

Prevalence and the Relationship between Characteristics and Parental Conditions with Risk Factors for Sudden Infant Death Syndrome (SIDS)

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Abstract

Introduction

Sudden Infant Death Syndrome (SIDS) is a disease which causes unexpected death of infants aged less than 1 year. Given the undeniable role of parents in the presence or absence of SIDS risk factors, the present study aimed to study the prevalence and the relationship between characteristics and conditions of parent's infants with SIDS risk factors.

Materials and Methods

In this cross-sectional descriptive-analytic study, 1,021 infants aged 1 to 12 months in the health centers in Qom-Iran in 2014 were selected as the sample by stratified random sampling method. The required data were collected using an author-made questionnaire on SIDS risk factors. The obtained data were analyzed by descriptive and inferential statistics in SPSS 18 at a significance level of 95%.

Results

4.5% of mothers were younger than 20 years, 92.3% infants had a co-sleeping with their parents, and 35.7% of infants had a bed-sharing with their parents. 19% of infants used Soft pillow. Study findings showed that there is no significant relationship between the age of mothers and using a shared bedroom ($P>0.05$), while such a relationship exists between education backgrounds of parents and sharing a bedroom ($P<0.05$).

Conclusion

The results showed that socioeconomic and educational status of parents play a significant role in the development of SIDS risk factors. Therefore, the incidence of such factors can be reduced through improving parental awareness and education.

Key Words: Bed-sharing, Infant, Risk factors, Sudden Infant Death Syndrome, SIDS.

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Introduction

Sudden infant death syndrome (SIDS) is defined as “a sudden death of an infant less than 1 year of age, which remains unexplained after a thorough investigation of the clinical history”. SIDS diagnosis can be made through full autopsy of infant, a careful inspection of death scene, evaluation of infant’s clinical status, and clinical history of infant before death (1). In other words, if the cause of sudden infant death remains unknown after complete dissection, thorough investigation, inspection of death scene, and review of clinical history, it is called sudden infant death syndrome (2). It is a very sad and tragic experience with detrimental effects on the family system, especially parents, taking the parents an average of 15.9 months to adapt themselves with the condition (3). SIDS is the leading cause of death in newborns and the third leading cause of death in infants. Its prevalence is 0.7 per 1,000 live births, and according to the census from the United States of America, SIDS was the cause of 2,295 infant deaths in 2002 and 2,246 infant deaths in 2004 (2, 4, 5). Another report indicated a total death of about 2,100 infants from SIDS in USA per year (6). Some common biological risk factors that increase the risk of this syndrome include infant age, gender, ethnicity, premature birth, and maternal exposure to tobacco or alcohol (7). In addition, a number of environmental factors that have shown to increase the risk of SIDS include sleeping in prone position, infant sleeping environment, infection, and stress (8). Since parents have the strongest relationship with their infants before and after birth, their conditions and characteristics play a significant role in the presence or absence of risk factors for SIDS (9). Conditions involved in this issue include socioeconomic status of parents (10), clinical problems during pregnancy and childbirth (11), parental smoking

during and after pregnancy (12), and provision of an inappropriate environmental temperature by parents (13). Recently information that the association of strains of *Escherichia coli* with sudden infant death syndrome (SIDS) and the possible role these bacteria play in this enigmatic condition (14). According to UNICEF, one of the most important indicators of health and the most significant indicator of national development are the mortality rate of children less than 1 year of age. Thus preventing the deaths of such children is a health priority in every society, and since SIDS is a leading cause of infant death, its prevention is the most important health priority which can be achieved through careful and integrated planning to reduce exposure to risk factors (4, 15, 16). In other words, until the exact cause of SIDS is not specified, proper planning for reducing the exposure to the risk factors is the best strategy for reducing SIDS. Significant role of research and planning in reducing SIDS rate can be clearly seen in other countries. For example, a series of planning in Washington during 1998 to 2000 led to a 44% decline in SIDS rate. Therefore, research and planning in this field is essential (5). Given the undeniable role of parents in the presence or absence of SIDS risk factors, this study aimed to investigate the prevalence of SIDS and the relationship between parental conditions and characteristics with SIDS risk factors.

