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# Association Of Various Feeding Practices, Malocclusion And Non-Nutritive Sucking Habits In Indian Child Subjects Aged 3-6 Years

**Dr. Dhananjay Singh Thakur[1], Dr. Shyam Sundar Sahu[2], Dr. Piyush Anand[3],Dr. Subash Chandra Nayak[4]***

[1]Assistant Professor, Department of Pediatrics, Bharat Ratna Late Shree Atal Bihari Vajapayee Memorial Government Medical college Rajnandgaon Chhattisgarh

[2]Associate Professor, Department of Pediatrics Surgery, Rajendra Institute of Medical Sciences, Ranchi, Jharkhand

[3]Associate Professor, Department of Pediatrics, Rajarshi Dashrath Autonomous State Medical College, Ayodhya, Uttar Pradesh

[4]*Professor, Department of Orthodontics and Dentofacial Orthopaedics, Hi-Tech Dental College and Hospital, Pandara Bhubaneswar, Odisha

***Corresponding author**

Dr. Subash Chandra Nayak

Email id: drsubashn@gmail.com

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## ABSTRACT

**Background:** NNS (non-nutritive sucking) and nutritive sucking might affect craniofacial development differently in the affected child subjects. However, existing literature data is scarce concerning these factors in developing children.

**Aim:** The present study aimed to assess the association between non-nutritive sucking habits (NNSHs), various feeding practices, and malocclusion in child subjects aged 3-6 years.

**Methods:** The study assessed 700 child subjects aged 3-6 years from the preschool including 188 subjects with non-nutritive sucking habits and 512 subjects without non-nutritive sucking habits. Feeding practice, the outcome of non-nutritive sucking habits, and exposure to developing malocclusion were assessed.

**Results:** The study results showed a prevalence of 26.8% of NNHS in study subjects aged 3-6 years. Significant gender difference was seen with p=0.02. Overall malocclusion developing prevalence in study subjects was 34.01% where the most common malocclusion was open bite followed by spacing, increased overjet, crowding, rotation and posterior crossbite, and overbite with 12.57%, 8.5%, 6.8%, 2.2%, 1.4%, and 1.14% respectively. The most common feeding practice was breastfeeding with high chances of NNSH with p<0.0001 in subjects that did not breastfeed compared to breastfeeding infants. A significant association was seen in feeding practices to increased overjet, open bite, and spacing with p=0.001, 0.04, and 0.02 respectively.

**Conclusions:** The present study concludes that the prevalence of NNSH increases the chances of developing various kinds of malocclusions including spacing, open bite, and increased overjet. Also, breastfeeding plays a protective agent role against the development of non-nutritive sucking habits.

**Keywords**: Breastfeeding, feeding practices, malocclusion, nonnutritive sucking habits

## 1. INTRODUCTION

Milk suckling helps in stimulation in infants for the overall development of the craniofacial complex using the overall oral musculature, palate, tongue, and lips. Sucking habits are divided into two types namely NNS (non-nutritive sucking habits) and nutritive sucking habits. Nutritive sucking habits include bottle feeding and breastfeeding, whereas, non-nutritive sucking habits include pacifier sucking, lip sucking, and digit sucking.1

Milk extraction during breastfeeding is a vital factor in the development of the stomatognathic system. During milk extraction, when the tongue is raised upward an under pressure of -64 mmHg is developed and during tongue lowering, the pressure is -145 mmHg. Under Pressure formed in the oral cavity largely poses an impact on the coordination of suck-

swallow-breath, heart rate, and breathing, however, this remains unclear. However, in bottle-feeding infants, there is lesser under pressure, lower oxygen saturation levels, poor orofacial structure involvement, and lesser force needed for sucking.2

WHO in 2001 recommended exclusive maternal breastfeeding in infants till 6 months of age appropriate complementary feeding following these 6 months and continuation of breastfeeding for 2 or more years. Fewer times, breastfeeding is either substituted by complementary feeding or shifted to bottle feeding at an early age. Bottle feeding is considered nutritive, however, it is inferior to breastfeeding as it does not add sufficiently to the developing oral musculature. NNSH (non-nutritive sucking habits) include cloth sucking, pacifier sucking, lip sucking, digit sucking, and/or thumb sucking.[3] These habits develop either due to improper feeding habits or psychological conditions. Thumb sucking is defined by Moyers as repeated and forceful sucking of the thumb with associated strong buccal and lip contractions. Other such habits are toes, fingers, blankets, and toy sucking. These habits pose a sense of relief in child subjects, especially those who are deprived of parental affection or care, insecure, apprehensive, and distressed. NNSH persistence till the age of 3 is considered normal, whereas, retention in these habits over 3 years of age works as a contributing factor in malocclusion development.[4]

