

Correlation of Blood Groups and Intelligence Quotient Levels among Medical Students

Erum Afaq^{1*}, Mariam Sajjad¹, Navaira Shoaib¹, Naveen Azhar¹, Arooma Shaukat Siddiqui¹, Ayesha Hussain¹, Hira Fatima Waseem²

¹Department of Physiology, Dow Medical College, Dow University of Health Sciences, Karachi, Pakistan.

²Department of Biostatistics, School of Public Health, Dow University of Health Sciences, Karachi, Pakistan.

Abstract: Background: Blood group and intelligence are both highly heritable traits unique to each individual. For the past several years, a possible correlation between these two traits has been suggested but existing studies report contrasting results in different geographical populations.

Objective: To investigate a potential relationship between blood group and intelligence among consenting medical and dental students of Dow University of Health Sciences, Karachi.

Materials & Methods: This study is a cross-sectional study involving the MBBS and BDS students of Dow University of Health Sciences within age group of 18-21 years. The study was conducted in the department of Physiology, Dow Medical College (DUHS) from 15th February 2021 to 1st July 2021. After the Institutional Review Board's approval, we determined the ABO and Rh blood group of the participants through test tube method (forward grouping) during the physiology practical sessions. Intelligence levels were assessed using the Stanford Binet IQ Test. SPSS 21 was used to analyze the data collected.

Results: Out of 353 participants, 67 (18.98%) were male and 286 (81.01%) were female with a mean age of 20 years. We found highest IQ scores in blood group A negative (25.80±8.25) with no statistical significance (p=0.162). Moreover, there was no statistically significant difference between the intelligence of male and female participants (p=0.257).

Conclusion: Blood group and intelligence of an individual are two heritable traits that are not linked with each other. There is no difference in the IQ of males and females. This finding has important implications in the educational field as it shows that male and female students of different blood groups have similar cognitive capabilities and consequently, similar educational needs.

Keywords: Blood group, ABO Blood group system, Blood group antigens, Intelligence, Cognition, Intelligence quotient, Intelligence tests, Stanford-Binet test.

INTRODUCTION

Human blood can be classified on the basis of various blood group systems. Amongst the numerous blood group systems that have been discovered to date, the most important is the ABO blood group system, identified by Karl Landsteiner in 1901. It classifies human blood into A, B, AB and O blood groups based on the presence of A and B antigens on the surface of red blood cells [1]. These antigens are encoded by 3 alleles; A, B and O, that are found on chromosome 9q [2]. Another clinically significant system is the Rh blood group system in which blood is classified as Rh-positive or Rh-negative depending on the expression of the D antigen. This antigen is encoded by genes present on chromosome 1 [3]. Humans all over the world have the same ABO and Rh blood types but the frequency and distribution varies between individual racial groups and different geographical regions of the world. In the Pakistani population, most common blood group is B with a frequency of 33.37%. This is followed by

blood group O (33.14%), then A (33.99%), and the least common blood group is AB (9.74%) [4].

Human intelligence refers to the capability of the human mind to reason, solve problems and learn from life experiences. It is a broad term that involves an integration of multiple cognitive abilities such as attention, perception, planning, memory and language to understand the world around us and find solutions to life problems [5]. Intelligence is a trait that not only distinguishes humans from the rest of the species but also helps to individualize every human from the rest of his kin [6]. It has significant implications in broad areas of life such as academic performance, career accomplishments and income status [7]. Several studies have shown that intellectual ability does not only predict socioeconomic status of an individual but also other parameters such as health outcomes and longevity [8]. That is why, over the years, scientists have come up with different tests to measure human intelligence. Alfred Binet and Theodore Simon were one of the first scientists to come up with an IQ test to identify intellectually disabled children

*Address correspondence to this author at the Department of Physiology, Dow Medical College, Dow University of Health Sciences, Karachi, Pakistan. Email: doc_erum@yahoo.com

and help them with their education. Lewis Terman, a psychologist at Stanford University, later reconsidered and amended the original test to create an updated version which is now called the Stanford-Binet IQ test. Since then, this test is regularly updated and used worldwide to assess intelligence [9].