Materials and Methods

A total of 1,021 infants from 1 to 12 months of age, were selected through stratified random sampling method from health centers in Qom, south of Tehran, Iran and included in this descriptive-analytical study. Qom health centers were divided into four separate zones, and 3 centers were selected randomly from each one. The study population consisted of all mothers of infants who visited the health

centers. The sample size was calculated at

$$\text{least 878 people. } N = \frac{z^2(1 - \frac{\alpha}{2})P(1-P)}{d^2} = \frac{1.98^2(1 - \frac{0.05}{2})0.29(1 - 0.29)}{0.03^2} \approx 878$$

To avoid possible errors and loss, 1,021 patients were enrolled in the study. For data collection, a literature-based researcher-made questionnaire designed in three parts including demographic information of parents (age of mother, educational level and occupation of parents, parental smoking during and after pregnancy, number of children, and family history of SIDS), demographic information of infants (age, sex, birth weight, gestational age, birth order, and infant health status during pregnancy), and infant sleeping environment (shared bedroom, shared bed, infant room temperature, infant sleep position, infant pillow type, and infant feeding). To determine the Validity of questionnaire, used the content validity. So after consideration new articles about this study and incorporate comments of 7 faculty members of the Ahvaz Jundishapur University of Medical Sciences, validity was confirmed. To determine reliability of this questionnaire, we used Cronbach's alpha method. The questionnaire's reliability was determined as 0.83 through Cronbach's alpha coefficient. After approval at the Research Deputy of Qom Branch of the Islamic Azad University (ID Code of Project = 34200), the researchers attended at the health centers and explained the study nature and importance of the study to the parents and after obtaining their informed consent to participate in the study and participation was completely voluntary and samples were free to leave the study at any stage, the questionnaire was completed through interview. The obtained data were analyzed by SPSS-18 using descriptive statistics (t- test, ANOVA and Chi-square).

Result

The number of subjects in the analyses included 1,021 mothers, 46(4.5%) of them were less than 21 years of age, while the majority of women (95.5%) belonged to the age group of above 21 years, and 491(48.1%) infants were male. Among the fathers, 92(9%) were smoking during pregnancy, while almost none [except one (0.1%)] of participated mothers were tobacco smoker during pregnancy. In addition, 261(25.56%) mothers and 297(29.08%) had lower secondary education and 922 (90.03%) mothers were housewives (Table.1).

Table 1: Parental Characteristics

| Parents' characteristics | Number | Percent |
|---------------------------------|--------|---------|
| Mother's age | | |
| Less than 21 | 46 | 4.5 |
| Higher than 21 | 975 | 95.5 |
| Mother's education | | |
| Illiterate | 35 | 3.4 |
| Primary | 81 | 8.3 |
| Middle | 141 | 13.8 |
| Secondary | 419 | 41 |
| University | 341 | 33.4 |
| Father's education | | |
| Illiterate | 17 | 1.7 |
| Primary | 117 | 11.5 |
| Middle | 163 | 16 |
| Secondary | 310 | 30.4 |
| University | 414 | 40.5 |
| Mother's occupation | | |
| Housewife | 922 | 90.3 |
| Employee | 72 | 7.1 |
| Self-employed | 16 | 1.6 |
| Other | 11 | 1.1 |
| Father's occupation | | |
| Unemployed | 18 | 1.8 |
| Worker | 252 | 24.7 |
| Employee | 289 | 28.3 |
| Other | 462 | 45.2 |
| Residence | | |
| City | 995 | 97.5 |
| Village | 26 | 2.5 |
| Smoking during pregnancy | | |
| Mother | 1 | 0.1 |
| Father | 92 | 9 |
| Smoking after pregnancy | | |
| Mother | 2 | 0.2 |
| Father | 95 | 9.3 |

The birth weight of 130 infants (12.7%) was less than 2.5 kg (Low Birth Weight, LBW); 54(5.3%) infants were multiple birth infants; 845(82.8%) infants were only breastfed and 124(12.1%) infants were preterm (gestational age of less than 37 weeks). There was no significant relationship between mother's age and gestational age (less than 37 weeks or more than 37 weeks) ($P=0.406$), however, a significant association existed between smoking parents and gestational age ($P=0.001$), in that infants with smoking parents were born with a gestational age of less than 37 weeks ($P=0.001$). There was also a significant association between parental smoking during pregnancy and breastfeeding, in that the number of breastfed infants of non-smoking parents was higher. It is noteworthy that parents' education had a significant association with breastfeeding ($P=0.005$), i.e. the higher the educational level of mothers was, the more common breastfeeding was. The relationship between parents' occupation (especially mothers) and infant feeding was significant ($P<0.05$), and the number of breastfed infants of housewife mothers was higher than those of working mothers. Regarding the place and conditions of infant sleep, 942 infants (92.3%) had shared bedroom (Co-Sleeping) and 346(35.7%) had shared bed (Bed-Sharing). The results revealed a significant association between mother's age and shared bed ($P=0.00$). There was also a significant relationship between mother's occupation and shared bed ($P=0.012$), in that the majority of working mothers had no shared bed with their infants. The results also showed that sleeping of parents near infants on a bed had a significant association with place of living ($P=0.003$), in that the majority of families with no shared bed with their infants were living in villages. According to the results, there was no significant relationship between mother's age and shared bedroom ($P=0.052$), but a

