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ORIGINAL ARTICLE

Bad sleeping habits in infants: risk factor for sudden infant death syndrome. Pilot study

Malos hábitos de sueño en lactantes: factor de riesgo para síndrome de muerte súbita del lactante. Estudio piloto

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What do we know about the subject matter of this study?

The American Academy of Pediatrics recommends that infants aged under one year old sleep in supine position to prevent sudden infant death syndrome (SIDS).

What does this study contribute to what is already known?

This study describes sleep habits in a sample of infants aged under 45 days, with frequent unsafe sleeping positions (prone or lateral), bed-sharing, and exposure to passive smoking. Educating about safe sleep is an effective tool in getting children to sleep in supine position.

Abstract

The American Academy of Pediatrics recommends, through the implementation of the "Back to Sleep (BTS)" campaign, the supine sleeping position for infant sleeping since it prevents to prevent Sudden Infant Death Syndrome (SIDS). **Objective:** To describe the sleeping position of a group of infants and the risk factors associated with sudden infant death syndrome (SIDS). **Subjects and Method**: Prospective pilot study, including infants < 45 days of life in well-child care visits at a medical center. Exclusion criteria: Preterm-born infant (gestational age < 37 weeks) and/or comorbidities (pulmonary, metabolic, cardiologic). A brief parental questionnaire was conducted regarding general demographic data and sleep habits. The questioner was based on the BISQ - Spanish version, due to the lack of validated instruments for infants < 3-month-old. **Results:** We included a sample of 100 infants between 16.78 ± 12.88 days old (57% girls). Mothers were the main information source (84%). 79% of the infants slept in supine position, 19% slept on their

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sides, and 2% in prone position. Regarding the place where the infants slept, 66% did in their crib in the parents' room and 31% slept in parents' bed. 74% of infants fell asleep while being fed. 28% of infants were exposed to passive smoking at home. 91% of parents were informed about safe sleep positions, reporting that pediatricians were the main source of information (54%). **Conclusion:** We found a high percentage of infants < 45 days of life who slept in an unsafe position, and frequently co-sleep with their parents. Thus, it is important to implement local SIDS prevention campaigns to reinforce safe infant sleep.

Introduction

How a newborn and infant should sleep is a controversial issue discussed and analyzed for many years in pediatrics, since it is associated with multiple pathologies[1-4]. Sudden infant death syndrome (SIDS) is defined as 'the death of a child aged under one year old, with a normal medical history, physical examination, and autopsy, where the definitive cause of death cannot be established'[1].

Several risk factors have been described, such as young age of the infant (under 4 months old) and prematurity[3,4]. The risk is higher if there has been exposure to prenatal and passive smoking at home, if the child sleeps in the parents' bed, and if there is history of a sibling's death due to SIDS, increasing the risk by 2 to 10 times[2,5]. About 90% of SIDS deaths occur during the first 6 months of life, almost two-thirds of the cases occur at night, mostly in the winter, and it's more common in males than females[2]. Other risk factors for SIDS are race (e.g. native americans and african americans), alcohol and illicit drug use (e.g. heroin) during pregnancy, soft bedding in the crib, and overheating[3].

In 1985, it was described that putting infants to sleep in supine position was a common practice in Hong Kong and SIDS was very rare. In contrast, in the United States, the incidence of SIDS was far higher, where most infants sleep in prone position. In 1992, the American Academy of Pediatrics (AAP) recommended any position other than prone for infant's safe sleeping[6]. Then, in 1994, 'Back to Sleep (BTS)' campaigns were implemented to raise awareness that supine position had the greatest effect in preventing SIDS[6] and was, therefore, the only position recommended. At the end of these campaigns, the role of health professionals became crucial.

In a systematic review published in 2016[6], regarding the effectiveness of BTS campaigns over the past 20 years, health professionals were still the main promoters of supine position as the safest one for infant sleeping. This same review described a decline in SIDS rates after the beginning of BTS campaign between 1991 and 1992, in countries such as Australia from 2.49 to 0.20 per 1,000 live births (1987-2013), USA from 1.37 to 0.87 per 1,000 live birth (1987-2013), and UK from 2.40 to 0.24 per 1,000 live birth (1987-2012)[6].

Over the past 30 years, health professionals and parents have been educated about the importance of supine sleeping position for infants under one year of age. Following BTS campaigns, awareness of supine position among health professionals increased by 10%[7,8]. However, parents' awareness of avoiding prone or lateral sleep position for infants has decreased over time, from 97% to 90% by the end of 2000[7-9].

