



# Maternal Knowledge and Unsafe Baby Sleep Position: A Cross-Sectional Survey in Southern Brazil

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## Abstract

**Objective** to evaluate women's knowledge about the best baby sleeping position and to identify factors associated with a greater probability of putting infants to sleep in an unsafe position, in Rio Grande, Southern Brazil. **Method** This is a cross-sectional population-based study that included all women who bore children in 2013 in this municipality. A single, standardized questionnaire was given within 48 h after delivery in the only two local maternity hospitals. The outcome was that women reported the lateral and the ventral decubitus as the best sleeping positions for babies. A Chi square test was used for proportions and Poisson regression was used with robust variance adjustment in the multivariate analysis. The prevalence ratio was the measure of effect used. **Results** We included 2624 women in this study. Of these, 82.1% (95% CI 80.6–83.6) stated that the baby should sleep in the lateral or ventral decubitus positions. 76.4% reported having acquired this knowledge from their mothers and 34.7% were willing to adopt the correct (supine) sleeping position for their child if recommended by doctors. The adjusted analysis showed that the lower the schooling of the mothers and the greater the number of people per bedroom and number of children, the greater the probability of women choosing an unsafe baby sleeping position. **Conclusions for Practice** This study showed that the percentage of women who are unaware of the correct baby sleeping position is very high, that doctors should be convinced to recommend the supine baby sleeping position, and that campaigns on this subject should also include grandparents as a priority intervention group.

**Keywords** Infant sleep · Sudden infant death · Infant health · Infant care

## Significance

The main way to prevent SIDS is to put the baby to sleep in the supine position. However, such practice is unknown to most women, who typically place the baby to sleep in

lateral decubitus, a teaching that was passed on to them by their mothers, the child's grandmother. Doctors must instruct mothers on the correct baby sleeping position during prenatal consultations. Factors such as lower levels of schooling, higher numbers of children and a high number of people per bedroom appear to aggravate this practice.

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## Introduction

The Sudden Infant Death Syndrome (SIDS) refers to the unexpected and unexplained death of children under 1 year of age, even after reviewing the clinical history, assessing the circumstances of the place of death and a postmortem examination (Krous et al. 2004).

This type of death is commonly reported in developed countries, since the cause of death is well investigated there and the infant mortality rate is low, which makes SIDS an important cause of death among children under 1 year.

In 2013, SIDS was considered the basic cause of 170 infant deaths in Brazil. However, possible underreporting in the Amazon Region and, above all, the lack of investigation of hundreds of infant deaths must be considered. In this same year, 1110 child deaths from ill-defined causes (Brazil, Ministry of Health 2013) were reported nationwide, suggesting that the frequency of SIDS as an underlying cause of infant deaths should be much larger than the official statistics report.

The main SIDS-associated risk factors are sleeping in the ventral or lateral position, sleeping in an inadequate environment (extremely soft mattress, excessive use of covers), co-sleeping, inadequate prenatal care, being a child of an adolescent mother, a mother with low schooling, and exposure to secondhand smoke (American Academy of Pediatrics (AAP) 2016; Takatsu et al. 2007). The main way to prevent SIDS is to put a baby to sleep in a supine position (AAP 2016).

In Brazil, the proportion of women knowledgeable about the correct baby sleeping position and that sleeping position is associated with SIDS is low. A single study conducted at a hospital in the Northeast showed that only 30% of women knew that sleep in the supine position prevents this type of death (Bezerra et al. 2015). Women's lack of awareness of the correct baby sleeping position is the result of following the instructions of their mothers or physicians and their own experience with other children (Cesar et al. 2013).

Infant mortality has been sharply declining in Brazil. In the period between 2000 and 2015, it fell from 29/1000 to 13/1000 (Brazil, Ministry of Health 2016), basically due to the implementation and expansion of the Family Health Strategy, which began to provide primary care on a regular basis, which continues from the onset of pregnancy to the end of the first year of life (Macinko and Harris 2015). Considering that putting the baby to sleep in the dorsal decubitus position can reduce infant mortality by 3/1000, we can safely assume that this lesson would contribute significantly to reducing child mortality nationwide if passed on to women.

