Journal of Neonatal Surgery
ISSN(Online): 2226-0439
Vol. 14, Issue 32s (2025)
https://www.jneonatalsurg.com

OPEN ACCESS

Correlation Of Severity Of Malocclusion To The Abo Blood Group In Indian Subjects

Dr. Manish.S Dagdiya[1], Dr. Subash Chandra Nayak[2], Dr Prachi Mendhe[3], Dr. Awanindra Kumar Jha[4]*

[1]Professor, Department of Orthodontics and Dentofacial Orthopaedics, Saraswati Dhanvantri Dental College, Parbhani, Maharashtra

[2]Professor, Department of Orthodontics and Dentofacial Orthopaedics, Hi-Tech Dental College and Hospital, Pandara Bhubaneswar, Odisha

[3]Assistant Professor, Department of Pathology, Abhishek I Mishra Memorial Medical College and Research, Bhilai, Durg, Chhattisgarh

[4]*Additional Professor, Department of Orthodontist and Dentofacial Orthopaedics, Dental Institute, Rajendra Institute of Medical Sciences, Ranchi, Jharkhand

***Corresponding author**

Dr. Awanindra Kumar Jha

Email id: mybraces@yahoo.com

Cite this paper as: Dr. Manish.S Dagdiya, Dr. Subash Chandra Nayak, Dr Prachi Mendhe, Dr. Awanindra Kumar Jha, (2025) Correlation Of Severity Of Malocclusion To The Abo Blood Group In Indian Subjects. *Journal of Neonatal Surgery*, 14 (32s), 2456-2460.

ABSTRACT

Background: Malocclusion represents irregularity in the teeth of affected subjects and is one of the major dental healthcare concerns seen globally. Malocclusion is being described as having multifactorial etiology. However, there has been comprehensive research on malocclusion, and existing data is limited on the correlation of malocclusion severity to ABO blood grouping.

Aim: The present study aimed to assess the correlation of severity of malocclusion to the ABO blood group in Indian subjects using DAI (Dental Aesthetic Index).

Methods: The study assessed 800 subjects aged 15-28 who reported to the Department of Orthodontics and Dentofacial Orthopedics within the defined study period. The subjects were divided into different groups based on their blood group type. Data gathered were statistically analyzed to assess any correlation between the severity of malocclusion to the ABO blood group.

Results: The study results showed that there was a significant correlation in the severity of malocclusion to the ABO blood group with the highest incidence of malocclusion in blood group A followed by the O blood group, B blood group and the least incidence was seen in subjects with blood group AB with a p-value of <0.05.

Conclusions: The present study concludes that rapid diagnosis, early intervention, and adequate treatment planning can help reverse malocclusion. This can be attained with periodic and regular dental visits during the child's developmental phase.

Keywords: ABO blood groups, Agglutination methods, Dental aesthetic index, Malocclusion, malocclusion severity

1. INTRODUCTION

Malocclusion is a term that signifies any deviation from normal or ideal occlusion. Malocclusion is the third most prevalent oral disease after dental caries or periodontitis and affects a considerable proportion of the population. Malocclusions are of two types namely acquired and inherited malocclusion. A major factor that contributes to malocclusion is genetics. Literature studies on families and twins have reported that malocclusion is heritable with a higher heritability for skeletal malocclusion components and a moderate to low heritability in dental components. However, it is challenging to predict the pattern of heredity of malocclusion with precision owing to multifactorial aspects of face development.1

One such significant genetic feature is the ABO blood group where previous literature data has reported a significant association of the ABO blood group to various diseases namely salivary gland tumors, gingivitis, periodontitis, and others. One of the most prominent blood grouping systems is the ABO blood group established by Karl Landsteiner in year 1901who

also reported

the Rh system in 1940. ABO system has two antigens namely A and B that are either found on cell membranes or secreted to body fluids as plasma. There are four blood types or blood groups depending on the lack or absence of antigens namely O, AB, B, and A blood group. These antigens are inherited as codominants and are located on chromosome number 9. ABO system distribution is combined globally and racial variations are rarely seen for blood group distribution.[2]

The association between dental malocclusion and blood group can be assessed because both blood groups and malocclusion are associated with hereditary components. Various studies that assessed the relationship between various systemic diseases and ABO blood types have depicted a close association including diseases such as dental caries, oral cancer, salivary gland tumors, and hematological malignancies. Considering recent literature data lowest and highest incidence of COVID-19 infection is seen in the O and B blood groups respectively.[3]

The data for the association of malocclusion severity and blood group type is scarce in the literature where few reports suggested the highest malocclusion prevalence in the B blood group and the least in the AB blood group. Other studies have reported the highest malocclusion for blood group A followed by O, B, and AB blood groups. Hence, previous literature is controversial and insufficient. A correlation can be seen between malocclusion and the ABO blood group as both share genetic components. In children from specific blood groups, data can be used for the prediction of future growth patterns and malocclusion.[4] Hence, the present study aimed to assess the correlation of severity of malocclusion to the ABO blood group in Indian subjects using DAI (Dental Aesthetic Index).

