PEDIATRICS • ORIGINAL ARTICLE

Parent–child co-sleeping in children with co-morbid conditions and sleep-disordered breathing

Lynda Sidhoum[1] · Alessandro Amaddeo[1,2] · Jorge Olmo Arroyo[1] · Livio De Sanctis[1] · Sonia Khirani[1,3] ·
Brigitte Fauroux[1,2]

Abstract

Purpose Co-sleeping is common in children with co-morbid conditions. The aim of the study was to analyze the prevalence and determinants of parent–child co-sleeping in children with co-morbid conditions and sleep-disordered breathing and the impact on parental sleep.

Methods Parents of consecutive children undergoing a sleep study filled in a questionnaire on co-sleeping.

Results The parents of 166 children (80 boys, median age 5.7 years (0.5–21) participated in this study. The most common co-morbid conditions of the children were Down syndrome (17%), achondroplasia (11%), and Chiari malformation (8%). The prevalence of parent–child co-sleeping was 46%. Reasons for co-sleeping were mainly reactive and included child's demand (39%), crying (19%), nightmares (13%), medical reason (34%), parental reassuring or comforting (27%), and/or over-crowding (21%). Sixty-eight percent of parents reported that co-sleeping improved their sleep quality because of reassurance/comforting (67%), reduced nocturnal awakening (23%), and child supervision (44%). Forty percent of parents reported that co-sleeping decreased their sleep quality because of nocturnal awakenings or early wake up, or difficulties initiating sleep (by 77% and 52% of parents, respectively), whereas both positive and negative associations were reported by 29% of the parents. Co-sleeping was more common with children < 2 years of age as compared to older children ($p < 0.001$).

Conclusions Parent–child co-sleeping is common in children with co-morbid conditions and sleep-disordered breathing. Co-sleeping was mainly reactive and had both positive and negative associations with parental sleep quality. Co-sleeping should be discussed on an individual basis with the parents in order to improve the sleep quality of the family.

Keywords Co-sleeping · Child · Sleep-disordered breathing · Sleep quality

Abbreviations
yrs.   years
wks   weeks

✉ Brigitte Fauroux
   brigitte.fauroux@aphp.fr

1   Pediatric noninvasive ventilation and sleep unit, AP-HP, Hôpital Necker Enfants-Malades, Paris, France

2   Paris Descartes University, Paris, France

3   ASV Santé, Gennevilliers, France

Introduction

Co-sleeping is an umbrella term that implies bed- or room-sharing for all or part of the night and does not necessarily refer to a child sleeping with a parent because other members (i.e., siblings) may be involved. Co-sleeping is a longstanding and worldwide practice with a prevalence ranging from 6 to 70% depending on the age of the child, the region of the world, and numerous socio-cultural determinants [1]. Unlike Asian and African countries in which interdependence is valued, Western countries praise and encourage early independence for sleep. This attitude is mainly explained by the potential risk of suffocation in infants and, in older children, the report of conflicting data on sleep quality associated with co-sleeping, both for the child and his/her parents [1–5]. Co-sleeping may be either a pro-active and intentional choice,

as a matter of routine, cultural beliefs or parental preference, or reactive, as a response to a problematic situation that may concern the child or the parents. This distinction between pro-active and reactive co-sleeping is essential for the understanding and the evaluation of the consequences of co-sleeping on the sleep quality of the child and parents.

Co-sleeping has been shown to be more prevalent in children with underlying disorders such as cerebral palsy and/or epilepsy [6, 7], autism [8], and Duchenne muscular dystrophy [9]. Reasons for co-sleeping may then include medical and personal factors, as well as the need for special care at night.

The majority of children referred to a sleep laboratory of a pediatric university hospital for an evaluation of sleep-disordered breathing have chronic, rare, genetic, and often severe underlying diseases [10]. The prevalence of parent–child co-sleeping may thus be higher in this population as compared to the general population. The subjective sleep quality of the child and the family may then be impaired by the child's objective sleep-disordered breathing, but also by associated practices such as co-sleeping.

The aim of the present study was to analyze the prevalence, patterns, and determinants of parent–child co-sleeping in children referred to the sleep laboratory of a pediatric university hospital for the evaluation of sleep-disordered breathing.