This study aimed to evaluate women's knowledge of the best baby sleeping position and to identify others who are more likely to put the baby to sleep in an unsafe position (lateral or ventral decubitus).

## Method

This cross-sectional study was conducted in the only two maternity hospitals in Rio Grande, a municipality with 210,000 inhabitants located in the extreme south of Brazil. All women residing in this municipality who had a child between January 1 and December 31, 2013 and whose newborn weighed at least 500 g or reached 20 weeks of gestational age were included.

All the information was collected through a single, standardized questionnaire given by previously-trained interviewers to all women within 48 h after delivery. This tool sought demographic, socioeconomic, environmental, reproductive life, and life habit information, and assistance received during pregnancy and childbirth characteristics. In addition, we evaluated the knowledge of women regarding the best baby sleeping position. The outcome was that 2154 women reported an incorrect baby sleeping position according to the AAP, that is, sleeping in the lateral or ventral decubitus positions (AAP 2016).

Four interviewers were selected and trained to perform this research. A pilot study was conducted in the month prior to the onset of data collection in the same two maternity hospitals. During the study, interviewers visited the hospitals on a daily basis, identifying postpartum women through medical records, followed by visits to the infirmaries. The questionnaire was given only after the women's agreement and signing two copies of the consent form, one copy of which the women retained.

The questions on each questionnaire applied were codified and fully revised before entry. Data were double entered by different professionals using the free software Epidata 3.1 (Lauritsen 2008), in which entries were also compared and corrected. Then, consistency and final analyses were carried out in the statistical package Stata version 11.2 (StataCorp 2011).

The descriptive analysis was performed by obtaining the outcome frequency and independent variables list. Poisson regression with robust variance adjustment was used (Barros and Hirakata 2003) for the crude and adjusted analyses of outcome-associated factors. The outcome measure was expressed through the prevalence ratio (PR), 95% confidence interval (95% CI) and p-value of the linear trend test for ordinal variables and Wald test for heterogeneity in the other variables (Kirkwood and Sterne 2003).

Regarding the adjusted analysis, a four-level hierarchical model was elaborated to determine the variables' entry order in the model (Victora et al. 1997). In this model, first-level variables were overdeterminant in relation to those of other levels, while those of the second level acted in the same way over those of the third level, and so forth. Thus, levels also established variables' entry order in the analysis model.

In the first (distal) level, women's demographic and socioeconomic variables were included (age, race, monthly household income, and schooling); the second level contained ambient features (number of people per bedroom); the third level included reproductive life characteristics (parity—number of live and deceased children); and the fourth (proximal) level contained variables related to pregnancy, delivery care, lifestyle, and behavior (number prenatal care consultations and services, type of delivery, number of cigarettes consumed daily during pregnancy and

alcohol consumption). The outcome was that 2154 women mentioned that babies should sleep in the lateral or ventral decubitus positions.

In the backward regression model used, all variables were adjusted for variables of the same level and previous levels with a  $p$ -value  $\leq .20$ . We assessed the statistical association and measure of effect between the independent variables and the outcome using the 95% CI and PR, respectively.

Quality control was ensured by repeating 7% of interviews through telephone calls. The concordance index was calculated for 24 questions, ranging from 0.61 for “reason for caesarean section” to 0.92 for “type of delivery”. Most of the other questions returned a concordance index above 0.70, which is satisfactory.

The research protocol was submitted and approved by the Health Research Ethics Committee of the Federal University of Rio Grande under N° 2623/2012-67.

## Results

According to the National Birth and Mortality Information System (SINASC/SINAN), 2731 women living in the municipality had a child in 2013. Of this total, 76 were not found and 31 did not know how to respond as to the best baby sleeping position and were therefore excluded from this study. Thus, the respondent rate in this study was 96.1%, and the denominator consisted of 2624 women.