Intelligence is a complex human attribute that is influenced by both environmental and genetic factors [10]. Several studies conducted in the past have made it increasingly evident that there is undoubtedly a strong influence of genes in determining the intelligence of an individual [11]. Recent studies approximate that the heritability of intelligence is dependent upon differences in the genome sequence that account for twenty percent of the inherited intelligence. However, there is no single gene that determines intelligence; rather intelligence is a polygenic trait that is affected by many genes of small effect [12].

Since both blood group and intelligence have a significant genetic influence, there is a possibility of some gene linkage that may associate them with one another. Numerous researches have been conducted in different population groupings to look for a possible relation between these two traits. In 2014, a study conducted in Jordan found significant association between blood group and intelligence with the highest IQ levels reported among individuals with 'AB' blood type [13]. In 2017, another research was carried out in Delhi, which compared academic scores of medical students with their blood group. The research concluded no significant association between the two parameters [14]. In 2018, another study on similar grounds was conducted in Tamil Nadu, India, which also failed to find any significant correlation between blood group and intelligence [15]. Since there are contrasting results reported in different geographical communities, it is possible that a correlation between blood group and intellectual capacity may be present only in some populations. The objective of our study is to observe this phenomenon in our local setting and see if any significant association is observed between blood group and intelligence among medical and dental students of Karachi.

MATERIAL AND METHODS

This cross sectional study was conducted at department of Physiology, Dow Medical College (DUHS) from 15th February 2021 to 1st July 2021. An official permission was taken from an Ethical Committee and Institutional Review Board (IRB-1651/DUHS/Approval/2020) DUHS.

For conducting this study, Convenience Sampling Technique (Non-probability) was applied. An open Epi calculator (Version 3) was used for sample size calculation. On the basis of 64.3% prevalence, 5% margin of error and 95% confidence

level, 353 sample size was calculated [13].

Moreover, written informed consent was obtained for the participation as well as for the blood sample collection. Medical and Dental students of MBBS and BDS, within the age group of 18-21 years were included in this study. Only the students of Dow University of Health Sciences (DUHS) were a part of the study. Individuals from other institutions and the students who did not meet the age criteria were excluded from the study.

Blood group of the participants was determined in the Physiology Lab of Dow University of Health Sciences through test tube method (forward grouping). Blood group of the participants was further confirmed by previous medical record.

Blood typing involves an antigen-antibody reaction between the antibodies present in serum and the antigens located on the erythrocyte membrane [16]. This reaction between the antigen and antibodies is indicated by the agglutination of blood cells. The process involves the following steps: Withdrawal of a blood sample from the participant and separating it into two vials. Blood sample in the first vial is mixed with Anti-A serum and the other with Anti-B serum. Agglutination reaction is observed in both the vials to determine the blood group. Once blood group is determined, anti D serum is added to a fresh sample of blood to determine whether it is RH positive or RH negative [17].

For the assessment of IQ, Stanford Binet intelligence scale was used. The version we used was a 50 questions-based test with a time limit of 12 minutes. The questions are formulated to gauge a person's intelligence based on 5 aspects: visual-spatial processing, quantitative reasoning, fluid reasoning, knowledge and working memory. The intelligence quotient is then enumerated using the total score [18].

STATISTICAL ANALYSIS

SPSS 21 is used to analyze the data collected. The socio-demographic details are executed using descriptive statistics. For continuous variables, mean and standard deviation is used and for categorical variables frequencies and percentages are used. Relationship between variables is determined using Chi square test and ANOVA. $P < 0.05$ will be regarded as significant.

RESULTS

Out of 353 students, 67 (18.98%) were male and 286 (81.01%) were female. 78 had blood group A (A positive=73 and A negative =05), 142 students had blood group B (B positive =134 and B negative=08), 28 had blood group AB (AB positive =26, AB negative =2) and 105 students had blood group O (O positive =100 and O negative =05). Age range of the students was 18-21 years. The highest percentage of students belonged to blood group B that is 40.2% (Table 1).

Table 1. Distribution of ABO Blood Groups and Comparison of Mean of Intelligence Quotient Range among the Study Participants.

