Prevalence of malocclusion traits and sucking habits among 3-year old children

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Abstract

◉ The aim of the present study was to evaluate the prevalence of malocclusion traits and sucking habits among 3-year-old children. A sample of 457 3-year-old children (234 girls and 223 boys) was obtained from three Public Dental Health clinics in Örebro County Council, Sweden. Data from clinical examination and a questionnaire were used to determine malocclusion traits, sucking habits, snoring and breathing pattern including nocturnal breathing disturbances. The results showed that 70% had one or more malocclusion traits at 3 years of age. The most common malocclusion traits were anterior open bite (50%), Class II occlusion (26%), increased overjet (23%) and posterior crossbite (19%). The prevalence of sucking habit was 66 % and dummy sucking was dominating and in connection with more malocclusion traits than finger/thumb sucking. A significant association was found between the sucking habits and the most prevalent malocclusions, anterior open bite, Class II occlusion, increased overjet and posterior crossbite.

In conclusion, the prevalence of malocclusion traits in 3-year-old children was high. Sucking habits was highly prevalent and dummy sucking resulted in more malocclusion traits than finger/thumb sucking did.

Key words

Primary dentition, prevalence, malocclusion, sucking habits

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Prevalens av bettavvikelser och sugvanor hos 3-åringar

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Sammanfattning

◎ Studiens syfte var att undersöka prevalensen av bettavvikelser och sugvanor hos en grupp 3-åringar. Ett material av 457 barn (234 flickor och 223 pojkar) från tre Folktandvårdskliniker i Örebro län undersöktes vid 3 års ålder. Klinisk undersökning och ett frågeformulär användes för att fastställa bettavvikelser, sugvanor och andningsmönster inklusive snarkning och andningsuppehåll nattetid. Vid 3 års ålder hade 70% en eller flera bettavvikelser. De vanligaste bettavvikelserna var frontalt öppet bett (50%), postnormalt bett (26%), stor horisontell överbitning (23%), och korsbett (19%). Prevalensen av sugvanor var 66%, nappsugning dominerade och var associerade med fler bettavvikelser än finger/tum sugning. Ett signifikant samband sågs mellan sugvanor och de vanligaste bettavvikelserna, frontalt öppet bett, postnormalt bett, stor horisontell överbitning och korsbett.

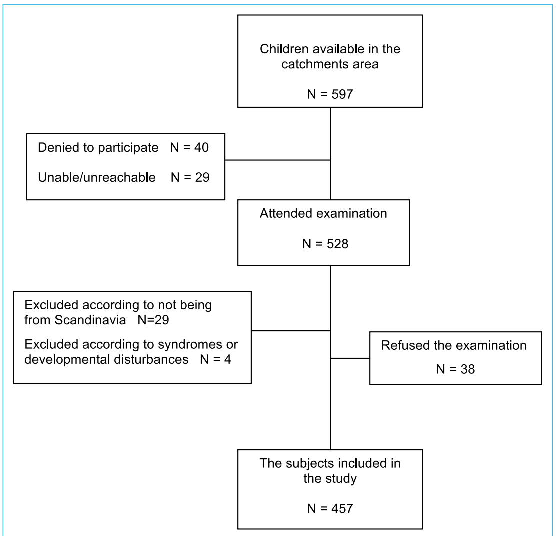
Sammanfattningsvis kan konstateras att prevalensen av bettavvikelser är hög hos 3-åringar. Prevalensen av sugvanor var också hög och nappsugning förknippades med fler bettavvikelser än finger/tumsugning.

Introduction

Malocclusion traits in three year old children have been described in earlier studies (6,12,16,18). The most common malocclusion traits found among preschool children are increased overjet, open bite, Class II occlusion and posterior crossbite. Several malocclusions are even more common among children with sucking habits (6,7,12,16,19,24,26,27) and prevalence of sucking-habits between 70-86% in preschool children has been reported (7,11,15,24). Over the years, the sucking habits have changed character. In the 1950-1970s, it was more common with thumb and/or finger sucking, while later in the 1980s, sucking dummy had become totally dominating (10).