Table 1 shows the main characteristics of the studied population. About one-fifth of women were adolescents ( $< 20$  years), two-thirds were white and 86% lived with a companion. About 60% had at least nine full years of schooling and a household income equal to or greater than 2 minimum wages, and just over half (52%) of households had one person per bedroom. Almost half of respondents were primiparous, 3% did not have a single prenatal visit and 61% had a child via cesarean section. Finally, 28% and 9% reported having smoked at least one cigarette per day and having consumed alcohol during pregnancy at least once a week, respectively.

Table 2 shows that almost all women (99.4%) who indicated an unsafe baby sleeping position pointed the lateral decubitus position. Three out of four said they had obtained this knowledge from their mothers (the babies’ grandmothers). Of those who provided an erroneous answer, 35% were willing to put their child to sleep in their dorsal position if recommended by their doctors.

Table 3 shows, by category evaluated, that the proportion of women unaware of the correct baby sleeping position ranged from 67% among women with 12 or more years of schooling to 93% among those with up to 4 years of schooling. This table also shows that, even after adjusted analysis, the variables of women’s schooling, the number of people

per bedroom and parity all remained significantly associated with the outcome. PR indicating an unsafe baby sleeping position among women with 1–4 years of schooling was 1.35 (95% CI 1.23–1.47) in relation to those with over 12 years of schooling, while those whose household had three or more people per bedroom showed PR = 1.05 (95% CI 1.00–1.09) compared to those in which there was one person per bedroom. Finally, having two or more children increased by at least 11% the likelihood of women indicating an incorrect baby sleeping position as compared to primiparous women.

## Discussion

This study showed that at least eight out of ten women were unaware of the correct baby sleeping position. Low schooling, excessive number of residents per bedroom, and high parity were the main determinants of this condition. In addition, women’s opinion was not affected by prenatal consultations, but influenced by the instructions of the babies’ maternal grandmothers (the women’s mothers). Finally, this paper identified the physician’s enormous potential to work with these women, guiding them to put the child in the correct sleeping position, that is, in the supine position.

We found that 82% of women have stated that the correct baby sleeping position is the lateral or ventral decubitus position. Such result is very similar to the 78% found in this municipality in 2010 (Cesar et al. 2013) and in another Brazilian municipality located in the same state in 2005 (Geib and Nunes 2006). This is clearly a highly and persistently prevalent problem in this municipality and possibly in the region. In the case of the municipality of Rio Grande, it derives from the lack of any kind of a mass campaign or approach during prenatal consultations, aimed at teaching women about the correct baby sleeping position.

There is sufficient evidence that enlightenment and incentive campaigns can change the practice of mothers in relation to baby sleeping position (Issler et al. 2009; Pollack and Frohna 2002; Salm Ward and Balfour 2016). A study with about 11,000 women conducted in Washington (USA) showed a substantial increase in the proportion of children who were put to sleep in the supine position following recommendations by the AAP (McKinney et al. 2008). AAP recommended that all children sleep in this position in order to reduce sudden death. In the period 1996–2002, the proportion of children sleeping in the supine position increased from 43 to 76% (McKinney et al. 2008), which shows the enormous potential of this type of intervention, and such initiatives should, therefore, be encouraged.

The risk of putting the baby to sleep in an unsafe position varied markedly with maternal schooling. The lower the respondent’s level of schooling, the more likely she was to indicate an incorrect baby sleeping position. No studies

**Table 1** Distribution of the sample according to women's knowledge of baby sleep position. Rio Grande, RS, Brazil, 2013

