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## Research paper

# Occlusal characteristics and ethnic variations in Malaysian orthodontic patients



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## Introduction

Investigations to detect malocclusion and variations in ethnic groups or local populations are important from clinical orthodontic as well as health delivery systems perspectives, to be able to offer orthodontic services specific to the needs and requirements of the communities. Occlusal traits and prevalence of malocclusion may be specific to certain races like Class II problems being more prevalent in whites of northern European descent and Class III problems being more prevalent in Oriental populations [1]. The Asian races of Chinese, Malay and Indians form the three ethnic sub-groups of populations of both Malaysia and Singapore due to their common origin and history. A few studies on prevalence of malocclusion and their inter-ethnic variations have been carried out on these populations.

A study by Woon et al. [2] on 347 Malaysian high school children showed significantly higher prevalence of Class III occlusion among Chinese and Malays as compared to Indians. They also concluded that a crowded dentition was the norm for all three races, edge-to-edge incisor relationship was a norm for Chinese and Malays whereas overjet between 2–4 mm and overbite of between 1/3rd to 2/3rd was more normal for Indians. Soh [3] et al. investigated the occlusal status of 339 Singapore male army recruits and

found that Class I molar relation occurred most frequently, however Chinese and Malays had higher prevalence of Class III incisor and molar relationships, whereas Class II division 1 was more common among Indians. Lew and Keng [4] who investigated 1050 Singapore Chinese school children found higher Class III, reverse overjets and open-bites, similar Class II and lower increased overjet, overbite and cross-bite prevalence in them as compared to Caucasians.

Occurrence of these traits in a population does not automatically translate into treatment need. One of the ways treatment need can be assessed is by analysing the characteristics or traits of malocclusion of the population seeking treatment, which are indicators of what patients consider to be severe or significant enough to seek orthodontic treatment. In other words, a study of the distribution of malocclusion in Orthodontic patients reflects the conditions for which patients seek treatment, which may or may not reflect the prevalence of malocclusion in the general population. Hence, we conducted this study with the objective of analyzing the distribution and variation in features of malocclusion among three ethnic sub-groups of Malaysian subjects specifically seeking Orthodontic treatment.

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## Materials and methods

For this cross-sectional study, clinical database and pre-treatment study models of 273 patients who were undergoing treatment in the Department of Orthodontics at Klinik Pergigian, Melaka Manipal Medical College, Melaka, Malaysia, between November 2011 and November 2014 were assessed.

By referring to the study done by Soh et al. [3], the sample size for prevalence of occlusal traits (malocclusion, overjet, overbite, crossbite, spacing, crowding and midline shift) was calculated by using the formula:

$$n = \frac{z^2(1-\alpha/2)P(1-P)}{d^2}$$

$$z^2(1-\alpha/2) = 1.92^2$$

P = Prevalence of Occlusal Traits.

d = Precision (0.05).

From all of the calculated values, the highest number of sample size was 1137 (for total Class I molar relationship). This projected ideal sample size was too large size firstly, since we were constrained by time given for submission of the students' elective research project and secondly this time constraint meant that we could only access cases visiting the Department of Orthodontics, from November 2011 until November 2014. Hence, keeping in view the time and resource constraints, it was decided to carry out a pilot study with 30 subjects in each ethnic group, which would sum up to a total of 90 subjects. Although the original target was to investigate 90 samples, we were able to obtain 112 out of a

total of 273 study models available for investigation after applying the inclusion and exclusion criteria.

Ethical approval for this study was obtained from the institutional Research Ethics Committee (Reference no: MMMC/FOD/AR/B2/E C-2014 (08)). To be included in the study the subjects had to fulfil the inclusion criteria of being Malaysian citizens and having good quality pre-treatment study models available. They were excluded if they had previous history of orthodontic treatment. Based on these criteria 112 study models were selected and on them measurements were carried out and recorded as described in Table 1 using electronic digital calipers, Insize® (Series 1108, Resolution 0.01 mm/0.0005") and metallic ruler. Each of the three examiners (AMI, JNR, MBNN) was trained in the methodology for carrying out measurements by the expert and principal investigator (MPS). Measurements on 30 study models by each of the three examiners were compared with those of the expert to assess the accuracy using Pearson's correlation coefficient. Measurements by all 3 examiners correlated highly with those of the expert at statistically significant levels ( $P < 0.05$ ).

Three sets of readings for all parameters were recorded by the three examiners and an average of the three readings was recorded as the final reading. Out of 112 study models involved, 10 were selected at random after six weeks for the second set of measurements for intra-examiner reliability analysis. From the data collected, frequency, percentage, range, mean, standard deviations and confidence intervals were calculated. Chi-Squared test was used to test association between occlusal traits and ethnicity. All the statistical

**Table 1 – Measurement method.**

Occlusal features	Measurement Method
Molar relationship Canine relationship Malocclusion	According to Angle's classification as Class I, Class II, Class III for the right and left sides [5]. Classified as Class I, Class II, Class III for the right and left sides [6]. Overall malocclusion class was assigned as Angle's Class I, Class II and Class III after assessing molar and canine relationship on both sides.
Incisor relationship according to British Standards' Institute (BSI) [7]	Class I – Lower incisal edges occlude with or lie immediately below the cingulum plateau of the upper incisors. Class II – Lower incisal edge lies posterior to the cingulum plateau of the upper incisors. Class III – The lower incisal edges lay anterior to the cingulum plateau of the upper central incisors. The overjet is reduced or reversed.
Overjet (mm)	Measured from the mid-point of the labial surface of the most anterior lower central incisor to the mid-point of the labial surface of the most anterior upper central incisor, parallel to the occlusal plane [3]
Overbite (mm) Cross bite [3]	The vertical distance between the incisal edges of the upper and lower central incisors [3] Anterior crossbite – When one or more upper incisor teeth were palatal to the lower incisor teeth at maximum intercuspation. Posterior buccal crossbite – When one or more lower posterior teeth in any quadrant distal to the lateral incisor were placed buccal to the upper posterior teeth at maximum intercuspation. Posterior lingual crossbite – When one or more lower posterior teeth in any quadrant distal to the lateral incisor were lingually placed with respect to the upper posterior teeth at maximum intercuspation.
Maxillary and mandibular crowding (mm)	Linear contact point displacement between adjacent teeth of the maxillary and mandibular arches were measured and summated to give a total score [3].
Maxillary and mandibular spacing(mm)	Spaces between adjacent teeth in maxillary and mandibular arches were measured and summated to give a total score
Midlines (mm)	The displacement of the lower midline as compared to the upper midline [2]

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