In Chile, there are currently no published studies of the most frequent position in which newborns and infants sleep or if professionals and non-professionals inform parents about safe sleep. The objective of this study was to describe the most frequent position in which a group of healthy infants sleep and the presence of risk factors for SIDS. In addition, to look for an eventual association between the education of caregivers about infant's safe sleep and child's sleeping position.

Subjects and Method

Study design and participants

A pilot, concurrent prospective study was conducted. Through convenience sampling, 100 subjects were selected, since there are no studies on the prevalence of infant's sleeping position in our population. Healthy term newborns (gestational age over 37 weeks) aged under 45 days were included who went for their well-baby visits at *San Joaquin Medical Center of UC Christus Health Network*. Exclusion criteria were prematurity (gestational age under 37 weeks) and underlying pathology (respiratory, metabolic, cardiovascular, etc.).

A survey developed by the researchers, based on the Brief Infant Sleep Questionnaire (BISQ) was applied[10]. This survey evaluates the following variables in infants aged from 6 to 29 months: the place where the child sleeps (crib in own room, parents' or siblings' room, or in parents' bed), sleep hours during day and night, how the child falls asleep (being held, alone in her/his crib, in crib with the presence of the caregiver, while fe-

eding or rocking), position in which she/he sleeps most of the night (supine, prone or lateral), night wakings, and bedtime. We used this questionnaire since, to our knowledge, there are no surveys on sleeping habits for children under 3 months of age. However, BISQ is a validated survey in spanish[11] in infants from 3 to 30 months with adequate validity and reliability for sleep assessment in younger infants than in Sadeh's original work[10].

In addition, demographic and social data were recorded, such as age, sex, caregiver's educational level, neighborhood, and passive smoking at home. Finally, we asked whether the caregiver was aware of the safest sleeping position for their child, professional or person who had informed them (pediatrician, nurse, and other health professional or close relative), and knowledge regarding SIDS prevention campaigns in Chile. The objective of this study was not to validate this questionnaire since it is a pilot type, as a first approximation to sleep habits in chilean infants.

This study was approved by the Ethics Committee of the Pontifical Catholic University of Chile (project #170823030). Informed consent was requested before the survey was completed, and parents were given a copy. Parents were guaranteed the possibility of leaving the study at any time, without prejudice to the child's future care.

Statistical analysis

For descriptive statistics, we used mean and standard deviation for the continuous variables and number and percentage for the categorical ones. A descriptive analysis was performed with the Chi-square test for dichotomous variables and Student's T-test for quantitative ones. We performed a logistic regression of variables associated with supine position of infants when sleeping. Odds ratio (OR) with 95% confidence interval was calculated and a p-value < 0.05 was considered statistically significant. All analyses were performed using SPSS Statistics version 24 software for MAC.

Results

We obtained a sample of 100 newborns aged 16.78 ± 12.87 days, 57% of them were female. The mother was the main source of information (84%), and 86% of the caregivers had completed higher education (technical/university). 60% of the children were first-born. Table 1 shows the general characteristics of the population.

Regarding infant sleep habits and risk factors for SIDS (see Table 2), almost 80% slept in supine position and 20% in prone or lateral position, with a bed-sharing rate of 30%. 73.74% fell asleep during feeding. Caregivers reported that children slept 8.7 ± 1.54 hours at night and 8.28 ± 1.98 hours during the day. 28.28% of infants were exposed to passive smoking at home, in 3.57% of the cases, the caregiver smoked inside the home.

Concerning safe sleep education, 90.91% were informed about safe sleep position, the pediatrician was the main informant (54.44%). The other informants were the nurse (22.22%), another health professional (11%), and another non-health professional (12.22%). Only 16.16% were aware of SIDS prevention campaigns. 10.1% of caregivers reported having a family member with a child who died of SIDS.

When comparing the group of newborns who slept in supine (n = 79) vs. those who slept in another position (prone or lateral) (n = 21), there were no significant differences in age, parents' educational level,

Table 1. Descriptive analysis of the studied population (n = 100)

Variables	Results
Age in days (average ± SD)	16.78 ± 12.87
Female sex %, (n)	57 (57)
Informant caregiver %, (n)	
Mother	84 (84)
Father	15 (15)
Other	1 (1)
Educational level of caregiver %, (n)	
Secondary education	14 (14)
Higher education	86 (86)

Definition of abbreviations: SD = standard deviation.