Variable	Position the baby should sleep		Total
	Supine	Prone/lateral	
Age in years			p = .008
13–19	14.0% (66)	18.1% (390)	17.4% (456)
20–29	47.9% (225)	51.0% (1099)	50.5% (1324)
30–34	24.9% (117)	18.8% (405)	19.9% (522)
35 or over	13.2% (62)	12.1% (260)	12.3% (322)
Race			p = .037
White	71.1% (334)	64.9% (1398)	66.0% (1732)
Mixed	19.4% (91)	23.0% (495)	22.3% (586)
Black	9.5% (45)	12.1% (261)	11.7% (306)
Living with a partner	87.5% (411)	85.6% (1843)	p = .287 85.9% (2254)
Level of education (complete)			p < .001
1–8	24.0% (113)	43.6% (938)	40.1% (1051)
9–11	47.7% (224)	43.8% (943)	44.5% (1167)
12 or more	28.3% (133)	12.6% (271)	15.4% (404)
Monthly household income (minimum wages)			p < .001
< 1	4.5% (21)	5.6% (120)	5.4% (141)
1–1.9	23.4% (110)	30.0% (645)	28.8% (755)
2–4.9	45.3% (213)	49.8% (1073)	48.9% (1286)
5 or more	26.8% (126)	14.7% (316)	16.9% (442)
Number of persons per bedroom			p < .001
1	62.8% (295)	50.0% (1077)	52.2% (1372)
2	25.7% (121)	31.5% (678)	30.5% (799)
3 or more	11.5% (54)	18.5% (399)	17.3% (453)
Parity			p < .001
0	57.7% (271)	44.5% (958)	46.8% (1229)
1	28.7% (135)	30.1% (649)	29.9% (784)
2 or more	13.6% (64)	25.4% (547)	23.3% (611)
Number of prenatal visits			p = .005
0	1.7% (8)	2.9% (62)	2.7% (70)
1–5	9.8% (46)	14.7% (317)	13.8% (363)
6 or more	88.5% (416)	82.4% (1775)	83.5% (2191)
Type of public prenatal care service (n = 2554)			p < .001
Public	37.2% (172)	53.6% (1122)	50.7% (1294)
Private	62.8% (290)	46.4% (970)	49.3% (1260)
Method of delivery			p = .001
Vaginal	32.1% (151)	40.1% (863)	38.6% (1014)
Caesarian	67.9% (319)	59.9% (1291)	61.4% (1610)
Number of cigarettes smoked per day during pregnancy			p < .001
0	78.3% (368)	70.2% (1513)	71.7% (1881)
1–9	7.7% (36)	6.8% (147)	7.0% (183)
10 or more	14.0% (66)	23.0% (494)	21.3% (560)
Consumption of alcohol during pregnancy	5.7% (27)	10.2% (219)	p = .003 9.4% (246)
Total (%) (n)	17.9% (470)	82.1% (2154)	100% (2624)

were found confirming this association, but this result was expected. Mother's schooling is known to be the main determinant of child health status, especially in developing

countries (Victora et al. 2011). It is plausible to think that women with more education have greater access to information and, since they understand it more easily, can transform

**Table 2** Knowledge of baby sleep position among women who gave birth in Rio Grande, RS, Brazil, 2013

Variable	Percentage
Best baby sleep position according to the participants (n = 2655)	
Dorsal decubitus (supine/lying on their back)	17.8% (470)
Lateral decubitus (lateral/lying on their side)	80.5% (2141)
Ventral decubitus (prone/lying on their stomach)	0.5% (13)
Do not know	1.2% (31)
Only women who said the baby should be put to sleep in the lateral or prone positions (lateral or ventral decubitus)	
Leaned about this position from	
Their mother (baby's grandmother)	76.4% (1646)
Another family member	8.4% (181)
By themselves	6.1% (132)
Experience with previous children	4.0% (85)
Healthcare professional	2.1% (45)
Other	3.0% (65)
Women who indicated willingness to put the baby to sleep in the supine position if recommended by a doctor	38.2% (824)
Total (n)	100.0% (2154)

this knowledge into action (UNICEF 2014; Gaydos et al. 2015). We should stress that the weak correlation between schooling and income was 0.393. For this reason, both were kept in the model.

