Oral Habits in the Primary and Mixed Dentitions of Some Nigerian Children: A Longitudinal Study

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Purpose: To longitudinally evaluate oral habits and their effects on the developing occlusion in Nigerian children.

Materials and Methods: A longitudinal epidemiological survey of 145 3- to 5-year-old children in a pre-primary section of a primary school near the Dental Centre, University College Hospital, Ibadan, Nigeria. The children at the first examination (Time 1) were screened for oral habits. They were then followed up and those located 4 years later were re-assessed for oral habits (Time 2) in the primary school section of the same establishment. Only subjects who were actively engaged in non-nutritive sucking were coded positive. The occlusal features at Time 1 were recorded according to Foster and Hamilton, whereas at Time 2 the molar relationship was based on Angle's classification. Both descriptive statistics and Pearson correlation coefficient were used in the data analysis.

Results: At Time 1, only 5 (3.4%) children in the original sample size were non-nutritive suckers, whereas at Time 2, 19 (31%) of the final sample size were involved in oral habits, with three of the initial children still involved, giving an incidence rate of 26.2%. Of the initial five non-nutritive suckers at Time 1, four were digit suckers and one a lip sucker. At Time 2, eight children were involved in digit sucking; seven in tongue thrusting/sucking, two in both digit and tongue sucking and two were nail biters. Five (4.5%) of 11 subjects with a Class 1 molar relationship at Time 1 had a Class II molar relationship at Time 2. The correlations between the oral habits at the two stages of occlusal development and anterior open bite were statistically significant ($P < 0.01$).

Conclusions: There was an increase in the number of children involved in oral habits at the early mixed dentition stage with significant correlations between oral habits and anterior open bite as well as a higher tendency towards Class II molar relationship for those with initial Class I.

Key words: Nigerian children, occlusal development, oral habits

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Over the years, studies across the globe have shown the importance of non-nutritive sucking habits in occlusal development with different forms of malocclusal traits, such as anterior open bite (AOB), incomplete overbite, posterior crossbite and proclination of the maxillary anterior teeth, among others (Larsson, 1972; Kohler and Holst, 1973; Ravn, 1976; Corruccini et al, 1983; Larsson, 1987; Modeer et al, 1989; Larsson et al, 1992; Fukuta et al, 1996; Farsi and Salama, 1997; Warren et al, 2001; Warren and Bishara, 2002; Afzelius-Alm et al, 2004; Warren et al, 2005; Bishara et al, 2006). Non-nutritive sucking habits are believed to have direct influence on the developing occlusion, as well as indirect influence by changing the swallowing pattern (Melsen et al, 1979).

There are differing opinions as to whether oral habits, especially digit sucking, are learned or innate. Usually, these habits start very early on in childhood, being evident within a very short time after birth.

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There is evidence to suggest their initiation even *in utero* (Gosell, 1942; Illingworth, 1964). The theory that prolonged digit sucking is a learned activity is supported by Ayer and Gale (1970). After the age of 3 years, oral habits (especially digit sucking – thumb or any finger), call for attention, but before this age it may be considered as a normal early developmental response (Graber, 1959; Ayer and Gale, 1970; Fletchen, 1975; Schneider and Peterson, 1982).

In addition to the aforementioned resultant effects of sucking habits on the occlusion, it is also believed that these habits can alter the angulations of the maxillary plane causing downward movement from the posterior region leading to increased facial height.

Like malocclusion, oral habits have been related to social class (Infante, 1976; Corruccini et al, 1983). In Nigeria, only a clinic-based study (Onyeaso, 2004a) has shown the relationship between social class and severity of malocclusion, and an epidemiological report (Onyeaso, 2004b) did not show any positive relationship between the prevalence of oral habits and social class.

Nigerian reports (Onyeaso and Sote, 2001; Onyeaso et al, 2002; Onyeaso, 2004b; Onyeaso and Onyeaso, 2006) have shown prevalence of 13.14%, 9.9% and 5% respectively for oral habits in the three special age groups on occlusal development with very significant relationships between digit sucking habit and malocclusion, especially AOB, with obvious need for preventive and interceptive orthodontic care, including dental counselling of the children and parents. However, these Nigerian reports were cross-sectional studies. Globally, there are more cross-sectional epidemiological surveys of oral habits than longitudinal studies. Among the relatively few longitudinal studies are those by Warren and Bishara (2002), Warren et al (2005) and Bishara et al (2006).

