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The pattern of refractive error associated with the different ABO blood group among the drivers attending the driving school of Al Ahsa region of Saudi Arabia

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Abstract: ABO blood grouping system is pivotal in blood transfusion. Blood group selection can be influenced by environmental, geographical conditions and migration frequency of the population. Association between ABO and refractive error has been established by many studies. The present study was conducted in Al Ahsa region of Saudi Arabia to determine the frequency of ABO and Rh blood groups among the people seeking for driving licenses of different nationality and ethnic group and its association with the refractive error. It was a cross sectional survey conducted on the subjects attending for medical examination for their driving license renewal /new license. All the subjects seeking driving license at the main medical exam center of driving school of Al Ahsa during the study period was the study population. The sample size was calculated using a Fisher‟s formula cited by which was calculated as 1689 in number The sampling was done by convenience sampling method till the sample size is achieved. A data collection sheet was prepared to record the age, sex, nationality and blood group and status of refraction of the eyes. The collected data were cleared, coded, entered and analyzed by the SPSS version 26. A p-value cut off point of 0.05 at 95% CI was used to determine statistical significance. A total of 1593 subjects were examined during the study period. The mean age of the participants was 30.98 ± Std. Dev. 10.21. The vast majority of the participants were Male (94.6%). A total of around 15% of the participants with blood group O+ were suffering from refractive error of which 7.5% each were suffering from Myopia and Hypermetropia. Myopia was significantly more among participants with O+ blood gro (P=0.000). Hypermetropia was significantly more common among the participants with blood group AB- (p =0.000). The present study has shown that Myopia was significantly more among participants with O+ blood group than other blood group. Hypermetropia was significantly more common among the participants with blood group AB- as compared to other blood groups. However, there is a need of larger cohort study to confirm any association of ABO blood group with refractive error.

Keywords: *ABO blood group, Association, Driver, Refractive error.*

1. Background

ABO blood grouping system, being developed by an Austrian Nobel prize winner scientist, Karl Land steineris (1900), is pivotal in blood transfusion. According to his finding, red cell of an individual contains antigen on its surface that correspond to the blood group. The antibodies in the serum identifies and combines with the antigen sites on the surfaces of mismatched red cell, causing hemolysis [1]. In other words, the immune system of the body recognizes another blood group type as foreign body and attacks it if it is introduced in the body resulting in transfusion reaction. So, any mismatch the blood group while transfusing can cause most serious and life-threatening transfusion reaction [2].

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Therefore, it is suggested that every individual should have their blood group checked and should remember or document it for any emergency. The suggested blood group is expressed by O, A, B and AB which are universally accepted since early 1950s. Rhesus factor (Rh factor), a protein when present on the RBC, the blood group is called Rh D positive (+) while absence of Rh factor protein on the surface of RBC is called Rh D (-) negative. For the compatibility of blood transfusion, the Rh factor must be the same. Study suggests that the blood group selection can be influenced by environmental, geographical conditions and migration frequency of the population [3]. One systematic review study has found that prevalence of A, B, O and AB blood groups in India as 23.16%,34.10% ,34.56% and 8.18% respectively and among them 94.13% were Rh(D) positive and only 5.89% were Rh (D) negative. The Blood group varied according to the geographic location of India in this study. As for example Blood group B was common in central India (36·18%) region while group O was common in southern India (38·95%) region [4]. One Iranian study reported that the most common blood group prevalent in their population was O (33.8%) while AB was the least common (8.3%) [5]. The prevalence of Rh-positive and Rh-negative was 88.2% and 11.8% respectively in this study [6]. ABO phenotype study in Saudi Arabia has shown that Group O was most common (48%) followed by group B (27%) and AB (3%). The percentage of positive and negative Rh grouping phenotypes were 90% and 4% respectively in this study [2]. Association between ABO and refractive error has been established by many studies. According to one study Blood group O showed slight predominance to myopia [7]. However, one study has reported that refractive error of subjects in different blood group in both genders had no significant difference. In blood group O, myopia was seen slightly dominant in this study.