Having more than one person per bedroom increased the likelihood of women not knowing the correct baby sleeping position in relation to those whose household had only one person per room. Family agglomeration is one social vulnerability indicator. Such condition is associated with low socioeconomic status, risk behavior and inability to pay attention to those who live there due to excessive numbers of people and other subsistence needs. An environment with these characteristics is unlikely to be concerned about baby's sleeping position. Co-sleeping, that is, the sharing of the same bed between adults and children (usually the father and the mother), is also an aggravating factor that increases the risk of SIDS (Thach 2014).

The greater the number of children, children, the less the women knew about the correct baby sleeping position. Such findings were also observed in a study by Pollack and Frohna (2002), where families with more than three children were 1.7 (95% CI 1.08–2.74) times more likely to put the baby to sleep in an unsafe position. Habits inherited from previous offspring may be the determinants of the sleeping position pattern of infants in these families (Gaydos et al. 2015).

We would like to emphasize that the prenatal consultations were not associated with knowledge about inadequate sleeping position after adjustment. Such result possibly suggests the lack of impact of prenatal consultations on women's knowledge on this topic. A study carried out in a municipality of the same State evidenced that the

pediatrician recommended the lateral decubitus as the only safe baby sleeping position for almost half of women who had made childcare consultations, besides recommending six times more the ventral position rather than the dorsal decubitus position (Geib and Nunes 2006). Similarly, a telephone survey conducted in the USA revealed that about 45% of women reported not receiving orientation on sleeping position or receiving guidance on a position other than the supine position (Colson et al. 2009). These data could suggest that the topic is not being addressed in consultations or that even doctors are unaware of the impact of sleeping position on the prevention of SIDS.

Respondents' knowledge about this issue stems almost exclusively from their mothers, that is, the baby's maternal grandmother. Three out of four women said they acquired this knowledge from their mothers. A study conducted with grandparents who regularly care for grandchildren under the age of 6 months in the State of Arkansas, USA, showed that they were less likely to put the baby to sleep in the supine position because they believed this position increased the risk of child suffocation and discomfort (Aitken et al. 2016). Despite the strong influence of grandmothers on the baby sleeping position, the need for intervention with grandparents in order to dispel common myths related to the supine position so contested by them is clear (Gaydos et al. 2015).

This study identified the physician's enormous modification potential in relation to low knowledge on the correct baby sleeping position. Even among women who reported lateral or ventral decubitus as the best baby sleeping position, 35% of them said they would put their children to sleep in the supine position if the physician recommended this. Another study supporting this finding showed that the

**Table 3** Crude and adjusted analyses for maternal knowledge of the best baby sleep position. Rio Grande, RS, 2013 (n = 2624)