Therefore, this report is aimed at presenting a pilot longitudinal study of oral habits among Nigerian children from primary to mixed dentitions.

MATERIALS AND METHODS

The material for this follow-up investigation was obtained from a pre-primary section of a popular nursery and primary school near the Dental Centre/ Faculty of Dentistry, University College Hospital/ College of Medicine, University of Ibadan, Ibadan, Nigeria. Pre-primary and primary school children attend the centre from different parts of Ibadan city.

After obtaining permission from the Oyo State Ministry of Education and the Management of the Centre to carry out the study, in October 2002, 145 (62 males and 83 females) pre-primary school Nigerian children, aged 3 to 5 years were initially examined for oral habits (Time 1). Only the children who were active non-nutritive suckers, as confirmed by their carers at the centre were coded positive for oral habits. The occlusion of each child was assessed according to Foster and Hamilton (1969) at Time 1. Each child was given a serial number during this initial assessment, and the names, age and sex were recorded in a notebook that was used to enter the data. Four years later (October 2006), the same subjects were followed up to the primary school section of the establishment for reassessment of oral habits involvement and occlusal features (Time 2). At Time 2, the anteroposterior relationship of the arches was assessed according to Angle's classification (1899).

During the second assessment of the subjects (Time 2), only 61 subjects were located and examined as some families had either relocated to other towns in the country or abroad. None of the final study sample of 61 subjects (31 females and 30 males) had received any form of dental treatment. In this paper, only the oral habits aspect of the study is reported; the other aspect of the study has been reported in Onyeaso and Isiekwe (in press).

Intra-examiner reliability test

Very good intra-examiner reliability of the examiner (COO) on the assessment of these occlusal conditions had been previously reported (Onyeaso et al, 2002; Onyeaso, 2004c).

Statistical analysis

Statistical Package for Social Sciences (SPSS 11.5 for Windows) was used to analyse the data. Both descriptive and non-parametric (Pearson Correlation Coefficient) statistics were used, and those having P value of < 0.05 were seen as statistically significant.

RESULTS

The prevalence of oral habits in the samples at the two stages of occlusal development assessed is shown in Table 1 with a marked increase in the prev-

Table 1 Oral habits in the cohort at the two stages of occlusal development

Oral habits	Time 1 (n = 145)		Time 2 (n = 61)	
	Male n (%)	Female n (%)	Male n (%)	Female n (%)
Digit sucking				
a. Thumb	1 (0.7)	1 (0.7)	3 (4.9)	4 (6.6)
b. Finger	1 (0.7)	1 (0.7)	1 (1.6)	–
Lip sucking	–	1 (0.7)	–	–
Tongue sucking	–	–	2 (3.3)	5 (8.2)
Digit sucking and tongue thrusting/sucking	–	–	1 (1.6)	1 (1.6)
Nail biting	–	–	1 (1.6)	1 (1.6)

Notes: (a) Five children (3.4%) at Time 1 had at least one oral habit whereas 19 (31%) from the cohort Time 2 had oral habits. (b) Three of the five subjects who had oral habits at Time 1 still had oral habits at Time 2, whereas the remaining two were not located for re-examination, giving the incidence of oral habits in this cohort as 16 (26.2%).

Table 2 Distribution of oral habits with the accompanying malocclusions in the subjects at the two stages of occlusal development

Age/sex	Oral habits		Malocclusions	
	Time 1	Time 2	Time 1	Time 2
3-year/7-year-olds				
Female	–	Thumb sucking	–	–
Female	–	Thumb sucking	–	AOB
Female	–	Thumb sucking	–	AOB
Female	–	Thumb thrusting	–	AOB
Female	–	Thumb thrusting	–	AOB
Female	–	Thumb thrusting	–	AOB
Male	–	Thumb sucking	–	–
Male	–	Thumb sucking	–	Incomplete overbite
Male	–	Thumb thrusting	–	AOB
Male	Finger sucking	Not located	Crossbite of 51, 61	Not located
Male	–	Finger sucking	–	–
Male	–	Nail biting	–	–
4-year/8-year-olds				
Female	–	Nail biting	–	Edge-to-edge bite
Female	Finger sucking	Finger sucking/ tongue thrusting	AOB	AOB, prolination of 1l and 21
Female	–	Tongue thrusting	–	AOB
Female	Thumb sucking	Thumb sucking	AOB	AOB
Female	Lip sucking	Not located	Increased overjet	Not located
Male	–	Tongue thrusting	–	Incomplete overbite
Male	Thumb sucking	Thumb sucking/ tongue thrusting	AOB	AOB
5-year/9-year-olds				
Female	–	Tongue thrusting	–	AOB
Male	–	Thumb sucking	Increased overjet/ deep overbite	Increased overjet/ traumatic overbite