2. MATERIALS AND METHODS

The present cross-sectional clinical study aimed to assess the correlation of severity of malocclusion to the ABO blood group in Indian subjects using DAI (Dental Aesthetic Index). The study subjects were from the Outpatient Department, Department of Orthodontic and Dentofacial Orthopaedics of the Institute. Verbal and written informed consent were taken from all the subjects before study participation.

The study assessed 800 subjects aged 15-28 who visited the Department of Orthodontics and Dentofacial Orthopaedics within the defined study period. The inclusion criteria for the study were subjects with permanent teeth in each arch with the exclusion of third molars and sufficient erupted teeth with the entire crown or cusp tip visible in the oral cavity. The exclusion criteria for the study were extracted teeth, previous orthodontic treatment, craniofacial deformities, congenital syndrome, and systemic illness subjects.

For blood testing, the blood grouping principle was used where red blood cells of a subject were treated with anti-serum having agglutinins to carry a reaction slide is visually inspected to determine whether clumping and hemolysis (agglutination) of red blood cells-which is brought on by an antigen-antibody reaction-are present or not. Blood testing was done using the tile method and finger prick.

Malocclusion severity was assessed with the DAI index where 10 DAI components were assessed to evaluate the need for orthodontic treatment and the severity of malocclusion of a subject and occlusal relationships were assessed at central occlusion. For all the subjects, age, gender, blood group, and DAI characteristics were assessed in a preformed proforma. Malocclusion severity and treatment needs were assessed and interpretations were done on DAI scores as <26 needed no or little treatment, 26-30 needed elective treatment, 31-35 highly desirable for treatment, and for >35- treatment was compulsory.

Data gathered were statistically analysed using the chi-square test, Fisher's exact test, Mann Whitney U test, and SPSS (Statistical Package for the Social Sciences) software version 24.0 (IBM Corp., Armonk. NY, USA) using ANOVA, chi-square test, and student's t-test. The significance level was considered at a p-value of <0.05.

3. RESULTS

The present cross-sectional clinical study aimed to assess the correlation of severity of malocclusion to the ABO blood group in Indian subjects using DAI (Dental Aesthetic Index). The study assessed 800 subjects aged 15-28 years who reported to the Department of Orthodontics and Dentofacial Orthopedics within the defined study period for any association between blood groups and severity of malocclusion.

It was seen that for comparison of DAI index and blood group in study subjects, for AB blood group, mean DAI was 29.26±7.71 and was <25, 26-30, 31-35, >36 in 9% (n=72), 5.5% (n=44), 4.5% (n=36), and 6% (n=48) subjects respectively. For the B blood group, mean DAI scores were 30.08±8.68 where <25, 26-30, 31-35, and>36 scores were seen in 8% (n=64), 5.5% (n=44), 5.25% (n=42), and 6.25% (n=500 subjects respectively. The mean DAI for the A and O blood groups was 33.94±8.32 and 32.06±6.91 respectively. The highest DAI was seen in A and lowest in AB blood groups (Table 1).

S. No	Blood group	DAI			Mean
		Score	Number (n)	Percentage (%)	
1.	AB	<25	72	9	29.26±7.71
		26-30	44	5.5	
		31-35	36	4.5	
		>36	48	6	
2.	B	<25	64	8	30.08±8.68
		26-30	44	5.5	
		31-35	42	5.25	
		>36	50	6.25	
3.	A	<25	30	3.75	33.94±8.32
		26-30	38	4.75	
		31-35	56	7	
		>36	76	9.5	
4.	O	<25	30	3.75	32.06±6.91
		26-30	48	6	
		31-35	56	7	
		>36	66	8.25	

Table 1: Comparison of DAI index and blood group in study subjects

The study results showed that for significance within between the blood groups A, B, AB, and O blood groups, the groups, the mean square was 1.063, and the sum of squares was 112.35. However, between the groups, the mean square was 3.209, and the sum of squares was 387.60. This ANOVA test results showed a significant difference between the groups with a p-value of 0.001 (Table 2).

