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Mother-baby sleeping patterns and its association with malocclusion among children: An analytical cross-sectional study

Oommen Nainan [1]*

[1] *Naval Hospital INHS Kalyani, Visakhapatnam, Andhra Pradesh, India*

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ABSTRACT

Aim & Background: Scientific literature is limited about the different mother-baby sleeping patterns in India and its possible association with the development of malocclusion. The prevalent mother-baby sleeping patterns were assessed in a cosmopolitan city of India with an aim to study if any type of sleeping pattern predisposes to the development of malocclusion.

Materials and Methods: 2150 children aged 2-6 years were included in this study. A questionnaire to determine type of sleeping pattern, duration of breastfeeding and presence of sucking habits was completed by the parents. The children then underwent a dental examination to evaluate presence of malocclusion which was recorded utilising the Baby-Risk of Malocclusion Assessment (ROMA) Index.

Results: Three different types of sleeping patterns were observed. The risk of developing malocclusion was found to be low when the baby and the mother shared the same bed for atleast 18 months from birth of the infant. When the duration of child and mother sharing the same bed reduced below 18 months, the child was found to have an increased incidence of non -nutritive sucking habits, had higher Baby ROMA scores and showed presence of at least one type of malocclusion.

Conclusion: Children co-sleeping with their mothers in the same bed for more than 18 months are observed to have fewer negative sucking habits, and a decreased incidence of malocclusion when compared to children who slept alone in a different room.

1. Introduction

Preventive orthodontics involves interventions and treatments that are undertaken in the primary or mixed dentition period with an intention to facilitate correct development of the occlusion and prevent the progression of malocclusion.[1,2] With a primary aim to ensure that all children have the support they need to grow up healthy, researchers, public health and public policy advocates have widened their search for possible factors that affect child health including development of malocclusion.

According to American Academy of Pediatrics (AAP), a quarter of children under the age of five don't get adequate sleep. Indian children are among the most sleep-deprived in the world. On average, they barely clock eight hours of sleep a night instead of the prescribed 10–12 hours.[3] This is worrying because poor sleep in the period of early childhood has been linked to many problems with the immune system, as well as anxiety and depression.[4] Parents often sleep with their babies on the same bed or in same room in order to prevent these issues.[5] Previous research has highlighted the beneficial impact of this practice on sleep improvement in babies.[6] However, scientific literature is scarce regarding how the stopping of this practice may affect the oral health of the child and its possible role in the development of

* *Corresponding author*.
E-mail address: droommennainan@yahoo.in (O. Nainan).

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malocclusion. This study was undertaken to address the lack of information in the available literature about the different prevalent mother-baby sleeping arrangements in India and determine its possible role in the development of malocclusion.[7]

The null hypothesis of this study was that there is no difference in the occurrence of malocclusion among babies who shared the bed with their mothers or slept in a cradle in the same room and those who slept in a different room. The study aimed to investigate the possible association between the prevalent sleeping patterns among children in a mixed Indian population and the risk of development of malocclusion in these children. The objectives of the study were as follows:

1. To investigate if there is a relationship between type and duration of mother-baby sleeping pattern and presence of non-beneficial sucking habits.
2. To determine if a particular type of sleeping arrangement is more beneficial from point of view of prevention of malocclusion in children.

2. Materials and Methods

2.1. Design and participants

Visakhapatnam, the largest city in the south Indian state of Andhra Pradesh was chosen for this cross-sectional study. The study was conducted over a period of 6 months, with a randomly selected sample of 2150 children from among pre-schools in the city. After obtaining permission from the educational authorities, the principal worker met with the teachers at the selected schools to inform them verbally and in writing of the aims and objectives of the study. The parents were informed about the study objectives and their written consent was obtained before proceeding with the study.

The Orthodontist obtained the data by planning school visits for carrying out free dental examinations for the children. Mothers were given a questionnaire to complete prior to dental examination of children. To avoid any bias, only one person monitored the total evaluation system. However, to ensure reproducibility and reliability of the index, the same orthodontist re-screened hundred children at an interval of 15 days.