significant relationship existed between parents' education and shared bedroom ($P=0.025$), in that shared bedroom was less common among working parents ($P=0.025$). No significant association was reported between smoking parents and shared bedrooms ($P>0.05$). Pillow type was normal in 827(81%) infants (i.e. firm enough to align head and neck with spine, just like standing), and the remaining (19%) were very soft pillows. Infant sleeping in prone (Prone position) and lateral positions (Side lying position) which are considered common risk factors were seen in 154 (15.1%) and 402(39/4%) infants, respectively. There was a significant association between mother's age and infant sleep position in this study ($P=0.042$). But the relationship between parents' education and infants sleep position was not significant ($P=0.132$). It is noteworthy that a significant association existed between mothers' occupation and infant sleep position ($P=0.001$), in that prone or lateral sleep position was more common in infants of working mothers. Soft pillow, which can choke infants, was used in 19% of infants. In 89(8.7%) infants, the head was covered by a sheet or blanket which may choke infants and was a risk factor for SIDS. A significant association existed in this study between mother's age and the use of very soft pillow ($P=0.005$), in that soft pillow was more common among mothers less than 21 years of age. On the other hand, no significant association was found between mother's age and infant head covering with a sheet or blanket ($P=0.596$). The relationship between parents' education, infant pillow type, and infant head covering was not significant ($P>0.05$). In addition, a significant association existed between place of living and infant pillow type ($P=0.12$), in that the use of very soft pillows was more common among the urban families. However, the results showed no significant relationship between

place of living and infant head covering (P=0.851).

Table 2: The Relationship between some parental conditions and a number of SIDS risk factors

| Variables | Number (%) | Mother age | Mother education | Father education | Mother occupation | Father occupation | Residence | Smoking during pregnancy | Smoking after pregnancy |
|-------------------------------------|------------|------------|------------------|------------------|-------------------|-------------------|-----------|--------------------------|-------------------------|
| Infant sleep environment conditions | | | | | | | | | |
| Shared bedroom | 942 (92.3) | >0.05 | <0.05 | >0.05 | >0.05 | <0.05 | >0.05 | >0.05 | >0.05 |
| Shared bed | 364 (35.7) | <0.05 | <0.05 | >0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| <hr/> | | | | | | | | | |
| *Bedroom temperature (°C) | | | | | | | | | |
| Warm :23-26 | 139 (13.6) | >0.05 | <0.05 | <0.05 | <0.05 | >0.05 | <0.05 | <0.05 | <0.05 |
| Medium: 20-22 | 864 (84.4) | | | | | | | | |
| Very hot: >27 | 20 (2) | | | | | | | | |
| <hr/> | | | | | | | | | |
| **Bedroom temperature (°C) | | | | | | | | | |
| Warm :>27 | 41(4) | >0.05 | <0.05 | <0.05 | <0.05 | >0.05 | <0.05 | <0.05 | <0.05 |
| Medium:23-25 | 653(64) | | | | | | | | |
| Cold : < 20 | 327(32) | | | | | | | | |
| <hr/> | | | | | | | | | |
| Infant's pillow type | | | | | | | | | |
| Very soft | 194(19) | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | >0.05 | >0.05 |
| Normal | 827(81) | | | | | | | | |
| <hr/> | | | | | | | | | |
| Infant's position at sleep | | | | | | | | | |
| Prone | 154(15.1) | <0.05 | >0.05 | >0.05 | <0.05 | >0.05 | <0.05 | >0.05 | >0.05 |
| Lateral | 402(39.4) | | | | | | | | |
| Supine | 465(45.5) | | | | | | | | |
| <hr/> | | | | | | | | | |
| Covering infant's head | 89(8.7) | >0.05 | >0.05 | <0.05 | >0.05 | >0.05 | >0.05 | >0.05 | >0.05 |
| <hr/> | | | | | | | | | |
| Infant's feeding | | | | | | | | | |
| Breastfeeding | 845 (82.8) | | | | | | | | |
| Formula | 53(5.2) | <0.05 | <0.05 | <0.05 | <0.05 | - | <0.05 | <0.05 | <0.05 |
| Both | 123(12) | | | | | | | | |
| <hr/> | | | | | | | | | |
| Gestational age | | | | | | | | | |
| <37 weeks | 124(12.1) | >0.05 | - | - | >0.05 | >0.05 | >0.05 | >0.05 | - |
| >37 weeks | 897(87.9) | | | | | | | | |

