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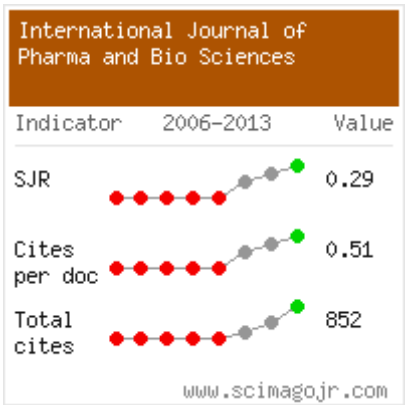

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CRANIOFACIAL MORPHOLOGY WITH GENETIC INFLUENCE OF ABO BLOOD GROUP IN MALAYSIAN ORTHODONTIC PATIENTS

FATHIN FADHILAH BINTI AHMAD SHOKOR[1,2], WAN SURIANA WAN AB RAHMAN[2]* AND MOHAMMAD KHURSHEED ALAM*[1]

**1 Orthodontic Unit, School of Dental Science, Universiti Sains Malaysia, Health Campus, 16150 Kubang Kerian, Kelantan, Malaysia*

**2 Pathology (Clinical Hematology) Department, School of Dental Science, Universiti Sains Malaysia, Kota Bharu, Kelantan, Malaysia.*

ABSTRACT

The prime purpose of this study was to evaluate the craniofacial morphology with genetic influence of ABO blood group in Malaysian orthodontic patients. A total of 200 orthodontics patients were selected using simple random sampling. The mean age of the population of this study was 18.98±4.14. The blood group of each patient was determined using the tile method. Age, gender, race, and lateral cephalogram were obtained from the patient's records. Craniofacial morphology (SNA, SNB, ANB, MMA, ALFH, UIA, LIA, ULA, UL-E, LL-E) were digitally analyzed using lateral cephalogram. There were 25.5% of patients from blood group A, 27% of blood group B, 40% of blood group O and 7.5% of blood group AB. The results showed no significant difference between ABO blood group craniofacial morphology. In conclusion, this study has shown that there was no genetic influence of ABO blood group in relation to variation in craniofacial morphology. Hence, the type of malocclusion cannot be predicted in the respective blood group.

KEYWORDS: Craniofacial morphology; ABO blood group; Malaysian orthodontics patients.

MOHAMMAD KHURSHEED ALAM & WAN SURIANA WAN AB RAHMAN
School of Dental Science, Universiti Sains Malaysia, Health Campus, 16150 Kubang Kerian, Kelantan, Malaysia

***Corresponding author**

INTRODUCTION

ABO blood types do not change as a result of environmental influences during life, they are inherited through genes on chromosome 9. From each parent a person's ABO type is determined by the inheritance of 1 of 3 alleles (A, B, or O)[1]. The ABO blood group is known to have influence in some of the diseases. Several diseases, like cardiovascular, obesity, osteoarthrosis, erthroblastosis in neonates and many other diseases especially, osteoporosis and suicide rate in different nations[2]. A study showed that blood group O has a higher prevalence for both denture plaque accumulation and denture stomatitis compared to other blood groups[3]. Different study stated that blood group is a genetic characteristic which is associated with some diseases and deformities. Multifactorial characteristics of facial development make it difficult to predict a genetic pattern in a specific maxillofacial deformity, but epidemiological evaluations can reveal relationships between such deformities and some genetic characteristics or accompanied diseases, and this will help to recognize and treat them. Among different blood groups, those with blood group B have a greater likelihood of association with maxillofacial deformities. The probability of the association of such deformities was the least with blood group A[4] In this study, we evaluated the relationship between ABO blood groups with craniofacial morphology of orthodontics patients of Hospital Universiti Sains Malaysia (Hospital USM) in Malaysia. By doing this study, we can predict the type of malocclusion that might present in certain blood group. Therefore, early treatment and intervention can be planned for the patient. However, there was no evidence to support that ABO blood group plays the major role in craniofacial morphology. Although genetic factors appear to govern the basic skeletal form and size, environmental factors have much influence on the bony elements[5, 6]. Cephlaometric radiograph is used both as a research and a clinical tool for the study of malocclusion and skeletal structure[7-25]. A cephlaometric radiograph and cephalometric norms plays a significant role in assessing the anterioposterior jaw relation[18], class of occlusion[7-15], to formulate a treatment plan, and is a substantive tool in Orthodontics to aid Orthodontic clinicians and research workers[7-25]. This study was conducted to determine whether ABO blood group gives significant effect on craniofacial morphology. Our objectives of this study are to determine the association between craniofacial morphology with the ABO blood group in orthodontics patients of Hospital USM.