Material and methods

Questionnaire

The parents of all consecutive children undergoing a sleep study in the pediatric sleep laboratory of Necker University Hospital, Paris, France, between April and July 2017, filled in a questionnaire on parent–child co-sleeping. This comprised questions on the family structure (two parents or single parent), number and ages of siblings, employment status of the parents, number of main room and bedrooms, and pets at home. Crowding was evaluated as the number of persons at home divided by the number of bedrooms. Co-sleeping was explored with multiple-choice questions about bed and room sharing, with occurrence ranging from never to every night, reasons for co-sleeping and the impact of co-sleeping on the parental sleep quality. Demographic (age, gender), and medical (co-morbid condition, results of the sleep study, use of noninvasive ventilation (NIV) at night) characteristics were also analyzed. Obstructive sleep apnea (OSA) was defined by an apnea-hypopnea index (AHI) > 1 event/h with mild OSA defined by $1 < AHI \leq 5$ events/h, moderate OSA by $5 < AHI \leq 10$ events/h, and severe OSA by AHI > 10 events/h [11]. Parental sleepiness was assessed by the Epworth Sleepiness Scale with daytime sleepiness defined by a score > 10 [12, 13]. The questionnaires were not offered to parents who did not speak French or who did not live with their child on a daily basis.

Informed consent was obtained from all individual participants included in the study. All procedures were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards and the study was approved by the Ethical Committee (Comité de Protection des Personnes Ile France II (CPP II) on May the 18th, 2017 (number ID-RCB/EUDRACT: 2013-A00374-41).

Statistical analysis

Data were expressed as median and range. Categorical data were compared using the chi-square test. Comparisons between two groups of continuous data used the Student t test (parametric test) or the Mann–Whitney Rank Sum Test (nonparametric test). Comparisons between three groups of quantitative data used the One-Way Analysis of Variance test (parametric test) or the Kruskal–Wallis One-Way Analysis of Variance on Ranks test (nonparametric test). A p value < .05 was considered significant.

Results

The parents of 166 children (80 males), median age 5.7 yrs. (range 0.5–21) participated in the study. All the children had a co-morbid condition with the most common conditions being Down syndrome (17%), achondroplasia (11%), Chiari malformation (8%), craniofaciostenosis (5%), Pierre Robin sequence (5%), Prader Willi syndrome (4%), neuromuscular diseases (4%), and metabolic diseases (4%) (Table 1). Home NIV was used by 8 (5%) children. A poly(somno)graphy was performed in 156 (94%) children whereas 10 (6%) children had an overnight recording of gas exchange (8 with NIV and 2 during spontaneous breathing during the NIV weaning process). OSA was present in 102 (65%) of the children with 56 (36%) having mild OSA, 19 (12%) moderate OSA, and 27 (17%) severe OSA. Twenty-one percent of the parents were single parents (Table 2). Twenty percent of the children had no sibling, 40% had one sibling, and 40% had two or more siblings. Fifty percent of the mothers and 75% of the fathers were employed. The majority of the parents had regular working hours with 7% of the mothers and 25% of the fathers having night shifts. Pets at home were reported by 28% of the families (Table 2). The median number of main rooms and bedrooms was 4 and 3, respectively.

Parent–child co-sleeping was reported by 46% of the parents with a frequency of 1 or 2 nights/week for 17%, 3 to 4

Table 1 Description of the patients (*n* = 166)

Median age (years), range	5.8 (0.5–20)
Age group, *n* (%)	
< 2 years	29 (17)
≥ 2 and < 6 years	57 (34)
≥ 6 and < 10 years	51 (31)
≥ 10 years	29 (17)
Gender (girls, boys)	86/80
Main co-morbid condition, *n* (%)	
Down syndrome	29 (17)
Achondroplasia	18 (11)
Chiari malformation	14 (8)
Craniofaciostenosis (Crouzon, Apert, Pfeiffer)	8 (5)
Pierre Robin sequence	8 (5)
Prader Willi syndrome	7 (4)
Neuromuscular disease	6 (4)
Metabolic disease	6 (4)
Laryngeal obstruction (malacia, paralysis)	5 (3)
Velopalatine cleft	5 (3)
Cardiac disease	4 (2)
Rett syndrome	3 (2)
Goldenhar–Francheschetti syndrome	3 (2)
Other	50 (30)
Patients treated with home noninvasive ventilation, *n* (%)	8 (5)
Results of sleep studies (*n* = 156)	
AHI, median (range)	2 (0–68)
AHI ≤ 1 event/h, *n* (%)	54 (35)
1 < AHI ≤ 5 events/h, *n* (%)	56 (36)
5 < AHI ≤ 10 events/h, *n* (%)	19 (12)
AHI > 10 events/h, *n* (%)	27 (17)

