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Preventive and interceptive orthodontic demand for malocclusion

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Summary

Orthodontic unit, University College Hospital, Ibadan is young and in need of baseline data for effective planning. The main aim of this study was to determine the nature of orthodontic demands in the unit that could benefit from preventive and interceptive treatment so as to enhance treatment planning, teaching and further research. Consecutive patients who presented for treatment in the Unit between May 1997 and November 1999 were included in the study. The patients aged 5 – 19 years with mean age of 8.8 ± 0.82 years. One hundred and twenty-one (60.5%) of the orthodontic cases that presented for treatment needed one form of preventive and interceptive treatment or the other such as extraction of retained primary teeth, use of upper removable orthodontic appliances to correct teeth in cross bite, extraction of erupted supernumerary teeth and fabrication of oral habit breaking appliances such as goal post appliance. Ninety-three (76.9%) of these children had retained primary anterior teeth while 9.1% had proclination of maxillary anterior teeth with moderate spacing. Based on dental history and clinical examination, nine (7.4%) children were involved with oral habits, seven (5.8%) and one (0.8%) had anterior crossbite and supernumerary teeth, respectively. The remaining 39.5% needed full-blown orthodontic treatments. No sex predilection was found in relation to the various needs ($P > 0.05$). We suggest a need for more emphasis on preventive and interceptive orthodontic treatment in our environment due to the relatively high prevalence of these presenting needs.

Keywords: Dental, malocclusion, preventive, interceptive, demand.

Résumé

La section orthodontique du centre hospitalier universitaire à Ibadan est jeune et à besoin des principes de base pour une planification dentaire effective. Le but de cette étude était de déterminer la nature des demandes orthodontiques pouvant aider à la prévention et au traitement afin d'améliorer la planification, le traitement et des recherches approfondies. Des patients consécutifs, âgés de 5-19 ans

(Moyenne d'âge : $8.8 - 0.82$ ans) avaient besoin d'un traitement quelconque dans cette unité de Mai 1997 à novembre 1999 étaient inclus dans cette étude. Cent vingt-un (60.5%) des cas orthodontiques admise avaient besoin d'une forme de prévention ou de thérapie telles que : extraction de la dent, l'utilisation des outils orthodontiques pour enlever ou corriger la dentition, l'extraction d'une éruption de dent supernuméraire ou fabrication des outils pour casser les objets. Quarante-vingt (76.9%) des enfants retenus avaient des problèmes des dents antérieure primaire et 9.1% avait une proclination des dents du maxillaire antérieure avec des espaces modérés. Basé sur l'histoire dentaire et l'examen clinique (7.8%) ces enfants avaient une hygiène orale régulière, 7(5.8%) et 0.8% avaient des dents croisées et supernumériques antérieure respectivement. Le reste 39.5% avait besoin des soins thérapeutiques orthodontiques complète. Il n'y avait aucune prédilection de sexe en relation au besoins variés ($P > 0.05$). Nous recommandons avec plus d'émphasis le besoin des soins préventives et thérapeutiques dans cette environnement ou le taux relatif de demande est plus élevé.

Introduction

Dental centre, University College Hospital, Ibadan is a young orthodontic centre and as such is in need of relevant data for proper planning and teaching purposes. Preventive and interceptive orthodontic treatment form a group of therapies which are within the scope of a well-trained dental practitioner.

Preventive measures are effective in dealing with environmental factors, but are unlikely to influence the outcome in cases where the genetic background is one of the more important determining factors[1]. Interception is early treatment of malocclusion rather than prevention with the basic principle of promoting naturally occurring changes, which are favourable, and suppressing factors which lead to malposition of the teeth and malocclusion[1].

There can be no doubt that for individual children, skilful, timely and knowledgeable interceptive treatment alone can produce a satisfactory result and for others early interception will simplify appliance therapy at a later stage [1].

It is important that students, general practitioners and community dentists should be trained to think along the lines of the developing occlusion when planning treatment [1].

Several features of modern Nigerian culture have simultaneously transpired to make early treatment of orthodontic problems more attractive and desirable. There seems to be now an awareness of orthodontic problems that did not exist in our earlier population, which can be attributed to modernisation and cultural interactions[2]. The poor economic situation in Nigeria may not only affect the financial power of patients to afford full-blown orthodontic treatments but could also affect the number of dental specialists being produced including orthodontists. However, the percentage of the population in need of orthodontic services is expected to rise with modernisation especially in a country like Nigeria with a growing population of over 120 million people. Preventive and interceptive interventions will not only be cost-effective as well as reducing time spent on full-blown orthodontic cases by orthodontists, but will also correct obvious problems, intercept developing problems and prevent obvious problems from becoming worse [1,3,4].

