Preventive and interceptive orthodontic treatment need in a Nigerian Teaching Hospital

***Utomi IL, **Agbonikhena AJ, *Isiekwe MC, *daCosta OO, *Sanu OO**

*Department of Child Dental Health, Faculty of Dental Sciences, College of Medicine, University of Lagos

**Department of Child Dental Health, Lagos University Teaching Hospital, Lagos, Nigeria

***Correspondence: Utomi IL**

E-mail: ifeomautomi@yahoo.com

Abstract

Objective: The Lagos University Teaching Hospital is a major referral centre for orthodontic care. There is need for baseline data for effective planning. The aim of this study was to determine prevalence of malocclusion traits needing preventive and interceptive treatment in 7-10 year old children.

Method: A retrospective audit study was carried out between June 2010 and May 2012 at the orthodontic unit of the Lagos University Teaching Hospital and data for all patients aged 7-10 years were retrieved from the patients records held by the unit. Data was analyzed using descriptive statistics and Chi-square test.

Result: There were a total of 132 patients that presented with malocclusion traits that needed some form of preventive and interceptive treatment or another. Some of the malocclusion traits observed were prolonged retention of primary teeth found in 3.0%, crossbite in 20.4%, anterior open bite in 4.5%, overjet of more than 6mm (40.2%), scissors bite (11.4%), functional shift on closure (2.3%) and oral habits (18.2%). There were no significant gender differences in the malocclusion traits.

Conclusion: This study revealed a significant need for interceptive orthodontic treatment among the children. More emphasis should be placed on preventive and interceptive orthodontics in a developing country like Nigeria.

Key words: Orthodontics, malocclusion, treatment need, interceptive

Introduction

Interceptive and preventive orthodontic procedures constitute an important part of modern orthodontics. Preventive orthodontics are procedures to promote the development of a normal occlusion and aid in preventing malocclusion from developing[1]. Interceptive orthodontics are procedures to restore normal occlusion once a malocclusion has started to develop[1]. According to Richardson[2], the art or science of interceptive orthodontics can be defined as the fostering of developmental changes that are favorable and halting or minimizing those that are not. Preventive and interceptive procedures have the advantage of being relatively simple and inexpensive treatment approaches that are targeted at developing malocclusion. For some children, timely, skillful and knowledgeable interceptive intervention alone can produce a satisfactory result while for others early interception will simplify later comprehensive orthodontic treatment[2].

It is important that conditions that predispose one to develop a malocclusion in the permanent dentition be detected early in the primary or mixed dentition. Early detection of these conditions would allow for prompt intervention or monitoring of occlusal development on an effective basis[2]. In this regard, Richardson[2] recommended three special vigilance age groups that will allow for effective practice of interceptive orthodontics. The first vigilance period is shortly after completion of the primary dentition at 3 years, the second period is about 7-9 years, when the first permanent molars will normally have erupted and the permanent incisors should be coming into the oral cavity and the third period is at about 11-12 years, when the premolars, second molars and canines should be erupting. This requires constant vigilance on the part of the orthodontist, paediatric dentist or general dental practitioner in order to intervene at the appropriate time.

Globally, despite earlier debates on timing of early orthodontic treatment, there is growing consensus on the need for this treatment approach due to its many benefits to the patient[3-7]. These interceptive procedures can improve a patient's self-image, eliminate destructive habits, facilitate normal tooth eruption, and improve some

growth patterns[3]. Further available reports show that these interceptive approaches are useful ways to reduce the severity of malocclusion[4-7]. In their report[8], Kerusuo et al showed that as a result of early orthodontic treatment in 8-15 year olds, definite treatment need decreased from 33% to 9%. Vakiparta et al[9] in an early treatment oriented program concluded that early treatment caused a significant reduction in treatment need from eight to twelve years. In addition, its psychological benefit to the child has been documented[10].

In the Western countries, there have been epidemiological and clinical reports on children and young adults that would benefit from early orthodontic treatment[13-15]. The reported number of children who would benefit from interceptive orthodontics varies widely due to the different definitions of interception, different aims and differences between samples. In a clinical study, Ackerman and Proffit[13] concluded that 15% of their patients would benefit from interceptive orthodontics. In a community study of British children, Hiles(14) found that 38.6% would benefit from interceptive treatment. In yet another community based study of 9-11-year-old children in Northern Ireland, Al Nimri and Richardson[15] showed that thirty-three percent of children were in need of interceptive treatment. Meanwhile, Chung and Kerr indicated that young people in Glasgow found interceptive intervention an acceptable form of therapy[16].