Table 2. Sleep habits and risk factors for SIDS in the studied population (n = 100)

Variables	Results
Sleep place %, (n)	
Crib in single room	3 (3)
Crib in parent's room	66 (66)
Parent's bed	31 (31)
Child falls asleep %, (n)	
While feeding	73.74 (73)
Being rocked	3.03 (3)
Being held	13.13 (13)
In crib alone	5.05 (5)
In crib with parents present	3.03 (3)
In parent's bed	2.02 (2)
Passive smoking %, (n)	28.28 (28)
Smokes inside house	3.57 (1)
Smokes outside house	96.3 (27)

Definition of abbreviations: SIDS = Sudden infant death syndrome.

Table 3. Comparison between groups of infants according to sleeping position (supine vs prone or lateral)

Variables	Supine position (n = 79)	Prone or lateral position (n = 21)	p
Age in days (average ± SD)	17.35 ± 13.47	14.61 ± 10.33	0.39
Female sex %, (n)	55.7 (44)	61.9 (13)	0.26
Educational Level of Caregiver %, (n)			0.44
Secondary education	15.2 (12)	9.5 (2)	
Higher education	84.8 (67)	90.5 (19)	
Sleep place %, (n)			0.33
Crib in single room	2.5 (2)	4.8 (1)	
Crib in parent's room	65.8 (52)	66.7 (14)	
Parent's bed	31.6 (25)	28.6 (6)	
Passive smoking %, (n)	27.8 (22)	30 (6)	0.04*
Smokes inside the house	1.3 (1)	0 (0)	
Smokes outside the house	26.6 (21)	28.6 (6)	
Knowledge about safe sleep position %, (n)	93.7 (74)	76.2 (16)	0.02*
Knowledge of SIDS prevention campaigns %, (n)	13.9 (11)	23.8 (5)	0.22

Definition of abbreviations: SIDS = Sudden infant death syndrome. SD = standard deviation.

sex, or sleeping place (see Table 3). We found that the group that did not sleep in supine position was more exposed to passive smoking (30 vs 27.8%, p = 0.04) and that their caregivers had less knowledge about safe sleeping position for their child (76.2 vs 93.7%, p = 0.02). Out of the 21 patients who did not sleep in supine position, 6 slept in the parents' bed and 3 of them were exposed to passive smoking. The parents of these last 3 children had been informed about the safe sleeping position and 1 had a relative who had died due to SIDS.

We performed a logistic regression of the variables associated with sleeping in supine position, adjusting for sex, caregivers' educational level, newborn's sleeping place, caregiver's information received about safe sleeping position, relative or family member died due to SIDS, and knowledge of public campaigns to prevent SIDS. Educating caregiver's about infant's safe sleep predicted supine sleep position with an OR 9.79 (95% CI 1.60-59.65, p = 0.013). Other variables such as sleep place, sex, having a family member or relative deceased due to SIDS, knowledge of SIDS prevention campaigns, or the caregiver's educational level were not significant predictors in this analysis.

Discussion

This pilot study is the first nationwide approach to describe sleep habits in newborns and infants aged under 45 days. We found a high prevalence of children sleeping in an unsafe position (20%), a high rate of bed-sharing (30%), and a lack of knowledge of current recommendations on how a child under one year old should sleep to prevent SIDS.

The American Academy of Pediatrics recommends supine position for sleeping in children under one year of age[12]. In Argentina, a study described the adherence to sleep recommendations in infants at one month and four months of age[13], finding a proportion of infants sleeping in supine position of 61.2% and 21.2%, respectively. In Brazil, 82.1% of mothers who were discharged with their newborn child expressed the belief that their child should sleep in a lateral or prone position[14]. To our knowledge, this is the first study in Chile that describes the frequency of infants sleeping in supine position. The prevalence found is similar to that reported in other international studies[15,16].

It is important to emphasize that supine position when sleeping does not increase the risk of gastric aspiration or asphyxia, even in children with severe gastroesophageal reflux, due to physiological airway protection mechanisms[12]. Prone position can only be allowed during wakefulness, supervised and controlled, during postprandial periods, and as stimulation. Finally, it is noteworthy that our study found no association between higher educational level of the primary caregiver and the child sleeping position. This differs from what is reported in other publications, which describe that although BTS campaign decreased the absolute risk of SIDS in all social groups, an increase in the gap and social inequity was observed since the decrease was mainly seen in groups with mothers with higher education and higher socioeconomic status[17].