The need for interceptive orthodontic treatment in the primary dentition was assessed recently in an epidemiological survey report in a Nigerian population [5]. Internationally, despite earlier debates on the ideal timing for early orthodontic treatment, there is now a growing interest in this treatment philosophy because of its many benefits to the patient such as improvement in functional and aesthetic qualities resulting from enhanced growth and development[6-8]. Popovich and Thompson [9] reported that 73% of their sample within the age range of 3-18 years should respond to interceptive treatment alone while Freeman [10] in a clinical study concluded that 14.3% of his sample will benefit from preventive/interceptive orthodontics. Chung and Kerr [11] showed that young patients in Glasgow found interceptive intervention an acceptable form of therapy. Even its psychological benefits to the child have been documented [12].

Reports of the number of children and young adults whose dentitions would benefit from interception are difficult to evaluate and compare because of differing interpretations of where interceptive orthodontics begins and ends. However, this treatment philosophy is not only beneficial to the patients but also allows the orthodontist (operator) adequate time to monitor the development of these patients and make subsequent interventions at appropriate times, should any feature of the occlusion relapse [1,4].

The aim of this study was, therefore, to report on the prevalence of the cases demanding preventive/interceptive orthodontic treatment in the Dental centre, University College Hospital, Ibadan between May 1997 and November 1999, which can be helpful in treatment planning, teaching purposes and further research.

Materials and methods

The study population comprised all patients who presented in the orthodontic unit in the Department of preventive dentistry, University College Hospital, Ibadan between May 1997 and Nov. 1999 for treatment. Two hundred patients of which 103 (51.5%) were females and 97 (48.5%) males aged 5-19 years were seen in the clinic during this period.

Each patient was examined clinically in two positions: open-mouthed and with the teeth in centric occlusion. All the findings were recorded in pre-designed orthodontic assessment forms. In addition to assessment forms, study models and clinical photographs were taken for most of the patients. Intra oral radiographs such as periapicals and occlusals were taken as deemed necessary. Our centre is limited by the lack of dental panoramic X-ray or cephalometric machines, so dental panoramic tomograms were not taken for these patients but few of them that clinical examinations indicated need for cephalometric radiographs were referred to a centre in Lagos where they had the radiographs taken.

Criteria for diagnosis

The need for preventive and interceptive orthodontic treatments was based on pathogenic potential of the dentition according to Jarvinen [13,14] as follows:

Anterior and posterior crossbite

Anterior cross bite: This was recorded when one or more maxillary incisors or canines occlude lingually to the mandibular ones. **Posterior cross bite:** 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. Proclinations 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 the patients when the child confirmed such habits or the parent coupled with clinical findings. Supernumerary teeth were scored present when the normal complement of the teeth were present in exclusion of the extra teeth/tooth or radiographically detected in the jaw. They may be normal or abnormal in form.

Data analysis

The information collected was computed using Epi-Info 6 Version 6.02 (October 1994) package. The frequency distribution and the percentage frequency of the variables were determined. Chi-square (X^2) test was used to determine association between variables and its P-value used to determine the significance of the association. Fisher's exact test was used where Chi-square test was not appropriate.

Results

The analyses showed that out of the 200 patients seen in the clinic during the period, 121 (60.5%) aged 5-19 years and mean age of 8.8 ± 0.82 years needed preventive and interceptive orthodontic treatments. This number comprised 61 males and 60 females. The peak age for these patients was 5-9 years. (Table 1)

Table 1: Age and sex distribution of subjects demanding preventive and interceptive orthodontic treatments.

Age Interval (years)	Males		Females		Total	
	n	(%)	n	(%)	n	(%)
5 – 9	41	(67.2)	42	(70)	83	68.6
10 – 14	17	(27.9)	16	(26.7)	33	27.3
15 – 19	3	(4.9)	2	(3.3)	5	4.1
Total	61	(100)	60	(100)	121	(100)

Mean age of subjects = 8.8 ± 0.82 (S.D) years

Out of the 121 patients demanding one form of preventive and interceptive orthodontic treatment or the other, 93 (76.9%) children were seen for retained primary incisors with the permanent successors erupting palatally and lingually in the maxillary and mandibular arches, respectively (Table 2). Children having proclination of the maxillary anterior teeth with moderate spacing were 11 (9.1%), anterior crossbite including functional crossbite 7 (5.8%) and supernumerary teeth 1 (0.8%) (Table 2).

The chi-square test or Fisher's exact test used to analyze the results showed no significant differences between gender and the malocclusions recorded ($P > 0.05$).

Discussion

Most orthodontic treatment is carried out for a patient who is constantly growing and developing in a way determined by the local environment interacting with the inherited genetic constitution. The orthodontic care of a growing, developing and maturing child should be seen as a privilege which brings great satisfaction when the aims of treatment are achieved[1].

In this study, the need for orthodontic treatment caused by crossbite of the permanent maxillary incisors including functional crossbite was estimated to be 5.8%. In a study by Heikinheimo [15] among Finnish children, treatment was estimated to be needed for 4% of children due to crossbite in incisor segment. However, this was lower in the study by Jarvinen [14] because some of the materials

Table 2: Need for interceptive interventions for malocclusion in 5-19-year-old Nigerians (n = 121) examined in the clinic.