The increasing urbanisation, modernisation and cultural interactions in Nigeria have resulted in increased awareness of orthodontic problems that did not exist in our earlier population[11]. This has translated to early treatment of orthodontic problems being more attractive and desirable. In a recent Nigerian report, majority of the patients seen were self-referred indicating a high level of awareness of orthodontic treatment problems[12]. Presently, Nigeria has a growing population of over 150 million people and the percentage of the population in need of orthodontic services is expected to rise. However, the poor economic climate may affect the ability of patients to afford comprehensive orthodontic care. Preventive and interceptive interventions will not only be cost effective but also increase access for low-income families[4]. This strategy has advantages over comprehensive orthodontic care because it is less complex, less costly and acceptable to most orthodontists[4]. Interceptive orthodontic treatment falls not only within the scope of the orthodontist but also that of general dental practitioner.

Several studies have been carried out to assess this need in the Nigerian population[17-20]. The study by Onyeaso[19] revealed that about 27% of the children examined in a large Nigerian sample needed one form of preventive or/interceptive orthodontic treatment or the other. However, to the best knowledge of the authors, only one clinic-based study has been conducted on this subject in Nigeria[20], but in a different city and in a different age group. The aim of this study was to determine the need for preventive and interceptive treatment among children aged 7-10years attending the orthodontic clinic of the Lagos University Teaching Hospital, Lagos.

Method

It was a retrospective audit study carried out between June 2010 and May 2012 at the Orthodontic unit of the Lagos University Teaching Hospital. Data for all patients aged 7-10years were retreived from the patients' case notes held by the unit. A total of 132 patients were assessed consisting of 73(55.3%)boys and 59(44.7%)girls. The summary of patients' assessment was imputed into pre-designed orthodontic assessment forms. The variables evaluated included age, sex, oral habits, occlusal traits such as overjet, overbite, and crossbite. The need for interceptive orthodontic treatment was based on the pathogenic potential of the occlusion according to Jarvinen[21,22]as follows:

Anterior and posterior crossbite

Anterior crossbite: This was recorded when one or more maxillary incisors or canines occlude lingually to the mandibular ones. Posterior crossbite: A relationship of the premolar/molar teeth where the buccal cusps of the upper teeth occlude lingual to the lower teeth. Crossbite was considered unilateral when it was present only on one side of the midline whereas bilateral crossbite was recorded when present on both sides.

Functional crossbite was scored when an initial contact between the teeth guides the mandible into an anterior or lateral displacement. Proclination of the upper incisors were diagnosed when there were increased labial inclinations of the upper incisors in relation to the Frankfort and/ or maxillary planes with or without potentially competent lips usually resulting in increased incisal overjet. Spacing was scored when there was no approximal contact between the teeth.

Retained primary teeth, which were deflecting their successors, were scored when the successors had erupted or were erupting with the primary predecessors still firmly in place. Oral habits were diagnosed in patients when the child and or parents confirmed such habits coupled with clinical findings. Supernumerary teeth were scored present when the normal complement of the teeth were present in exclusion of the extra too/teeth or radiographically detected in the jaw. They may be normal or abnormal in form.

Data analysis

This was done using the statistical package for social sciences (SPSS version 19).The frequency distribution and the percentage frequency of the variables was determined. Chi-square and Fisher's exact tests were used to determine association between variables and it's p values used to determine the significance of the association.

Results

Table 1 shows the age and gender distribution of the children. There were a total of 132 children of which 73 (55.3%) were males and 59(44.7%) females. The distribution of malocclusion traits needing interception according to gender is shown in **(Table 2)**. There were no significant differences between gender and malocclusion distribution ($p > 0.05$) except for retained teeth and functional crossbite where significantly higher proportions of females had the need **(Table 2)**.

