



Assessment of Malocclusion among Yemeni Adolescents Using Canine and Incisor Classifications

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ABSTRACT

This study aimed to assess the prevalence of malocclusion using canine and incisor classifications among Yemeni adolescents in relation to gender. The sample consisted of 2400 14-year-old, equally distributed by gender and selected by multi-stage stratified random technique stretching over nine governorates (urban and rural) and covering five geographical zones of Yemen. Clinical examinations were carried out using disposable mouth mirrors under natural lighting. Measurement of the canine relationship showed bilateral Class I (53.3%), bilateral Class II (25.6%) and bilateral Class III (2.4%). Asymmetric canine relationship was found in 18.7% of the sample. The distributions of incisor relationship of the overall sample were Class I (57.5%), Class II division 1 (27.8%), Class II division 2 (1.2%) and Class III (13.5%). No statistically significant difference was found by gender in the overall sample ($P > 0.05$). Canine Class I was the most prevalent followed by Class II and Class III relationships. The prevalence of malocclusion regarding incisor relationship was Class I, Class II division 1, Class III and Class II division 2 in descending order of proportions. Findings from this study form the basis not only for future research, but also for planning orthodontic care in Yemen.

Keywords: Malocclusions, Canine Classification, Incisor Classification, Yemeni adolescents.

1. Introduction

Assessment of malocclusion in different populations provides significant information which is essential in determining resources required in orthodontics. A number of classifications and indices for measuring malocclusion have been used, each method designed for various

purposes (Thilander et al, 2001). The most widely used and accepted methods to describe cases of malocclusion among orthodontists are Angle and Incisor Classifications for buccal and incisor segments, respectively. Angle Classification system was introduced by an American orthodontist, Edward Angle in 1899. Angle admitted that his system is not sufficient for classification of all possible malocclusion types, such as unilateral Class II. Furthermore the reliability of Angle Classification has been questioned by Ackerman and Proffit (1969). Rinchuse and Rinchuse (1998) established that Angle was not clear about the description and definition of the classes and this leads to the chance of one class overlapping into another. Modification of Angle Classification was later done by Katz (1992), Pair et al, (2001) and Snyder and Jerrold (2007). The modified method widely used as a quantitative epidemiological tool for malocclusion assessment, however had been shown to be valid and reliable (Du et al, 1998 and Brin et al, 1999).

Incisor Classification, based on the work of Backlund (1963), had acceptance from the time when introduced by Ballard and Wayman (1964). Backlund studied relationship of the lingual surfaces of the upper incisors on which the lower incisors occluded in Caucasians sample by using lateral radiographs. He divided the palatal surface of the upper incisors into three equal parts, this lateral radiographic study formed the basis for the British Standard Classification of Malocclusion (BS4492 1982) and was later modified by Williams and Stephens (1992) which is now a widely used method for incisor occlusion measurement.

To date information regarding canine and incisor relationship among Yemeni adolescents is not available. Prevalence and types of malocclusion among Yemeni population should be interest to dental professionals, general practitioners and dental public health staff. Findings from this study also form the basis for future research in country and highlighting to occlusal characters of Arab-Asian population.

2. Methodology

A random sample of 2,400 14-year-old Yemeni adolescents, equally distributed by gender was included in the study. A multi-stage stratified sampling technique was applied in five geographical zones (north, south, middle, east and west) in Yemen were selected. Ethical approval was obtained from the Scientific Research Committee, University of Malaya (DF CD0701/0006(P)). Clinical examination was carried out under natural lighting and using disposable mouth mirrors. Each subject was seated on an ordinary chair with the head in an upright position. The subjects achieved centric occlusion before occlusal assessment was made. Assessment of the antero-posterior relationship of canine was based on modified Angle Classification which included three basic classes;

Class I: The tip of the maxillary canine lies in the embrasure between the mandibular canine and the first premolar.

Class II: The tip of the maxillary canine lies mesial to the embrasure between the mandibular canine and first premolar, measured according to four units; $\frac{1}{4}$ Unit: the tip of maxillary canine lies anywhere within mesial to the embrasure between the mandibular canine and first premolar and distal to the tip of mandibular canine. $\frac{1}{2}$ unit: the tip of maxillary canine lies on the tip of mandibular canine. $\frac{3}{4}$ Unit: the tip of maxillary canine lies anywhere within mesial

to the tip of mandibular canine and distal to the embrasure between the mandibular canine and lateral incisor. Full Unit Class II: the tip of maxillary canine lies in the embrasure between the mandibular canine and lateral incisor mesially.

Class III: The tip of the maxillary canine lies distal to the embrasure between the mandibular canine and first premolar, measured according to four units similar to the descriptions for Class II but in the distal direction.