*: (at winter); **: (at summer)

Discussion

Factors affecting sudden infant death syndrome (SIDS) have been partially identified. Previous studies indicate high prevalence of SIDS in the world, mainly due to similar factors. Although an exact figure of such death is not available in Iran, its prevalence can be estimated according to its severity in majority of countries. Since the prevention of SIDS lies in the elimination of risk factors, family and medical teams should be informed about their responsibility towards learning preventive methods. The risk of SIDS is higher to mothers aged less than 21 years because of low age and lower

experience in infant care. Blair et al. (2009) showed that 17% of mothers aged less than 20 years (17). According to the results of our study, the number of mothers aged less than 21 was about 25% of other studies, which can reduce SIDS risk in our sample society. In this study, 46 mothers (4.5%) were less than 21 years of age. Since males are more prone to SIDS and about half of the investigated subjects were boys (48.1%), families with male newborns should be more careful against other risk factors. Smoking, as a risk factor, has been discussed, at length. In fact, smoking mothers and fathers are of primary causes of SIDS, both during and

after pregnancy. Maternal cigarette smoke during pregnancy increases the risk for sudden infant death syndrome (SIDS) (18). Results showed that 9% and 9.3% of fathers were smoking before and after delivery, respectively. The rate of smoking mothers was much lower in Iran than in other countries. In a study by Blair et al. (2009) in UK, smoking rate amongst pregnant was 14% (17). In a study by Mitchell et al. (1993), smoking rate amongst pregnant was 12%, 33%, and 49% in women with high, middle, and low socioeconomic status, respectively, which was very high (19). The difference in the results of Blair and Mitchell with those of present study is probably arisen from differences in race, culture, and life style. Alm et al. (2006) showed that the rate of smoking declined from 23.5% to 9.5% with a proper planning (20). According to this research, planning can be used to reduce smoking as the most important and very common SIDS risk factor, and hence prevent its occurrence. At this present study, educational level in 261 participated mothers (25.56%) lower secondary education. In a study by Fu et al. (2008), 18.7% of mothers lower secondary education (5). Lahr et al. (2007) showed that shared bed was most prevalent in families with incomes of less than \$30,000 (20). Low income may be one of the main causes of shared bed.

Results showed that 18.8% of the newborn infants were the third or subsequent children of the family, which are more prone to SIDS risk, because the higher is the birth order, the more will be SIDS risk. In the study by Blair et al. (2009), 40 infants (32.80%) who died of SIDS were the third or subsequent children of the family (17); therefore, parents with more children have to take more care with their newborns. In addition, birth weight of less than 2,500 grams is a risk factor. In this study, 12.7% of infants had a birth weight of less than 2500 grams. Similar results

were observed in other studies. In a study by Pinho et al. (2011), 8.4% of the infants in the control group had a birth weight of less than 2500 grams (2). Pokudino et al. (2009) reported that tobacco smoking during pregnancy could reduce birth weight (21). Therefore, smoking parents are of the main causes of low birth weight, which is per se a risk factor for SIDS. The lack of breastfeeding is also a risk factor for SIDS. According to the results of this study, 82.8% of infants were breastfed and the remainders were fed with infant formula (5.2%), or both formula and breast feeding (12%). Pinho et al. (2011) showed that only 43.7% of infants were breastfed (2). The difference in the results can be related to cultural differences in the place of study. In the present study, 9.7% of mothers were employed, and since employment of mothers may interrupt regular breastfeeding of infants, working mothers must plan as far as possible for breastfeeding of their infants. Results of the present research showed that 12.1% of the infants were premature, while 5% and 10.5% of the infants were premature in the study of Blair et al. (2009) (17) and that of Pinho et al. (2011) (2), respectively. According to the results of Ion et al. (2015), parental smoking during pregnancy had a significant role in premature birth (23). Since 9% of parents were smokers in the present study, smoking had a slight effect on occurrence of SIDS in the studied population. The risk factor of shared bed in this study was 35.7% (364 people).

