to eat solid food. Fortunately, most infants and mothers eventually adjusted to each other's sleep patterns.

The baby had been sleeping almost all night since around the 100th day after birth. By the way, you know, baby teeth are ready to erupt at 6 months, right? When the baby had lower teeth, he would eat once and sleep all night, but he would wake up 3 times every night when his upper teeth erupted. (Participant 18, 8 months old)

Five mothers reported that the quality of their infants' sleep decreased during the period from 100 days to 1 year old due to their increased mobility and curiosity, which made them want to keep playing without napping.

I recently realized that my baby responds more to his surroundings. I feel like he is more aware of the light. He likes to touch things and shows more curiosity about new objects. These changes make him sleep less. (Participant 2, 6 months old)

Room-sharing

Room-sharing was reported in most mother-infant pairs. Seventeen mothers (85%) reported that they shared a room with their infants for sleep. Three mothers slept apart from their infants in a different room, and one infant, who was 3 months old and fed only formula, slept alone in a separate room. Of the 17 mothers who slept in the same room with their infants, 13 (65%) reported that all family members slept together in the same room. Five mothers reported using a bumper bed, cribs, or mats to separate their infant's sleeping space from theirs, while 12 mothers shared their bed with their infants to feed or watch them during sleep. Those mothers mentioned that sharing their beds helped the infants to sleep well. However, three-quarters of mothers complained about a lack of sleep and fatigue because they were sensitive to their infants' movements and sounds while sleeping.

One of the hardest things for me was to teach sleep training early. I unconditionally put him in his crib when he falls asleep in order not to sleep with him. But I gave up (sleep training) and now sleep together with my baby through the night. I lay next to him, so he wakes up during sleep and touches me, then he goes back to sleep. Now we sleep just next to each other (on the same mattress). (Participant 6, 15 months old)

The older kid sleeps, I sleep, the little one sleeps, and daddy sleeps. Everyone sleeps together in one room. Originally, I slept separately from the first child. Ever since I got pregnant with my second child, my first one became more attached. So we just sleep together. It's a pity. He grew up alone for long. He started losing his hair after his sister was born. (Participant 16, 17 months old)

Environmental factors affecting sleep

Various environmental factors were found to promote or disturb the sleep of infants and their mothers. The presence of the mother was the most influential factor for promoting infants' sleep. Breast-feeding, skin-to-skin touch, a dark room, a quiet environment, and attachment objects were also helpful. The infant's good sleep was the most influential factor for promoting mothers' own sleep. A quiet environment, a mild to moderate level of physical activity (eg, yoga or massages), and being relaxed and unworried also helped mothers sleep better.

I lay next to the baby and pat him again when he moves a little or opens his eyes, then he sleeps well. But if I am not with him, he wakes up completely, so I can't do anything while he is taking a nap . . . I have to lie down and just watch my baby. (Participant 12, 19 months old)

Factors disturbing infants' sleep were the presence of others, light and noise, absence of the mother, and unusual events (eg, going out, guest visits, or illness). According to some mothers, breastfeeding could either help or interrupt an infant's sleep. While breastfeeding, both infants and mothers experienced light sleep and often woke up. Infants' sleep quality and health condition were the most influential factors disturbing mothers' sleep. Smartphone use was the next most frequently cited factor, followed by excessive thinking, burdensome maternal roles, and noise.

My smartphone—I use it a lot. Usually, I use my smartphone while I feed my baby. I use it even when I put my baby to sleep. When he is breastfeeding to sleep, I still use my smartphone. I use it at night before I go to bed. I search and read news or stories through various social networking services every day. I post pictures there for my husband to see. (Participant 7, 9 months old)

Efforts to improve sleep quality

Mothers tried to improve their infants' quality of sleep. These efforts were classified into 2 further themes: "practicing sleep rituals" and "searching for helpful information about infant sleep."

Practicing sleep rituals

Mothers conducted various sleep rituals to promote their infants' sleep. The most common sleep ritual was turning off the light and creating a suitable physical environment for sleep, as reported by 18 mothers. Bathing the baby before sleep was the next most common ritual, as reported by more than half of the participants. Other useful sleep rituals that the mothers practiced were lying down with the infant, hugging and patting the infant until he or she fell asleep, saying goodbye to an attachment object with the infant, and reading a book.

I read 3 books to my baby, and then I lie down, I pray, sing 3 songs, and then he falls asleep... But this sleep ritual takes an hour. My baby has her pillow with a special name. When I say, "You go to the rabbit pillow, and your brother goes to the lion pillow," then they go to bed. (Participant 9, 17 months old)

Searching for helpful information about infant sleep

Mothers tried to obtain information about how to change infants' sleeping patterns. The most common sources were books on infant

care, social networking services, friends, and medical advice. Mothers expressed disappointment over the lack of adequate information sources and wanted more practical help.

