Factors Associated With Fragmented Sleep at Night Across Early Childhood

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Objective: To identify the factors most strongly associated with sleeping less than 6 consecutive hours at night for children aged 5, 17, and 29 months.

Design, Setting, and Participants: A randomized survey design used a representative sample of infants born in 1997-1998 in the Canadian province of Quebec. Data were collected by questionnaires and interviews. Interviews were scheduled at home with the mothers. The number of consecutive hours slept at night by 1741 children aged 5, 17, and 29 months was assessed from parental reports. Factors associated with fragmented sleep were investigated for each age in a cross-sectional design.

Results: At 5 months of age, 23.5% of children did not sleep 6 consecutive hours. Of the children who did not sleep 6 consecutive hours at night at 5 months or 17 months of age, 32.9% were still not sleeping 6 consecutive hours at night at 29 months of age. The factor most strongly associated with not sleeping at least 6 consecutive hours per night at 5 months of age was feeding the child after an awakening. Parental presence until sleep onset was the factor most strongly associated with not sleeping at least 6 consecutive hours per night at 17 months and 29 months of age.

Conclusions: Sleep consolidation evolves rapidly in early childhood. Parental behaviors at bedtime and in response to a nocturnal awakening are highly associated with the child's sleep consolidation. The effects are probably bidirectional and probably create a long-term problem. Early interventions could possibly break the cycle.

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Infants' sleep problems represent one of the most frequent complaints of parents consulting a pediatrician. Large-scale epidemiological surveys have reported that between a quarter and a third of children between the ages of 6 months and 5 years have difficulties going to bed, falling asleep, or sleeping through the night. These sleep problems are often transient (related to colic, illness, noisy environment), but it is clear that they can persist for many years. It has been reported that sleep problems showed a continuity from the age of 6 months to school age. This continuity is important because children who have fragmented sleep end up sleeping fewer hours at night than children who sleep through the night. In turn, reduced total sleep time might have detrimental effects on normal cognitive and social development.

We believe that a consolidated sleep can be modulated by a number of biopsychosocial factors. The aim of this study was 2-fold: representing the evolution of sleep at 5, 17, and 29 months of age and identifying the factors associated with sleeping less than 6 consecutive hours at night from infancy to early childhood. To achieve these goals, we analyzed data obtained from a large longitudinal study. It was hypothesized that certain parental behaviors at bedtime and in response to nighttime awakening are important factors for children who experience fragmented sleep.

METHODS

This research is part of the Quebec Longitudinal Study of Child Development, a large, ongoing epidemiological study conducted by the Quebec Institute of Statistics (Quebec City, Quebec). The infants were recruited from the Quebec Master Birth Registry of the Ministry of Health and Social Services. We used a randomized 3-level stratified survey design to have a representative sample of infants born in 1997-1998 in the province of Quebec.

Figure 1 shows the sample selection and recruitment by year. The first data collection was conducted from March to December 1998.
and was discontinued during the summer months (June to September). A total of 2223 children born in 1997-1998 and aged approximately 5 months were included in the study to identify the factors associated with sleeping less than 6 consecutive hours during the night. At the second round, 2045 children aged approximately 17 months were included in the study. Finally, 1997 children aged approximately 29 months were included in the study. To draw the evolution of sleep at 5, 17, and 29 months of age, longitudinal data were available on 1741 children, after we removed missing values of the main variable, the number of consecutive hours slept at night.

OUTCOME MEASURES

Data were collected by questionnaires and interviews. First, the Self-Administered Questionnaire for the Mother, which took about 20 minutes to complete, provided information on the infant’s sleep characteristics, such as the number of consecutive hours slept in general per night, total sleep time at night, and total sleep time during the day. This questionnaire gave also information on mother-child interaction: parental behaviors surrounding the infant’s sleep periods (at bedtime and in response to a nocturnal awakening), use of an object to fall asleep, cosleeping (defined as sharing a room or bed with the parents or siblings), and how the child was fed or not during the night (breastfeeding or bottle-feeding).

