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Evaluation of Correlation of Blood Type, Gender, Age and BMI on Cognitive Ability of 125 top 10 Undergraduated Students

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ABSTRACT

Introduction: Cognitive abilities have been the focus of behavior investigations for decades. Cognitive impairment share many common risk factors, such as hypertension, elevated cholesterol, hyperglycemia, and obesity are all associated with longitudinal declines in cognitive function and dementia. We investigated correlation of blood type, age, gender and BMI on cognitive abilities of 125 top 10 undergraduated medical students.

Objective: This study aimed to determine and evaluate the correlation of blood type, age, gender and BMI on cognitive abilities of 125 top 10 undergraduated medical students in Ahmad Shah Abdali Higher Education Institute of Khost province of Afghanistan.

Method and Materials: It is prospective descriptive cross sectional study, on 125 top 10 undergraduated medical students in Ahmad Shah Abdali Higher Education Institute of Khost province from 2019/ Nov / 07 to 2020/ Apr / 06. The including parameters were blood type, age, gender, BMI of all 125 participants under study that recorded in computer special format. Blood type and BMI are done by special regents and scale. Recorded findings processing, comparison and evaluation results have been identified by IBM SPSS-25 version.

Results: The study was conducted during (5) month on 125 top 10 undergraduated medical students in Ahmad shah Abdali Higher Education Institute of Khost province. Initially we described all participants according to gender and age. At the current study the female participants were 71 (56.8) and male were 54 (43.2), with (mean age: 21.27 ± 2.38; range: 17-29 years). All participants of this study were from all classes (1st, 2nd, 3rd, 4th and 5th) and each main class has two or more subclasses. Statistic description of all participants, according to blood type shows that (B+) blood type was more prevalent 38 (30.4) among the whole participants, and in the second grade was (O+) blood type 28 (22.4). For comparison we divided all participants into two groups, high cognitive group according to roll number (from 1 to 5, roll number one is the best learned and intelligent student in the class and this grade is gradually decreased up to roll number 10th) and low cognitive group according to roll number (from 6 to 10). In the high cognitive group included 64 students. Statistic description of the high cognitive group shows that number of female 36 (56.3) participants is more prevalent than male 28 (43.8) participants. The (B+) blood type participants are more prevalent 25 (39.1) inside this group, and the (O+) blood type 14 (21.9) is in the second grade. Mean age: 21.18 ± 2.20; range: 17-28 years. Mean BMI; 22.84± 3.43, range: 16.48-31.14. In the low cognitive group included 61 students. Statistic description of the low cognitive group shows that prevalent of female 35 (57.4) higher than male 26 (42.6). The prevalent of (A+) blood type participants were highest 16 (26.2) inside this group, and the (O+) blood type 14 (23.0) is in the second grade. Mean age: 21.36 ± 2.57; range: 17-29 years. Mean BMI; 23.11± 3.31, range: 16.42-30.10. For comparison between high and low groups we detected following findings. The number of female in high cognitive group was more prevalent 36 (28.8) than female in low cognitive group 35 (26.85), (P<1.00). The (B+) blood type was more prevalent in high cognitive group 25 (20.0), and the second grade (O+) blood type 14 (11.2) and the third grade (A+) blood type are gradually decreased, but in comparison to the blood type in low cognitive group (A+) blood type is more prevalent 16 (12.28) than the others, and the second grade was (O+) blood type 14 (10.74), (P<0.390). Mean average and age range are in the high group: 21.18 ± 2.20; range: 17-28 years, but in low group mean average and age range: 21.3607 ± 2.57; range: 17-29 years. Mean average and BMI range in the high group is; 22.84 ± 3.43, range: 16.48-31.14, but in low group are 23.11 ± 3.31, range: 16.42-30.10, (P<0.735).

Conclusion: Overall, findings of our study indicated that, age, gender, blood type and BMI have no significant

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correlation with cognitive ability of undergraduated students. However, this issue needs to further investigations in socialeconomical, cultural, political, genetics, environment and geographical areas to confirm these findings.

Keywords- Cognitive ability, Age, Gender, Blood type, BMI, Khost.

I. INTRODUCTION

Previous studies have shown that gender plays a decisive role in the academic performance of students enrolled in undergraduate accounting programs, as well as other factors affect male and female academic performance differently. This article examines factors that influence student academic performance based on gender, specifically in the Accounting field, and compares them through a consistent and robust estimator for models with censored data using the Tobit technique and Tobit-Blinder-Oaxaca decomposition on a sample of 3,219 students enrolled at the Autonomous University of Barcelona. The article contributes to current literature by specifically examining and comparing the factors that impact academic performance of male and female accounting students, whereas prior studies focused on determining whether or not gender impacts overall academic performance.[2]