2. Materials and Methods

It was be a cross sectional survey conducted during the September 2023-October 2023. The present study was conducted at the Ministry of Health approved medical examination center of Al Ahsa region of Saudi Arabia. The subjects of different nationalities attending for their driving license during the study period (September 2023 –to October 2023) were the study population. The sample size was calculated using a Fisher"s formula cited by; $n = Z^2pq / e^2$, Where n = the desired sample size, Z = the standard normal deviate at 95% confidence level (1.96) ,P = Expected prevalence of blood group 'O ' among around 50% of population as suggested by a study conducted in Saudi Arabia . q = 1-p, e = desired level of precision (0.025), $n = (1.96)^2(0.50)(0.50) / 0.025^2 = 1536$,n = 1536,Considering a 10% inconvenient sample 1536x 10%= 153 So estimated sample size was 1536+153= 1689. The sampling was be done by convenience sampling method till the sample size is achieved. A data collection sheet was prepared to record the age, sex, nationality and blood group of the individual. The data sheet also included the status of visual acuity test and the general health condition of the individual. The blood specimen was collected by well-trained technician from the local pathology laboratory (approved by Ministry of Health).and was analyzed to determine ABO and Rh-D blood groups based on agglutination principle with micro plate. ABO grouping was be done using Anti-A, Anti-B anti-AB and Anti-D antisera. The individual typed as Rh-D negative was confirmed using an antiglobulin weak D test. Visual acuity test was done by snellen chart kept at the 6 meter distance. Individual wearing spectacle was documented with the types of the prescribed glass like spectacle with myopic correction or hypermetropia correction. Those with refractive error were referred to ophthalmologist and were subjected to refraction and the result of refraction was documented. The collected data were cleared, coded, entered and analyzed by the SPSS version 26. Descriptive statistics was presented using counts, proportions (%), mean ± standard deviation whenever appropriate. The comparison of the blood group within the different nationality and refractive error with the different blood group was performed using chi square test. A p-value cut off point of 0.05 at 95% CI was used to determine statistical significance. The research will be approved by the King Faisal University IRB committee. Consent was also taken from each participant.

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3. Results

A total of 1593 subjects were examined during the study period. The mean age of the participants was 30.98 years ± Std. Dev. 10.21years (range 17-73 years). The vast majority of the participants were Male (94.6%). Only 5.4% were female. Thirty five percent were Saudi followed by Indian (15.5%), Egyptian (13.6%) Pakistani (10.7%) and Sudani (9.0%). Yemini, Bangladeshi, and Nepali constituted 6.5%,5.0% and 3.6% respectively Minority of the participants were from. Nepal (3.6%), ,Syrian(0.8%) and Sri lankan (0.4%). The majority of the participants (43.1%) belonged to blood Group 'O+' followed by those(25.7%) with 'A+' and those(16.1%) with 'B- .The participants with 'AB+' blood group was 6%.Blood group 'O-' , 'A- ,'B-' and 'AB-' constituted 3.3%,4.1%,,1.2% and 0.5% respectively. The vast majority of the participants were emmeitropic (85.0%) while 7.5% each were myopic and hypermetropic.The details of the socio demographic characteristics with ABO grouping and refractive status of the participants is shown in Table 1.

Table 1.
Showing the demographic characteristics with ABO grouping and refractive status of the participants.

Variables	No.	Percentage
Age		
30.98 years ± Std. Dev. 10.21 years (range 17-73 years)		
Sex		
Male	1507	94.6
Female	86	5.4
Nationality		
Saudi	558	35.0
Pakistani	170	10.7
Indian	247	15.5
Sudanese	143	9.0
Egyptian	217	13.6
Syrian	12	0.80
Yemini	104	6.5
Bangladeshi	80	5.0
Nepali	57	3.6
Sri Lankan	5	0.40
Blood group		
O+	687	43.1
O-	53	3.3
A+	410	25.7
A-	66	4.1
B+	256	16.1
B-	19	1.2
AB+	95	6.0
AB-	7	0.50
Vision status		
Emmetropia	1180	85.0
Myopia	107	7.5
Hypermetropia	113	7.5

Distribution of Blood group among the participants of different socio demographic characteristics.

