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ORIGINAL ARTICLE

Current recommendations on infants' sleeping position are being followed—initial results of a population-based sentinel study on risk factors for SIDS, 1996–2006, in Hamburg, Germany

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Abstract Sudden infant death syndrome (SIDS) is a target for public health care in Germany. The aim of this study was to monitor data on risk-related behavior in the population of Hamburg, Germany, in order to respond to changes quickly and to estimate the effectiveness of prevention activities. Data have been gathered using the sentinel system with repeated surveys (1996, 1998, 2001, and 2006) in pediatric practices, thus allowing an estimate of the prevalence of risk factors in an urban population, both transversally and vertically. From 1996 to 2007, the SIDS rate in Hamburg fell from 0.9/1,000 live births to 0.1. The prevalence of infants sleeping prone declined from 8.1% in 1996 to 3.5% in 2006. In this small subgroup, up to 81.7% (2006) of the caretakers were well aware of the risk of sleeping prone. The prevalence of infants sleeping on their sides fell from 55.3% in 1998 to 10.6% in 2006. The sentinel setting is suitable for gathering risk-related data on SIDS. Despite the fact that, so far, no nationwide back-to-sleep campaign has been instituted in Germany, local campaigns have proved successful in reducing prone sleeping for infants. Moreover, the substantial reduction of side sleeping within a short time span going along with a reduced SIDS rate is an indicator of the effectiveness of prevention activities on a local basis.

Keywords SIDS · Sleeping position · Side sleeping · Sentinel · Prevention

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Introduction

As in many other countries, the incidence of sudden infant death syndrome (SIDS) in Germany declined substantially in the mid-1990s due to regional and international back-to-sleep campaigns discouraging parents from putting their infants to sleep in the prone position [1–8]. The drop in the German SIDS rate continues [GBE-Bund, www.gbe-bund.de]. In the background of this positive development, pathmorphological, epidemiological, and ethical aspects of SIDS are still an important matter of research in forensic medicine [9–12]. As no unified pathogenetic mechanism nor specific "treatment" for SIDS has been identified so far, the ongoing decline most likely results from a change in parental behavior towards their infants. Recently, it has no longer been recommended to put infants to sleep on their side [13, 14]. However, the effects of those recommendations have not yet been studied. Epidemiologic case-control studies on SIDS have been performed in many countries, but the data are somewhat out-dated.

The aim of this study was to monitor data on parental behavior at several time points in order to (1) respond quickly to changes in risk-related behavior in the population, and (2) to estimate the effectiveness of prevention activities. The present paper focuses on infant's sleeping position and parents' knowledge about the specific risks of different positions.

Materials and methods

Data were gathered using the sentinel system. The word sentinel refers to the function of keeping guard. Sentinel practices are best known for providing early warning of epidemic diseases. The method has been internationally validated [15, 16] and has been evaluated in Germany

especially for use in pediatric practices [17]. Participating doctors report health-related data of their patients to a study center, which samples and statistically evaluates them.

In the present study, all data were gathered anonymously. Each recruited pediatric practice received a feedback on the results for the study population as well as for their individual clientele. In 1996, 1998, 2001, and 2006 pediatric practices, mother's health care consultants, and midwife practices were asked to take part in the study. Each participating practice was provided with standardized, single-sheet questionnaires concerning risk-related behavior such as sleeping position, bedding habits, parental smoking, and feeding habits. The questionnaires were filled in subsequently by the staff of the practice by interviewing parents of infants in their first year of life at routine medical check-ups (in Germany, these check-ups are part of the national health system). Detailed instructions for filling in the questionnaires were provided. If the interview failed (e.g., due to language problems), only basic data like sex and age were recorded. There were 60 pediatric practices and 50 other practices. The question on parents' knowledge about sleeping positions is shown in Table 1.

The database was evaluated using Epi Info™ 6 provided by the World Health Organization. Epi Info™ 6 is a series of microcomputer programs for handling epidemiologic data in questionnaire format and for organizing study designs and results into text that may form part of written reports. It allows various epidemiologic data management and analysis techniques. Ninety-five percent confidence intervals (95%CI) of the estimated prevalences were calculated with Ahlbohm's method [18]. Differences were accepted as being statistically significant on a 5% level when the 95%CI did not overlap.