Initially, 3258 mother–child dyads were screened for eligibility. From this group, 2150 children qualified as per eligibility criteria which was sufficient to provide a power of approximately 80% at 5% level of significance. Cluster sampling was performed. The following were inclusion criteria: children aged 2–6 years, children who were breastfed at night for at least six months and those born anytime between 37 weeks and 42 weeks to ensure a healthy sample. The exclusion criteria were as follows: children who did not co-operate, those with local/systemic diseases that could affect their oral health status and children who had initiated orthodontic treatment. Children who gave history of being bottle-fed before six months of age, those who received a mix of breastfeeding and bottle-feeding during first six months or were never breastfed at night were excluded. Parents who were mentally or physically disabled and those who submitted incomplete questionnaires were also excluded.

Analysis was carried out for the following parameters: duration and type of sleeping pattern (months), use of bottle, pacifier use, and digit sucking. When any of these habits was reported to be present, additional information which included frequency of the habit was recorded in hours/day, and length of its presence was expressed in months. Data on nail biting and thumb/finger sucking were collected by means of the questionnaire administered to the parents/ caregivers, and the habit of lip/tongue interposition was determined during the clinical examination. Tongue interposition was investigated by the observation of water swallowing and checking for tongue projection and the participation of the perioral musculature. Parents were also required to mention the duration of breastfeeding in months.

2.2. Procedures

Mouth mirrors, a millimetre scale, sterile gloves, and mouth masks, were used for the examination of children. The examination was carried out under bright day light in the school premises. Due to the inability of the traditional indices (like OI, IPION and ICON), to assess the need for orthodontic treatment in children, the Baby-Risk of Malocclusion Assessment (ROMA) Index was used in this study and its suitability for utilisation in terms of ease of use and reliability was checked.[8] This index is a modification of the ROMA Index and records the skeletal and functional aspects of malocclusions in mixed and permanent dentitions. Post validation of the ROMA Index, it was modified to the Baby-ROMA index to evaluate the primary dentition. The Baby-ROMA index has four groups - systemic, craniofacial, dental, and functional, and evaluates occlusal parameters and skeletal and functional factors (Table 1). Each group in this index has a number that marks the intensity and a letter of the alphabet that corelates to a type of malocclusion and brings out, in the form of a score scale, the need for interceptive orthodontic treatment. Anonymous data collection was employed, and all the collected data remained confidential. Guidelines of the index were used for coding the examined teeth for each participant and this was recorded in the applicable table according to the score of each code.

2.3. Statistical analysis

Statistical Package for Social Sciences (SPSS) version 22.0 was utilised for the data analyses. A t-test was performed on the descriptive analysis to determine if the dependent

variables differed according to socio-demographic variables. χ^2 or Pearson's correlation established the relationships between variables depending on their type. Bonferroni test was used to measure the significance of post hoc comparisons. A two-way mixed-design ANCOVA (each habit and co-sleeping) was used for Baby ROMA Index, adjusted by covariates (rest of the habits). To estimate correlation coefficients between frequency and duration of sucking habits and malocclusion, Pearson's correlation was used. Hierarchical regression analysis was used to determine the predictive capacity of the variables in the Baby ROMA Index. A statistical significance level of $P < 0.05$ was used to evaluate the results.

3. Results

The distribution of 2150 children were 986 boys and 1164 girls. The participating children had a mean age of 4.34(±0.69) years, with a range of 2–6 years. The mothers' age ranged from 24 to 39 years (M = 29.26 years, SD = 3.941). The data from parents revealed that 58.6% of them completed secondary education, 82.9% of the parents had a job, and 57.9% of the families belonged to middle or lower-middle class economic level (**Table 2**).

3.1. Duration of sleeping patterns and habits

From responses obtained, three prevalent mother-infant sleeping arrangements emerged: mother-infant co-sleeping on same bed (Group 1, N= 1273,59%), infant sleeping in same room as the mother but not in same bed (Group 2, N=632, 29%), and solitary sleeping in a different room(Group 3, N=245,12%). The influence of the sleeping pattern on the development of non-nutritive sucking habits and malocclusion was assessed.