The sucking pattern and muscular activity differ between dummy- and finger/thumb-sucking implying different influences on the dento-alveolar complex. Consequently, a dummy is more associated with transversal malocclusions like posterior crossbite while finger/thumb habits result in more pronounced effects in the incisal region (1,24,25). While earlier studies indicate that sucking habits have negative effects on occlusion in the primary dentition we know little about the duration of these sucking habits and development of malocclusion traits. This is also a limitation in the understanding of malocclusions in the primary dentition and the persistence into the mixed dentition (27). It has been claimed that as soon as the sucking habit has ceased, a good possibility will exist for spontaneous correction of the altered teeth and occlusion. Thus, studies have reported that the prevalence of open bite has changed from 51% in the primary dentition to 4% in the mixed and early permanent dentition due to spontaneous correction after the sucking habit has ceased (6,21). Also, spontaneous correction of posterior cross-bite occurs but is not clearly understood (8,9,13,20,22). In addition, data are also sparse considering the prevalence of malocclusion traits and sucking habits in three year old children. Therefore, the aim of the present study was to evaluate the prevalence of malocclusion traits and sucking habits among 3-year old children.

Figure 1. Flow-chart of the children in the study.



Material and methods

Subjects

The Ethics committee of the Örebro Health Care region, Sweden approved the study protocol and informed consent form in 2003(87/03).

The study sample was obtained from three Public Dental Service (PDS) clinics in Sweden. The clinics are located in three different small rural communities with a total of about 22 000 inhabitants in the catchment areas and in 2003, 597 3-year-old children belonged to those clinics. A number of subjects denied participating in the study (n=40) and 29 children were unreachable. Thus 528 children attended the clinical examination, which was performed in connection to the regular dental examination that every child routinely received at the age of 3. In order to reduce potential confounding factors like ethnic differences and environmental conditions, children not being from Scandinavia were excluded (n=29) and patients with syndromes or development disorders (n=4) were also excluded. Every child got at least two opportunities to attend the examination but 38 children refused the examination resulting in a final sample of 457 children (Figure 1).

A drop out analysis was made according to gender and clinics.

Clinical examination

The examination was performed by one experienced clinician (LD) between 2003 and 2005. The examination followed a specific protocol using a mouth-mirror and probe. No x-ray examination was performed. The method of Björk et al (2) and Foster& Hamilton (4), were used as guide for registration of malocclusion traits in centric occlusion. To determine the sagittal occlusion, the relation between the primary canines was used according to the method by Foster&Hamilton (4). Overjet and overbite were measured by a stainless steel ruler with an accuracy of 0.5 mm.

Data on sucking habits, breathing pattern including nocturnal breathing disturbances were collected by a questionnaire that the parents were asked at the time for the clinical examination.

Measures

Class I relation (normal occlusion): The tip of the upper primary canine tooth in the same vertical plane as the distal surface of lower primary canine tooth in centric occlusion.

Class II relation (postnormal occlusion): The tip of the upper primary canine tooth in anterior relationship to the distal surface of the lower primary canine tooth in centric occlusion.

Class III relation (prenormal occlusion): The tip of the upper primary canine tooth in posterior relationship to the distal surface of the lower primary canine tooth in centric occlusion.

Overjet was measured at the most protruding upper incisor and was classified as normal in the range of 0-4 mm. Anterior crossbite was registered if one or more maxillary primary incisors occluded lingually to the lower incisors. A deep bite was registered when the maxillary incisors covered more than 2/3 of the mandibular primary incisors. A negative overlap in the vertical plane was recorded as an anterior open bite. All other vertical relations between the incisors were considered normal.

Posterior crossbite or scissorsbite was recorded and subdivided into unilateral and bilateral crossbite/scissorsbite.

Finally, supernumerary teeth, hypodontia and gemination/fusions were registered.

Questionnaire

The questionnaire comprised eight questions.

1. Has your child ever had a sucking habit?
   Response options: Yes No
2. Is the habit ongoing?
   Response options: Yes No
3. Is the habit terminated?
   Response options: Yes No
   If yes, at what age (in months) of the child did the sucking habit terminate?
4. What kind of sucking habit did your child have?
   Response options: Dummy
   Finger/thumb
   Other objects.
5. Duration- Estimate the rate of sucking habit during a day!
   Response options: Night+day (>16hours)
   Night (8-16hours)
   Part of night+day (< 8 hours)
6. Does your child normally breathe with the mouth open?
   Response options: Yes No
7. Does your child snore while sleeping?
   Response options: Yes,every night
   Sometimes
   No
8. Does your child have nocturnal breathing interruptions during sleep?
   Response options: Yes No

Statistical analysis

All data were analysed using the SPSS version 15.0 software program. T-test was used to assess differences in numerical data. Chi-square was used to describe the relationship between sucking habit and each malocclusion trait and in the drop out analysis to find differences between gender and clinics. Fishers exact test was used when testing the association between sucking pattern and malocclusion traits due to one cell with expected count less than 5. Differences with probabilities of less than 5% ($p<.05$) were considered to be statistically significant.

