Prone Infant Sleeping Despite the “Back to Sleep” Campaign

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Objectives: To determine sleep position variation during the first 6 months of life and to identify risk factors for prone sleeping.

Design: Cohort study of healthy term newborns recruited from November 1995 to September 1996 and followed up to age 6 months. Pediatricians were surveyed about sleep position advice. At recruitment, all parents were instructed to avoid prone sleeping. Parents were telephoned at 1 week and then monthly to ensure that they recorded sleep position. Investigators were unaware of sleep position until the infant was 6 months of age, when sleep log data and reasons for sleep position choice were ascertained.

Setting: Practice-based study conducted by the Children’s National Medical Center Pediatric Research Network, Washington, DC.

Participants: A total of 402 consecutive healthy term newborns followed up by a Pediatric Research Network pediatrician were enrolled. Exclusion criteria were prematurity, a serious medical condition, and absence of a telephone. Of the 402 enrolled newborns, 348 (86.6%) completed the study.

Results: Only 34.0% of infants maintained a consistent sleep position. Prone sleeping increased from 12.2% at birth to 32.0% at 6 months. One third of pediatricians discussed sleep position beyond the newborn period. The following were associated (P < .05) with prone sleeping: male sex, lower maternal education level, single marital status, having siblings, and black race. Perceived infant comfort was the main reason for prone sleeping.

Conclusions: Most newborns are placed by parents in nonprone sleep positions. Pediatricians need to consistently reinforce the “Back to Sleep” message when the infants are 2 to 4 months of age because this is the most likely time that they are switched to prone sleeping and the highest risk period of sudden infant death syndrome. Parents should not use prone sleeping as a means of comforting infants.


Sudden Infant Death Syndrome (SIDS) is defined as the sudden death of an infant younger than 1 year that remains unexplained despite a thorough investigation, including review of the clinical history, death scene investigation, and a complete autopsy.1 Sudden infant death syndrome is the leading cause of death for term infants between 1 month and 1 year of age in the United States. Although approximately 6000 infant deaths are attributed to SIDS each year,2 a clearly defined pathophysiological cause remains elusive. It is clear from results of epidemiological studies that prone sleeping is a major preventable risk factor for SIDS. Since the initial 1992 American Academy of Pediatrics statement recommending nonprone sleep positions,3 the prevalence of prone sleeping in the United States has decreased from 70% to approximately 25% in 1996.4,5 Concurrently, the rate of SIDS in the United States declined by approximately 30%, from a rate of 1.2 per 1000 live births in 1992 to 0.87 per 1000 live births in 1995.6-7 Because the change from prone to nonprone sleep position is associated with the largest decrease in SIDS in the United States in the past decade, it is increasingly important to determine why any otherwise healthy infant is still being placed in the prone position for sleep.

This article is also available on our Web site: www.ama-assn.org/peds.
PARTICIPANTS AND METHODS

This study was approved by the institutional review boards of Children's National Medical Center, Washington, DC; Holy Cross Hospital, Silver Spring, Md; Walter Reed Army Medical Center, Washington, DC; and Uniformed Services University of the Health Sciences, Bethesda, Md.

We recruited a consecutive cohort of healthy term infants at a community hospital nursery and in participating pediatricians' offices at the first well-baby visit. Infants were eligible for participation if they were full term and healthy and if they planned to be seen regularly by a pediatrician participating in the Children's National Medical Center Pediatric Research Network. The Pediatric Research Network is a practice-based research network in the Washington, DC, area and consists of 10 suburban private practices with 13 sites, 3 urban pediatric centers, and the Walter Reed Army Medical Center. Infants were excluded from study entry for the following reasons: (1) gestational age younger than 37 weeks, (2) any chronic medical condition requiring hospitalization or ongoing medical care, and (3) absence of a working telephone for monthly contacts.

Parents of 402 newborns were enrolled from November 1995 to September 1996. Most infants (n = 355) were recruited from the community hospital nursery. Research assistants consecutively approached parents of newborns who would be followed up by participating pediatricians in suburban practice sites. Parents were recruited 2 weekdays and 1 weekend day every week during the study. In addition, 47 newborns not born in the community hospital were also recruited during the first well-baby visit by pediatricians practicing at the military and urban sites. Approximately 15% of accessible parents met exclusion criteria or chose not to enroll because of time constraints or knowledge of a relocation in the upcoming year. Demographic information was not collected for these families. Parents completed an initial survey regarding demographic information, birth history, and child care environment after giving informed consent. They were advised at enrollment by a research assistant or their pediatrician to place their infants on the side or back for sleep according to the American Academy of Pediatrics guidelines. At 6 months of age, the sleep log data were collected. At this time, the parents were asked open-ended questions about factors important in choosing the initial sleep position and, for those infants whose sleep position changed, reasons for changing the position. The sample size for this study was calculated to address the motor development outcome for prone and supine sleepers.