Blood group classification yield four different phenotypes, Type O, Type A, Type B and Type AB. Type O is characterized by the absence of both of the antigen modifications, while the other phenotypes have combinations that include at least one of the modified forms. This variation in phenotypes influences plasma levels of a glycoprotein called von Willebrand factor. Importantly, people with the Type O blood phenotype have 25-30% less of this coagulation factor compared to non-O individuals. This has clinical relevance because plasma levels of von Willebrand factor are mildly predictive of coronary artery disease in the general public, and substantially predictive of outcome in already identified vascular disease patients. Indeed, this difference in levels of a coagulation factor may be why Type O individuals, compared to non-O individuals, are at reduced risk for a wide range of cardiovascular illnesses. For example, it is suggested as the reason why Type O individuals are at reduced risk of coronary artery disease and myocardial infarction and peripheral artery disease. One longitudinal cohort study found that 8.9% of all mortality due to cardiovascular disease was attributable to non-O blood phenotypes. The human brain requires a substantial and continuous flow of oxygenated blood, consuming about 20% of the body's oxygen supply despite only being about 2% of the total body mass. It could, therefore, be assumed that neurological health would also be associated with individual variation in blood physiology, such as ABO groups. There is evidence that being Type O is protective of the development of ischemic stroke. A recent study showed that adults over age 45 with Type AB blood were at increased risk of cognitive decline when compared to individuals with Type O blood In addition, older people with Type O blood seem to develop less postoperative cognitive dysfunction following surgery. This suggests that being Type O may be a protective factor in the development of dementia. Furthermore, there is evidence that psychiatric disorders are related to Type AB blood, with a trend to Type O being a protective factor. Overall, the results seem to suggest better clinical-neurocognitive prognosis in individuals with Type O blood compared to other phenotypes. In addition, there is evidence for structural brain differences between individuals with Type O and non-O blood. On structural magnetic resonance imaging (MRI), Type O individuals, compared to non-O individuals, have larger volumes in areas of the posterior ventral cerebellum and anterior temporal lobes bilaterally, and larger regions of the left hippocampus and right uncus. The reasons for these structural differences are not known. It is possible that they are related to the availability of von Willebrand factor and its impact on circulation. Alternately, the antigens of the ABO blood group system are not only found on red blood cells, but also on some neurons and this could potentially influence the brain directly. Given the associations of blood group, specifically. Type O, being protective of cognitive impairment and associated with brain structure, it might be expected that there are associations between Type O blood phenotype and better cognitive function in healthy samples. However, evidence either way for this is sparse. In one large study comparing ABO phenotypes, as well as several other blood classification systems, it was suggested that increasing homozygosity (such as Type O) is associated with better verbal and spatial test performance, but not with speed of processing of memory tests. However, the authors stress that effect sizes are very small and of doubtful practical significance. A study in the UK suggested a link between intelligence test scores and blood phenotype, with higher scores observed in people with a subtype of the A phenotype, A_2, and the O phenotype, when compared to individuals with the A_1 phenotype. However, the results of the research have not been replicated, and have generally been discounted due to research weaknesses which confound interpretation. In particular, socioeconomic status was not considered. This is important because blood group phenotype has possible ethnic and socioeconomic correlates. Some studies have revealed no link between socioeconomic

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status and blood type, such as one in Ireland. However, the current research was conducted in South America, where this is unlikely to be the case. This is because, before the arrival of conquistadors in the early 16th century, the indigenous population appear to have been almost completely of the Type O phenotype. This is known from genetic analysis of pre-Columbian human skeletal and mummified remains. In contrast, the European colonists had much greater variance, including the A and B alleles. To this day, native populations in the Americas have a high rate of O phenotype compared to most other groups worldwide. Native populations in Latin America also suffer greater socioeconomic hardship compared to those with colonial heritage, including mestizos, i.e. those with mixed Native American and European ancestry. Therefore, it is anticipated that samples from Ecuador, ABO blood group phenotype will be associated with socioeconomic status and that could obscure relationships between blood phenotype and cognitive ability, as socioeconomic status is consistently found to be linked to cognitive ability. In the current research, human blood group phenotypes, either Type O or non-O (i.e. A, B, or AB) are associated with cognitive functioning. Although there is evidence for the influence of blood group on neurological health and structure, there is no clear evidence for effects on cognitive function, nor for which cognitive functions might be implicated.[3-6]

There is a grading understanding that cardiovascular disease (CVD) and cognitive impairment share many common risk factors. Hypertension, elevated cholesterol, hyperglycemia and obesity are all associated with longitudinal declines in cognitive function and dementia. Higher levels of the hemostatic markers von Willebrand factor (vWF), coagulation factor VIII (FVIII) and D-dimer have also been related to risk of cognitive impairment and dementia. ABO blood group is associated with many forms of CVD, including coronary heart disease (CHD), stroke, and venous thromboembolism. In general, individuals with blood group O have a reduced risk of CVD. Non-O blood types are associated with higher levels of vWF and FVIII, procoagulant proteins that circulate as a complex in blood, because the ABO antigen affects clearance of vWF. Levels of both vWF and FVIII are associated with thrombosis and were recently linked to dementia risk. A recent report demonstrating an association between blood type AB and stroke risk found that 60% of that association was mediated by differences in FVIII level. Although ABO blood group is a CVD risk factor, we are not aware of studies on its relationship with cognitive impairment.[7-8]