Table 1: Age and sex distribution of the subjects

Age	Male		Female		Total	
	n	(%)	n	(%)	n	(%)
7.0	8	(10.9)	6	(10.2)	14	(10.6)
8.0	15	(20.5)	19	(32.2)	34	(25.7)
9.0	22	(30.1)	9	(15.3)	31	(23.5)
10.0	28	(38.4)	25	(42.4)	53	(40.2)
Total	**73**	**(55.3)**	**59**	**(44.7)**	**132**	**(100.0)**

Table 2. Need for interceptive intervention for malocclusion by gender

	Males		Females		Total		x	P-value
	n	(%)	n	(%)	n	(%)		
Anterior crossbite	11	(15.1)	10	(16.9)	21	(15.9)	0.377	0.539
Posterior crossbite	4	(5.5)	2	(3.4)	6	(4.5)	2.812	0.0936
Anterior open bite	4	(5.5)	2	(3.4)	6	(4.5)	3.657	0.055
Overjet >6mm;	33	(45.2)	20	(34.0)	53	(40.2)	0.311	0.576
Oral habits	13	(17.8)	11	(18.6)	24	(18.2)	0.231	0.630
Retained teeth	2	(2.7)	2	(3.4)	4	(3.0)	8.220	0.004
Scissors bite	5	(6.8)	10	(16.9)	15	(11.4)	.068	0.793
Functional shift on closure	1	(1.4)	2	(3.4)	3	(2.3)	3.363	0.0003
Total	**73**	**(55.3)**	**59**	**(44.7)**	**132**	**(100)**		

The need for interceptive treatment as a result of crossbite was estimated to be 20.4% (15.9% in the anterior segment and 4.5% laterally). The overall prevalence of oral habits was 24(18.2%) with digit sucking presenting in 3.7% of the children. Treatment was needed for 4.5% of children with anterior openbite. Children with proclination of maxillary anteriors leading to increased or extreme incisal overjet of >6mm was 53(40.2%), retained primary teeth was seen in 4 children(3.0%), functional shift on closure was seen in 3(2.3%) and scissors bite was observed in 11.4%. Overall, all the children had one form of preventive/interceptive orthodontic need or the other. The association between oral habits and anterior openbite is shown in **Table 3**. No statistically significant association was observed between oral habits and anterior openbite ($p > 0.05$). **Table 4** shows a statistically significant association between oral habits and increased overjet ($p < 0.05$).

Table 3. Association between oral habits and anterior openbite

Habit	AOB Absent		AOB Present		Total	
	n	(%)	n	(%)	n	(%)
Absent	103	(81.7)	5	(83.3)	108	(81.8)
Present	23	(18.7)	1	(16.7)	24	(18.2)
Total	**126**	**(95.5)**	**6**	**(4.5)**	**132**	**(100)**

$X^2 = 3.659$, df = 4, P = 0.454

Table 4. Association between oral habits and increased overjet

Habit	Overjet ≤ 6mm		Overjet > 6mm		Total	
	n	(%)	n	(%)	n	(%)
Absent	68	(86.1)	40	(75.5)	08	(81.8)
Present	11	(3.9)	13	(24.5)	24	(18.2)
Total	**79**	**(59.8)**	**53**	**(40.2)**	**132**	**(100)**

Discussion

The main aim of interceptive orthodontics is fostering developmental changes which are favourable and halting or minimizing those which are not[2]. The number and severity of malocclusions increase with age and the advancing transition of teeth and as such malocclusions that benefit from early treatment should be detected in time, preferably in the early mixed dentition[23-25]. Marked improvement of malocclusion with early treatment has been reported previously[15,16,26].

In this study the need for orthodontic treatment caused by crossbite was 20.4% (anterior crossbite 15.9%, lateral crossbite 4.5%) which is much higher than that reported by Kabue et al[27] and Kerusuo[28]. Kabue et al[27] reported crossbite among pre-school children in Kenya as 6%(5% for anterior segment and 1% laterally). Kerosuo[28] reported crossbite among Tanzanian children(3-8yrs) as 9%(anterior segment 8% and 1% laterally), but noted a higher prevalence of 19%(anterior segment 6% and 13% laterally)among Finnish children.