For the incisor relationship, the British Standard Institute for Incisor was used:

Class I: The mandibular incisor edges preclude with or lie immediately below the lingual plateau (middle part of the palatal surface) of the maxillary central incisor.

Class II: The mandibular incisor edges lie posterior to the cingulum plateau of the maxillary incisors. This is further split into two divisions Division 1: There is increase in overjet and the maxillary central incisors are usually proclined, or Division 2: The maxillary central incisors are retroclined, the overjet is usually minimal, but may be increased.

Class III: The mandibular incisor edges lie anterior to the cingulum plateau of the maxillary incisors; the overjet is reduced or reversed.

2.1 Examiner Reliability

Inter-examiner calibration was carried out by one of the authors (R.A) with a gold standard on 30 subjects. Kappa values for the canine relationship right side, left side and incisor relationship were 0.81, 0.75 and 0.73, respectively indicating acceptable agreement between the two examiners. Intra-examiner agreement was obtained by re-examination of subjects by the same examiner, with a time lapse of one week between the two examinations to exclude memory bias. The Kappa test of canine relationship on the right side, on the left side and incisor relationship were 0.91, 0.80 and 0.78, respectively, showed good reliability as interpreted by Landis and Koch (1977).

2.2 Statistical analysis

All information collected was transferred into the data entry template using the SPSS version 18 statistical package. Descriptive statistics were generated to look at the data profile. Chi-square statistic was used to assess statistical significance between different proportions. Statistically significant difference was set at *P* values of less than 0.05.

3. Results

Analysis of canine relationship was carried out on only 2,369 records. The remaining 31 records were excluded because of extraction or impaction of canines. It was found that 81.3% of the sample had symmetrical canine relationship. Of those, bilateral Class I (CL I) relationship was found to be two times more prevalent in the sample than bilateral Class II (CL II) relationship. Only a small proportion of adolescents were found to have bilateral Class III (CL III) relationship. Asymmetrical canine relationship was seen in 18.7%, the majority were found to have a mixed Class I and II relationship in right and left sides of occlusion (Figure 1).

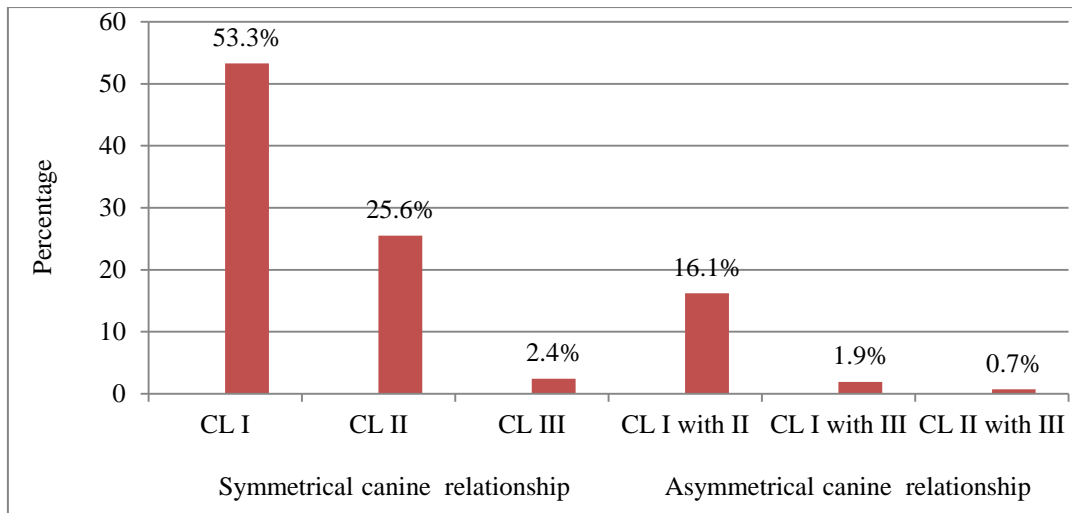


Figure 1. Distribution of symmetrical and asymmetrical canine relationship

Findings also showed that more of the sample with malocclusion had a Class II relationship on the left than right side (37.3% versus 30.6%), while more Class III relationship was observed on the right side (3.9% versus 3.5%). Furthermore, the $\frac{1}{4}$ unit deviation from normal canine relationship was found to occur more as compared with other units of Class II and III malocclusion (Table 1). When classes of canine relationship was analysed by gender there were no significant differences found on both sides of occlusion (Table 2).