I think this information is very important. It would be nice to hear that it's natural for infants to wake up early in the morning and to sleep differently at this stage of their development. The baby has his own pace. It would be great if mothers can get help to put their baby to sleep with support from their friends. (Participant 1, 8 months old)

Childcare community? I have downloaded an application to calm the baby down before sleep. I've also tried all kinds of classical music, but nothing works. I hope I can get some help to improve the baby's sleep now. (Participant 8, 14 months old)

Infant sleep and the mother's health

Infant sleep also affected mothers' physical and emotional health. Most mothers experienced sleep deprivation, and some experienced sleep disorders. Mothers complained of physical fatigue due to frequent sleep disturbances and not sleeping deeply at night, and frequently cited emotional health issues (eg, anxiety, nervousness, and emotional instability). Mothers reported frequently crying, being easily agitated, and getting angry with their infants and families, and also commented that their emotional health issues interrupted their sleep.

I couldn't sleep. I would have too many miscellaneous thoughts to sleep. Sometimes I would have nothing to do, and I wanted to fall asleep early with my kids. But I couldn't sleep, so I used to take melatonin. (Participant 16, 17 months old)

Now, I knew babies might not sleep well some nights. Well, there were times when I felt like the world was going to end if my baby didn't sleep well the night before. My baby's sleep pattern is regular now; however, it was like chaos when his sleep had no pattern. Back then, I was so nervous that I couldn't sleep well. (Participant 1, 8 months old)

Discussion

This study explored the ecological factors that influence infants' sleep patterns. The results of this study reveal that infants and mothers experience sleep issues together and develop a reciprocal relationship. Their sleep patterns evolve together.

In this study, mothers' statements suggested that the infant's biological maturity was a primary factor affecting the sleep patterns of infants and their mothers. This result is consistent with bio-ecological systems models suggesting that children's biological characteristics are a major factor driving their development.¹⁷ According to our findings, infants and their mothers experienced the greatest difficulty sleeping before the infants reached 100 days old. The mothers in this study described both their infants' sleep problems and their own difficulties due to frequent breastfeeding at night.¹² Gradisar et al¹² also showed that infants had the most sleep problems during the first 6 months of life and that sleep interventions were not effective during this period. A previous study likewise demonstrated that infant sleep was strongly associated with feeding patterns.⁵ At approximately 4 months of age, infants' circadian rhythm is established, and their stomach volume increases, resulting in prolonged sleep at night.¹⁸

This study confirmed that, as infants' biological maturity increased, their sleep patterns gradually stabilized and maternal sleep quality improved. Therefore, sleep interventions should be flexibly designed based on infants' biological maturity and their mothers' needs. For example, developmentally tailored sleep guidance for the first year engendered shorter and more consistent bedtime routines, earlier bedtimes, prolonged nighttime sleep duration, and improved sleep-related behaviors of infants.¹⁹ Alternatively, since sleep-wake patterns during early infancy tend to be inconstant, interventions could focus on maternal sleep. A pilot study supported the feasibility and acceptability of a maternal intervention for sleep and fatigue during the early postpartum period.²⁰

Notably, in this study, culture had a profound effect on the daily sleep of infants at the microsystem level. Room-sharing for sleep between infants and mothers is a prominent feature of Korean culture. The infants and mothers in this study mostly slept in the same room, and 60% of the mothers slept in the same bed as their infants. These results are consistent with a previous study on the sleep practices of Korean infants and toddlers.²¹ Ahn et al²¹ reported that only 5.5% of Korean infants and toddlers slept in their own rooms, whereas 63.9% of infants and toddlers slept in their parents' beds. The room-sharing or bed-sharing culture in South Korea differs significantly from that of Western countries, where it is substantially more common for infants to sleep in separate rooms.²²

Bed-sharing is a natural practice from an evolutionary perspective. However, bed-sharing has declined in the West since the early 20th century under the influence of behaviorism and medical perspectives, and solitary infant sleep has increased through efforts to regulate their sleep.¹⁸ Nonetheless, some studies have reported recent increases in bed-sharing in Western societies. Australian-based studies of a safe sleep program found that bed-sharing at 3 months of age was a usual practice for 46% of infants in 2002²³ and 50% in 2017.²⁴ Bed-sharing enables the infant and the mother to respond, give sensory signals, and react to each other.²⁵ Barry¹⁸ suggested that bed-sharing promotes the development of infants' brains and attachment, which is related to breastfeeding. The American Academy of Pediatrics has recommended room-sharing with the infant on a separate sleep surface since bed-sharing is a risk factor for sudden infant death syndrome.²⁶ According to UK guidelines, all families should be counseled about safe sleep and a nonjudgmental attitude should be taken towards family bed-sharing.²⁷ Therefore, safe sleep strategies should be incorporated into parental education.