Blood group	Total Number of students (Frequency)	Percentage (%)	IQ ^a Scores (Mean ±SD ^b)	p-value
A	78	22.1	17.83±7.3	0.819
B	142	40.2	17.67±6.63	
AB	28	7.9	18.64±6.67	
O	105	29.7	17.30±6.86	

p-value calculated by using One-way ANOVA test.

^aIQ: Intelligence quotient.

^bSD: Standard deviation.

Table 2. Distribution of ABO and Rh Blood Groups among Study Population and Comparison of Mean Intelligence Quotient Range among the Study Participants.

Blood group	Total Number of students (Frequency)	Percentage (%)	IQ ^a Scores (Mean ±SD ^b)	p-value
A+	73	20.7	17.29±6.92	0.162
A-	05	1.4	25.80±8.25	
B+	134	38	17.79±6.41	
B-	08	2.3	15.63±9.92	
AB+	26	7.4	18.35±6.80	
AB-	02	0.6	22.50±3.53	
O+	100	28.3	17.16±6.95	
O-	05	1.4	20.00±4.00	

p-value calculated by using One-way ANOVA test.

^aIQ: Intelligence quotient.

^bSD: Standard deviation.

Table 3. Comparison of IQ Scores in Males and Females of Study Population.

Gender	Total Number of students (Frequency)	Percentage (%)	IQ ^a Scores (Mean ±SD ^b)	p-value
Males	67	18.98	18.52±7.50	0.257
Females	286	81.01	17.47±6.65	

p-value calculated by using independent sample t-test.

^aIQ: Intelligence quotient.

^bSD: Standard deviation.

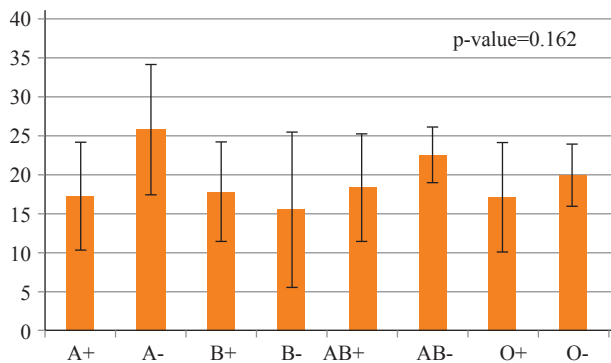


Fig. (1). Blood Group Wise Marks Distribution of IQ Scores.

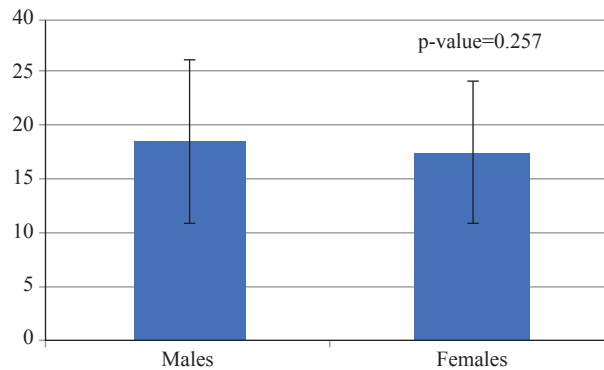


Fig. (2). Gender-specific Marks Distribution of IQ Scores.

Results shows that there is no difference in the IQ level in various ABO and Rh blood groups using Stanford Binet intelligence scale for IQ scoring. We found highest IQ Scores in blood group A negative (25.80 ± 8.25) with no statistical significance ($p=0.162$). (Table 2) (Fig. 1).

Gender-specific marks analysis show statistically no difference in the IQ scores since mean IQ score of the both gender shows insignificant p-value (Table 3) (Fig. 2).

DISCUSSION

Intelligence is the virtue that sets apart man from animal. Throughout history, humans have always prided themselves on the superiority of their intelligence and looked for ways through which they could maximize their intellectual capacity. The race for superior intelligence prompted the question: What makes one person smarter than the other? In this regard, several studies were conducted to determine whether the blood group of an individual has any influence on their cognitive capacity? However, different studies conducted in different geographical communities reported contrasting results which begs the possibility that an association between blood group and intelligence may be present only in some populations. Therefore, we conducted a cross-sectional study on medical and dental students of Karachi to look for a possible relationship between blood group and intelligence. Our findings suggest that there is no significant association between IQ scores and blood group.