AHI apnea–hypopnea index

Table 2 Information on family and housing

Parental status (*n* = 166)	
Single parent, *n* (%)	35 (21)
Siblings, *n* (%)	
No sibling	33 (20)
1 sibling	67 (40)
≥ 2 siblings	66 (40)
Parent employment, *n* (%)	
Mother employed	91 (55)
Regular working hours	76 (84)
Night shifts	6 (7)
Father employed	125 (75)
Regular working hours	97 (78)
Night shifts	25 (20)
Pet at home, *n* (%)	47 (28)
Dog	19 (11)
Cat	27 (16)
Other	15 (9)
Housing, median (range)	
Number of main rooms	4 (1–6)
Number of bedrooms	3 (0–6)

nights/week for 4%, and ≥ 5 nights/week for 26% of the total population (Table 3). Bed-sharing was reported by 53% and room-sharing by 42% of the parents. Co-sleeping was more frequent in single parents as compared to two parents families (66% vs. 41%, *p* = 0.002). Reasons for co-sleeping reported by the parents included: child's demand (39%), crying (19%), or nightmares (13%), medical reason (34%), parental reassuring or comforting (27%), absence of one parent (8%), crowding (21%), and/or family habits (10%). Crowding scores were higher in families reporting crowding as a reason for co-sleeping (the mean crowding ratios were 2.6 ± 1.0 and 1.9 ± 1.2 in families evoking and not evoking crowding, respectively, *p* = 0.048). Sixty eight percent of parents reported that co-sleeping improved their sleep quality because of reassurance/comforting (67%), reduced nocturnal awakening (23%), and child supervision (44%). Forty percent of parents reported that co-sleeping decreased their sleep quality because of nocturnal awakenings or early wake up (77%) or

difficulties initiating sleep (52%), whereas both positive and negative associations were reported by 29% of the parents.

Parent–child co-sleeping was significantly more common in children younger than 2 years of age as compared to the older age groups (*p* < 0.001, Fig. 1). Co-sleeping was not associated with the type of co-morbid condition. Indeed, when looking at the three most common disorders, namely Down syndrome, achondroplasia, and Chiari malformation, the prevalence of co-sleeping was 55%, 61%, and 50%, respectively (*p* = 0.58). However, when co-sleeping was present, the prevalence of frequent co-sleeping, namely > 5 nights/week, was more common in patients with achondroplasia (56%), as compared to patients with Down syndrome (17%) or Chiari malformation (14%) (*p* = 0.009).

Parent–child co-sleeping was not associated with objective sleep-disordered breathing assessed by the AHI on the sleep study (*p* = 0.59). Co-sleeping was reported by 5 of the 8 parents of patients treated with home NIV with one parent reporting co-sleeping 1 or 2 nights/week and 4 parents reporting co-sleeping ≥ 5 nights/week. Of the 47 families who had a pet at home, 12 were sleeping with their pet among which 4 families were sleeping with the pet in their own bed. For 10 (83%) of these families, sleeping with the pet did not affect sleep. Finally, 29 (17%) parents had daytime sleepiness as defined by the Epworth Sleepiness Scale with only 10 (34%) parents reporting parent–child co-sleeping (1 to 2 nights/week: 5 parents, 3 to 4 nights/week, 2 parents, and ≥ 5 nights/week, 3 parents).
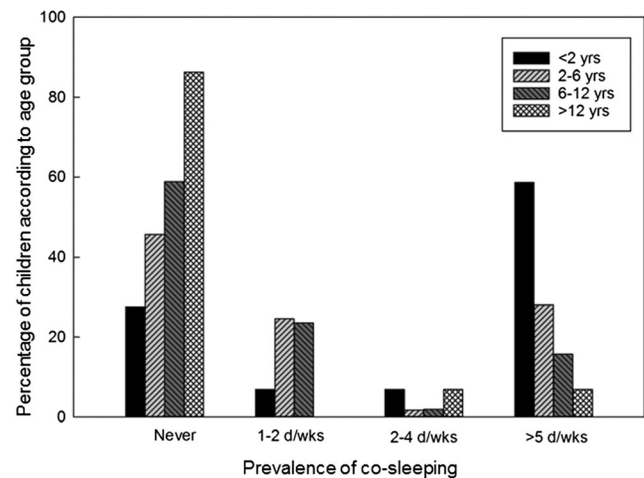
Table 3 Information on co-sleeping