Significant correlation between subjects involved in oral habits at Time 1 and Time 2 ($r = 0.492$, $P = 0.01$).
AOB: Anterior open bite.

Table 3 Anteroposterior arch relationships at Time 1 and Time 2 of the subjects with oral habits at Time 2

Anteroposterior relationship (according to Foster and Hamilton, 1969)	Anteroposterior relationship (according to Angle's classification)			
	Class I n (%)	Class II n (%)	Class III n (%)	Asymmetrical relationship n (%)
Class 1 (flush terminal plane relationship) (n = 11)	4 (36.4)	5 (45.4)	–	2 (18.2)
Class 2 (distal step) (n = 1)	1 (100)	–	–	–
Class 3 (mesial step) (n = 4)	3 (75)	–	1 (25)	–
Asymmetrical (Class 3, right, Class 1, left)	1 (100)	–	–	–

Two subjects had not erupted all the four first permanent molars at Time 2.

Table 4 Correlation between oral habits at the first (Time 1) and second (Time 2) examinations and the presence of AOB

Oral habit	AOB	
	Time 1	Time 2
Time 1	0.759**	–
Time 2	–	0.622**

Significant correlations at the 0.01 level (**$P < 0.01$).
AOB: Anterior open bite.

alence at Time 2. The incidence rate for oral habits during the study period was 26.2%.

Table 2 presents the distribution of oral habits and accompanying malocclusions in the subjects at both Time 1 and Time 2 stages of occlusal development. Three of the initial five subjects with oral habits at Time 1 were seen at Time 2 and still demonstrated oral habits. Two of these three having AOB at both Time 1 and Time 2. Only 4 (21%) of the subjects with oral habits at Time 2 had no obvious malocclusal traits associated with their habits.

The anteroposterior arch relationships at Time 1 and Time 2 of the subjects with oral habits at Time 2 are shown in Table 3. Five (45.4%) of the 11 subjects with Class 1 (flush terminal relationship) at Time 1 resulted in Angle's Class II relationship at Time 2.

Table 4 presents the correlations between oral habits at the first (Time 1) and second (Time 2) examinations and the presence of AOB. The correlations were both positively and statistically significant ($P < 0.01$).

DISCUSSION

There is an increasing emphasis on early recognition of conditions predisposing young children to malocclusion worldwide and the corresponding preventive and interceptive procedures (Larsson, 1971, 1972; Richardson, 1995). Adequate information is, therefore, essential on this important aspect of modern orthodontics in any health sector of a growing population, namely Nigeria (Onyeaso, 2004c).

This present Nigerian study is among the relatively few longitudinal studies on oral habits globally and has shown a high incidence of oral habits over the years in the studied cohort. According to Ravn (1974), Infante (1976), Schneider and Peterson (1982), Larsson (1987) and Larsson et al (1992), increased uses of pacifiers in some civilised countries of the world have resulted in marked reduction in the prevalence of digit sucking, with increase in age being related to a decrease in the prevalence of the habits. Also, Bishara et al (2006) observed reduction in prevalence of oral habits with increase in age. Previous Nigerian reports (Onyeaso and Sote, 2001; Onyeaso, 2004c; Onyeaso and Onyeaso, 2006) also revealed decreasing prevalence rates in oral habits with increasing age groups of studied populations: 13.14%, 9.9% and 5.5% for 3 to 5-year-olds, 7 to 10-year-olds and 11 to 12-year-olds respectively. The difference between the present Nigerian study and the aforementioned ones is that the present study is a longitudinal study of the same group of children, whereas the previous studies were cross-sectional studies involving different study populations. However, the present longitudinal study raises important questions. First as the centre used for the study is a private institution and relatively more expensive than public schools, could the high incidence of oral habits during the study period (or increased prevalence of oral habits at Time 2) in this group of Nigerian children be because their mothers (who are mainly working women from middle-class families) would have stopped breastfeeding their children much earlier and placed them in the care of those at the day-care centre. This may result in an increase in non-nutritive sucking as the children get older. Further studies with possible larger