A total of 42 pediatricians from 13 practices participated in the routine well-baby child care for the study infants. Pediatricians were surveyed informally at the beginning of the study and formally at the conclusion to determine their beliefs and usual counseling practices regarding sleep position. At the beginning of the study, all practices reported that they believed that prone sleeping was a risk factor for SIDS. Eighty-one percent (34/42) of participating pediatricians, representing all the practice sites, completed the formal survey at the conclusion of the study. All reported that throughout the study they had advised parents of newborns to avoid the prone sleep position, but only 33% reported that they usually counseled parents about sleep position at visits beyond the newborn period. Most (22 of 34) pediatricians recommended the side or supine position, with the remainder endorsing only the supine position. Few pediatricians (4 of 34) distributed the “Back to Sleep” brochure in their offices, except to those enrolled in this study.

Univariate analysis of continuous variables was done by the Kruskal-Wallis test, and categorical variables were analyzed with the Fisher exact test. To control for confounding variables, multiple logistic regression analysis was also conducted.

We hypothesized, based on observations by practicing pediatricians, that some parents would continue to choose prone positioning for their infants despite the “Back to Sleep” message. To determine why some parents choose the prone sleep position despite counseling by health care providers to avoid prone sleeping and receiving the “Back to Sleep” pamphlet we conducted a prospective, longitudinal, practice-based study of a cohort of healthy term infants.

Beginning when their infants were 1 week old, parents kept a sleep position log, listing the percentage of time that their infants slept in the prone, supine, or side position each month until the infant was 6 months old. Sleep position was defined as the position in which the parents placed the infant for sleep. This study was conducted as part of a project to examine associations between early motor development and sleep position. Therefore, parents also kept a log to document motor development during the first year of life. A research assistant contacted the families by telephone monthly to ensure that they were keeping the developmental log and sleep log current but did not ask or give further information about sleep position until the infant was 6 months old. If asked, the research assistant recommended the supine or side position according to the American Academy of Pediatrics guidelines. At 6 months of age, the sleep log data were collected. At this time, the parents were asked open-ended questions about factors important in choosing the initial sleep position and, for those infants whose sleep position changed, reasons for changing the position. The sample size for this study was calculated to address the motor development outcome for prone and supine sleepers.

RESULTS

DEMOGRAPHIC INFORMATION

Of the 402 participants enrolled, 348 (86.6%) completed the study. Of the 54 participants who did not complete the study, 39 (72%) had a geographic move or a disconnected telephone, with the remainder developing medical complications that precluded further participation.

In our sample of 348 infants, 169 (48.6%) were boys; 237 (68.0%) were white; 70 (20.0%) were black; 10 (3.0%) were Asian American; and 31 (9.0%) were Hispanic American, Indian, or other. Of the 348 infants, 146 (41.9%) were first born, 128 (37.0%) had 1 sibling, and 74 (21.1%) had 2 or more siblings. The mean ± SD maternal age was 31.3 ± 5.0 years, with only 2.0% of mothers (n = 7) being younger than 20 years. Two hundred ninety-five mothers (84.8%) were married and 20 mothers (5.7%) were unmarried, and the marital status of 33 mothers (9.5%) was unknown. The mean ± SD maternal education level was 15.3 ± 2.6 years, with 6.0% of the mothers having less
Table 1. Sociodemographic Factors Associated With Initial Sleep Position Choice (N = 348)*