Frequency of co-sleeping ($n = 166$), n (%)	
Never	89 (54)
1 or 2 nights/week	28 (17)
3 to 4 nights/week	6 (4)
≥ 5 nights/week	43 (26)
Parental bedroom sharing ($n = 74$)*, n (%)	
Bed-sharing	41 (53)
Room-sharing	32 (42)
Both	1 (1)
Reasons for co-sleeping ($n = 77$), n (%)	
Child's demand	30 (39)
Child's crying	15 (19)
Child's nightmares	10 (13)
Medical reason	26 (34)
Reassures/comforts you	21 (27)
Absence of one parent	6 (8)
Family habits	8 (10)
Crowding	16 (21)
Other	8 (10)
Several	36 (47)
Associations of co-sleeping with parental sleep quality ($n = 77$), n (%)	
No association	11 (14)
Positive associations	52 (68)
Reassures/comforts you	35 (67)
Child supervision	23 (44)
Reduces night rises	12 (23)
Other	5 (10)
Several	20 (38)
Negative associations	31 (40)
Nocturnal awakenings or early wake up	24 (77)
Difficulties to get asleep	16 (52)
Makes you feel too warm	2 (6)
Other	2 (6)
Several	12 (39)
Both positive and negative associations	22 (29)

*Data not available for 3 patients

Fig. 1 Prevalence of co-sleeping according to age

Discussion

This study is the first to analyze parent–child co-sleeping in a large cohort of children with co-morbid conditions referred to a pediatric sleep laboratory for the evaluation of sleep-disordered breathing. The prevalence of co-sleeping was high (46%) and reasons for co-sleeping were numerous with the child's demand (39%) and a medical reason (34%) being the most commonly reported. Co-sleeping was mainly reactive and had both positive and negative associations with parental sleep quality.

Bed-sharing (the practice of parent and child sharing a sleeping surface) and co-sleeping (shared sleep that includes room-sharing, bed-sharing and everything in between) is a worldwide phenomenon that has been debated for decades. The prevalence of co-sleeping is highly dependent on age with a peak in the first 12 months of age which is explained by breastfeeding practice [2]. Indeed, breastfeeding and bed-sharing appear to be mutually reinforcing [1]. Co-sleeping is also largely influenced by cultural background with a higher prevalence in Asian and African than in Caucasian countries [2, 4, 14, 15].

Although sleep tends to be recognized as a global health concern, co-sleeping has been poorly studied in the general French population and mostly within the context of sudden infant death prevention [16]. A national survey performed in 2017 by the French National Institute on Sleep and Vigilance (Institut National du Sommeil et de la Vigilance (INSV)) on a representative sample of 1000 individuals in France is thus particularly interesting [17]. This survey showed that 25% of the adults living with a child reported parent–child co-sleeping. Co-sleeping was reported as being "occasional" for 68% of the participants and concerned mainly children between the age of 2 and 5 years (45%) and older (45%). Co-sleeping was nearly exclusively reactive with only 11% of the participants reporting a personal decision, routine, habits, or cultural belief. The most common reasons for parent–child co-sleeping were child's crying (31%), child's demand (28%), absence of one parent (21%), and/or a medical reason (17%).