Diagnosis	Males		Females		Total		X^2	p-value
	n	(%)	n	(%)	n	(%)		
* Anterior Crossbite	1	(1.6)	4	(6.7)	5	(4.1)	1.93	0.87 (NS)
** Functional								
Anterior Crossbite	2	(3.3)	0	(0)	2	(1.7)		Fisher's exact test (p = 0.25) (NS)
Proclination of maxillary								
Anterior teeth with moderate spacing	6	(9.8)	5	(8.3)	11	(9.1)	0.08	0.77 (NS)
Oral habits	5	(8.2)	4	(6.7)	9	(7.4)		Fisher's exact test (p = 0.51) (NS)
Retained primary anterior teeth	47	(77.0)	46	(76.6)	93	(76.9)	0.00	0.96 (NS)
Supernumerary teeth	0	(0)	1	(1.7)	1	(0.8)		Fisher's exact test (p = 0.50) (NS)
Total	61	(100)	60	(100)	121	(100)		

(NS = No significant sex differences).

* A reversed overjet, the mandibular incisors being labial to the maxillary incisors.

** An initial contact between the teeth guides the mandible into an anterior or lateral displacement (crossbite).

used by the author [14] had received preventive and interceptive orthodontic treatment at the age of 3-5 years earlier.

In cases of crossbite of the permanent incisors, the malocclusion can lead to hindered growth of the maxilla or to asymmetry between the jaws [2,4,5,6,8]. An earlier report [5] on 3-5 year-old Nigerians gave the need for crossbite treatment as 17.9%. From the crossbite prevalence reported by Otuyemi et al [5], it is possible that there are more people with this malocclusion who do not report for orthodontic treatment either because of ignorance of available treatment or due to financial limitations. The prevalence of crossbite would be expected to drop in our environment if earlier screening and interceptive treatment of the crossbite malocclusion is practiced.

Proclination of maxillary anteriors leading to increased or extreme incisal overjet of over 6 mm correlates with an increased risk of traumatic injuries to the teeth [16], and the interceptive treatment should be started early enough [17]. In fact, earlier reports [18,19,20] in Nigeria on trauma to the permanent incisors consistently gave increasing prevalences of traumatic injuries to the maxillary incisors as 14.5%, 15.9% and 19.1%, respectively, except one [21] on a rural population which gave 6.5%. Thus, supporting the need for interceptive orthodontics in our environment.

Oral habits such as digit sucking, tongue thrusting and lip sucking have been associated with anterior open bite [1,5,7]. A functional open bite, referring to open bite combined with different oral habits, creates a manifest risk of jaw malformation [22]. All the patients in this study with persisting oral habits presented with anterior open bites except one 5-year-old boy. In cases of functional open bite, however, orthodontic intervention or education to break the child of the habit can be alternative methods. Otuyemi et al [5] reported the prevalence of oral habits as 5.2% while our present study recorded 7.4%.

A total of 76.9% was found having retained primary teeth in the present study. Bearing in mind that a resorptive follicle surrounds all unerupted teeth, it seems unlikely that the roots of retained primary teeth could cause much deflection of the permanent successors at an early stage of development. A much more likely explanation of a 'double row of teeth' is that the permanent teeth were out of line from the start and have failed to resorb the baby teeth. After eruption of the permanent teeth however, contact between the crowns of primary and permanent teeth may prevent spontaneous alignment of the permanent series [2]. The relative high occurrence of retained primary teeth with the permanent set deflected in position as recorded in this study seems to confirm the view that Nigerian children erupt their teeth earlier than their Caucasian counterparts [23]. Immediate extraction of the retained primary teeth should be carried out and this is expected to at least give some

improvement in permanent tooth alignment. Subsequently, in most cases the tongue and other soft tissues help in improving the alignment.

Supernumerary teeth found in a girl were supplemental lateral incisors which were in the line of the arch bilaterally giving the prevalence of 0.8%. The prevalence of maxillary supernumerary and congenitally missing permanent incisors was reported as 3.5% in Finnish children aged 7 years [24]. Jarvinen [12] reported the prevalence of numerical variation of the permanent incisors as 0.4% which was relatively low and was attributed to non-radiographic examination of the total material. Our present study recorded a prevalence of supernumerary teeth (0.8%). An earlier epidemiological survey in the northern part of Nigeria reported a prevalence of 0.7% for supernumerary teeth [25]. A more realistic prevalence of numerical variation of permanent dentition will require a radiographic investigation of all the material in a subsequent study.

In conclusion, orthodontic cases needing preventive and interceptive orthodontic treatment have been reported in a significant percentage ($P < 0.05$) of patients seen in the short experience of orthodontic practice in the University College Hospital, Ibadan. In all, 60.5% of the patient needed one form of preventive/interceptive orthodontics or the other which is higher than that (20.8%) reported by Otuyemi et al⁵ on primary dentition. There is no doubt that emphasis on this aspect of orthodontics at the undergraduate course will be of immense help in the practice of orthodontics in the country as appreciable number of the patients might not have to be involved in expensive full-blown orthodontic treatments. This is likely to reduce the load of work on the few orthodontists in the country and increase access to oral health care generally.

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