The second questionnaire, the Interviewer Completed Computerized Questionnaire, was conducted with the person who best knew the child (the biological mother, >99% of cases). A face-to-face structured interview that took around 1 hour 45 minutes, it provided information on the child’s characteristics: prematurity (defined as <37 weeks of gestation), sex, health status, and degree of difficult temperament. The questions were multiple choice. The child’s degree of difficulty was assessed on a Likert-type scale ranging from 0 (very easy) to 7 (highly difficult), where 4 was average. We separated this variable into 2 categories for analyses: more difficult than the average and less difficult than the average. This second questionnaire also included questions on the mother’s characteristics: immigrant status, depression status, and feelings of efficacy and overprotectiveness. Depression was indicated by the presence of symptoms of depression during the past week. The assessment was based on a shortened version of a published Likert-type scale ranging from 0 (not depressed) to 10 (very depressed). The mother’s feelings of efficacy and overprotectiveness were evaluated through Likert-type scales ranging from 0 (not at all) to 10 (exactly), from the Parental Perceptions and Behaviors Scale. Finally, the questionnaire provided information about the family’s context: the day-care setting, income status, and number of siblings. The assessment of the family’s income status used 3 indicators: family income, family size, and regional area (ZIP code). The children’s data were separated into 2 groups. One group represented children who slept more than 6 hours consecutively at night, and the second group comprised children who slept less than 6 hours in a row at night. The cutoff of 6 hours has already been used as an index of sleeping through the night in infants.

Before participating in the study, all families received detailed information by mail on the aims and procedures of the research program and signed a consent form.

STATISTICAL ANALYSES

Statistical analyses were conducted using SAS version 8 (SAS Institute Inc, Cary, NC). We calculated a probability sampling weight for each subject at each age to make inferences with the results about the target population and to limit biases of estimate. We corrected the weight to take into account overall non-response and the subjects who dropped out of the study. To identify the associated factors, the corresponding weighted estimations at 5, 17, and 29 months let us generalize to more than 99% of the total target population at each year (infants born in 1997-1998 in the province of Quebec who still lived there at age 29 months).

To determine which factors were significantly associated with sleeping at least 6 consecutive hours at night, we entered the variables into a Poisson regression model, which also estimated the risk ratios with a 95% confidence interval.

RESULTS

In the initial sample of children, 84.5% had a Canadian nonimmigrant mother and 15.5% had a first-generation immigrant mother. The majority of the sample was white (88.4%). Black Africans, Native Amerindians, Arabs, and Asians represented 3.4%, 0.3%, 2.0%, and 1.6% of the
sample, respectively. The mean age of mothers was 29.3 years (SD=5.3). Most mothers spoke French as a first language (76.3%), 8.7% spoke English, and 15.0% had another first language.

As much as 23.5%, 7.2%, and 10.3% of children were sleeping less than 6 hours in a row at 5, 17, and 29 months of age, respectively. Figure 2 shows the evolution of the sleepers from 5 months to 29 months of age. At 5 months of age, 76.5% (n=1331) of infants were sleeping at least 6 consecutive hours per night. Of the infants who were sleeping less than 6 hours in a row per night, 17.8% (n=73) remained in this category, and among the children sleeping less than 6 consecutive hours at both 5 months and 17 months of age, 32.9% (n=24) continued to do so at 29 months of age. A total of 24 children (1.4%) were not sleeping at least 6 consecutive hours at any of the 3 ages. Compared with children sleeping at least 6 consecutive hours, these poor sleepers were characterized by a significantly shorter total sleep time at night (8 hours 51 minutes vs 10 hours 13 minutes; difference, −1 hour 22 minutes; 95% confidence interval, −2 hours 37 minutes to −0 hours 37 minutes) but a similar sleep duration during the day (1 hour 54 minutes vs 1 hour 56 minutes; difference, 2 minutes; 95% confidence interval, −2 hours 8 minutes to 10 hours 13 minutes; difference, −1 hour 22 minutes; 95% confidence interval, −2 hours 8 minutes to 10 hours 13 minutes).