The prevalence of parent–child co-sleeping was nearly twice as high in the present study (46%) than in the general French population (25%) with also a higher number of co-sleeping nights per week [17]. This is not surprising as co-sleeping has been reported to be common in children with chronic diseases such as neurological disorders, cerebral palsy and/or epilepsy [6, 7], autism [8], and Duchenne muscular dystrophy [9]. In these populations, parent–child co-sleeping

is mostly reactive and explained by the child's night-time care needs [18]. This was also observed in the present study with a medical reason being cited as a reason for co-sleeping by 34% of the parents. As the children suffered from a large range of heterogeneous disorders, it was not possible to list the different medical reasons reported by the parents. Of note, for 27% of the parents in the present study, co-sleeping was reassuring or comforting. This contrasted with only 16% in the French national INSV survey (16%). Finally, it is important to note that several reasons for co-sleeping were cited for nearly half of the parents.

A main observation of our study is that nearly two thirds of the parents reported positive associations of parent–child co-sleeping with their own sleep quality. An opposite effect was observed in the INSV study which revealed that 45% of the adults who co-slept with their child reported negative associations with their sleep and only 25% positive associations [17]. In the INSV study, negative associations comprised night rises or early wake ups (for 29% of the adults) and difficulties initiating sleep (for 18% of the adults). This difference may be explained by the presence of a co-morbid condition in the children of the present study.

The prevalence of parent–child co-sleeping did not differ among the three main diseases, namely Down syndrome, achondroplasia, and Chiari malformation. Eight children were treated with home NIV. NIV may be perceived as a stressful treatment because it associates an intrusive, although noninvasive, technology that the child has to sleep with during the entire night [19]. But, as the aim of NIV is to correct sleep-disordered breathing and restore a normal sleep duration and quality, it is generally well accepted by the child and the caregivers. In our experience, most children accept NIV very well and have an objective mean compliance of around 8.5 h of NIV use per night [20]. This may be explained by the improvement in sleep quality of the child with NIV, as shown in children with spinal muscular atrophy or Duchenne muscular dystrophy [21, 22]. However, the small number of children treated with NIV does not allow any comparison with patients not treated with NIV.

We are aware of the limitations of our study. Co-sleeping was evaluated in a highly selected population referred to a pediatric tertiary university hospital. Moreover, it was not possible to separate the impact of the co-morbid condition from the sleep-disordered breathing on the co-sleeping. Families came from different socio-economic and cultural backgrounds which were not evaluated. As the parents reported several reasons for co-sleeping, which could be both pro-active and reactive, it was not possible to separate and thus compare the parents in whom co-sleeping was pro-active or reactive. Sleep quality in the parents was not assessed objectively, for example by actigraphy. Moreover, it was not possible to ascertain the reasons for parental daytime sleepiness. Co-sleeping was not assessed in a control group. And finally, the number of children treated with home NIV was small.

In conclusion, parent–child co-sleeping is common in children with co-morbid conditions and sleep-disordered breathing. Co-sleeping was mainly reactive and was associated with both positive and negative associations with parental sleep. Parent–child co-sleeping should be discussed on an individual basis with the parents in order to improve the sleep quality of the family.

Compliance with ethical standards

All procedures were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards and the study was approved by the Ethical Committee (Comité de Protection des Personnes Ile France II (CPP II) on May the 18th, 2017 (number ID-RCB/EUDRACT: 2013-A00374-41).

Conflict of interest The authors declare that they have no conflict of interest.

References

1. Mileva-Seitz VR, Bakermans-Kranenburg MJ, Battaini C, Luijk MP (2017) Parent-child bed-sharing: the good, the bad, and the burden of evidence. Sleep Med Rev 32:4–27

2. Salm Ward TC (2015) Reasons for mother-infant bed-sharing: a systematic narrative synthesis of the literature and implications for future research. Matern Child Health J 19:675–690

3. Paul IM, Hohman EE, Loken E, Savage JS, Anzman-Frasca S, Carper P, Marini ME, Birch LL (2017) Mother-infant room-sharing and sleep outcomes in the INSIGHT study. Pediatrics 140: e20170122