S. No		Mean square	Sum of squares	p-value
1.	**Within the groups**	1.063	112.35	**0.001**
2.	**Between the groups**	3.209	387.60	

Table 2: Significance within the between the blood groups A, B, AB, and O

It was also seen that for multiple comparisons among various blood groups in study subjects, significant results were seen that for AB blood group no significant results were seen for the comparison of AB blood groups to O, A, and B blood groups with p=0.07, 0.32, 0.27, and 0.86 respectively. For the comparison of the B blood group to O, A, and AB blood groups, a significant comparison was seen with only A blood group with p=0.003. For the A blood group, a significant comparison was seen for the O and B blood groups with p=0.001 and 0.003 respectively. For the O blood group, a significant comparison was seen for the A blood group with p=0.001 as seen in Table 3.

S. No	Blood group	Blood groups	Mean difference	Standard error	p-value
1.	**AB**	O	2.800	1.125	0.07
		A	-1.860	1.125	0.32
		B	1.960	1.125	0.27
2.	**B**	O	0.810	1.125	0.86
		A	-3.840	1.125	**0.003**
		AB	-1.960	1.125	0.27
3.	**A**	O	4.660	1.125	**0.001**
		B	3.840	1.125	**0.003**
		AB	1.860	1.125	0.339
4.	**O**	A	-4.460	1.125	**0.001**
		B	-0.810	1.125	0.884
		AB	-2.600	1.125	0.07

Table 3: Multiple comparisons among various blood groups in study subjects

4. DISCUSSION

The present study assessed 800 subjects aged 15-28 years who reported to the Department of Orthodontics and Dentofacial Orthopedics within the defined study period for any association between blood groups and severity of malocclusion. The study design of the present study was similar to the previous studies of Shokor FF et al[5] in 2015 and Heidari et al[6] in 2022 where authors adopted a study design similar to the present study in their respective studies to assess the association of malocclusion and ABO blood grouping.

The study results showed that for comparison of DAI index and blood group in study subjects, for the AB blood group, mean DAI was 29.26±7.71 and was <25, 26-30, 31-35, >36 in 9% (n=72), 5.5% (n=44), 4.5% (n=36), and 6% (n=48) subjects respectively. For the B blood group, mean DAI scores were 30.08±8.68 where <25, 26-30, 31-35, and>36 scores were seen in 8% (n=64), 5.5% (n=44), 5.25% (n=42), and 6.25% (n=500 subjects respectively. The mean DAI for the A and O blood groups was 33.94±8.32 and 32.06±6.91 respectively. The highest DAI was seen in A and lowest in AB blood groups. These results were consistent with the findings of Al-Askar M et al[7] in 2017 and Al-Khatieeb MM et al[8] in 2018 where authors reported results for DAI index and blood group in their studies similar to the present study.

It was seen that for significance within and between the blood groups A, B, AB, and O blood groups, the groups, mean square was 1.063, and the sum of squares was 112.35. However, between the groups, the mean square was 3.209, and the sum of squares was 387.60. This ANOVA test results showed a significant difference between the groups with a p-value of 0.001. These findings were in agreement with the results of Vivek S et al[9] in 2013 and Gupta SP et al[10] in 2018 where significance within and between the blood groups A, B, AB, and O blood groups similar to the present study was reported by the authors in their respective studies.

The study results also showed that for multiple comparisons among various blood groups in study subjects, significant results were seen that for AB blood group no significant results were seen for the comparison of AB blood groups to O, A, and B blood groups with p=0.07, 0.32, 0.27, and 0.86 respectively. For the comparison of the B blood group to O, A, and AB blood groups, a significant comparison was seen with only A blood group with p=0.003. For the A blood group, a significant comparison was seen for the O and B blood groups with p=0.001 and 0.003 respectively. For the O blood group, a significant comparison was seen for the A blood group with p=0.001. These results were in line with the findings of Rashid A. et al[11] in 2019 and Sharma R. et al[12] in 2015 where for multiple comparisons among various blood groups in study subjects results

reported by the authors in their studies were comparable to the results of the present study.

5. CONCLUSION

Considering its limitations, the present study concludes that rapid diagnosis, early intervention, and adequate treatment planning can help in reversal of the malocclusion. This can be attained with periodic and regular dental visits during the developmental phase of the child. However, further studies are needed to reach a definitive conclusion.

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