Group 1 children slept with their mothers for a mean duration of 24.20(±5.02) months. These children reported exclusive breastfeeding for a period of 18.74(±3.12) months. 9.3% of these children used pacifiers, with a mean duration of use of 6.2(±1.21) months and a mean daily use of 6.12(±4.21) hours; a finger-sucking habit was seen in 6.4% with a mean age of 28.2(±4.72) months and with a mean daily duration of 2.75(±1.71) hours. In this group, 2.3% exhibited atypical swallowing, and 4.3% showed oral breathing. Based on average duration of sleeping together, Group 1 sample was divided into two sub-groups: Sub group 1- children sharing a bed for 18 months or less and Sub group 2-children sharing a bed for more than 18 months. Major differences in the duration of breastfeeding were found between these groups, with a mean (SD) of 13.47(±3.45) months for the group that slept together for 18 months or less and 19.94 (±3.81) months for children who shared a bed for more than 18 months. The children from Group 1 were shifted to either Group 2 or Group 3, when the child was sufficiently weaned away from breast feeding.

When the child and mother slept in the same room, children were found to share the same bed for a duration of 5.40(±2.10) months and exclusive breast feeding was reported for 9.60(±3.02) months. After a period of 16.20(±5.02) months, the children were shifted to a different room. For children who were reported to be sleeping in a different room, there was observed to be a duration of 6.45(±2.02) months when they shared the same bed or room as their mothers before they were made to sleep in a different room. In this group, the mean duration of exclusive nighttime breast feeding was 7.35(±1.2) months. In this group, mothers of infants consisted mainly of working women or those that had their own/spouse health issues. Whenever the infant slept in a different room, there was some form of baby monitor to keep a tab on the requirements of the infant. This type of arrangement was predominantly seen in the upper middle class and upper socio-economic group.

Analysis of the results reveals that appearance of harmful oral habits in children is closely related to the duration of mother and baby sharing the same room or bed. When the mother and child sleep together for 18 months or less, there was significantly higher frequency of pacifier use ($X^2(1) = 4.44$, $P = 0.035$), finger sucking($X^2(1) = 6.89$, $P = 0.009$), and atypical swallowing($X^2(1) = 5.00$, $P = 0.025$) than the mother-baby group that slept together for more than 18 months. Daily usage of pacifier in the group where mother-baby sleep together for more than 18 months was found to be lower than other groups (pacifier; $t = 2{,}194$, $P < 0.05$; finger; $t = 2{,}482$, $P < 0.05$) (**Table 3**). Oral breathing was not found to be related to the duration of co-sleeping.

3.2. Sleeping pattern and appearance of malocclusion

It was noticed that when children slept in another room i.e. Group 3, they had higher mean Baby ROMA($t = 3{,}851$, $P < 0.01$) scores compared to the other groups where mother and baby slept together on the same bed or same room (**Table 3**). In the two groups where mother and baby slept together on the same bed or in the same room, more malocclusion was seen in the group that co-slept on a different bed in the same room, which was statistically significant ($t = 2, 531$, $P < 0.01$).Other findings in children across all groups was observed to be dental caries (12.7%), followed by crossbite (7.6%). In Group 1, 3.6% (46) infants developed one type of malocclusion, while this number increased to 17.2% (108) in Group 2 and 46.8% (114) in Group 3 children. In children who slept alone and showed some type of malocclusion, 65.5%(74) needed monitoring and check-up of occlusion before growth spurt, and 11.7%(14) needed immediate orthodontic treatment. Anterior open bites, posterior crossbites, canine Class II, deepbite/ overbite and overjet were found to be more in the group where mother and baby slept together for less than 18 months. Within Group 1 children, those that co-slept for