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Both 'O+ and negative were significantly more common among the female than the male (56.97% vs.42.33% and 15.11% vs.2.66%, P=0.000). Blood group A+ was signi9ficantly more prevalent among male than female (26.54% vs.11.62%, P=0.000) but Blood group A- was significantly more common among female (6.97% vs.3.98%, P-0.000). Similarly, blood group B+ and B- was significantly more common among the male than their female counterpart (16.32% vs.5.81% and 1.26% vs.0.00%, P=0.000). The blood group AB+ and AB- were also more common among the male than the female (6.10% vs.3.48% and 0.19% vs.0.00, P=0.000). All the srilankan who visited for driving license medical examination had blood group of O+. The blood group O+ was significantly more among the Yemini population than Sudanese ,Saudi Arabiaan ,Pakistani , Egyptian ,Indian, ,Nepali , Bangladeshi and Syrian population (54.11% Vs.52.10% vs.44.22% vs.41.53% vs. 39.61% vs.34.10vs.37.68% and 25%,P=0.000).The blood group O- was significantly more ptrevalent among the Syrian participants than Pakistani, Sudani, Saudi , Srilankan and Egyptian (33.33% vs.8.44% vs. 6.72% vs.4.56% vs.25.0% vs.0.54%,P= 0.000).The frequency of blood group A+ was significantly more among the Syrian followed by Bangladeshi ,Yemini ,Nepali , Egyptian .Saudi , Indian and Pakistani (41.66% Vs.33.33%vs.31.76% vs.31.48% vs.30.05 vs.25.89%vs.25.34% vs.17.53% , P=0.000).The frequency of A- was low across all these drivers of different countries.It was significantly higher among Pakistani than Yemini ,Indian Saudi ,Egyptian and Sudanese (6.49%vs.5.88%vs.5.06vs.4.98%vs.3.82and Vs.0.84%,P=0.000)..The blood group of B+ was significantly higher among the Nepali than Bangladeshi .Indian,Pakistani, Egyptian ,Saudi and Yemini (25.92%vs.24.63% vs.24.42% vs.21.34% vs.14.74% vs.12.94% vs.4.70, P=0.000).The blood group B- was not recorded from Pakistani,Syrian ,Yemini ,Nepali ,Bangladeshi and Srilanka.However it was more prevalent among the Sudani than Indian ,Egyptian and Saudi (3.36% vs.2.52% vs.0.55% vs.0.20%,P=0.000).As far as the blood group AB+ is concerned it was not prevalent among the participants from Syrian ,Nepali and Srilankan However .It was significantly higher among Sudanese than those from Egyptian,Saudi ,Pakistani ,Indian ,Bangladeshi and Yemini(10.92% Vs.8.74% vs.5.57% vs.5.37% Vs.5.19% vs.4.34% vs. 3.52%, P=0.000).AB- was the least prevalent blood group(0.59%) and was found among Saudi population only. The details of the blood group distribution across the socio demographic characteristics of the participants is shown in Table 2.

A total of around 15% of the participants with blood group O+ were suffering from refractive error of which 7.5% each were suffering from Myopia and Hypermetropia .Myopia was significantly more among participants with O+ blood group than other blood group such as O- „A+ ,A-,B+,B- ,AB+ and AB- blood group (14.11% vs,0.0% vs.3.17% vs.1.51% vs.1.95% vs.5.26% vs.2.10% vs.0.00% ,P=0.000)..Hypermetropia was significantly more common among the participants with blood group AB- followed by A+ ,B+,AB+,A- ,O+ ,O- and B- (33.33% vs.14.63% vs.10.15% vs.8.42%,Vs.4.55% vs.3.37% vs.1.89% and vs.1.25% vs. 0.00% ,p =0.000).The details of association of blood group with the visual status of the eyes is shown in Table 3:

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Table 2.
Showing the distribution of type of blood group among the participants of different socio demographic characteristics.