Existing literature data reports that of child subjects aged 3-5 years, nearly 36% had deleterious oral habits. Any of these habits' persistence may lead to malocclusion development in early childhood as protruded maxilla, incompetent lips, maxillary and mandibular anterior teeth proclination, spacing, posterior crossbite, midline diastema, overjet, and anterior open bite. Various cultural and social differences exist concerning feeding practices. In India, owing to diversities, existing literature data is scarce concerning this issue.[5]

Additively, certain function transition is seen in the age of 3-6 years, and hence, such associations are vital to assess in the 3-6 years age group. Hence, the present study aimed to assess the associations of various feeding practices, malocclusion, and non-nutritive sucking habits in Indian child subjects aged 3-6 years.

## 2. MATERIALS AND METHODS

The present case-control clinical study was aimed to assess the associations of various feeding practices, malocclusion, and non-nutritive sucking habits in Indian child subjects aged 3-6 years. The study subjects were from the Outer Patient Department of the Institute. Verbal and written informed consent were taken from all the subjects before study participation.

The study assessed a total of 700 child subjects aged 3 years that were divided into cases and controls where there were 188 cases having NNSHs and 512 controls that did not have NNSHs. The study assessed subjects from preschool who were selected randomly. The exclusion criteria for the study were subjects with medical conditions that might affect their outcome or examination, children living separately from parents, adopted children, children with congenital disorders or syndromes affecting orofacial structures, and subjects undergoing dental or orthodontic treatment.

All the children were examined by a single examiner expert in the field. Using tongue blades and mouth mirrors under adequate light. In all subjects, demographic data were gathered including socioeconomic status, gender, and age along with descriptive and categorical variables such as feeding practices types and developing malocclusion as an open bite (dichotomous: presence or absence), crossbite, crowding, spacing, increased overjet as a type of developing malocclusion.

The data gathered were analyzed statistically using SPSS (Statistical Package for the Social Sciences) software version 24.0 (IBM Corp., Armonk. NY, USA) for assessment of descriptive measures, Student t-test, ANOVA (analysis of variance), and Chi-square test. The results were expressed as mean and standard deviation and frequency and percentages. The p-value of $<0.05$ was considered statistically significant.

## 3. RESULTS

The present case-control clinical study was aimed to assess the associations of various feeding practices, malocclusion, and non-nutritive sucking habits in Indian child subjects aged 3-6 years. The study assessed 700 child subjects aged 3-6 years from the preschool including 188 subjects with non-nutritive sucking habits and 512 subjects without non-nutritive sucking habits. Feeding practice, the outcome of non-nutritive sucking habits, and exposure to developing malocclusion were assessed. There were 46.57% (n=326) males and 53.42% (n=374) females in the study. Education of mothers was illiterate, primary, and higher in 8.28% (n=58), 4.28% (n=30), and 87.42% (n=612) subjects. There were 49.14% (n=344) parents employed and 50.85% (n=356) parents unemployed in the study. Family income was ≤10 lakhs and >10 lakhs in 39.71% (n=278) and 60.28% (n=422) study subjects respectively. Gestation duration was pre-term and full-term in 16.66% (n=100) and 85.71% (n=600) study subjects respectively (Table 1).