Table 1: Parameters assessed in the Baby ROMA index

Systemic problems		**Grade**
	Maxillofacial trauma with condylar fracture	5a
	Maxillofacial trauma without condylar fracture	2a
	Congenital syndromes/malformations	5b
	Postural/orthopedic problems	2c
	Medical or auxological conditions	2d
	Inheritance of malocclusion	2e
Craniofacial problems		
	Facial or mandibular asymmetries	4f
	TMJ dysfunctions	4g
	Outcomes of trauma or surgery on the craniofacial region	5j
	Maxillary hypoplasia or mandibular hyperplasia (OVJ < 0 mm)	4 k
	Maxillary hypoplasia or mandibular hyperplasia (OVJ > 0 mm)	2 k
	Maxillary hyperplasia or mandibular hypoplasia (OVJ > 6 mm)	3 h
	Maxillary hyperplasia or mandibular hypoplasia (3 mm < OVJ < 6 mm)	2 h
Dental problems		
	Caries and early loss of deciduous teeth	4 l
	Scissor bite	4 m
	Crossbite >2 mm or lateral shift	4n
	Crossbite <2 mm or no lateral shift	2n
	Displacement >2 mm	3o
	Displacement >1 mm—absence of diastema	2o
	Open bite >4 mm	3p
	Open bite >2 mm	2p
	Hypodontia up to two teeth	3q
	Hypodontia more than two teeth	4q
	Overbite >5 mm	2r
	Poor oral hygiene	2t
Functional problems		
	Supernumerary teeth	4q
	Parafunctions (bruxism, jaw clenching)	2v
	Thumb/finger sucking habits	2w
	Oral breathing/OSAS	2x
None of the problems listed above (N)		1

Table 2: Characteristics of study participants (N=2150)

Variables	N	Percentage
Children gender		
Male	986	45.8%
Female	1164	54.2%
Children age		
2 years	102	4.7%
3 years	581	27.1%
4 years	697	32.4%
5 years	652	30.3%
6 years	118	5.5%
Parents' age (years)		
≤30	1121	52.1%
>31	1029	47.9%
Education of head of family		
None/elementary	891	41.4%
Secondary/higher	1259	58.6%
Employment status of head of family		
Employed	1782	82.9%
Unemployed	368	17.1%
Socio-economic status (based on monthly income)		
Lower	415	19.3%
Lower middle	531	24.7%
Middle	713	33.2%
Upper middle	414	19.2%
Upper	77	3.6%

Table 3: M (SD) and significance for the variables for the different types of sleeping arrangements: mother-infant co-sleeping in same bed (Group 1, N= 1273), infant sleeping in the same room as the mother but not in the same bed (Group 2, N=632), and solitary sleeping in a different room (Group 3, N=245)

Variable	Sleeping arrangement	M(SD)	P
Duration of pacifier use	Group 1	9.3 (8.65)	0.042*
	Group 2	29.32 (13.43)	
	Group 3	47.82 (18.17)	
Frequency of daily pacifier use	Group 1	6.12 (0.47)	0.059*
	Group 2	9.17 (0.71)	
	Group 3	17.42 (0.96)	
Duration of finger sucking	Group 1	6.4 (5.78)	0.054*
	Group 2	28.16 (9.32)	
	Group 3	41.49(15.86)	
Frequency of daily use of finger sucking	Group 1	2.75 (1.27)	0.010**
	Group 2	8.43 (2.63)	
	Group 3	14.57 (5.34)	
Baby ROMA Score	Group 1	6.36 (0.47)	0.004**
	Group 2	17.85 (0.71)	
	Group 3	26.62 (0.96)	

*P < 0.05; **P < 0.01

Table 4: Pearson's correlation between Baby ROMA Score and pacifier use (duration and frequency)