Variables	O+	O-	A+	A-	B+	B-	AB+	AB-	P value
Sex									0.000
Male	638(42.33)	40(2.65)	400(26.54)	60(3.98)	251(16.32)	19(1.26)	92(6.12)	3(0/19)	
Female	49(56.97)	13(15.11)	10(11.62)	6(6.97)	5(5.81)	0(0.00)	3(3.48)	0(0.00)	
Nationality									0.000
Saudi	250(44.22)	23(4.59)	130(25.89)	25(4.98)	65(12.95)	7(1.42)	27(5.38)	3(0.59)	
Pakistani	61(39.61)	13(8.44)	27(17.53)	10(6.49)	35(22.73)	4(2.60)	4(2.60)	0().00)	
Indian	74(34.10)	0(0.00)	55(25.35)	11(5.07)	53(24.42)	12(5.53)	12(5.53)	0(0.00)	
Sudani	62(52.10)	8(6.73)	16(13.44)	1(0.84)	15(12.61)	4(3.36)	13(10.92)	(0.00)	
Egyptian	76(41.53)	1(0.55)	55(30.05)	7(3.83)	2(1.09)	1(0.55)	16(8.74)	(0.00)	
Syrian	3(25.00)	4(33.33)	5(41.67)	0(0.00)	0(0.00)	0(0.00)	0(0.00)	(0.00)	
Yemini	46(54.12)	0(0.00)	27(31.76)	5(5.88)	4(4.71)	0(0.00)	3(3.53)	(0.00)	
Bangladeshi	26(37.68)	0(0.00)	23(33.33)	0(0.00)	17(24.64)	0(0.00(	5(7.25)	(0.00)	
Nepal	23(46.30)	0(0.00)	17(31.47)	0(0.00)	14(25.93)	0(0.00)	0(0.00)	(0.00)	
Sri Lanka	4(80.0)	1(20.0)	0(0.00)	0(0.00)	0(0.00)	0(0.00)	0(0.00)	(0.00)	

Table 3.
Showing the association of refraction status of the eyes with the different blood group.

Variable	O+	O-	A+	A-	B+	B-	AB+	AB_	P value
Visual status									
Emmetropia	567(82.52)	52(98.11)	337(82.20)	62(93.90)	225(87.90)	18(94.74)	88(89.48)	6(67.67)	0.000
Myopia	97(14.11)	0(0.00)	13(3.17)	1(1.51)	5(1.95)	1(5.26)	2(2.10)	0(0.00)	
Hypermetropia	23((3.37)	1(1.89)	60(14.63)	3(4.55)	26(10.15)	0(0.00)	5(8.42)	1(33.33)	

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4. Discussion

Many studies related to association of ABO phenotype has shown that ABO blood groups were correspondingly linked with an increased risk of various infectious and non-infectious diseases [8] Recently emphasis have been given by various researchers to find out the possible association of different blood groups with the refractive errors. The present study was an attempt to find any association of different ABO phenotypes with the different types of refractive error. This study has found that the vast majority of the participants were Emmetropic (85.0%) while 7.5% each were myopic and hypermetropic. Myopia was found significantly higher among the participants with blood group O+ as compared to other blood groups. Similarly, Hypermetropia was significantly more common among the participants with blood group AB- as compared to other blood groups. However, in a similar Pakistani study, the researchers have found that that majority of the participants were myopic (60%). Myopia was significantly higher among the participants having blood group O+ in this study while Hypermetropia was more common in the participants with blood group A [9, 10]. In one Indian study the relative risk for the occurrence of both myopia and hpermetropia was found to be highest in blood group O+ [11]. However, other Indian study has reported that B blood group showed higher prevalence of myopia when compared to other ABO blood groupsbut this association was not statistically significant [12]. One Ghana study has found no significant correlation between myopia and ABO or Rh blood groups (p-values of 0.381 and 0.0802, respectively) [13]. One similar Nigerian study has reported that Myopia was slightly dominant among the participants with blood group O+ while the rest of the blood groups have similar percentage distribution.