It was also seen that normal and cesarean delivery was done in 54% (n=378) and 46% (n=322) subjects respectively. Feeding practice was breastfeeding, bottle feeding, and combined in 96% (n=670), 57.14% (n=400), and 7.4% (n=52) subjects respectively. In NNSHs, digit sucking, lip sucking, and pacifier sucking was seen in 23.42% (n=164), 2.57% (n=18), and 0.85% (n=6) subjects respectively. In malocclusion, spacing, rotation, crowding, posterior crossbite, open bite, anterior overbite, and anterior overjet was seen in 8.57% (n=60), 1.42% (n=10), 2.28% (n=16), 1.42% (n=10), 12.57% (n=88), 1.14% (n=8), and 6.85% (n=48) study subjects respectively (Table 1).

| S. No | Characteristics | Number (n) | Percentage (%) |
|---|---|---|---|
| **1.** | **Genders** | | |
| **a)** | Males | 326 | 46.57 |
| **b)** | Females | 374 | 53.42 |
| **2.** | **Education of mother** | | |
| **a)** | Illiterate | 58 | 8.28 |
| **b)** | Primary | 30 | 4.28 |
| **c)** | Higher | 612 | 87.42 |
| **3.** | **Occupation** | | |
| **a)** | Employed | 344 | 49.14 |
| **b)** | Unemployed | 356 | 50.85 |
| **4.** | **Family income (lakhs)** | | |
| **a)** | ≤10 | 278 | 39.71 |
| **b)** | >10 | 422 | 60.28 |
| **5.** | **Duration** | | |
| **a)** | Pre-term | 100 | 16.66 |
| **b)** | Full term | 600 | 85.71 |
| **6.** | **Delivery type** | | |
| **a)** | Normal | 378 | 54 |
| **b)** | Cesarean | 322 | 46 |
| **7.** | **Feeding practice** | | |
| **a)** | Breastfeeding | 670 | 96 |
| **b)** | No | 30 | 4 |
| **c)** | Bottle feeding | 400 | 57.14 |
| **d)** | No | 300 | 42.85 |
| **e)** | Combined | 52 | 7.4 |
| **f)** | No | 648 | 92.75 |
| **8.** | **NNSHs** | | |
| **a)** | Digit sucking | 164 | 23.42 |
| **b)** | Lip sucking | 18 | 2.57 |
| **c)** | Pacifier sucking | 6 | 0.85 |
| **9.** | **Malocclusion** | | |
| **a)** | Spacing | 60 | 8.57 |
| **b)** | Rotation | 10 | 1.42 |
| **c)** | Crowding | 16 | 2.28 |
| **d)** | Posterior crossbite | 10 | 1.42 |
| **e)** | Open bite | 88 | 12.57 |
| **f)** | Anterior Overbite | 8 | 1.14 |
| **g)** | Anterior overjet | 48 | 6.85 |
| **10.** | **Others** | | |
| **a)** | Tongue bite | 94 | 13.42 |
| **b)** | BMI cat | | |
| **c)** | Above 13.7 | 312 | 44.57 |
| **d)** | Below 13.7 | 388 | 55.42 |

**Table 1: Demographic and disease data in study subjects at baseline**

It was seen that for the distribution of oral habits and non-nutritive sucking habits in study subjects, NNSHs were seen in 23.42% (n=164) study subjects whereas all habits were seen in 45.71% (n=90) study subjects. Bruxism, mouth breathing, tongue thrust, pacifier sucking, lip sucking, and digit sucking were seen in 0.2% (n=2), 11.71% (n=82), 6.8% (n=48), 0.8% (n=6), 2.5%(n=18), and 23.42% (n=18) study subjects respectively (Table 2).

| S. No | Habits | Frequency (n) | Percentage (%) |
|---|---|---|---|
| 1. | All habits | 90 | 45.71 |
| 2. | Bruxism | 2 | 0.2 |
| 3. | Mouth breathing | 82 | 11.71 |
| 4. | Tongue thrust | 48 | 6.8 |
| 5. | Pacifier sucking | 6 | 0.8 |
| 6. | Lip sucking | 18 | 2.5 |
| 7. | Digit sucking | 164 | 23.42 |
| 8. | NNSHs | 188 | 26.85 |

**Table 2: Distribution of oral habits and non-nutritive sucking habits in study subjects**

On assessing the association of NNSHs with feeding practice and malocclusion in study subjects, spacing was present in 10/374 subjects and absent in 26/326 subjects which was significant with p=0.02. Similar highly statistically significant results were seen for open bite, increased overjet, and NNSHs with p=0.04, <0.001, and <0.001 depicting that there are significantly higher chances of developing malocclusions as spacing, open bite, and increased overjet in NNSHs (Table 3)