Variable	1	2	3	4	5	6
Years of co-sleeping in bed	rPN	-0.432 0.000 1273	-0.634 0.000 1273	-0.867 0.000 1142	-0.342 0.015 642	-0.317 0.019 154
Years of co-sleeping in room	rPN	-0.365 0.000 632	-0.325 0.000 625	-0.287 0.000 324	-0.219 0.013 128	-0.117 0.011 97
Years of solitary sleeping	rPN	-0.246 0.000 245	-0.254 0.000 245	-0.276 0.000 245	-0.323 0.014 245	-0.115 0.012 245
Baby ROMA Score	rPN		0.384 0.000 1214	0.467 0.000 1347	0.642 0.015 1618	0.917 0.019 1618
Pacifier duration	rPN			0.457 0.000 1347	0.537 0.000 1618	0.582 0.000 1618
Pacifier frequency	rPN				0.514 0.000 1618	0.523 0.000 1618

r - population correlation coefficient based on all the elements from the sample
P - proportion of sample elements having a particular attribute
N- number of elements in the sample

less than 18 months were found to have higher incidence of anterior crossbite, but the numbers were insignificant. Utilising regression analysis, the duration and frequency of use of pacifiers were found to be significantly related to Baby ROMA scores (**Table 4**).

4. Discussion

From a review of literature, it emerges that this research is the first study in India to utilize observational data to assess the possible link between duration of mother-baby sleeping pattern and development of malocclusion. Another plus point for this study is that the study was conducted in a relatively large sample of mothers and children in a mixed Indian population in a cosmopolitan city of India.

Mothers and infants sleeping within proximity to each other (co-sleeping) represents normal, healthy, and expectable human behaviour, especially if mothers breastfeed.[9] It has been established by previous research that mother and baby sleeping together plays an important part in promoting breastfeeding by increasing the duration of mother-baby contact, which in turn plays an significant role in the enhancement of emotional and cognitive abilities in the child. This is attributed to the release of oxytocin in human breast milk which results from sucking, touch, and warmth, reducing negative tendencies and enhancing social-emotional functioning in infants.[10] A deep reading of available literature also indicates that exclusive breastfeeding may reduce the risk of children acquiring finger and pacifier habits due to reported connections between infant feeding practices and non-nutritive sucking habits (pacifier and finger sucking).[11] Few other studies, however, could not establish any relation between sleeping pattern and the duration of breastfeeding.[12] This study was able to demonstrate marked variations in the duration of exclusive breastfeeding between the three groups.

Children with an average age of 4.34 years and parents with a mean age of 32.26 years participated in this study. This study has been able to demonstrate interesting results regarding the prevailing varied mother-baby sleeping patterns in a cosmopolitan city of India encompassing various social and economic groups. The important finding of this study has been highlighting the massive benefits of mother and baby sleeping together on the same bed and that a period of at least 18 months is required for these benefits to have the intended positive influence. It was noted that the development of harmful sucking habits was significantly different in the three groups - varying with the period of mother-baby sleeping together on the same bed, with more harmful oral and non-beneficial habits being noted in the group with solitary sleeping arrangement. There are different opinions regarding the correct age for stopping mother and child sleeping together on the same bed. Few studies have opined that children may share the room with their parents for the first year at the most or a minimum period of first 6 months after birth. It has been noticed that after around 6 months of life, babies are likely to feel separation anxiety and so manifest specific signals that force parents to come to their aid.[13] The parents when quizzed about the reasons for sleeping on the same bed for a longer duration with their child presented reasons such as individual preference, reduction of anxiety and facilitation of sleep for children, circumstances dictated by housing/financial considerations like limitation of space and not being able to buy a new/separate cradle. Infant care and breastfeeding convenience were also listed as reasons for mother-baby sleeping together for a longer period.

One novelty of this study is the new information obtained about children who slept lesser than 9 months with their parents, which was seen to contribute to a higher risk for development of malocclusion. This association has not been analysed till date. Few studies have analysed the link between breastfeeding, use of pacifiers, and digit sucking with problems in primary dentition.[14] However, it is also important to note that a review of the literature

on breastfeeding, use of bottle for feeding, and risk of developing malocclusion by Abreu et al. obtained inconclusive results. [15]

Results show significant differences between the three groups regarding malocclusion status with increased development of malocclusion in the group with solitary sleeping arrangement. Since p>0.05, statistically there was significant difference in distribution of malocclusion among males and females with females exhibiting more severe malocclusions than males. An important takeaway from this study is the reliability and utility of the Baby-ROMA index for evaluation of early orthodontic treatment needs in milk teeth.