Results pertaining to child, mother, and family variables at 5, 17, and 29 months of age are presented in Tables 1, 2, and 3, respectively. For children aged 5 months, parental behaviors after a nocturnal awakening were the factors most strongly associated with sleeping less than 6 hours in a row at night. The risk of being a poor sleeper was 2.6 times greater among the children who were fed and 1.7 times greater in children who were rocked to sleep or brought into the parents’ bed in response to an awakening, compared with children comforted in their beds. Another factor was the infant’s difficult temperament. Breastfeeding and cosleeping were also factors strongly associated with sleeping less than 6 consecutive hours per night at 5 months of age.

At the ages of 17 and 29 months, the factors most strongly associated with the behavior of sleeping less than 6 hours in a row during the night were the following:

- Putting children to bed already asleep or staying with them until asleep rather than letting them fall asleep alone
- Feeding children after nocturnal awakenings rather than letting them cry or comforting them in their beds
- Rocking children or bringing them into the parents’ beds after nocturnal awakenings (rather than letting them cry or comforting them in their beds)
- The infant’s difficult temperament (at 17 months of age; question not asked at 29 months of age)
- Cosleeping, which was defined as sharing a room or bed with parents or siblings (at 17 months of age; question not asked at 29 months of age)

For example, the risk of being a poor sleeper was 4.6 times greater at 17 months of age and 2.1 times greater at 29 months of age among children who were lulled to sleep or had parental presence until asleep, compared with children who fell asleep on their own.

Among good sleepers, the proportion of parental behaviors at bedtime that presume the autonomy of the child toward sleep, such as putting the child awake in bed, is very high across all ages (5 months, 43.3%; 17 months, 76.3%; 29 months, 74.8%) compared with poor sleepers (5 months, 24.1%; 17 months, 28.7%; 29 months, 47.3%).

The percentage of children sleeping at least 6 consecutive hours during the night significantly increased between the ages of 5 months and 17 months and remained stable between the ages of 17 months and 29 months. A small sample study,16 based on 1-week sleep diaries, had also found that the longest sleep period increased significantly between the ages of 6 months and 18 months and remained the same between the ages of 18 months and 33 months. The present study thus supports the notion that sleep consolidation evolves rapidly early in life.

Our results also clearly indicate that when children do not sleep 6 hours in a row until 17 months of age, they have a decreased probability of being able to do so at 29 months of age. In a small sample, Zuckerman et al8...
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lems, or social impairments.12,22,23 A chronic sleep debt
ment of problems such as poor mood, behavioral prob-
time sleepiness can in turn contribute to the develop-
formation regarding this population. Excessive day-
younger children might explain the relative absence of
might begin sooner than elementary school. The pau-
relationship between reduced sleep time and sleepiness
executive functions,11,23,24 and has been shown to ad-
versely affect academic performance.22 Another study24
poor sleeper was 2.6 times greater among the children who were fed in response to an awakening compared with children comforted in their beds.