Level	Variable	Proportion of women who think the baby should sleep in the lateral or prone positions	Prevalence ratio (CI 95%)	
			Crude	Adjusted
1°	Age in years		p = .005	p = .341
	13–19	85.5% (390)	1.08 (1.03–1.14)	1.00 (0.95–1.05)
	20–29	83.0% (1099)	1.05 (1.01–1.10)	1.03 (0.95–1.05)
	30 or over	78.8% (665)	1.00	1.00
	Race (self-reference)		p = .028	p = .697
	White	80.7% (1398)	1.00	1.00
	Mixed	84.5% (495)	1.05 (1.00–1.09)	1.01 (0.97–1.06)
	Black	85.3% (261)	1.06 (1.00–1.11)	1.02 (0.97–1.07)
	Level of education (full year)		p < .001 <sup>a</sup>	p < .001 <sup>a</sup>
	1–4	92.6% (150)	1.38 (1.27–1.50)	1.35 (1.23–1.47)
	5–8	88.6% (788)	1.32 (1.23–1.42)	1.28 (1.19–1.39)
	9–11	80.8% (945)	1.21 (1.12–1.30)	1.18 (1.09–1.27)
	12 or more	67.1% (271)	1.00	1.00
	Monthly household income (minimum wages)		p < .001	p = .132
< 1		1.15 (1.07–1.26)	1.03 (0.96–1.13)	
1–1.9	85.1% (120)	1.16 (1.10–1.22)	1.04 (0.98–1.10)	
2–3.9	85.4% (645)	1.15 (1.09–1.21)	1.06 (1.01–1.12)	
4 or more	84.8% (881)	1.00	1.00	
2°	Number of persons per bedroom		p < .001 <sup>a</sup>	p = .037 <sup>a</sup>
	1	78.5% (1077)	1.00	1.00
	2	84.9% (678)	1.08 (1.04–1.12)	1.03 (0.99–1.07)
	3 or more	88.1% (399)	1.12 (1.07–1.17)	1.05 (1.00–1.09)
3°	Parity		p < .001 <sup>a</sup>	p < .001 <sup>a</sup>
	0	78.0% (958)	1.00	1.00
	1	82.8% (649)	1.06 (1.02–1.11)	1.07 (1.02–1.12)
	2	89.2% (280)	1.14 (1.09–1.20)	1.12 (1.06–1.19)
	3 or more	89.9% (267)	1.15 (1.10–1.21)	1.11 (1.04–1.19)
4°	Number of prenatal visits		p = .001	p = .337
	0	88.6% (62)	1.09 (1.03–1.13)	0.98 (0.93–1.04)
	1–5	87.3% (317)	1.08 (1.00–1.19)	1.00 (0.95–1.05)
	6 or more	81.0% (1775)	1.00	1.00
	Type of prenatal care service (n = 2554)		p < .001	p = .261
	Private	77.0% (970)	1.00	1.00
	Public	86.7% (1122)	1.12 (1.08–1.17)	1.03 (0.98–1.08)
	Type of delivery		p = .001	p = .472
	C-section	80.2% (1291)	1.00	1.00
	Vaginal	85.1% (863)	1.06 (1.02–1.10)	0.98 (0.95–1.03)
	Number of cigarettes smoked per day during pregnancy		p < .001	p = .065
	0	80.4% (1513)	1.00	1.00
	1–9	80.3% (147)	1.00 (0.93–1.08)	0.94 (0.87–1.02)
	10 or more	88.2% (494)	1.09 (1.06–1.14)	1.03 (1.00–1.08)
Consumption of alcohol during pregnancy		p < .001	p = .304	
No	81.4% (1935)	1.00	1.00	
Yes	89.0% (219)	1.10 (1.05–1.15)	1.03 (0.97–1.09)	

<sup>a</sup>Test for linear trend

physician's recommendation was strongly associated with putting the baby to sleep in the supine position (Colson et al. 2009). In addition, women feel more confident in receiving advice from doctors, which facilitates adherence to appropriate childcare practices (Hwang et al. 2016). Thus, it is possible to suggest that physicians have great potential to reduce SIDS rates by recommending the correct baby sleeping position to mothers.

When interpreting these results, it is necessary to bear in mind that the design used with a single approach was based only on women's reports. Women may have forgotten or even omitted some information. However, this does not seem to have occurred systematically, that is, affecting a specific group of women, such as, for example, the younger ones or women with lower socioeconomic levels. The fact that measures of effect are not very expressive and that the p-value is generally high is a result of the high occurrence of the outcome (82%), which gives little scope for the identification of expressive PRs, in this case, of at most 22% (100/82). Were it not for the large sample size, which allowed working with a power above 90%, these small differences would not even have been found. However, we should note that this is a population-based study, with a very low level of losses (2.8%) and with enormous potential to subsidize public health policies, which in itself already justifies its importance.

The expressive reduction of infant mortality in Brazil involves interventions that go beyond those routinely provided by health services. In the case of the recommendation to put the baby to sleep in the supine position, we wish to emphasize at least three aspects: (1) there is sufficient scientific evidence that this measure actually reduces the occurrence of sudden death; (2) this low-cost procedure is simple and easy to apply; and (3) health professionals, especially physicians, have several intervention opportunities, because these women undergo at least six prenatal consultations.

The campaigns of enlightenment and encouragement to put the baby to sleep in the supine position should be resumed by focusing mainly on grandmothers and doctors. Otherwise, countless deaths will continue to occur due to an easily preventable cause.

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