One limitation of this study is the possible role of heredity and presence of other harmful oral habits in the development of malocclusion which were not analysed in this study. Secondly, the applicability of this result to a wider population is to be considered with caution since a representative sample from a specific segment of the child population was considered. Another possible limitation is that since parents filled the questionnaire on their own, there exists a probability for memory bias and giving responses based on social desirability.

5. Conclusion

From this study, it can be safely deduced that when the mother and baby sleep together for more than the first 18 months after birth of the infant, it is associated with lower risk of development of malocclusion than sleeping together for a duration equal to or less than 18 months. In addition, it was observed that the duration of non-nutritive sucking habits (use of pacifiers and finger sucking), reduced whenever there was a longer duration of mother-baby sharing the same bed. All these results when put together in context are highly relevant since it suggests that the risk of developing malocclusion in Indian children reduces when the duration of mother and baby sleeping together increased beyond 18 months after birth.

5.1. Clinical significance

Orthodontists would be immensely benefitted with this knowledge about the prevalent sleep arrangements and practices and would be able to adequately counsel parents about the benefits of co-sleeping with the child on the same bed for atleast 18 months, to help reduce the development of malocclusion.

6. Source of Funding

None.

7. Conflict of Interest

None.

References

1. Sheiham A. Guest editorial: The Berlin declaration on oral health and oral health services. *Quint Int*. 1993;24:829–60.
2. Proffit WR. The timing of early treatment: An overview. *Am J Orthod Dentofacial Orthop* . 2006;129(4):47–56.
3. Mishra A. Sleeping habits among school children and their effects on sleep pattern. *J Caring Sci*. 2017;6(4):315–38.
4. Jernelöv S. Development of atopic disease and disturbed sleep in childhood and adolescence. *J Brit Soc Aller Clin Immunol*. 2013;43(5):552–9.
5. Ward TCS. Reasons for mother-infant bed-sharing: A systematic narrative synthesis of the literature and implications for future research. *Mater Child Health J*. 2015;19(3):675–90.
6. Barry ES. Co-sleeping as a proximal context for infant development: The importance of physical touch. *Infant Behavior Dev*. 2019;57:101385.
7. Reddy K. Evaluation of Sleep patterns and practices in healthy Indian infants: Is there a cultural difference? *Indian J Sleep Med*. 2021;16(3):82–7.
8. Grippaudo C. Early orthodontic treatment: A new index to assess the risk of malocclusion in primary dentition. *Eur J Paediatr Dent*. 2014;15(4):401–7.
9. Ball HL. Reasons to bed-share: Why parents sleep with their infants. *J Reprod Infant Psychol*. 2002;20(4):207–28.
10. Krol KM, Grossmann T. Psychological effects of breastfeeding on children and mothers. *Bundesgesundheitsblatt*. 2018;61(8):977–85.
11. Freire L. Exploring the association between feeding habits, non-nutritive sucking habits, and malocclusions in the deciduous dentition. *Prog Orthod*. 2015;16:43.
12. Kaymaz N. Prolonged rooming-in in infancy is associated with generalized anxiety disorder in the adolescent period. *Int J Adolescent Med Health*. 2015;27(4):383–9.
13. Blunden S. Behavioural treatments to encourage solo sleeping in pre-school children; an alternative to controlled crying. *J Chil Health Care*. 2011;15(2):107–24.
14. Sum FKMH, Zhang L, Ling HB. Association of breastfeeding and three dimensional dental arch relationships in primary dentition. *BMC Oral Health*. 2015;15:30.
15. Abreu LG. Breastfeeding, bottle feeding and risk of malocclusion in mixed and permanent dentitions: A systematic review. *Brazilian oral Res*. 2016;30:1–21.

Author's biography

Oommen Nainan, Associate Professor https://orcid.org/0000-0002-7159-7444

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