Socio-cultural norms and family values contribute to the bed-sharing phenomenon.²⁸ In this study, mothers continued bed-sharing despite its difficulties due to its benefits for infants' sleep, reflecting traditional Korean cultural norms that emphasize the maternal role in parenting. They tried to help their infants sleep well by responding sensitively to small signals from infants. Mothers took a natural approach to their infant's sleep habits. Bed-sharing was prominently noted among breastfeeding mothers, reflecting a biologically natural approach to infant care, as stated by Rudzik and Ball.⁵ These results reflect the traditional naturalistic view of parenting in South Korea.

The recent emphasis on cultural influences on human development has led to the argument that ecological models should consider culture on the microsystem level.²⁹ Since culture has a profound effect on infants' sleep through the mother's parenting style, future studies should investigate associations between cultural factors and the development of infants' sleep patterns.

This study showed that smartphone use disturbed mothers' sleep. However, the mothers in this study also used their smartphones within their constraints of time and space to enjoy their leisure time and handle various everyday tasks. A previous study suggested that new mothers' online activities could make them feel supported and connected, ultimately improving their well-being.³⁰ Recent qualitative research also demonstrated that mothers of infants less than 6

months of age appreciated prompt access to unlimited information and multiple opinions regarding parenting and infant care decisions.³¹ Therefore, future studies should clarify the value of smartphones as support resources relative to their impact on sleep quality. The mothers in this study expressed anxiety about their infants' irregular sleeping patterns and concerns about their maternal roles. In particular, even if the baby was sleeping well at night, some mothers worried whether such sleep patterns were normal. This finding is consistent with that of another study on new mothers' sleep experiences.³² In early childhood, when infants' sleep patterns fluctuate, the social emphasis on standardized sleep patterns and general sleep principles can further aggravate mothers' worry and anxiety. To improve mothers' quality of sleep, it is necessary to broaden new mothers' understanding of normal infant sleep patterns and to relieve their anxiety by communicating accurate information regarding infant sleep ecology.

Furthermore, mothers were responsible for most of the childcare in this study, and the father's role was not highlighted. The Korean government legally guarantees parental leave for one-year post-childbirth to mothers and fathers. Although fathers have been guaranteed equal parental leave since 2001, the proportion of men among parental leave-takers fluctuated between 1% and 6% until 2015. The recent father-friendly governmental policy boosted this proportion to 13.4% in 2017, but fathers' participation in childrearing remains low.³³ After childbirth, mothers experience substantial changes physically, mentally, and emotionally, and fathers play a very important role as partners in buffering these changes.³⁴ Paternal involvement in children's sleep care has been identified as a protective factor against nocturnal awakenings.³⁵ Therefore, promoting fathers' participation in parenting may be a useful strategy for improving infants' and mothers' sleep quality.

Limitations

This study did not examine socioeconomic factors or paternal factors. Another limitation is that this study population encompassed a large infant age range, raising the possibility that recall bias might have affected the recollections of mothers with older infants. This study also did not corroborate maternal recall with sleep diaries or sleep monitoring data.

Cultural factors should be considered when interpreting the study results since they only reflect the perspectives of South Korean mothers. However, this study meaningfully identified the evolving characteristics of sleep among mothers and infants younger than 2 years old. Furthermore, this study can serve as a reference for using an ecological perspective to analyze the sleep behaviors of infants and mothers.

Conclusions

The sleep patterns of infants and mothers evolve together in a reciprocal relationship, and sleep issues result from mutually influential interactions between the infant and the mother. Infants' sleep patterns evolve according to the infant's biological maturity in a specific cultural context. Therefore, mothers should be prepared to understand the evolving characteristics of infant sleep and interactions between infant sleep and ecological factors, including mothers themselves. Healthcare professionals should provide parenting education addressing the characteristics of infant sleep and sleep safety based on an understanding of parents' cultural backgrounds. In future research, a mixed-methods approach incorporating quantitative, objective, and real-time sleep measurements would be helpful. The findings of this study also suggest that maternal use of social media

and the internet should be examined in relation to infant and maternal sleep.

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Declaration of conflict of interest

The authors declare no conflicts of interest.

Supplementary materials

Supplementary material associated with this article can be found in the online version at doi:10.1016/j.sleh.2021.10.013.

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