sample sizes comparing pre-school children from different socio-economic classes will be helpful in answering this question. It should be noted that pacifier use among pre-school children in Nigeria is virtually non-existent. Second, alternatively, could this higher prevalence of oral habits during their early mixed dentitions be an indication of a generally increasing prevalence of oral habits in Nigerian children during the early mixed dentition stage? This will require a larger sample size from a cross-sectional study to ascertain.

Angle's Class II molar relationship has been reportedly prevalent in children with sucking habits (Humphreys and Leighton, 1950; Popovich and Thompson, 1973; Ravn, 1976). The present study has revealed that > 45% of the subjects with Class 1 molar relationship (flush terminal plane) at Time 1 of the study, who had oral habits, resulted in Class II at Time 2. An earlier report from this longitudinal study showed that, only seven children who initially had Class 1 molar relationship at Time 1 developed into Class II molar relationship at Time 2 (Onyeaso and Isiekwe, 2008). This means that five of seven were involved in non-nutritive sucking habits. Therefore, this finding seems to suggest that development of Class II molar relationship was encouraged by the non-nutritive sucking habits during the study period.

However, it should be noted that there are other factors during the transition from primary to permanent dentitions that could encourage the development of Class II molar relationship from the initial either distal step (Class 2) or flush terminal plane (Class 1) relationships. According to Moyers (1988) and Proffit (1993) such factors include the presence of inadequate leeway space and no or minimal differential forward growth of the mandibles or the presence of available leeway space, but without good growth. In fact, the transition is usually accompanied by a one-half (3 to 4 mm) relative forward movement of the mandibular molar, accompanied by a combination of differential growth and tooth movement (early and late mesial shifts).

The present Nigerian study has shown that among other malocclusal traits, AOB occurred most frequently in association with the non-nutritive sucking habits of the subjects with a strong positive correlation observed. This is consistent with other studies (Humphreys and Leighton, 1950; Graber, 1959; Larsson, 1971, 1972, 1987; Kohler and Holst, 1973; Popovich and Thompson, 1973; Ravn, 1974; Fletchen, 1975; Infante, 1976; Ravn, 1976; Melsen et al, 1979; Schneider and Peterson, 1982; Richardson, 1995; Fukuta et al, 1996; Farsi and Salama, 1997; Onyeaso and Sote, 2001; Warren et al, 2001; Onyeaso et al, 2002; Warren and Bishara, 2002; Onyeaso, 2004b; Afzelius-Alm et al, 2004; Warren et al, 2005; Bishara et al, 2006). AOB is believed to occur in such subjects because of the interruption of vertical growth of the alveolar processes in the anterior region of the object being sucked (digit, tongue or pacifiers). A discontinuation of the habit often results in the closure of the open bite by vertical growth of the alveolar processes as long as the subject is still growing. Therefore, the subjects still involved in oral habits at Time 2 of this study would benefit from counselling along with their parents, and the examiner offered this to them. Also, some of these children were advised to wear appliances such as an inverted goal post or tongue rake to prevent their oral habits. Unfortunately, not many have benefited from such preventive orthodontic treatment for financial reasons. The payment for orthodontic treatment in Nigeria is still largely by 'fee-for-service'. The National Health Insurance Scheme in Nigeria is yet to incorporate orthodontic treatments, and this could improve access to orthodontic care.

CONCLUSIONS

The present Nigerian study has shown a high incidence rate of oral habits in a group of Nigerian children from primary to early mixed dentitions with strong correlations between AOB and oral habits at the two stages of occlusal development.

A higher tendency for development of Angle's Class II molar relationship was observed for the subjects with oral habits having initial Class 1 molar relationship in the primary dentition.

RECOMMENDATION

More longitudinal studies involving different socio-economic classes and larger sample sizes, with some information on the duration of breastfeeding of the children could be worthwhile so as to gain further understanding of the interaction between breastfeeding, social class and incidence of oral habits in a longitudinal study.

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