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| S. No | Feeding practices | Present/absent | Percentage | p-value |
|---|---|---|---|---|
| 1. | Spacing | 10/374 present | 2.6 | **0.02** |
| | | 26/326 absent | 7.9 | |
| 2. | Open bite | 28/374 present | 7.6 | **0.04** |
| | | 46/326 absent | 14.11 | |
| 3. | Increased overjet | 4/374 present | 1 | **<0.001** |
| | | 24/326 absent | 7.6 | |
| 4. | NNSHs | 88/374 present | 23.52 | **<0.001** |
| | | 148/326 absent | 45.39 | |

**Table 3: Association of NNSHs with feeding practice and malocclusion in study subjects**

## 4. DISCUSSION

The present study assessed 700 child subjects aged 3-6 years from the preschool including 188 subjects with non-nutritive sucking habits and 512 subjects without non-nutritive sucking habits. Feeding practice, the outcome of non-nutritive sucking habits, and exposure to developing malocclusion were assessed. There were 46.57% (n=326) males and 53.42% (n=374) females in the study. Education of mothers was illiterate, primary, and higher in 8.28% (n=58), 4.28% (n=30), and 87.42% (n=612) subjects. There were 49.14% (n=344) parents employed and 50.85% (n=356) parents unemployed in the study. Family income was ≤10 lakhs and >10 lakhs in 39.71% (n=278) and 60.28% (n=422) study subjects respectively. Gestation duration was pre-term and full-term in 16.66% (n=100) and 85.71% (n=600) study subjects respectively. These findings were comparable to the studies of Doğramacı EJ et al[7] in 2016 and Montaldo L et al[8] in 2011 where a similar distribution of preschool subjects to the present study was reported by the authors in their respective studies.

It was noted that normal and cesarean delivery was done in 54% (n=378) and 46% (n=322) subjects respectively. Feeding practice was breastfeeding, bottle feeding, and combined in 96% (n=670), 57.14% (n=400), and 7.4% (n=52) subjects respectively. In NNSHs, digit sucking, lip sucking, and pacifier sucking was seen in 23.42% (n=164), 2.57% (n=18), and 0.85% (n=6) subjects respectively. In malocclusion, spacing, rotation, crowding, posterior crossbite, open bite, anterior overbite, and anterior overjet was seen in 8.57% (n=60), 1.42% (n=10), 2.28% (n=16), 1.42% (n=10), 12.57% (n=88), 1.14% (n=8), and 6.85% (n=48) study subjects respectively. These data were in line with the recordings of Lopes TS et al[9] in 2014 and Ling HT et al[10] in 2018 where demographics reported by the authors in their studies were comparable to the present study.

The study results showed that for the distribution of oral habits and non-nutritive sucking habits in study subjects, NNSHs were seen in 23.42% (n=164) study subjects whereas all habits were seen in 45.71% (n=90) study subjects. Bruxism, mouth breathing, tongue thrust, pacifier sucking, lip sucking, and digit sucking were seen in 0.2% (n=2), 11.71% (n=82), 6.8% (n=48), 0.8% (n=6), 2.5%(n=18), and 23.42% (n=18) study subjects respectively. These findings were consistent with the results of Paolantonio EG et al[11] in 2019 and Luzzi V et al[12] in 2011 where the distribution of oral habits and non-nutritive sucking habits similar to the present study were also reported by the authors in their respective studies.

Concerning the assessment of the association of NNSHs with feeding practice and malocclusion in study subjects, spacing was present in 10/374 subjects and absent in 26/326 subjects which was significant with p=0.02. Similar highly statistically significant results were seen for open bite, increased overjet, and NNSHs with p=0.04, <0.001, and <0.001 depicting that there are significantly higher chances of developing malocclusions as spacing, open bite, and increased overjet in NNSHs. These results were in agreement with the findings of Feştilă D et al[13] in 2014 and Dhull KS et al[14] in 2018 where authors reported results for the association of NNSHs with feeding practice and malocclusion in their studies comparable to the present study.

## 5. CONCLUSIONS

The present study, considering its limitations, concludes that the prevalence of NNSH increases the chances of developing various kinds of malocclusions including spacing, open bite, and increased overjet. Also, breastfeeding plays a protective agent role against the development of non-nutritive sucking habits. Further longitudinal studies in the future with larger sample sizes from different geographical backgrounds are needed to reach a definitive conclusion.

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