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Prone (n = 40)</th>
<th>Nonprone (n = 308)</th>
<th>Univariate Analysis Odds Ratio (95% CI)†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal age ≤20 y</td>
<td>14 (40)</td>
<td>26 (75)</td>
<td>4.81 (2.28-10.20)</td>
</tr>
<tr>
<td>Maternal education ≤12 y</td>
<td>19 (5.5)</td>
<td>21 (6.0)</td>
<td>3.75 (1.89-7.41)</td>
</tr>
<tr>
<td>Single marital status</td>
<td>4 (1.1)</td>
<td>17 (4.9)</td>
<td>2.65 (0.82-8.50)</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>19 (5.5)</td>
<td>221 (63.5)</td>
<td>0.36 (0.18-0.70)</td>
</tr>
<tr>
<td>Black</td>
<td>14 (4.0)</td>
<td>55 (15.8)</td>
<td>2.48 (1.22-5.05)</td>
</tr>
<tr>
<td>Other</td>
<td>7 (2.0)</td>
<td>32 (9.2)</td>
<td>...</td>
</tr>
<tr>
<td>Male sex</td>
<td>18 (5.2)</td>
<td>151 (43.4)</td>
<td>0.85 (0.44-1.65)</td>
</tr>
<tr>
<td>Birth weight, mean ± SD, kg</td>
<td>3.45 ± 0.47</td>
<td>3.50 ± 0.51</td>
<td>P = .59</td>
</tr>
<tr>
<td>1 Sibling</td>
<td>20 (5.7)</td>
<td>55 (15.8)</td>
<td>4.60 (2.32-9.13)</td>
</tr>
<tr>
<td>Military site</td>
<td>6 (1.7)</td>
<td>15 (4.3)</td>
<td>3.45 (1.25-9.43)</td>
</tr>
<tr>
<td>Inner city site</td>
<td>9 (2.6)</td>
<td>17 (4.9)</td>
<td>4.98 (2.14-12.05)</td>
</tr>
<tr>
<td>Birth weight, mean ± SD, kg</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Information is expressed as number (percentage) unless otherwise indicated. CI indicates confidence interval; and ellipses, data not applicable.
† Using the Kruskal-Wallis test or univariate logistic regression.

than 12 years of education, 71.2% having attended or completed college, and 22.8% having postgraduate training. At enrollment, 90.4% of parents anticipated being the infant’s primary caregiver during the study.

SLEEP POSITION

The usual sleep position at a given age was defined as the position the infant was placed in for sleep more than 70% of the time. Nonprone sleeping was defined as back or side sleeping more than 70% of the time. Infants who were not predominantly prone or nonprone sleepers were considered indeterminate or mixed sleepers and were not included in the analysis. Initial sleep position was measured at 1 week of age. Only 40 infants (11.5%) slept prone initially. When prone and nonprone sleepers were compared, factors significantly associated with initial prone sleeping by Fisher exact test or Kruskal-Wallis test included a lower maternal education level, having older siblings, and being cared for in an urban or military clinic. White race was significantly associated with initial nonprone sleeping (Table 1). When asked about factors affecting their initial choice of sleep position, 54.9% (191/348) of parents cited media exposure or reading as important; 32.8% (114/348) cited health care provider advice; 12.1% (42/348) cited infant comfort; 9.8% (34/348) cited prior experience; 2.9% (10/348) cited advice from a relative or friend; and 2.0% (7/348) cited hospital positioning. There were significant differences in the factors affecting initial sleep position for prone and nonprone sleepers, as shown in Figure 1.

When pediatricians were asked to rate the most influential sources of sleep position information for parents of their patients they named themselves (62% [21/34]), the media (47% [16/34]), and friends or relatives (18% [6/34]) as the most influential sources of sleep position information for their patients. Pediatricians underestimated the prevalence of prone sleeping in their patients. Most believed that parents put their infants prone to sleep because of infant comfort (76% [26/34]), with previous experience (12% [4/34]) and fear of choking (12% [4/34]) also mentioned. Pediatricians believed that expanded media coverage and reinforcement of the “Back to Sleep” message at well-child visits were the best means of lowering prone sleeping rates for their patients.

Sleep position changed for 66.7% (232/348) of infants from birth to 6 months of age. Prone sleeping increased from 12.2% at 1 week to 32.0% at 6 months, supine sleeping increased from 28.3% to 48.2%, and side sleeping decreased from 57.1% to 14.3% (Figure 2). No infants changed their “usual” sleep position more than once. Parents who changed their infant’s usual sleep position stated that the following factors were most important in deciding to change: infant comfort (67.4%), a specific medical indication (3.1%), media exposure (2.0%), health care provider advice (2.0%), advice from a relative or friend (2.0%), previous experience (1.1%), and no reason (21.0%). Sixty-seven (19.2%) of 348 infants were switched from a nonprone to a prone sleep position. Most parents who changed their infants from the nonprone to the prone position (38 of 67 parents) did so because they thought that their baby slept better or was more comfortable in the prone position. Only 8 of the 40 initially prone infants switched to the nonprone position. Two of these changed because of advice from a health care provider or friend; the others did not state a reason.
Based on sleep position during the entire study, infants were additionally categorized as “usually prone” if they were usually placed in the prone position for sleep (>70% of the time) at any time during the first 5 months of life and as “never prone” if they never slept in the prone position at any time throughout the study. Parents of 59 infants reported that they occasionally, but not usually, placed their infants in the prone position for sleep at 1 or more of the measurement points. Five months was chosen as the upper age limit because some infants were able to roll from prone to supine after 5 months, making sleep position determination less reliable. The sociodemographic characteristics of the usually prone and never prone groups are compared in Table 2. On univariate analysis with the Kruskal-Wallis test or logistic regression, male sex, black race, young maternal age, lower maternal education level, single marital status, and having siblings were significantly associated with prone sleeping at any time during the first 5 months of life. Controlling for confounding variables using multiple logistic regression analysis, lower maternal education level, the presence of siblings, black race, and male sex were associated with prone sleeping.