4. Jiang Y, Chen W, Spruyt K, Sun W, Wang Y, Li S, Shen X, Wang G, Jiang F (2016) Bed-sharing and related factors in early adolescents. Sleep Med 17:75–80

5. Palmer CA, Clementi MA, Meers JM, Alfano CA (2018) Co-sleeping among school-aged anxious and non-anxious children: associations with sleep variability and timing. J Abnorm Child Psychol 46(6):1321–1332

6. Larson AM, Ryther RC, Jennesson M, Geffrey AL, Bruno PL, Anagnos CJ, Shoeb AH, Thibert RL, Thiele EA (2012) Impact of pediatric epilepsy on sleep patterns and behaviors in children and parents. Epilepsia 53:1162–1169

7. Jacquier D, Newman CJ (2017) Co-sleeping in school-aged children with a motor disability: a comparative population-based study. Dev Med Child Neurol 59:420–426

8. Köse S, Yılmaz H, Ocakoğlu FT, Özbaran NB (2017) Sleep problems in children with autism spectrum disorder and intellectual disability without autism spectrum disorder. Sleep Med 40:69–77

9. Bloetzer C, Jeannet PY, Lynch B, Newman CJ (2012) Sleep disorders in boys with Duchenne muscular dystrophy. Acta Paediatr Scand 101:1265–1269

10. Pautrat J, Khirani S, Boulé M, Ramirez A, Beydon N, Fauroux B (2015) Carbon dioxide levels during polygraphy in children with sleep-disordered breathing. Sleep Breath 19:149–157

11. Kaditis AG, Alonso Alvarez ML, Boudewyns A, Alexopoulos EI, Ersu R, Joosten K, Larramona H, Miano S, Narang I, Trang H, Tsaoussoglou M, Vandenbussche N, Villa MP, Van Waardenburg D, Weber S, Verhulst S (2016) Obstructive sleep disordered breathing in 2- to 18-year-old children: diagnosis and management. Eur Respir J 47:69–94

12. Johns MW (1991) A new method for measuring daytime sleepiness: the Epworth sleepiness scale. Sleep 14:540–545

13. Johns MW (1994) Sleepiness in different situations measured by the Epworth Sleepiness Scale. Sleep 17:703–710

14. Takahashi M, Adachi M, Yasuda S, Osato-Kaneda A, Saito M, Kuribayashi M, Nakamura K (2017) Prevalence of sleep problems in Japanese preschoolers in a medium-sized city: community-based survey using the Children's Sleep Habits Questionnaire. Pediatr Int 59:747–750

15. Salm Ward TC, Robb SW, Kanu FA (2016) Prevalence and characteristics of bed-sharing among black and white infants in Georgia. Matern Child Health J 20:347–362

16. D'Halluin AR, Roussey M, Branger B, Venisse A, Pladys P (2011) Formative evaluation to improve prevention of sudden infant death syndrome (SIDS): a prospective study. Acta Paediatr 100:e147–e151

17. Philip P, Vecchierini MF, Davenne D, Gronfier C, Adrien J (2018) Enquête Journée du Sommeil 2017 : dormir seul ou pas : quel impact sur le sommeil ? Médecine du Sommeil 15:46

18. Mörelius E, Hemmingsson H (2014) Parents of children with physical disabilities - perceived health in parents related to the child's sleep problems and need for attention at night. Child Care Health Dev 40:412–418

19. Seear M, Kapur A, Wensley D, Morrison K, Behroozi A (2016) The quality of life of home-ventilated children and their primary caregivers plus the associated social and economic burdens: a prospective study. Arch Dis Child 101:620–627

20. Ramirez A, Khirani S, Aloui S, Delord V, Borel J-C, Pépin J-L, Fauroux B (2013) Continuous positive airway pressure and noninvasive ventilation adherence in children. Sleep Med 14:1290–1294

21. Mellies U, Dohna-Schwake C, Stehling F, Voit T (2004) Sleep disordered breathing in spinal muscular atrophy. Neuromuscul Disord 14:797–803

22. Nozoe KT, Polesel DN, Moreira GA, Pires GN, Akamine RT, Tufik S, Andersen ML (2016) Sleep quality of mother-caregivers of Duchenne muscular dystrophy patients. Sleep Breath 20:129–134