MATERIALS AND METHODS

All participants provide their written informed consent (One of the parents, either father and/or mother gave written consent for the adolescent subjects). This study was approved by the Ethical Committee of the Hospital Universiti Sains Malaysia (HUSM) [USM/JEPeM/1405201], which complies with the Declaration of Helsinki.

Subjects

This cross-sectional study was conducted at orthodontic clinic of Hospital USM. This study was carried out on 200 patients, using simple random sampling. Clinical and laboratory data consisting age, race, gender, ABO blood group, results were recorded. All patients in dental clinic Hospital USM, who received an orthodontic check-up and consented to the research, were included. These patients were never underwent any orthodontic treatment before this. Those patients with craniofacial deformities and had underwent orthodontics treatment were excluded from the study.

Blood samples

Their blood group was determined using tile method. Blood samples will be taken by a sterile finger prick with a disposable needle. The blood grouping examinations were performed by slide method. One drop of anti-A and 1 drop of anti-B reagent will be placed separately on a labeled slide or tile. One drop of 20% test red cell suspension was added to each drop of the known antiserum. The cells and reagent were mixed using a clean stick. The slide was then tilted and agglutination was observed.

Craniofacial morphology

Craniofacial details were obtained from their clinical records (from archive) and analysed. From the clinical record, information such as age, gender, and race were obtained. Lateral cephalogram (from archive) of all the subject were digitally analyzed using Romexis software (Planmeca, Finland) to obtained their details such as SNA, SNB, ANB, MMA, ALFH, UIA, LIA, ULA, UL-E, and LL-E. Figure 1 showed Cephalometric measurements done using Romexis software (Planmeca, Finland). Calibration of measurements done under supervision of calibrated Orthodontist.

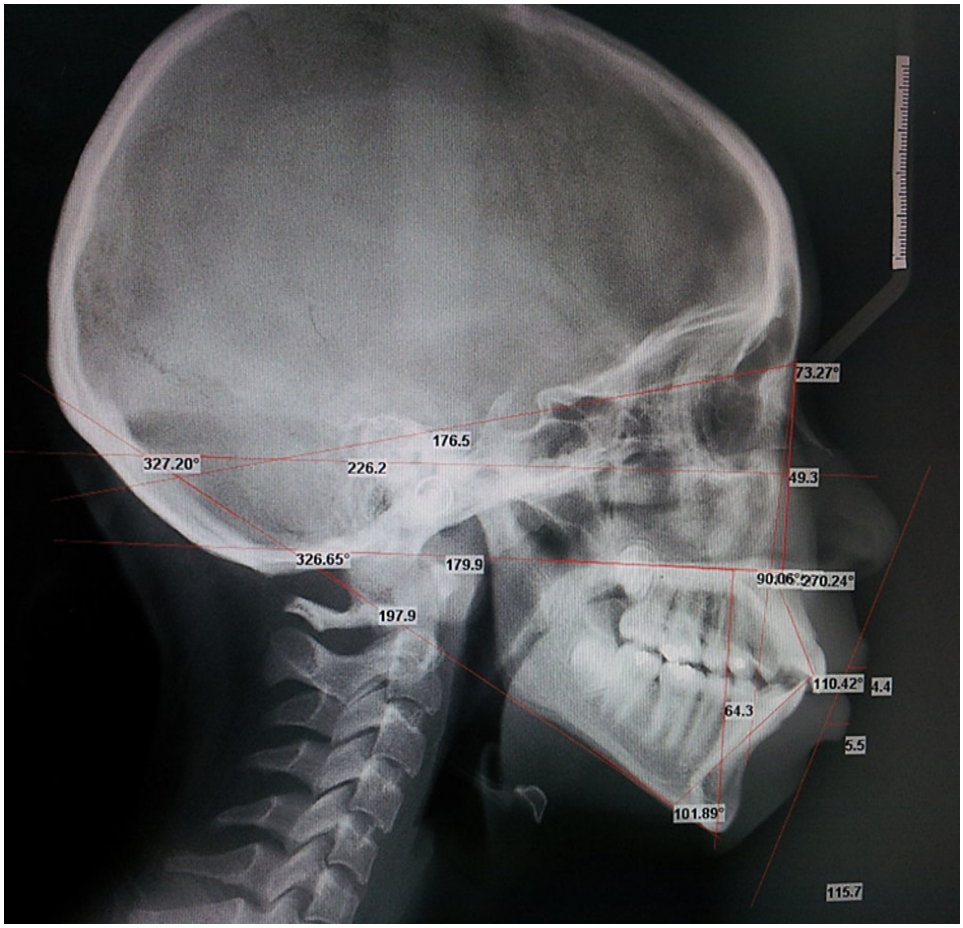

Figure 1
Craniofacial morphology measurements on lateral cephalogram using Planmeca Romexis software.