Table 1. Frequencies and Percentages (or Mean ± SD), Risk Ratios, and 95% Confidence Intervals of Good (≥6 h) and Poor (<6 h) Sleepers at 5 Months of Age for Different Variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>Good Sleepers</th>
<th>Poor Sleepers</th>
<th>Adjusted RR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Count†</td>
<td>%‡</td>
<td>Count†</td>
</tr>
<tr>
<td>Child's characteristics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male sex</td>
<td>716</td>
<td>49.6</td>
<td>240</td>
</tr>
<tr>
<td>Poor health status</td>
<td>90</td>
<td>6.6</td>
<td>40</td>
</tr>
<tr>
<td>Premature</td>
<td>76</td>
<td>6.8</td>
<td>15</td>
</tr>
<tr>
<td>Difficult temperament</td>
<td>58</td>
<td>3.8</td>
<td>43</td>
</tr>
<tr>
<td>Immigrant mother</td>
<td>111</td>
<td>9.7</td>
<td>84</td>
</tr>
<tr>
<td>Parental behaviors at bedtime</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lulling child to sleep, staying until child is asleep</td>
<td>839</td>
<td>57.7</td>
<td>307</td>
</tr>
<tr>
<td>Parental behaviors after an awakening ¶</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feeding (breast/bottle)</td>
<td>431</td>
<td>30.8</td>
<td>296</td>
</tr>
<tr>
<td>Out of bed (rocking, parents' bed)</td>
<td>184</td>
<td>12.6</td>
<td>53</td>
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<tr>
<td>Give object to fall asleep</td>
<td>1053</td>
<td>72.8</td>
<td>263</td>
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<tr>
<td>Cosleeping (not alone in a bedroom)</td>
<td>424</td>
<td>31.5</td>
<td>207</td>
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<tr>
<td>Breastfeed</td>
<td>405</td>
<td>27.6</td>
<td>246</td>
</tr>
<tr>
<td>Insufficient income</td>
<td>292</td>
<td>22.4</td>
<td>123</td>
</tr>
<tr>
<td>Day-care setting</td>
<td>49</td>
<td>3.4</td>
<td>18</td>
</tr>
<tr>
<td>Depression of the mother</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Mean ± SD‡</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother's feeling of efficacy</td>
<td>8.8 ± 1.2</td>
<td>8.7 ± 1.2</td>
<td>1.0 (0.9-1.1)</td>
</tr>
<tr>
<td>Mother's feeling of overprotectiveness</td>
<td>5.3 ± 2.4</td>
<td>6.0 ± 2.5</td>
<td>1.0 (1.0-1.1)</td>
</tr>
<tr>
<td>No. of siblings</td>
<td>0.8 ± 0.9</td>
<td>0.9 ± 1.0</td>
<td>1.0 (0.9-1.1)</td>
</tr>
</tbody>
</table>

Abbreviations: CI, confidence interval; RR, risk ratio.
*For risk ratios greater than 1.0, the risk was greater in the group of infants who slept less than 6 consecutive hours at night (poor sleepers), whereas for risk ratios less than 1.0, the risk was greater in the group of infants who slept at least 6 consecutive hours at night (good sleepers). For example, the risk of being a poor sleeper was 2.6 times greater among the children who were fed in response to an awakening compared with children comforted in their beds.
†Counts were reported for each factor without the weight for 1851 infants. The good sleepers included 1445 infants, whereas the poor sleepers included 406 infants.
‡Percentages and means ± SDs are presented with the probability sampling weight at 5 months of age. The good sleepers included 1404 infants, whereas the poor sleepers included 433 infants.
§Risk ratios are adjusted for all other factors from a Poisson regression performed with the probability weights at 5 months of age.
¶As opposed to letting children fall asleep on their own.
As opposed to comforting children in their own beds.

also found that children with sleep problems at 8 months of age were more likely to have sleep problems at 3 years of age than children who did not have sleep problems at 8 months of age. Our study validates that sleep problems have a greater chance of becoming long-term and more serious if left overlooked during infancy.

The present study found that, in comparison with the good sleepers, the poor sleepers end up sleeping on average nearly 1 hour 30 minutes less per night, and they do not compensate with more sleep time during the day. It is well documented that reduced total sleep time is significantly associated with a greater level of sleepiness during the day among elementary school children, middle-school children,19 and teenagers.20 However, the relationship between reduced sleep time and sleepiness may begin sooner than elementary school. The paucity of validated instruments to assess sleepiness in younger children might explain the relative absence of information regarding this population. Excessive daytime sleepiness can in turn contribute to the development of problems such as poor mood, behavioral problems, or social impairments.12,22 A chronic sleep debt can also contribute to cognitive deficits, especially in executive functions,11,23,24 and has been shown to adversely affect academic performance.22 Another study24 has reported that the incidence of fragmented sleep was significantly higher in 12- and 13-year-old boys with academic problems than in the control group. We are only beginning to be aware of the negative impact of insufficient or fragmented sleep among preschool-aged children. Longitudinal studies are needed to measure the long-term effects of insufficient sleep time from an early age on behavior and school performance.

