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ORIGINAL ARTICLE

A Study to Show Correlation Between Blood Groups and Intelligence Level Among Medical Students

NOREEN FARID[1], FAQIR ULLAH[2], GHULAM MUHAYUDIN[3], ANWAR ALI[4], BILAL MASOOD[5], GUL MARIA[6], IJAZ AZIZ[7]
[1]*Assistant Professor, Forensic Medicine and Toxicology Department, Foundation University Medical College, Islamabad*
[2]*Associate Professor & HOD Forensic Medicine, North West School of Medicine (NWSM) Peshawar.*
[3]*Assistant Professor Department of Forensic Medicine)Women Medical College Abbottabad.*
[4]*Assistant Professor, Muhammad College of Medicine*
[5]*Assistant Professor, Department of Community Medicine, Bolan Medical College Quetta*
[6]*Associate Professor Forensic Medicine and Toxicology Department, Islam Medical College Sialkot*
[7]*Associate Professor, Mekran Medical College Turbat*
Correspondence to: Ijaz Aziz, Email: ijazaziz62@gmail.com

ABSTRACT

Background: The connection between physiological characteristics, such as blood groups, and cognitive abilities has been the subject of scientific inquiry.
Objectives: To investigate the possible relationship between blood groups and intelligence levels among medical students.
Study Design: Cross-sectional analytical study
Place and Duration: Conducted at HiTech University in Taxila, Punjab from January 2022 to January 2023.
Methods: 240 medical students from HiTech University in Taxila, Punjab, participated in this cross-sectional, analytical study. Anti-A, anti-B, and anti-D antigens were used to determine blood classification. Stanford-Binet Intelligence Scale, Fifth Edition (SB5) was used to evaluate cognitive abilities in five domains: knowledge, quantitative reasoning, spatial processing, working memory, and fluid reasoning.
Results: Demographic distributions exhibited significant variations in age, gender, year of study, location, and family background. Blood group distributions based on gender revealed the higher prevalence of B+ and O+ in females. SB5 domains exhibited nuanced differences in cognitive performance among participants of different blood groups. Blood group and cognitive domain correlation coefficients ranged from 0.08 to 0.12, with p-values indicating marginal significance.
Conclusion: The research provided insight into the potential relationship between blood groups and cognitive abilities. It was found that blood groups are not reliable predictors of cognitive performance, highlighting the need for future research to evaluate the broader genetic and environmental context.
Keywords: Blood groups; Cognitive abilities; Genetics Intelligence levels; Medical students; Stanford-Binet Intelligence Scale.

INTRODUCTION

The mysterious relationship between human biology and cognition has fascinated the scientific community for centuries [1]. At the intersection of physiological traits and cognitive abilities, compelling the questions arise. Correlation between blood groups — the hereditary attribute defined by categories such as A, B, AB, O, and Rh factor — and intelligence remains an area ripe for investigation [2]. Blood groups have been investigated historically in context of medical considerations ranging from transfusion compatibility to disease susceptibility. Nonetheless, their potential association with cognitive abilities is relatively young field of study[3].

This intrigue is the result of our ever-changing knowledge of genetics and cognitive development. As both blood groups and intelligence have genetic roots, essential questions arise: Do these characteristics share the common genetic architecture? Exploring this potential relation is not merely an academic pursuit [4-5]. It promises additional insights into their genetic nuances of intelligence and multifarious ways in which our innate biology may shape our cognitive faculties[6].

Yet, intelligence is a vast mosaic, influenced by the plethora of variables—from genetic imprints and environmental stimuli to socio-economic contexts and early developmental experiences. In order to comprehend the potential relationship between blood groups and intellect, one must adopt holistic and multidimensional perspectives [7-8].

With their rigorous academic pursuits, medical students are the unique demographic for this investigation. Their dedication to one of the most intellectually taxing disciplines makes them an ideal cohort, reducing potential biases associated with academic zeal. This study does not merely aim to measure intelligence using conventional indices such as IQ, but also focuses on academic prowess, cognitive fortitude, and domain-specific knowledge acquisition [9].