The results of Aneez et al. (1995) showed that 44% of infants had a shared bed with their parents (24). In a study by Fu et al. (2008), 32.5% of the infants had a shared bed (5). Another study by Fu et al. (2010) showed that about half (47.4%) of the infants had a shared bed (25). According to the results of Ateah et al. (2008), the rate of this risk factor was 72% (26). While it was 48% in a study by Blair et al. (2009)

(17). In a research conducted in 2002 by Ramos et al., 63% of mothers had a shared bed with their infants (27). The frequency of shared bed was reported 43%-47% in UK (28), USA (29), and New Zealand (30). In a study by Tan et al. (2009), this risk factor was reported 73.3% (30). In study by Karl et al. (2015) showed that there was a steady increase in bed sharing throughout the period of study. In all of these studies, except Tan et al.'s, the results were almost identical, which may be due to mother-to-child emotional bonding that makes mothers to always keep children on their side and even have a shared bed. No significant association was observed between smoking parents and shared bed in our study. In the study Fu et al. (2008), no association was also found between parental smoking and shared bed (5). In addition, no evidence was observed regarding the association between smoking parents and shared bed in this study compared with the research by Tan et al. (2009) (31).

A recent study systematically reviewed the issue but only partially answered such questions as was the child unsettled/unwell that led to the baby joining the parents in their bed? The review divided reasons for bed sharing into either "intentional" or "reactive;" "monitoring" the baby was given as a reason in 56.9% of situations (66.7% in Blacks) and "crying" in 32.4% (32). Since shared bed is a very important risk factor and had a significant relationship with a majority of parents' conditions in this study, its avoidance is recommended as far as possible to reduce the risk of SIDS. The results showed that shared bedroom was the greatest risk factor (92.3%); this is also evident in other studies. In the study by Mitchel et al. in Germany (1993), shared bedroom with parents or other siblings was the greatest risk factor (82.6%) (19). Results of Fu et al. (2008) showed that shared bedroom was the greatest risk factor (48.6%) (5). It

is noteworthy that evidence similar to the study of Ten et al. (2009) (31) was found in our study regarding the significant relationship between mother's occupation and shared bedroom. The results of McCoy et al. (2004) (33) were similar to the present study in this regard. Given the significance of the relationship between mother's occupation and education and shared bedroom, it is recommended to instruct housewife mothers who have lower education. Regarding infant sleep positions, the results showed that 154 infants (15.1%) were sleeping in prone and 402 infants (39.4%) in lateral positions. In a study by Pinho et al. (2011), the prevalence of prone and lateral sleep positions were 7.5% and 73.4% in the control group, respectively (2). In a study by Mitchel et al. (1993), the prevalence of prone and lateral positions were 4.01% and 44.7% in the control group and 28.1% and 27.2% in the intervention group, respectively, during the last 4 weeks (19). This emphasizes infant sleep position as an important factor in development of SIDS. According to the results of Alm et al. (2006), prone position was declined from 31.8% to 5.6% during 1991 to 2003 through planning (20).

A preliminary investigation showed that the hypothesis that prone sleep position increases the risk of such colonization by *Staphylococcus aureus* and *Escherichia coli* (34). Accordingly, physicians are recommended to consider training young pregnant women in terms of infant sleep position more seriously. Very soft pillows and covering infant's head can increase the risk of infant death (35). In our study, the prevalence of using very soft pillows and infant head covering were 19% and 8.7%, respectively. The incidence of sudden death due to covering of infant's head was reported 15.6% in New Zealand and 28.1% in Germany (36).

Conclusion

The results showed that socioeconomic and educational status of parents play a significant role in the development of SIDS risk factors. Therefore, the incidence of such factors can be reduced through improving parental awareness and education. The prevalence of SIDS risk and relevant factors may vary in different regions given the differences in culture, race, and life style. Proper planning for education of parents and increasing their awareness can reduce infant mortality, promote health indicators and national development, reduce costs, and prevent its damaging effects on families. Significant role of research and planning in reducing SIDS can be clearly seen in other countries. At the end, it is recommended to investigate the prevalence of SIDS risk and relevant factors in all cities, including parents' conditions, to reduce its incidence through proper planning.

Conflict of Interest: None.

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