### Table 2. Sociodemographic Factors Associated With Sleep Position for 5 Months (N = 289)*

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Usually Prone (n = 114)</th>
<th>Never Prone (n = 175)</th>
<th>Univariate Analysis Odds Ratio (95% CI)‡</th>
<th>Multiple Logistic Regression‡</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal age ≤20 y</td>
<td>21 (7.3)</td>
<td>14 (4.8)</td>
<td>2.60 (1.26-5.35)</td>
<td></td>
</tr>
<tr>
<td>Maternal education ≤12 y</td>
<td>36 (12.5)</td>
<td>29 (10.0)</td>
<td>2.32 (1.33-4.07)</td>
<td>2.38 (1.29-4.37)</td>
</tr>
<tr>
<td>Single marital status</td>
<td>10 (3.5)</td>
<td>6 (2.1)</td>
<td>2.94 (1.03-8.36)</td>
<td></td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>72 (24.9)</td>
<td>129 (44.4)</td>
<td>0.61 (0.37-1.02)</td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>28 (9.7)</td>
<td>25 (8.6)</td>
<td>1.95 (1.07-3.56)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>14 (4.8)</td>
<td>21 (7.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male sex</td>
<td>68 (23.5)</td>
<td>73 (25.2)</td>
<td>1.28 (2.07-3.33)</td>
<td>2.13 (1.29-3.51)</td>
</tr>
<tr>
<td>Birth weight, mean ± SD, kg</td>
<td>3.49 ± 0.49</td>
<td>3.50 ± 0.52</td>
<td>P = .74</td>
<td></td>
</tr>
<tr>
<td>≤1 Sibling</td>
<td>36 (12.5)</td>
<td>31 (10.7)</td>
<td>2.14 (1.23-3.73)</td>
<td>1.65 (1.0-2.79)</td>
</tr>
<tr>
<td>Military site</td>
<td>8 (2.8)</td>
<td>10 (3.5)</td>
<td>1.25 (0.48-3.23)</td>
<td></td>
</tr>
<tr>
<td>Inner city site</td>
<td>11 (3.8)</td>
<td>10 (3.5)</td>
<td>1.76 (0.72-4.29)</td>
<td></td>
</tr>
</tbody>
</table>

*Information is expressed as number (percentage) unless otherwise indicated. CI indicates confidence interval; ellipses, data not applicable.
†Using the Kruskal-Wallis test or univariate logistic regression.
‡Using the Wald method.

Results of recent studies conducted in the United States confirm the association between prone sleeping and SIDS. The “Back to Sleep” message seems to be reaching most parents, given the reported decrease in the point prevalence of prone sleeping in the United States from 70% before the “Back to Sleep” campaign to 25% in 1996. The difference in factors affecting initial sleep position choice may reflect differences in health care beliefs for parents who chose the prone over the nonprone position. Socio-demographic risk factors for initial prone sleeping included having other siblings, lower maternal education level, black race, and receiving health care in an urban or military clinic. The infants who received care at the urban and military sites were recruited during the initial well-baby visit rather than during the hospital stay. Therefore, they did not consistently receive advice from the research assistant to avoid the prone sleep position before hospital discharge. In addition, we have no information about how these infants were placed to sleep in the newborn nursery or what information they received about sleep position in the hospital. Because they may not have been given this information from hospital personnel, these parents may have been more likely to choose a position based on either previous experience or perceptions of how their infant slept. Brenner et al found that observation of hospital personnel placing the infants in the prone position for sleep was no more reliable than parental recall of how their infant slept. The sociodemographic risk factors for initial prone sleeping were associated with an increased frequency of SIDS, which was present in 70% of the infants in the prone position for sleep throughout the first 6 months of life. Many nonprone-sleeping infants (67 of 351) in our sample were switched to the prone position at 2 to 4 months of age, the highest risk period for SIDS. In a similar practice-based study, Chessare et al also reported a low prevalence of prone sleeping among newborns, whereas infants in the 2- to 4-month age group had the highest prevalence. They recommended that a longitudinal study be conducted because they could not determine whether sleep position actually changed over time because of the cross-sectional nature of the study design. Most parents of newborns in our sample followed the “Back to Sleep” recommendation initially, with 87.8% of parents placing their infants in a nonprone position at 1 week. Mothers who chose the nonprone position were more likely to depend on their health care provider or the media for sleep position advice, whereas those who chose the prone position were more likely to rely on personal experience or their own perceptions about which sleep position was most comfortable for their infant. The difference in factors affecting initial sleep position choice may reflect differences in health care beliefs for parents who chose the prone over the nonprone position.
fant in the prone position for sleep was a strong predictor of prone sleeping at 3 to 7 months of age. However, none of the parents of the prone infants stated this as an important factor in their decision. All infants recruited at the community hospital site were placed on the side or back for sleep in the nursery.