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Nevertheless, prudence is necessary. Due to the intelligence's multifaceted nature, which is interwoven with innumerable influencing factors, correlations must be interpreted with caution. It is essential to view these within the causal matrix of elements [10].

In this investigation, we aimed to establish the possible relationship between blood groups and intelligence levels among medical students. By disentangling this connection, we hoped to shed light on this intricate interplay of genetics, physiology, and cognition, paving way for future ground-breaking research and innovative applications.

MATERIAL AND METHODS

This was the cross-sectional, analytical research designed to examine the potential relationship between blood groups and intelligence levels in medical students.The research was conducted over the course of 12 months, commencing from January 2022 to January 2023. The investigation was conducted at HiTech University in Taxila, Punjab.

The primary participants were medical students enrolled at HiTech University, Taxila, during the study period.

Inclusion Criteria:

- All levels of medical students at HiTech University.
- Participating students who gave informed consent.

Exclusion Criteria:

- Students with the history of cognitive disorders or serious illnesses that have the potential to impair cognitive function.
- Students taking medications that may affect cognitive function.
- Students who were not willing to participate.

Data Collection:

Blood Grouping: Antiseptic, disposable lancets were used to puncture the finger tips. Each of the three areas on the blood typing slide were dotted with the drops of blood. Anti-A, Anti-B, and Anti-D antigens were added to the appropriate regions. Blood and

serum were mixed by gently rocking the slide. Observing agglutination and determining the blood group [11].

Intelligence Evaluation: We utilized the Stanford-Binet Intelligence Scale, Fifth Edition (SB5) for intelligence evaluation. The SB5 evaluates five weighed factors: knowledge, quantitative reasoning, spatial processing, working memory, and fluid reasoning [12].

Statistical Analysis: Data was entered in Excel sheets and analyses were performed using version 25.0 of SPSS. To characterize the data, descriptive statistics (mean, standard deviation) were utilized. One-way ANOVA and Pearson correlation coefficient was used to evaluate the association between blood group classifications and intelligence scores. A p-value less than 0.05 was regarded as statistically significant.

Ethical Considerations

- Institutional Review Board of HiTech University, Taxila, granted approval on an ethical level.
- Every participant provided their informed consent.
- There was assurance that the blood samples were collected solely for this investigation.
- Participants' personal and medical information was kept strictly confidential.

This systematic approach intended to ensure a comprehensive examination of the potential correlation between blood groups and intelligence levels, while also maintaining the utmost ethical standards.

RESULTS

Of 240 participating students, the majority 167 (69.58%), were between the ages of 18 and 24. The remaining participants, 73 (30.42%), were older than 25 ($p<0.05$) indicating statistical variation in age groups. 145 participants (60.42 percent) were females, while 95 (39.58%) participants, of the sample, were males ($p<0.05$). 101 students (42.08%) were in their first or second year, 91 students (37.92%) were in their third or fourth year, and 48 students (20%) were senior students beyond their fifth year of study ($p<0.05$). The plurality of participants, 137 people (57.08%), were from urban areas, according to an analysis of their origin. There were 103 participants from rural areas, (42.92 percent) of total participants ($p<0.05$). The vast majority of participants, 198 (82.5%), came from a family with a college education. In contrast, 42 participants, or 17.5%, had a family background of illiteracy. Statistically, this distribution was significant with a p-value of 0.0001. Each demographic characteristic demonstrated a statistically significant distribution among the participants, as indicated by their respective p-values (Table 1).