Several intrinsic and extrinsic factors can interact with the development of sleep consolidation.25,26 This present study shows that, among the numerous biopsychosocial factors studied, parental behaviors at bedtime and in response to nocturnal awakening are front-runners. Continued parental presence at bedtime is considered sleep-onset protodyssomnia in a new classification of sleep disorders in young children.27 Van Tassel28 found that parent-child bedtime interactions were the best predictors of sleep problems in early childhood. Moreover, it was shown that children who learn to fall asleep on their own at bedtime have normally longer sustained sleep periods than those who do not.10,29,30 The present study lends support to the recommendation of putting children to bed while they are dozy but still awake so that they can develop appropriate sleep-onset associations.22 Similarly, in response to a nocturnal awakening, comforting children outside their beds (eg, feeding children, bringing children into the parents’ beds, or rocking them out-
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rapidly than formula milk, which could account for the
On one hand, infants seem to digest breast milk more
Two pieces of information can explain this association.
was associated with fragmented sleep at 5 months of age.
found that breastfeeding compared with bottle-feeding
in comparison with bottle-fed infants.5,32,33 Indeed, we
were not weaned at this early age. Elias et
al32 found, in a small sample, that significantly more in-
fants generally have a closer temporal association be-
tween demand and response compared with bottle-fed
infants should limit as much as possible the number and
duration of “out-of-crib” interventions in response to noc-
turnal awakening. Although the existing literature points
to the interpretations described earlier, it is important to
keep in mind that these associations might simply re-

Table 2. Frequencies and Percentages (or Mean ± SD), Risk Ratios, and 95% Confidence Intervals of Good (≥6 h) and Poor (<6 h) Sleepers at 17 Months of Age for Different Variables*

<table>
<thead>
<tr>
<th>Variables</th>
<th>Good Sleepers</th>
<th>Poor Sleepers</th>
<th>Adjusted RR (95% CI)§</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count†</td>
<td>%†</td>
<td>Count†</td>
<td>%†</td>
</tr>
<tr>
<td>Male sex</td>
<td>845</td>
<td>50.2</td>
<td>66</td>
</tr>
<tr>
<td>Poor health status</td>
<td>157</td>
<td>9.5</td>
<td>24</td>
</tr>
<tr>
<td>Premature</td>
<td>78</td>
<td>5.9</td>
<td>2</td>
</tr>
<tr>
<td>Difficulty temperament</td>
<td>73</td>
<td>4.5</td>
<td>18</td>
</tr>
<tr>
<td>Immigrant mother</td>
<td>160</td>
<td>13.1</td>
<td>25</td>
</tr>
<tr>
<td>Parental behaviors at bedtime</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lulling child to sleep, staying until child is asleep¶</td>
<td>369</td>
<td>24.0</td>
<td>83</td>
</tr>
<tr>
<td>Parental behaviors after an awakening¶</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feeding (breast/bottle)</td>
<td>210</td>
<td>13.5</td>
<td>43</td>
</tr>
<tr>
<td>Out of bed (rocking, parents’ bed)</td>
<td>440</td>
<td>26.4</td>
<td>50</td>
</tr>
<tr>
<td>Give object to fall asleep</td>
<td>1427</td>
<td>83.9</td>
<td>82</td>
</tr>
<tr>
<td>Cosleeping (not alone in a bedroom)</td>
<td>406</td>
<td>26.7</td>
<td>64</td>
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<tr>
<td>Bottle-feed</td>
<td>1196</td>
<td>71.5</td>
<td>91</td>
</tr>
<tr>
<td>Insufficient income</td>
<td>312</td>
<td>21.6</td>
<td>39</td>
</tr>
<tr>
<td>Day-care setting</td>
<td>70</td>
<td>4.2</td>
<td>4</td>
</tr>
</tbody>
</table>

Abbreviations: CI, confidence interval; RR, risk ratio.

*For risk ratios greater than 1.0, the risk was greater in the group of children who slept less than 6 consecutive hours at night (poor sleepers), whereas for risk ratios less than 1.0, the risk was greater in the group of children who slept at least 6 consecutive hours at night (good sleepers). For example, the risk of being a poor sleeper was 4.6 times greater among children who were lulled to sleep or had parental presence until asleep compared with children who fell asleep on their own.