Statistical analysis

The data was verified and analysed statistically using IBM SPSS Statistics Version 22.0 (Armonk, NY: IBM Corp. Released 2013) with confidence level set at 95% ($P < 0.05$) to test for significance. The prevalence of craniofacial morphology in blood groups was descriptively analysed. Chi-square test was used for the association of categorical data and blood groups and one way ANOVA was used for association of numerical data and blood groups. Fourty (40) radiographs were selected randomly to determine the errors associated with digitizing and measurements. All procedures such as landmark identification, and measurements were repeated 4 weeks after the first examination by the same investigator. Intraclass correlation coefficients were performed to assess the reliability of the measurements and the coefficients of reliability of the measurements were between 0.89 and 0.96. Dahlberg's formula was used to determine the method-error of cephalometric measurements, which did not exceed 0.43 mm

for the linear variables, 0.71 degrees for the angular variables. The combined error for any of the variable was small and considered to be within acceptable limit[26].

RESULTS

Sociodemographic background

Sociodemographic distribution of this orthodontics population in term of ABO blood grouping, race and gender were shown in Figure 2. Among the 200 orthodontics patients, 28.5% were male and 71.5% were female, there were 25.5% of blood group A, 27% of blood group B, 40% of blood group O and 7.5% of blood group AB. Our subjects comprised of 59% of Malay population and 41% of Chinese population.

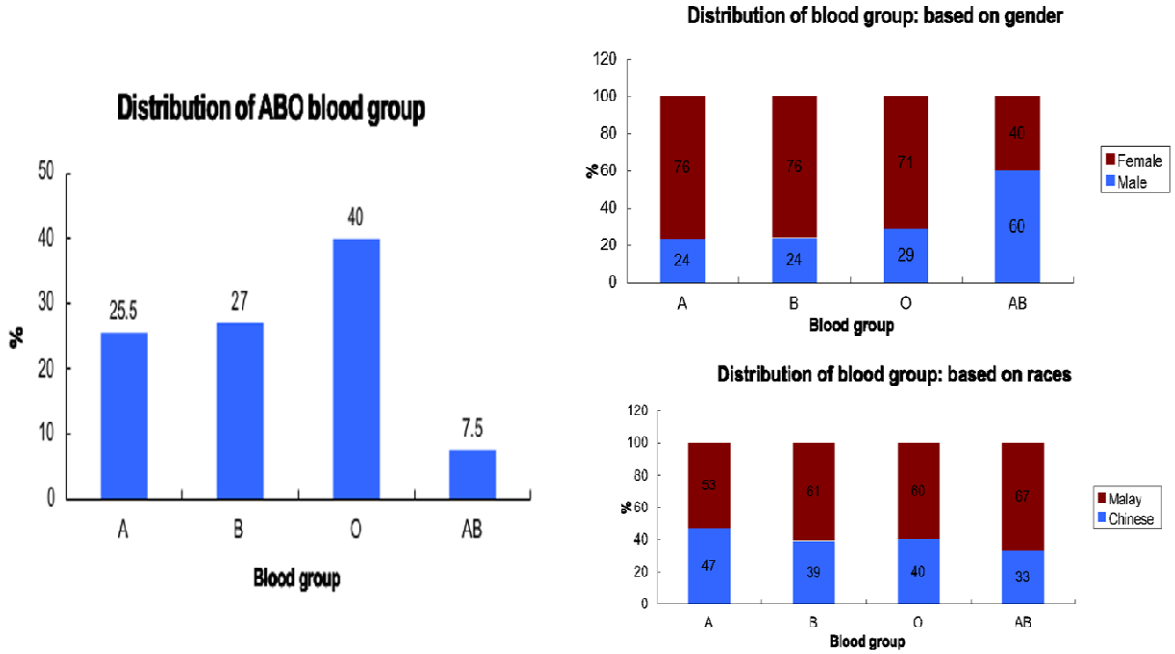

Figure 2
Sociodemographic distribution of subjects with ABO blood groups.

Craniofacial morphology

Craniofacial morphology (SNA, SNB, ANB, MMA, ALFH, UIA, LIA, ULA, UL-E, LL-E) were digitally analyzed using lateral cephalogram. Table 1 showed the results obtained by digital analysis of lateral cephalogram using Romexis software. There was no significant associations were found among various factors.