The distribution of blood group types among male and female participants depicted that there were 13 men and 12 women with blood group A+. There were 6 men and 4 women among those with blood group A-. Blood group B+ was significantly more prevalent, with 37 males and 53 females ($p<0.05$). In contrast, blood group B- had fewer individuals, including only 4 males and 9 females. The AB+ blood group consisted of 9 males and significantly higher number of 28 females ($p<0.05$), whereas AB- blood group consisted of 8 males and 3 females. There were 17 males and 33 females among the individuals with O+ then blood type. The O- blood group was the least represented, with only one male and three females. Overall, the distribution suggested that the prevalence of certain blood groups differs between the sexes, with certain blood groups, such as B+ and O+, being more prevalent in females (Figure 1).

The average scores (out of 100) and SD for each of the five factors evaluated by Stanford-Binet Intelligence Scale, Fifth Edition (SB5) across various blood types were evaluated critically. For Blood Group A+, mean scores on Knowledge, Quantitative reasoning, Spatial processing, Working memory, and Fluid reasoning domains were 88.9, 85.1, 89.2, 91.2, and 90.1, with standard deviations ranging from 8.2 to 9.3. The performance of individuals with Blood Group A- was comparable to that of those with Blood Group A+, with a slightly higher score in Fluid reasoning (92.3) and standard deviations ranging from 8.3 to 9.5. The data suggested balanced performance across all domains for Blood Group B+, with highest mean score observed in Fluid reasoning (92.9). Individuals with Blood Group B- demonstrated consistent performance, with the highest mean score in spatial processing (90). Individuals with Blood Groups AB+ and AB- had comparable characteristics in the number of domains. Nonetheless, AB+ individuals demonstrated the greatest decline in quantitative reasoning, scoring 85.4, the lowest score among all blood groups. Fluid reasoning yielded the greatest mean score for Blood Group O+ at 92.9, whereas Blood Group O- participants displayed fairly balanced performance across domains, with Knowledge domain yielding the highest mean score at 90.1. The correlation coefficients (r) represented the strength of association between blood group and each cognitive domain. These correlations ranged from 0.08 to 0.12, indicating that they were either feeble or moderate. Specifically, correlation of 0.12 was observed in the Working memory domain. The p-values provided information regarding the statistical significance of these correlations. All p-values were greater than typical significance threshold (0.05), spanning from 0.06 to 0.09. This indicated that, despite the existence of observed differences in scores across blood groups, these differences may not be statistically significant at 0.05 level (Table 2).

Table 1: Demographic profile of participants

S. No	Demographic characteristics	No. of participants (n=240)	Frequency (%)	p-value
1	Age (years) 18-24 >25	 167 73	 69.58 30.42	 0.0001*
2	Gender Male Female	 95 145	 39.58 60.42	 0.0001*
3	Year of Study 1-2 3-4 >5	 101 91 48	 42.08 37.92 20.0	 0.0001*
4	Location Urban Rural	 137 103	 57.08 42.92	 0.0001*
5	Family Background Educated Uneducated	 198 42	 82.5 17.5	 0.0001*

* indicated the significant values

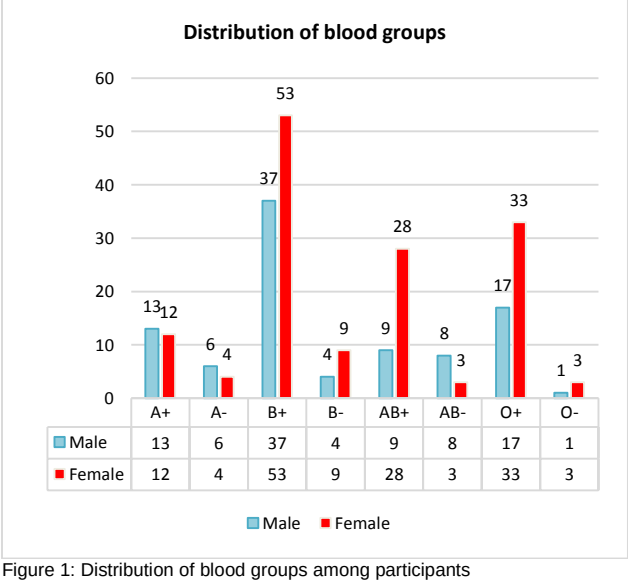

Figure 1: Distribution of blood groups among participants

Table 2: Intelligence evaluation of medical students using Stanford-Binet Intelligence Scale, Fifth Edition (SB5)