†Counts were reported for each factor without the weight for 1803 children. The good sleepers included 1683 children, whereas the poor sleepers included 120 children.

‡Percentages and means ± SDs are presented with the probability sampling weight at 17 months of age. The good sleepers included 1650 children, whereas the poor sleepers included 128 children.

¶As opposed to comforting children in their own beds.

As opposed to letting children fall asleep on their own.

As opposed to putting children to sleep for 6 consecutive hours at night. Pinilla and Birch35 have shown that introducing a short delay between the
don't disrupt sleep consolidation; further, the more
brief sleep periods in infancy are associated with the
duration of sleeplessness.42-45 A greater percentage of disruptive sleep problems was observed among children who slept in the parents’ bed, especially
in a reactive way, such as in response to nocturnal awakenings.7,8,42,43 However, feeding
the child in response to a nocturnal awakening later in

side their beds) is associated with poor sleep consolidation
across early childhood, in contrast to comforting
children in their own beds.

Not surprisingly, at 5 months of age, feeding the child
after an awakening was strongly associated with sleep-
ing fewer consecutive hours at night because the major-
ity of infants were not weaned at this early age. Elias et
al32 found, in a small sample, that significantly more in-
fants who were not weaned slept in short bouts than
weaned infants. In infancy, breastfeeding has been shown
to be related to the tendency of babies to awaken at night.
Our study also substantiates the notion that bringing
the child into the parents’ bed in response to an awak-
ening (when it’s a sporadic sleep arrangement) can be
detrimental to sleep consolidation.42-45 A greater per-
centage of disruptive sleep problems was observed
among children who slept in the parents’ bed, especially
in a reactive way, such as in response to nocturnal awak-
enings.7,8,42,43 However, bed sharing has a number of ad-

The present results suggest that par-
ents should limit as much as possible the number and
duration of “out-of-crib” interventions in response to noc-
turnal awakening. Although the existing literature points
to the interpretations described earlier, it is important to
keep in mind that these associations might simply re-

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ents should limit as much as possible the number and
duration of “out-of-crib” interventions in response to noc-
turnal awakening. Although the existing literature points
to the interpretations described earlier, it is important to
keep in mind that these associations might simply re-

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Carey,52 a particular aspect of the temperament is at play: amplified response to stimuli during the day makes the child more likely to wake up at night, or the child’s sensory threshold. Two hypotheses could explain it: amplified response to stimuli during the day as well as during the day. Additional studies are needed to verify these hypotheses. In the present study, sharing a room or a bed with parents or siblings was found to be associated with fragmented sleep. More investigations are needed to understand the associations between different sleep environments, bed sharing, and consolidated sleep.

Finally, factors such as the child’s sex, health status, and prematurity; immigrant status; the use of a transitional object; income status; day-care setting; depression of the mother; the mother’s feelings of efficacy and overprotectiveness; and the number of siblings do not seem to have a strong relationship with the behavior of sleeping for at least 6 consecutive hours per night or one that would be independent of the types of parental behaviors adopted. It would be interesting to replicate these analyses with a twin population to identify possible genetic factors contributing to sleep consolidation. Also, some chronic childhood sleep problems could be part of a larger central nervous system dysfunction or could be the result of a more specific sleep disorder (eg, sleep disorders breathing).

The major strength of our analyses was the number of variables measured longitudinally in a large cohort of children. However, this study has a few limitations that are important to mention. First, our data do not permit causal explanation. This longitudinal, prospective study, which was representative of the whole province of Quebec, has identified factors that covary with sleep consolidation. Also, the result of a more specific sleep disorder (eg, sleep disorders breathing).