Hamburg is a federal city state in the northern part of Germany with approximately 2 million inhabitants and around 16,000 births per year. The SIDS rate in Hamburg in 1996–2007 has been calculated using the official birth rate and the number of SIDS cases registered in the Department of Legal Medicine of the University Medical Center of Hamburg-Eppendorf. The Department of Legal Medicine in Hamburg functions as a public morgue for all deceased

Table 1 Parents' knowledge about sleeping positions

Which sleeping position to your knowledge increases the risk for sudden infant death the most?
(Only 1 answer!)
Supine[a]
Side
Prone[a]
Do not know

[a] For easier understanding, the German words "Rückenlage" and "Bauchlage" have been used in the original questionnaire

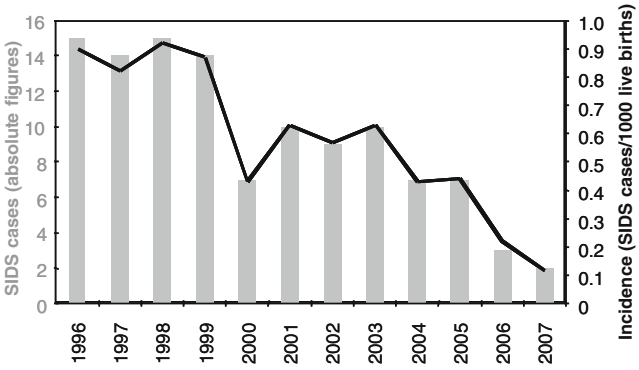

Fig. 1 SIDS cases (*grey bars*) and incidence (*line*) in Hamburg, 1996–2007

with an unnatural or undetermined manner of death. Emergency doctors in Hamburg do not fill in death certificates and are technically obligated to report all sudden deaths to the police. This guarantees the complete registration of all SIDS cases without having to depend on unreliable official SIDS rates [19]. The autopsy rate on suspected SIDS cases from 1996 to 2007 was 84.1% (95/113), with 67.4% (64/95) of all autopsies having been performed either by JPS or by KP.

Since 1995, the study has been accompanied by different preventive measures initiated by an interdisciplinary working group appointed by Hamburg's Federal Bureau of Health and Social Affairs. The prevention campaign included the distribution of pamphlets, public lectures, television productions, anti-smoking campaigns, promotion of sleeping bags, press conferences, and the development of multilingual posters.

Results

Hamburg's yearly SIDS rates from 1996 to 2007 are shown in Fig. 1. A decline in 2000 was followed by another substantial decline in 2006.

The number of participating practices decreased between 1996 and 2006, which is attributable to the closing of mother's health care consulting practices in Hamburg. However, the number of participating pediatric practices, where approximately two thirds of the questionnaires were filled out, remained at stable level (27 practices in 1996, 29 in 1998, 27 in 2001, and 29 in 2006). Overall, between 1,704 and 2,027 questionnaires were returned to the study center in each survey. Basic epidemiologic data are summarized in Table 2.

The prevalence of particular sleeping positions is shown in Fig. 2. The proportion of infants who were placed in the prone position to sleep diminished significantly from 8.1% in 1996 to 3.2% in 2001. In 2006, this proportion did not reduce further (3.5%). The side sleeping position was the

Table 2 Summary of epidemiologic data

	1996	1998	2001	2006
Number of practices	76	70	59	46
Number of returned questionnaires	2,001	2,027	1,752	1,704
Sex ratio (boys/girls)	1.18: 1	1.01: 1	1.03: 1	1.08: 1
Age (weeks)				
Mean±standard deviation	14.0±8.6	14.2±8.9	14.6±8.9	13.3±8.8
Distribution	1–40	1–42	1–48	1–43

most frequently found in 1996 and 1998 with 50.6% and 55.3% cases, respectively, but decreased significantly in 2001 (41.5%) and 2006 (10.6%). Over the same time, the supine position became the most frequently chosen sleeping position with 34.0% in 1996 increasing to 76.5% in 2006.

The proportion of parents who felt informed about the advantages and disadvantages of different sleeping positions increased from 81.4% in 1996 to 86.0% in 2006 (with a significant increase also noted between 1998 and 2001), whereas the proportion of those who explicitly did not feel informed dropped from 17.4 in 1996 to 9.4 in 2006 (Fig. 3).

Paradoxically, most parents who still chose the prone sleeping position for their infant were well aware of it as being a specific risk for SIDS (81.7% in 2006). In 2006, only 11 out of 1,704 caretakers (0.6%) chose the prone sleeping position *and* were not aware of its risk (3.4% in 1998).

Discussion

This study was aimed at estimating the prevalence of risk factors in an urban population, both transversally and vertically. The chosen method of gathering data in sentinel practices has not yet been applied in the context of SIDS.

The reliability of the method itself has been evaluated elsewhere. The sentinel method is especially suitable for settings when nonmorbidity-related contacts with health care systems occur in a high percentage of the population. This prerequisite is fulfilled in the routine medical check-ups of infants and children in Germany. A control of the quality of the data is provided by the results of the GeSID, a case-control study on SIDS that was conducted in Germany from 1998 to 2001 [20]. Hamburg was one of the study regions.

The positive trend in the SIDS rate in Hamburg over the last decade is not a result of a diagnostic shift towards explained causes of death or otherwise classified entities but does reflect a true and substantial decrease. An incidence of 0.12 SIDS cases per 1,000 live births (2007) is close to the figures for the Netherlands, which traditionally has the lowest SIDS incidence in Europe (less than 0.1) [21].