Table 1
The association of Craniofacial morphology between Blood Group A, B, AB, O

Dental Morphology	Blood Group								
	A		B		AB		O		p- value
	Mean (SD)	95% CI	Mean (SD)	95% CI	Mean (SD)	95% CI	Mean (SD)	95% CI	
SNA	84.52 (4.58)	83.23, 85.81	84.80 (6.04)	83.15, 86.44	82.53 (4.22)	80.20, 84.87	83.73 (5.85)	82.42, 85.05	0.439
SNB	80. 65 (11.75)	77.34, 83.95	82.76 (5.88)	81.96, 84.36	78.93 (4.53)	76.43, 81.44	81.44 (5.11)	80.29, 82.58	0.278
ANB	3.49 (2.24)	2.86, 4.12	3.90 (2.75)	3.15, 4.65	3.67 (2.01)	2.56, 4.78	3.47 (2.65)	2.88, 4.07	0.791
MMPA	26.00 (6.72)	24.11, 27.89	26.56 (6.17)	24.87, 28.24	29.03 (7.17)	25.07, 33.00	26.46 (6.66)	24.97, 27.96	0.476
FMPA	26.19 (7.35)	24.13, 28.26	28.28 (6.22)	26.58, 29.98	29.50 (5.83)	26.27, 32.73	27.32 (7.27)	25.69, 28.94	0.287
UIA	115.69 (14.73)	111.54, 119.83	115.28 (21.56)	109.39, 121,16	128.70 (33.92)	109.91, 147.49	120.30 (15.94)	116.73, 123.87	0.058
LIA	98.23 (9.31)	95.61, 100.84	114.85 (140.89)	76.39, 153.31	95.52 (8.70)	90.70, 100.34	95.97 (16.38)	92.31, 99.64	0.500
IIA	112.05 (21.32)	106.05, 118.04	116.72 (13.01)	113.17, 120.27	123.73 (34.07)	104.86, 142.60	115.70 (12.40)	112.92, 118.48	0.140
ALFH	55.61 (4.08)	54.47, 56.76	54.96 (4.30)	53.79, 56.13	55.18 (2.47)	53.82, 56.55	55.84 (3.55)	55.04, 56.63	0.612
UL-E	0.06 (2.63)	-0.68, 0.80	0.18 (2.84)	-0.60, 0.95	1.18 (2.48)	-0.25, 2.61	-0.49 (3.48)	-1.26, 0.29	0.238
LL-E	1.30 (3.22)	0.39, 2.21	1.75 (4.05)	0.64, 2.85	2.10 (3.29)	0.28, 3.92	1.09 (3.01)	0.42, 1.77	0.600

p<0.05

DISCUSSION

Clinically, ABO and Rhesus blood groups are among the most important blood groups[27]. Remarkably, apart from the significance of ABO and Rh blood groups in blood transfusion practice, they are beneficial in population genetic studies, researching population migration pattern. Hence, it is imperative to have knowledge on the distribution of these blood groups in any population group that includes different ethnic groups. The ABO blood group is known to have influence in some of the diseases[3]. ABO blood group is a genetic characteristic which is associated with some diseases and deformities. Multifactorial characteristics of facial development make it difficult to predict a genetic pattern in a specific maxillofacial deformity, but epidemiological evaluations can reveal relationships between such deformities and some genetic characteristics or accompanied diseases, and this will help to recognize and treat them. The distribution of ABO blood group among 200 orthodontic patients were O>B>A>AB. The same scenario was experienced by study done for a Malaysian population where blood group O was the highest followed by B, A and AB. Other countries like Britain (47%), USA (46%), Iran (35%), India (39%), Nigeria (49%) having blood group O as the most prevalent blood group[28]. We found no significant association between overjet and complete bite with ABO blood groups in dental morphology. These might be due to environmental variation and other factors. Genetic factors appeared to govern the basic skeletal form and size, however, environmental factors have much more influences on the bony elements[29, 30]. In another study stated that genetically-influenced facial types and growth patterns, environmental factors also played an important role[31]. It has been found by several investigators that different ethnic groups have different dentofacial patterns. Many researchers had tried to define and put cephalometric norms for different ethnics groups. However, these studies may be specific to an ethnic group and cannot always be applied to other ethnic groups[7-25]. An ethnic group is a nature or

populations that shares either the same geographic boundary, language or culture and are either historically or racially related[7-25]. Most cephalometric studies have proven that the 'norms' should be based on ethnic, sex and age differences[7-25]. Exact comparison of the craniofacial morphology and association with ABO blood group between current study and other related study cannot be achieved as no research has been done before. As the information is very limited, therefore, other institutions should carry out such research to explore the differences.

CONCLUSION

The distribution of ABO blood group in this orthodontic population were highest in blood group O, followed by blood group B, then blood group A, and the least was blood group AB. No significant differences between ABO blood group and craniofacial morphology were found.

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