In a study of Nigerian children, Otuyemi et al[17] reported crossbite malocclusion as 17.9%, while Onyeaso et al[18] reported crossbite as 12.8% (anterior segment 4.4%,0.9% laterally and functional cross bite of anterior or lateral segment as 7.5%). In a study of a similar age group, Onyeaso[19] reported crossbite as 10.3%. The prevalence of crossbite reported in this study is higher than the figures reported in previous Nigerian studies[17-19], but compares well with that of a clinic based study[12] in which prevelance of crossbite was 21.8% (anterior segment 21.8% and 7.2% laterally). This could be due to the fact that the latter study was also conducted in an orthodontic population. Crossbites should be treated as soon as they are detected. Delay in treatment may result in adverse periodontal problems, mobility and fracture[29] Most of these crossbites are amenable to interception with removable appliances.

In the present study, the prevelance of oral habits was 18.2%. Previous reports[17,30] from epidemiological surveys in Nigerian pre-school children (early special vigilance period) gave prevalence rates of oral habits as 5.2% and 13.14% respectively. Meanwhile, in a report on 7-10 year old children in Nigeria, Onyeaso reported the prevalence as 9.9%[31]. The prevelance of oral habits in this study is much lower than the 24.3% and 34.1% reported by Nnachetta[32] and Quashie-Williams[33] respectively in Lagos though the latter studies were not strictly on the special vigilance age group.

The prevalence of digit sucking reported in this study (3.7%) is much lower than that reported by Nnachetta and

Quashie Williams[32,33]. It is also less than the 18% reported by Holm[34] in 3-5year old Finish children, and the 48% recorded in 4 year old Swedish children[35], 10.7% in a study of 3-5year old Nigerian children[18] and 4.6% in a Nigerian population[17]. It however compares well with the 2.1% reported by Isiekwe[36] and indicates a decrease in prevalence of oral habits with age. The deleterious effects of prolonged oral habits such as anterior openbite can be very difficult to manage and habit-breaking appliances are useful in preventing the occurrence of these untoward effects. Oral habits such as digit sucking, tongue thrusting and lip sucking have been associated with anterior open bite[2,31,32]. In the present study, there was no significant association between oral habits and anterior openbite.

In this study, the prevalence of extreme incisal overjet >6mm was 40.2% and this contrasts with the report of Onyeaso[19]. There was a significant association between oral habits and increased overjet. The report of Onyeaso and Onyeaso et al[18,19] showed a significant relationship between oral habits and observed occlusal discrepancies. Proclination of maxillary anterior teeth leading to increased incisal overjet of over 6mm correlates with an increased risk of traumatic injuries to the teeth[37,38]. A large proportion of the children in this study presented with increased incisal overjet and this indicates a need for early interceptive intervention. Previous Nigerian studies[39,40-42] on traumatic anterior dental injuries reported the prevalence as 4.5%, 15.9% and 19.1% , and 6.5% respectively.

Retained primary teeth were recorded in 3.0% in the present study which is lower than 6.9% reported by Onyeaso et al[20] but compares well with that of Utomi[43] children with in special needs children. Retained primary teeth could lead to displacement of the permanent successors. This indicates a need for interceptive treatment such as early extraction of the retained primary teeth which can help to align the arch. It was interesting to note that all the patients in this study needed one form of preventive/interceptive orthodontic treatment or the other. This contrasts with that of a clinical[20] and epidemiological report[17] which showed 65% and 20.8% of patients respectively as needing interceptive orthodontic intervention. This suggests a high level of orthodontic awareness in Lagos, which had been noted in a previous study[12].

Treatment modalities that would be needed for these patients include use of removable appliances (expansion appliances, habit-breaking appliances, crossbite correction appliances), functional appliances, and extractions including serial extractions. These preventive and interceptive procedures are less expensive than comprehensive orthodontic treatment and generally take less time to complete. They are also within the scope of the general dental practitioner.

Conclusion

This study showed a great need for preventive and interceptive orthodontic treatment in this special vigilance age group . Early screening, detection, prevention and prompt interceptiontion of the abnormal development in these children will be of immense help in their occlusal development. There is need to promote dental heath education in schools and increase dental awareness in the community in general. Access to dental health care for these children can also be improved by Government subsidy of routine dental screening. This would assist in early recognition of these conditions and prompt intervention.

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