Table 3. Frequencies and Percentages (or Mean ± SD), Risk Ratios, and 95% Confidence Intervals of Good (≥6 h) and Poor (<6 h) Sleepers at 29 Months of Age for Different Variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>Good Sleepers</th>
<th>Poor Sleepers</th>
<th>Adjusted RR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Count† %‡</td>
<td>Count† %‡</td>
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</tr>
<tr>
<td>Child’s characteristics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male sex</td>
<td>821 50.9</td>
<td>78 49.5</td>
<td>0.9 (0.6-1.1)</td>
</tr>
<tr>
<td>Poor health status</td>
<td>157 9.8</td>
<td>19 12.3</td>
<td>1.2 (0.8-1.9)</td>
</tr>
<tr>
<td>Premature</td>
<td>75 6.2</td>
<td>7 6.1</td>
<td>0.9 (0.5-1.6)</td>
</tr>
<tr>
<td>Immigrant mother</td>
<td>144 12.5</td>
<td>27 24.5</td>
<td>1.3 (0.9-1.9)</td>
</tr>
<tr>
<td>Parental behaviors at bedtime</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lulling child to sleep, staying until child is asleep</td>
<td>360 25.0</td>
<td>77 53.5</td>
<td>2.1 (1.5-2.9)</td>
</tr>
<tr>
<td>Parental behaviors after an awakening</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feeding (breast/bottle)</td>
<td>124 8.7</td>
<td>30 20.0</td>
<td>1.9 (1.3-2.9)</td>
</tr>
<tr>
<td>Out of bed (rocking, parents’ bed)</td>
<td>316 21.0</td>
<td>57 36.2</td>
<td>1.6 (1.1-2.2)</td>
</tr>
<tr>
<td>Bottle-feed</td>
<td>413 27.3</td>
<td>61 40.7</td>
<td>1.1 (0.8-1.5)</td>
</tr>
<tr>
<td>Insufficient income</td>
<td>281 19.6</td>
<td>37 29.3</td>
<td>1.1 (0.8-1.6)</td>
</tr>
<tr>
<td>Day-care setting</td>
<td>117 7.3</td>
<td>15 9.1</td>
<td>1.3 (0.8-2.2)</td>
</tr>
<tr>
<td>Mean ± SD‡</td>
<td></td>
<td>Mean ± SD‡</td>
<td></td>
</tr>
<tr>
<td>Mother’s feeling of efficacy</td>
<td>8.2 ± 1.5</td>
<td>8.0 ± 1.7</td>
<td>0.9 (0.8-1.0)</td>
</tr>
<tr>
<td>Mother’s feeling of overprotectiveness</td>
<td>3.9 ± 2.3</td>
<td>4.5 ± 2.3</td>
<td>1.0 (1.0-1.1)</td>
</tr>
<tr>
<td>No. of siblings</td>
<td>1.0 ± 0.9</td>
<td>0.9 ± 0.9</td>
<td>1.0 (0.8-1.2)</td>
</tr>
</tbody>
</table>

Abbreviations: CI, confidence interval; RR, risk ratio.

*For risk ratios greater than 1.0, the risk was greater in the group of children who slept less than 6 consecutive hours at night (poor sleepers), whereas for risk ratios less than 1.0, the risk was greater in the group of children who slept at least 6 consecutive hours at night (good sleepers). For example, the risk of being a poor sleeper was 2.1 times greater among children who were lulled to sleep or had parental presence until asleep compared with children who fell asleep on their own.

†Counts were reported for each factor without the weight for 1782 children. The good sleepers included 1623 children, whereas the poor sleepers included 159 children.

‡Percentages and means ± SDs are presented with the probability sampling weight at 29 months of age. The good sleepers included 1592 children, whereas the poor sleepers included 177 children.

¶As opposed to comforting children in their own beds.

§Risk ratios are adjusted for all other factors from a Poisson regression performed with the probability weights at 29 months of age.

‖As opposed to letting children fall asleep on their own.

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sleeping hours and the sleep time measured objectively in the laboratory. The relationship between sleep fragmentation and parental behaviors with respect to the child’s sleep period is probably bidirectional. This conclusion reflects a cycle, and the sleep problem is better managed if both triggers are addressed. Indeed, therapeutic approaches that target behavioral modification of sleep disturbances for the child and also parental behaviors have a high rate of success. Prevention programs that focus on educating parents about sleep for young infants have observed a decrease in the occurrence of sleep problems. Parental compliance with the behavioral intervention is a key determinant of the programs’ success. 

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