Results

General data

In the sample of the 457 children participated in the study, 234 were girls and 223 boys. The examination was performed as close as possible to 3 years of age and at the time of examination the average age was 2.9 years (SD 0.3). No significant difference in any of the variables used in the study was found between boys and girls. Consequently, the data for girls and boys were pooled and analyzed together. The dropout analysis showed that the dropout's subjects did not differ regarding gender or clinics to the final sample.

Malocclusion traits

A prevalence of 70% of one or more malocclusion traits was found and the most common malocclusion traits were anterior open bite, Class II occlusion, increased overjet, and unilateral crossbite (Table 1).

Anterior crossbite was found in 8 children, hypodontia in 2 (two teeth in each individual) and supernumerary teeth in one child, whereas fusion/gemi-

Table 1. The prevalence of different malocclusion traits and sucking habits of the subjects in the study (n=457).

Malocclusion traits	N	%
One or more malocclusion traits found	318	70
Sagittal relation at primary canines (valid n= 452)		
Class II	116	26
Class III	40	9
Overjet (valid n=439)		
>4 mm	99	23
<0 mm	5	1
Vertical relation		
Overbite (valid n=453)		
<0 (open bite)	226	50
>2/3 (deep bite)	29	6
Transversal relation (valid n=457)		
Unilateral crossbite	60	13
Bilateral crossbite	29	6
Scissors bite	0	0
Sucking habits (valid n=457)		
Ongoing sucking habit	301	66
Ceased sucking habit	62	14
Type of sucking habit (valid n=363)		
Dummy	334	92
Finger/thumb	24	7
Others (e.g. blanket, teddybear)	5	1

Table 2. Malocclusion traits and the association with sucking habit of the subjects in the study (n=457).

	No sucking habit (n=94) %	Sucking habit (n=363) %	P[1]
One or more malocclusion traits found	34	80	<0.001
Malocclusion traits with a significant association to sucking habits			
Class II relation	2	32	<0.001
Overjet >4 mm	4	27	<0.001
Overbite <0	1	63	<0.001
Posterior crossbite	1	24	<0.001

[1] P-value with the null hypothesis that there is no difference in the prevalence of malocclusion traits between children with no sucking habit and children with a sucking habit. Chi-Square test was used.

nation was found in 2(one tooth in each individual) of the subjects.

Sucking habits

The prevalence of sucking habits was 66%. The most common sucking habit was dummy sucking, while 14% of the children had ceased the sucking habit before the age of 3 years (Table 1).

Sucking habits and malocclusion traits

A strong association was found between sucking habits and malocclusion traits. In children without sucking habits the prevalence of malocclusion traits was 34% while 80% in those with sucking habits (Table 2). A significant association was found between sucking habits and anterior open bite, Class II occlusion, increased overjet and posterior crossbite.

When comparison was made between dummy and finger/thumb sucking habit a higher number of malocclusion traits (Class II occlusion and anterior open bite) was found in children with a former or ongoing dummy sucking habit (Table 3).

A significant association was only found between the duration of the sucking habit and posterior crossbite (Table 4).

Mouth breathing, snoring and nocturnal breathing disturbances

Mouth breathing occurred daily in 86 children (19%) and 9 % snored every night according to the parents. In 6 % of the 457 children the parents had expe-

Table 3. Dummy or finger/thumb sucking habit and the association to different malocclusion traits. Other habit (N = 5) is excluded.

Malocclusion	Dummy (n=334) %	Finger/thumb (n=24) %	P[1]
One or more malocclusion trait	82	54	0.001
Class II relation	34	4	0.003
Overjet >4mm	28	29	NS
Overbite <0	66	25	<0.001
Posterior crossbite	25	17	NS

[1]P-value with the null hypothesis that there is no difference in the prevalence of malocclusion traits between the group with dummy sucking and the group with finger/thumb sucking. Fisher's exact test was used according to one cell with expected count less than 5.
NS: not significant.

Table 4. The association between malocclusion traits and duration of the sucking habit.