This is similar to the results reported by a study conducted among the health science students in RMMCH, Annamalai University, Tamil Nadu which found no significant correlation between blood group and IQ scores [15]. In the same year in India, another study was done on first year medical students by Kumar Sarvottam and companions. They found that the percentage marks distribution was highest for blood group "O" and lowest for blood group "B", but concluded no significant association between blood group and IQ [19]. Another study conducted in Delhi in 2017 reported contrasting findings as blood group "A" had higher academic score in comparison with other blood groups, but despite the variation no significant association was found between blood group and academic performance ($p < 0.05$) [9]. However, in 2014 Dr. Mohamad Saleh Atoom conducted a similar research in Jordan using Otis- Lennon's test for mental ability. His study reported significant association between blood group and intelligence with higher IQ levels among individuals with blood group "AB" and lowest IQ scores in blood group "B" [13].

For the longest time in history, men were considered to be intellectually superior to women, bagging all the leadership roles in society. However, in modern times, ideas are chang-

ing and women are proving to be just as smart and capable as men. If we compare the IQ scores between male and female participants in our study, no gender-specific variations were found. This is consistent with the results reported by another study conducted in Nigeria which found no gender-based differences in academic performance [20]. Likewise, no significant gender difference was found in the study conducted in Jordan [13]. However, Dr. Kumar's study reported better academic performance among females as compared to males, with AB positive females scoring the highest marks. But the method of comparison was based on the marks achieved in 1st year professional MBBS examination rather than a standardized IQ test like we have employed in our study [19].

Our study has important implications in the field of education as it emphasizes that students cannot be intellectually differentiated based on their blood group nor their gender. The individual differences in intelligence depend on genetic and environmental variations but have no significant dependence on blood type or sex. Both male and female students, irrespective of their blood group, have similar intellectual capabilities and hence, similar educational needs. They should be provided with similar learning opportunities to ensure utilization of maximum intellectual potential.

Our research also opens up opportunities to further study the potential role and impact of blood group antigens in determining not only the intelligence of an individual, but also other aspects of human nature like their thinking, attitude, temperament and behavior. In our study, we have used the Stanford Binet IQ test for the assessment of intelligence, which is a more reliable tool than the mere comparison of marks or grades to evaluate the intelligence of an individual since factors like stress or personal tragedy can affect the academic performance of an individual. The student may face many ups and downs in the academic years altering his or her result in that respective year. This makes our study better grounded than other studies that have been conducted in the past using grades as a measure of intelligence. However, our study is limited to medical students of age group 18-21 years, so further studies are needed that focus on individuals of a more diverse age group and academic background. Furthermore, our study population consists of medical students belonging to Dow university of Health Sciences only, so in future, studies with larger sample size involving various universities can be done for better outcome.

Future studies on the same topic will help identify and understand the factors responsible for individual differences in intelligence and will open up ways for further improvement in educational field. Furthermore, similar studies should be done relating blood group with other aspects of human psyche which will provide a better scope in understanding human

nature and behavior.

CONCLUSION

Blood group and intelligence are highly heritable traits unique to each individual that do not have any significant association with each other. Moreover, there is no significant difference in the intelligence of males and females provided they are tested in a similar fashion. This has important implications in the field of education, as it shows that male and female students of different blood groups have similar cognitive capabilities and consequently, similar educational needs.

AUTHORS' CONTRIBUTION

Erum Afaq: Conceived, Designed, Manuscript writing and editing.

Marium Sajjad: Data collection and Statistical analysis.

Navaira Shoab: Data collection, Review and Editing of manuscript.

Naveen Azhar, Arooma Shaukat Siddiqui and Ayesha Hussain: Data collection.

Asif Iqbal Khan: Proofread.

CONFLICT OF INTEREST

Declared none.

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