However very few studies have been done to explore the relationship of blood group with the refractive error and whatever the studies have been done, were done with small sample size. The present study was done on a large sample size. There is a need to undertake more cohort-based studies to confirm the relationship between different ABO blood group and refractive error.

Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

References

[1] G. Garratty, W. Dzik, P. Issitt, D. Lublin, M. Reid, and T. Zelinski, "Terminology for blood group antigens and genes—historical origins and guidelines in the new millennium," *Transfusion*, vol. 40, no. 4, pp. 477-489, 2000. https://doi.org/10.1046/j.1537-2995.2000.40040477.x

[2] S. Deepthi, S. Singh, and K. Maruthy, "Distribution frequency of ABO and rhesus blood groups among medical students- A study from Narayana medical college and hospital in South India," *Int J Health Sci Res*, vol. 5, no. 9, p. 5, 2015.

[3] M. Shakir, S. Khan, and G. E., "Frequency of ABO and Rh (D) blood groups among blood donors in Rawalpindi/Islamabad area," *Pak Armed Forces Med J*, vol. 62, no. 2, pp. 59–64, 2012.

[4] K. P. Gopal and D. Yashaswi, "Distribution of ABO and Rh (D) blood groups in India: A systematic review," *Department of Transfusion Medicine, All India Institute," ISBT Science Series International Society of Blood Transfusion*, vol. 16, no. 1, pp. 1-12, 2020. https://doi.org/10.1111/voxs.12576

[5] M. Andalibi, Z. Dehnavi, A. Afshari, M. Tayefi, H. Esmaeili, and M. Azarpazhooh, "Prevalence of ABO and Rh blood groups and their association with demographic and anthropometric factors in an Iranian population: Mashad study," *East Mediterr Health J*, vol. 26, no. 8, pp. 916–922, 2020. https://doi.org/10.26719/emhj.20.048

[6] M. Elsayid, Y. Y. Aseeri, F. Saqri, A. Alanazi, and S. Qureshi, "A study of prevalence of blood group of Saudi patients in King Abdulaziz Medical City-Riyadh," *Sci J Public Health*, vol. 3, no. 4, pp. 559-562, 2015. https://doi.org/10.11648/j.sjph.20150304.25

[7] M. A. Sarhan, K. A. Saleh, and S. M. Bin-Dajem, "Distribution of ABO blood groups and rhesus factor in Southwest Saudi Arabia," *Saudi Med Journal*, vol. 30, no. 1, pp. 116-119, 2009.

[8] S. B. Abegaz, "Human ABO blood groups and their associations with different diseases," *BioMed Research International*, vol. 2021, no. 1, p. 6629060, 2021. https://doi.org/10.1155/2021/6629060

[9] Ş. T. Y., "ABO blood groups and rheumatic diseases," *Eur J Rheumatol*, vol. 4, no. 4, pp. 250-253, 2017. https://doi.org/10.5152/eurjrheum.2017.17044

[10] A. Hussain, "Association between blood groups and refractive errors," *Pakistan Ophthalmology*, vol. 6, no. 2, pp. 26-28, 2016.

[11] M. Amponsah, H. A. Awuni, S. Kyeremeh, and N. Y. Koomson, "Association between myopia and the abo/rh blood groups among college of science students, Knust," *Journal of Science and Technology, Special Issue, vol. 1 no. 1, pp. 112 - 122* ©, 2024.

[12] N. K. GUPTA and K. NISHI, "A study on the incidence of myopia and hypermetropia in ABO blood groups," *National Journal of Life Sciences*, vol. 10, pp. 31-33, 2013.

[13] R. Sonal, N. Y. C. Gaonkar, and A. Nibedita, "Anjusha IB, ABO blood group distribution and its association with myopia among first year medical students in bangalore - a cross sectional study," *International Journal of Contemporary Medical Research Section: Physiology*, vol. 7, no. 5, 2020. http://dx.doi.org/10.21276/ijcmr.2020.7.5.15

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