In the beginning of the study, prone sleeping was no longer the preferred sleeping position for infants (8%). A decreasing proportion of caretakers placing infants to sleep in the prone position to 3.5% was observed in 2006. Our results are in accord with the results of the GeSID study with 4.1% prone sleeping between 1998 and 2001 [22]. Since no data on sleeping positions are available for Hamburg before 1996, the so-called Westfalian SIDS study (conducted in the midwestern parts of Germany) might serve as a reference [4, 23]. According to this study, prone sleeping had a prevalence of 41% in 1990 and 11% in 1994. Germany never instituted a nationwide back-to-sleep campaign. However, the drop of the SIDS rate in Hamburg might reflect a worldwide trend but might also be attributed

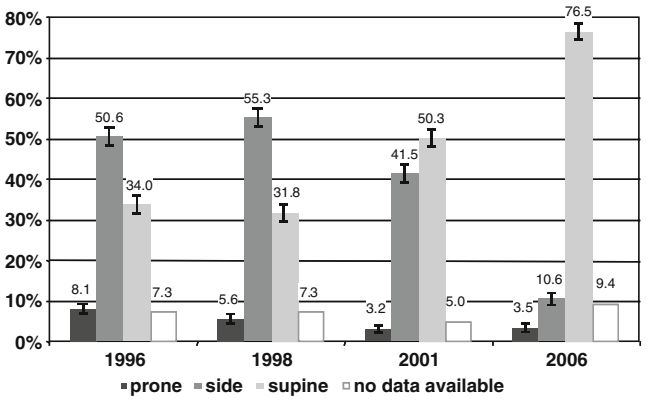

Fig. 2 Preferred sleeping position for infants, 1996, 1998, 2001, and 2007

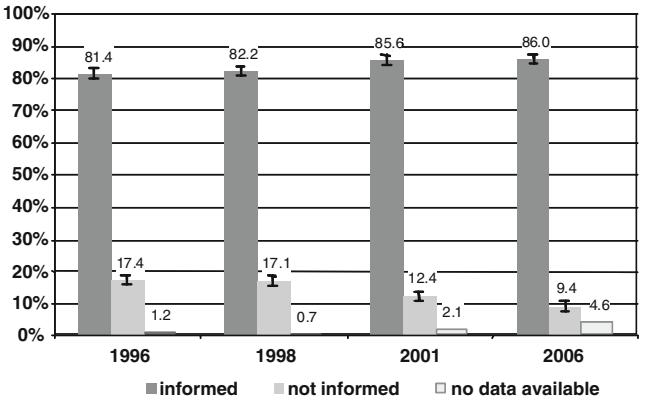

Fig. 3 The proportion of caretakers feeling informed about sleeping positions increased from 1996 to 2006

to the local prevention campaign. The increasing proportion of caretakers informed of the advantages and disadvantages of sleeping positions in Hamburg is a further indicator of the effectiveness of the local prevention campaign.

The stability of prone sleeping between 2001 and 2006 (3.2% and 3.5%, respectively) indicates that further substantial progress in preventing prone sleeping is unlikely to occur. In 2006, most parents using the prone sleeping position for their infants knew that it could be dangerous. However, the study was not designed to find out why those parents still preferred prone sleeping despite having knowledge of its risks.

A remarkable result is the rapid and dramatic change of the predominant sleeping position in Hamburg between 1998 and 2006. Unlike the UK, where sleeping supine was more popular than the side position in the mid-1990s [24], the side position predominated in other countries, such as New Zealand [25] and Germany [4]. The GeSID study from 1998 to 2001 found a prevalence of side sleeping in the control group of 46.5% [22]. In a meta-analysis of various international studies, Scragg and Mitchell calculated a summarized odds ratio for side vs. back sleeping of 2.02 [13]. As the prevalence of prone sleeping fell after the back-to-sleep campaigns, side sleeping became the second important risk factor for SIDS in many countries (after smoking during pregnancy), with an attributable risk between 18.4% and 37% [13]. This might well explain the decline of the SIDS rate in Hamburg accompanying the lower prevalence of side sleeping. In Hamburg, side sleeping has no longer been encouraged since 2001. The fourth edition of our pamphlet (2002) included the recommendation to exclusively place the infants to sleep in a supine position, whereas the third edition (2000) still recommended the side *or* supine sleeping position. However, the fast response of the population most likely reflects a true success of the local campaigns. The ongoing decline of the SIDS incidence has got a direct impact on forensic case work. In the GeSID study, the prevalence of unsuspected unnatural deaths among infants who die suddenly and unexpectedly was 5% [26]. As the prevalence of such cases is not being influenced by the avoidance of risk factors for SIDS, it has to be expected that the relative proportion of infanticides increases.

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