Bed-sharing is a controversial issue. It is defined as an infant sleeping in the same surface with one or

two adults, whether it is a bed, couch, or another surface[12]. The prevalence of bed-sharing is variable across countries, with evidence for increased SIDS and other inconclusive evidence. In Chile, an international study on sleeping habits in 3-month-old infants revealed a prevalence of 64% bed-sharing in a population of 226 children[18], similar to countries in Africa and Asia[19]. Despite how frequent this practice appears to be in our population, there are factors in which bed-sharing is contraindicated and represents a risk of asphyxiation and SIDS, such as infants under 4 months (OR = 4.7 to 10.4), smoker parents (OR = 2.3 to 21.6), prematurity, parents with alcohol or drug use (OR = 1.66 to 89.7), and bed-sharing with a non-parent of the infant (OR = 5.4)[12].

In our study, all infants were under 2 months of age, which is the age of highest risk for SIDS. Our group previously reported that 81% of SIDS cases registered in Chile between 1997 and 2009 occurred before 2 months of age[2]. We consider that the 30% rate of bed-sharing found is extremely high given the age of susceptibility of the children. It is worth to mention that there is an important ethnic and cultural factor associated with SIDS. A British study[20] that surveyed 2,560 families of infants aged 2-4 months found that Asian families (from Bangladesh, India, or Pakistan) were more likely to practice bed-sharing (OR = 8.48 [95% CI 2.92-24.63]) than white families. However, Asian families were also more likely to protect the infant from other unsafe sleeping situations such as exposure to prenatal smoking, alcohol use by both parents, sleeping with soft bedding in the crib, and sleeping on a couch with a parent. This may explain why, despite increased bed-sharing in Asian populations, the prevalence of SIDS tends to be lower[6].

Smoking by mothers during pregnancy and by both parents in the postnatal period is a risk factor for SIDS. The risk is cumulative, with postnatal exposure to one parent who smokes having an OR = 2.5 (95% CI 1.2 - 5.0) for SIDS and if both parents smokes it increases to an OR = 5.77 (95% CI 2.2 - 15.5)[21]. Our work described that almost 30% of the children were exposed to parental smoking, which is significantly higher in the group that did not sleep safely. This means a cumulative risk factor for SIDS which, when added to bed-sharing, puts a vulnerable infant at considerable risk[9].

Finally, it is noteworthy that the group with children sleeping in an unsafe position had significantly less knowledge of the current recommendations for safe sleep. After the multivariate analysis, the only significant predictor for the infant sleeping in supine position was that the caregiver had information regarding infant's safe position at bedtime. This means that with early education about safe sleep, the percentage of children who sleep in prone or lateral position during their first year of life may decrease. It is essential to focus efforts on developing national education campaigns for the population since we are facing a public health problem with dramatic repercussions on family lives.

Our work has limitations. A small number of subjects were sampled for convenience and were not representative of the general population. In addition, an un-validated survey was used in our population, even though it is validated in Spanish. On the other hand, it was not possible to delve into the reasons why caregivers did not follow safe sleep recommendations, especially regarding sleeping position. Lastly, since the caregivers' educational level was much higher than the national reality (84% vs 19.8%)[22], it could limit the extrapolation of the data.

The main strength of this pilot study is that it seeks to promote safe sleep habits and the development of public policies for the prevention of SIDS. Research projects should be conducted nationwide describing infant sleep habits in all Chilean regions and characterizing other modifiable risk factors (e.g., overheating, crib characteristics, use of soft bedding in the crib) and protective factors for SIDS (breastfeeding and pacifier use). Also, it would be interesting to investigate why caregivers follow (or do not follow) the recommendations, thus guiding promotion and prevention strategies for safe sleep in infants.

Conclusions

In this sample of infants, there was a high percentage of children sleeping in an unsafe position, with frequent bed-sharing. It is important to implement SIDS prevention campaigns in Chile that reinforce safe sleep for infants. Education regarding safe sleep is an effective tool in making children sleep in supine position.

Pediatricians are the leading educators on safe infant sleep. However, it is essential to educate both primary and tertiary care professionals about the importance of infant position during sleep, among other risk factors for SIDS.

Ethical Responsibilities

Human Beings and animals protection: Disclosure the authors state that the procedures were followed according to the Declaration of Helsinki and the World Medical Association regarding human experimentation developed for the medical community.

Data confidentiality: The authors state that they have followed the protocols of their Center and Local regulations on the publication of patient data.

Rights to privacy and informed consent: The authors have obtained the informed consent of the patients and/or subjects referred to in the article. This document is in the possession of the correspondence author.

Conflicts of Interest

Authors declare no conflict of interest regarding the present study.

Financial Disclosure

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