Malocclusion	Duration: Only day %	Only night %	Day and night %	P[1]
One or more malocclusion trait (valid n=273)	74	81	86	NS
Class 2 relation (valid n=108)	24	36	34	NS
Overjet >4mm (valid n=92)	26	29	30	NS
Overbite <0 (valid n=219)	60	60	70	NS
Posterior crossbite (valid n=86)	17	23	31	0.043

[1]P-value with the null hypothesis that there is no difference in the prevalence of malocclusion traits between the three groups of duration. Chi-Square test was used.
NS: not significant.

rienced that the child was affected by a nocturnal breathing disturbance like breathing interruptions.

Discussion

The new knowledge gained from this study was that dummy sucking resulted in more anterior open bite and Class II occlusion than finger/thumb sucking did. A possible explanation may be that a dummy can be used more continuously, for example simultaneously with the daily activities, resulting in longer duration of muscular activities acting on the dento-alveolar complex than when a finger is used. Another aspect is that finger/thumb sucking may start later in life than dummysucking and therefore at three years the habit has not caused detrimental changes on occlusion yet.

It was also found that the duration of the sucking habit has a significant influence on the prevalence of posterior crossbite but not on increased overjet, Class II occlusion and frontal open bite (Table 4).

The dominating malocclusion trait found in this material was anterior open bite. The prevalence of 50% is similar to earlier studies (6,3). The prevalence of posterior crossbites (19%) and increased overjet (23%) is also similar to what previous studies have reported (15,18). Also, the amount of Class II occlusion (26%) found was within the range of previous reports (18,23,27).

Sucking habits were common (80%) and comparable to Scandinavian studies presented twenty to thirty years ago (7,11,15,24). Dummy sucking was the totally dominating sucking habit and this is also in accordance to studies from 1980s (10).

It was obvious that the sucking habit had a strong association to anterior open bite, Class II occlusion, increased overjet and posterior crossbite and this have been verified by several other authors (6,7,12,15,16,19,24,25,27). Further on, a strong association between sucking habits and Class II occlusion was found but this association had previous studies shown disagreement about (7,19,27).

Evaluations of fusions/geminations and hypodontia in primary dentition have been rare. The low rate of these conditions found in this study was comparable to what have been earlier described in the literature (3,5).

Few studies have evaluated the breathing and snoring pattern among 3-year-old children. Interestingly, in our study it was found that the parents reported that 19% of the children were mouth breathers, 9% snored every night and 6% had nocturnal breathing interruptions. In a previous study (14) there were only 9,3% mouth breathers while, 6,0% snored every night and 4,3% were reported having nocturnal breathing interruptions. These differences may be explained by the fact that they are highly relied on the parents' subjective experiences.

The sample size of 457 participants gives the study the power that has often been lacking in many of the previous conducted studies in this field. As many other epidemiological studies, this study also have its limitations. First, as mentioned above, the reported amount of mouth breathing, snoring and nocturnal breathing interruptions must be interpreted with caution since these observations are highly relied on the parents' subjective experiences.

Second, even if the dropout rate was fairly acceptable, it must be considered that the children that had to be excluded because they refused the clinical examination may be more immature than expected for a normal 3 year-old child. Consequently, these children who refused examination probably to a higher extent were dummy or finger suckers than those who was examined clinically, and this fact is important to have in mind when analyzing the results. Nevertheless, the dropout analysis revealed no differences between the final sample and dropouts regarding gender or clinical belonging, and thus, in this respect making a homogenous missing material.

Some authors claim that Class II occlusion and posterior crossbite seldom self-corrects after 4 years of age since these malocclusions are stable from this early age into the permanent dentition (6,17). On the other hand, other proclaims that posterior crossbite may be spontaneously corrected in a range between 17 and 45% (8,13,22). Overall, it has not been clearly shown to which extent and how long time it will take for spontaneous correction of different malocclusions after the sucking habit has ceased. One way to explore this is to longitudinally follow the occlusion from the early primary dentition to the mixed dentition in children with and without sucking habits. Since such studies are very few (6,7), new longitudinal studies are desirable. To supply sufficient evidence when and to which extent spontaneous corrections of malocclusion traits occur from the primary to the mixed dentition longitudinal studies have to be carried out. Therefore, the sample in this study will be followed up to 7 years of age and be presented in a future study.

Conclusion

The prevalence of malocclusion traits in 3-year-old children was high. Sucking habits was highly prevalent and dummy sucking resulted in more malocclusion traits than finger/thumb sucking did.

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