Table 1. Distribution of canine relationship units in the sample

Canine relationship	Right side		Left side	
	n	%	n	%
Class I	1551	65.5	1403	59.2
Class II				
$\frac{1}{4}$ Unit	312	13.2	448	18.9
$\frac{1}{2}$ Unit	305	12.8	328	13.9
$\frac{3}{4}$ Unit	37	1.6	41	1.7
Full class II	71	3.0	67	2.8
Class III				
$\frac{1}{4}$ Unit	52	2.2	42	1.8
$\frac{1}{2}$ Unit	13	0.5	15	0.6
$\frac{3}{4}$ Unit	28	1.2	23	1.0
Full class III	0	0	2	0.1
Total	2369	100	2369	100

Table 2. Distribution of canine relationship classes between genders

Canine relationship	Gender (N= 2369)				P-value*	
	Male		Female			
	<i>n</i>	%	<i>n</i>	%		
Right side	Class I	781	65.6	770	65.4	0.387
	Class II	370	31.0	355	30.1	
	Class III	40	3.4	53	4.5	
	Total	1191	100	1178	100	
Left side	Class I	716	60.1	687	58.3	0.230
	Class II	441	37.0	443	37.6	
	Class III	34	2.9	48	4.1	
	Total	1191	100	1178	100	

* Chi-square test conducted, level of significance at $P < 0.05$

Class I incisor relationship was found in more than half of the sample and the smallest proportion (1.2%) was Class II division 2. Slightly more female have Class III than male, while more Class II incisor relationship was found in the male (30.7%) than females (27.3%), however there was no statistically significant differences (Table 3).

Table 3. Distribution of Incisor Classification Classes by gender

Incisor Classification	Gender (N= 2400)				P- value*	
	Male (n= 1200)		Female (n= 1200)			
	<i>n</i>	%	<i>n</i>	%		
Class I	672	56.0	707	58.9	0.167	
Class II	div 1	353	29.4	315		26.3
	div 2	16	1.3	12		1.0
Class III	159	13.3	166	13.8		

* Chi-square test conducted, level of significance at $P < 0.05$

4. Discussion

Angle classification has been used commonly in the diagnosis of malocclusion. Molar relationship which is considered to be of clinical importance in diagnosing buccal segment does not always match the canine relationship. Information on canine relationship provides relevant information on the severity of malocclusion. In addition, orthodontists usually focus on canine relationship at the end of orthodontic treatment.

Symmetric Class I canine relationship was found in 53% of this study. This figure was higher than that reported by Behbehani et al, (2005) on the Kuwaiti sample (36%). The difference might be due to the high prevalence (70%) of malalignment in the anterior segments for both arches in the Kuwaiti sample. In addition, the much higher crowding might influenced by the

canine position. The occurrence of symmetrical Class II canine relationship (25.6%) found in this study was almost equal to the finding of sagittal relationship malocclusion as measured by Angle Classification (28%) among subjects of various ethnic backgrounds in Israel by Krzypow and co-workers (1974).

The prevalence of a Class III canine relationship (2.4%) was in line with the previous study by Al-Emran et al, (1990) who reported 3% prevalence among 14 year-old Saudi Arabian sample with Class III malocclusion, but lower than that reported among Chinese in Hong Kong (Tang, 1994), and Nigeriann population (Onyeaso, 2004). Dissimilarity of these findings might be attributed to the smaller sample sizes in these two studies compared with the present study, as well as different ethnic groups.

This study also found a considerable proportion (18.8%) of asymmetric canine relationship among the Yemeni adolescents. There is limited data in the literature related to canine relationship, to the knowledge of the author, with no previous study specifically done to assess details of Class II and III canine relationship on both sides (right and left). The possible explanation for the asymmetric canine relationship may be due to premature loss of deciduous teeth which further led to mesial migration of adjacent permanent teeth. In Yemen, due to lack of systematic treatment for caries together with poor oral hygiene habits, early extraction of primary teeth is a common practice causing loss of space for the permanent successors (Al-Haddad et al 2009).

Incisor relationship plays a significant role in the cosmetic of dental occlusion (Williams and Stephens, 1992). Slightly more than half (57.5%) of the sample in current study had a Class I incisor relationship, 27.8% Class II division 1, 1.2% Class II division 2 and 13.5% Class III. These finding are in agreement with that observed in a Malaysian sample figure by Adnan and Abdul Kadir (1988) based on the Incisor Classification.

5. Conclusion

This study found that Class I canine relationship was the most prevalent in Yemeni adolescents, followed by Class II and Class III relationships. Based on the British Standard Institute measurement for incisor relationship, the prevalence of Class I, Class II division 1, Class III and Class II division 2 were in descending order of proportions. No significant differences were observed in the prevalence of malocclusion between genders. Findings from this study have important implications in terms of planning for orthodontic care in Yemen as well as for future research.

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