Once infants in our sample began prone sleeping, it was difficult to change this practice. Despite counseling at the initial well-baby visit, only 8 of the 40 initially prone sleepers switched to non-prone. However, many of our initially nonprone sleepers subsequently became prone sleepers. The major reason parents initially chose or switched to the prone sleep position was for infant comfort, which included responses such as “the baby sleeps better” or “is happier.” This was also seen in studies by Rainey and Lawless14 and Brenner et al13 in the United States and Ponsonby et al15 in Tasmania, in which infant comfort was the predominant reason for prone sleeping. The children in these studies were predominantly born to young, poorly educated, medically indigent mothers. In our sample, maternal age and education level were high, even among mothers of prone-sleeping infants. Yet, despite the higher sociodemographic status of our sample and the universal counseling to avoid prone sleeping, many parents still changed their infant’s sleep position to prone during the first 6 months of life because of perceived infant comfort. Studies10 show that prone sleeping is indeed associated with an increase in sleep duration and a decrease in arousals, confirming parental perceptions. In addition, infants sleeping in the supine position are more likely to be awakened from startling to loud noises.17 Parents may place their infants in the prone position to decrease this likelihood.

Like other investigators,13,14,18 we also found that placing infants in the prone position for sleep, initially and throughout the study, was more common among black mothers, those with other children, and those with lower levels of education. In addition, we found male sex to be significantly associated with the prone position. These sociodemographic factors also have been independently associated with an increased risk of SIDS.19,20 It is unclear why male sex is associated with prone sleeping.

Parents initially chose the side position for their infants 3 times more often than they chose the supine position. This may in part have reflected discomfort of some health care professionals with placing infants in the supine position.13,21,22 Despite the fact that the side is an unstable position,23,24 because these infants were recruited before the American Academy of Pediatrics 1996 recommendation that supine sleep is safest and preferable to side and prone sleep,24 it is likely that many of the infants were placed on the side by hospital nursery personnel.

We acknowledge that this study is limited by the accuracy of parental responses. Despite the fact that we were unaware of the infant’s sleep position until 6 months of age, parents may have been reluctant to fully document the extent of prone sleeping. In addition, our study sample was skewed toward older and more highly educated parents, who are less likely to place their infants in the prone position.25,26 Both these factors may have resulted in an underrepresentation of the true prevalence of prone sleeping in the general population of the Washington, DC, area.

We conclude that physicians must play an active, ongoing role in discouraging prone sleeping. Because we found that the incidence of prone sleeping increases during the first 6 months of life, parents should have the “Back to Sleep” message consistently reinforced during all health care encounters, beginning as early as possible and continuing throughout the half year. Because there is some evidence that prenatal intention to place the infant in the prone position is a strong predictor for prone sleeping,11 it is important that physicians begin their counseling at the prenatal visit; if this is not possible, counseling should begin in the nursery. The message should also be tailored to anticipate that certain ethnic and sociodemographic groups may rely more on personal experience and perception than on health care provider advice and media reports of medical advances. Parents are more likely to place their infants in the prone position if they perceive that the infant is happier or sleeps better despite medical advice to the contrary. Health care providers should acknowledge that prone-sleeping infants tend to “sleep better” but should caution parents that this sound sleeping may be precisely what puts some infants at higher risk for SIDS. Parents should be counseled to try alternative methods of decreasing sleep arousals, such as swaddling, but care must be taken not to overbundle infants. It is especially important to target parents with limited social support and those with temperamentally difficult infants. With more active participation by health care providers throughout the entire SIDS risk period, perhaps the prevalence of prone sleeping in the United States can be reduced even further to levels achieved by other developed countries.

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REFERENCES