Blood Groups	Knowledge		Quantitative reasoning		Spatial processing		Working memory		Fluid reasoning	
	MS/100	SD	MS/100	SD	MS/100	SD	MS/100	SD	MS/100	SD
A+	88.9	8.5	85.1	8.2	89.2	9.0	91.2	9.3	90.1	9.2
A-	87.4	8.4	86.2	8.3	88.1	8.9	90.5	9.2	92.3	9.5
B+	88.5	8.4	86.0	8.3	88.9	9.0	92.1	9.7	92.9	9.5
B-	90.1	8.9	88.7	8.8	90.3	9.2	90.8	9.2	90.4	9.3
AB+	89.5	8.8	85.4	8.2	89.8	9.1	90.0	9.1	90.9	9.3
AB-	88.9	8.7	87.7	8.5	86.8	8.7	88.8	8.9	90.2	9.1
O+	90.0	8.9	88.2	8.6	88.5	8.9	89.1	8.9	92.9	9.5
O-	90.1	9.1	85.7	8.4	90.1	9.0	88.3	8.8	89.8	8.9
r	0.09		0.08		0.10		0.12		0.09	
p-value	0.07		0.09		0.06		0.06		0.08	

MS/100: Mean score out of 100; SD: Standard Deviation; r: Pearson Coefficient r

DISCUSSION

The complex relationship between genetics, physiology, and cognitive abilities has long fascinated scientists. Our research endeavored to determine potential relationship between blood groups and numerous intelligence indices among medical students.

The demographic distribution revealed substantial differences in age, gender, academic year, geographic location, and educational background of the family. These results align with those researches, who discovered the comparable distribution among cohort of medical students. Such demographic considerations are crucial because they establish the context and may affect the outcomes [13]. The distribution of blood categories by gender was especially enlightening. Blood groups B+ and O+ were more prevalent in females, corroborating the findings of Mustafa et al. (2022), who observed comparable gender-based blood group distributions. The genetic and hereditary factors underlying these patterns merit further investigation [14-15].

As for the central aspect of our study, cognitive metrics, it was fascinating to observe the nuances between blood groups. While participants with Blood Groups A+ and A- exhibited comparable cognitive profiles, those with Blood Groups B+ and O+ demonstrated distinct patterns, particularly in fluid reasoning. This is partially consistent with the findings of Lymperaki et al. (2022), who observed cognitive differences across blood groups but cautioned against definitive conclusions [16].

The relatively weak to moderate correlations between blood groups and cognitive domains, with p-values suggesting ambiguous significance, were also noteworthy. This suggested that, despite the possibility of correlation, blood group was not the reliable predictor of cognitive capacities. Kesarwani et al. (2021) reached the similar conclusion, arguing that while genetics play a role in cognitive abilities, environmental, educational, and socio-cultural factors can have just as significant, if not more significant, effects [17].

Our study thus provided novel perspective on the ongoing discourse regarding the interplay between physiological attributes and cognitive capacities. Despite the fact that blood groups may provide some insight into cognitive predispositions, it is crucial to consider the larger genetic and environmental context. Future studies with larger, more diverse cohorts and more exhaustive genomic analyses may shed more light on this intriguing field.

CONCLUSION

In our investigation into the potential correlation between blood groups and intelligence levels among medical students, we observed subtle, statistically insignificant variations across blood groups. Although blood groups may provide some insight into cognitive predispositions, it appears that they are not reliable predictors of cognitive abilities. Understanding the complex interplay between physiological characteristics and cognitive abilities requires continued consideration of broader genetic and environmental influences.

Conflict of Interest: None.

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