Academic professionals today are faced with classrooms students who come to them with varying levels of individual background. Some are active, self-directed learners who know how to learn and are able to apply what they know in various learning situations. Others maybe average students who work hard, but don't have an awareness of their learning strengths and weaknesses. Cognitive abilities have been the focus of behavior investigations for decades, and are defined as processes in the mind that produce thought- and goal-directed action. Cognitive abilities are influenced by various factors, which include genetics, environment, and economy. It has been reported that genetic influences affect cognition, and this hereditability of cognitive ability increases from childhood to adulthood. Economic conditions at birth also play an influence on cognitive functioning later in life in various domains. Economic recessions negatively influence numeracy, verbal fluency, recall abilities, as well as scores on the omnibus cognitive indicator. Several measures have been developed to assess cognitive functioning.[9-13]

The findings from earlier studies thus indicate that it is reasonable to expect that obesity impacts student's academic performance negatively, especially for adolescents. However, the results from previous studies are based on small sized samples and focused more on children and therefore, the inferences drawn by these studies may not be applicable to adolescents. Thus there is a need to conduct empirical studies to further examine the issue of obese and academic performance, as obesity among adolescents has become too visible to be ignored. Students, who are adapted to this competitive educational pattern from childhood, work hard with a great devotion and dedication to achieve higher education in universities. So many children were there childhood because of chasing after this dream and it is a tragedy in Sri Lanka now. The use of BMI on the students was relevant as they have all the characteristics needed for its use which included homogeneity in environment, Food, Racial disposition and daily physical engagement.[14-15]

II. OBJECTIVE

This study aimed to determine and evaluate the correlation of blood type, age, gender and BMI factors on cognitive abilities of top 10 undergraduated medical students in Ahmad shah Abdali Higher Education Institute of Khost province of Afghanistan.

III. METHOD AND MATERIALS

It is prospective descriptive cross sectional research, on 125 top 10 undergraduated medical students in Ahmad shah Abdali Higher Education Institute of Khost province from 2019/ Nov/ 07 to 2020/Apr/06. The blood type, age, gender, and BMI parameters of all 125 participants under study recorded in computer special format. Blood types were founded by special regents (anti-A, anti-B and anti-O) that were made in France. The BMI was calculated by special formula (Weight (kg)/height $(m)^2$). Recorded remarks processing, comparison and evaluation results have been identified by IBM SPSS-25 version.

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IV. RESULTS

The study was conducted on 125 top10 undergraduated medical students including 54 males and 71 females (mean age: 21.27 ± 2.38; range: 17-29 years). The correlation of blood type, age, gender and BMI on cognitive abilities of top 10 undergraduated medical students are described in the following tables.

Table 1: Descriptive statistics of all participants' students, according to gender and age range

N=of under study students	Gender		Age range (Year)			
	Male%	Female%	Minimum	Maximum	Mean	Std. Deviation
125	54 (43.2)	71 (56.8)	17	29	21.27	2.384
Total	125 (100%)		125 (100%)			

Table 2: Descriptive statistics of all participants' students, according to the education classes

Class	Frequency	Percent	Valid Percent	Cumulative Percent
"First"	34	27.2	27.2	27.2
"Second"	29	23.2	23.2	50.4
"Third"	27	21.6	21.6	72.0
"Forth"	27	21.6	21.6	93.6
"Fifth"	8	6.4	6.4	100.0
Total	125	100.0	100.0	

Table 3: Descriptive statistics of all participants' students, according to the roll number from (1 to 10)

Roll number	Frequency	Percent	Valid Percent	Cumulative Percent
1	14	11.2	11.2	11.2
2	13	10.4	10.4	21.6
3	13	10.4	10.4	32.0
4	11	8.8	8.8	40.8
5	13	10.4	10.4	51.2
6	11	8.8	8.8	60.0
7	13	10.4	10.4	70.4
8	13	10.4	10.4	80.8
9	11	8.8	8.8	89.6
10	13	10.4	10.4	100.0
Total	125	100.0	100.0	

Table 4: Descriptive statistics of all participants, according to blood type

Blood type	Frequency	Percent	Valid Percent	Cumulative Percent
A-	2	1.6	1.6	1.6
A+	26	20.8	20.8	22.4
AB-	2	1.6	1.6	24.0
AB+	17	13.6	13.6	37.6
B-	6	4.8	4.8	42.4
B+	38	30.4	30.4	72.8
O-	6	4.8	4.8	77.6
O+	28	22.4	22.4	100.0
Total	125	100.0	100.0	

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Table 5: Descriptive statistics of high cognitive group according to roll number (from 1 to 5)

Category	N. Of students	Gender %		Blood type %							
		Male	Female	A+	A-	B+	B-	AB+	AB-	O+	O-
High group	64	28(43.8)	36(56.3)	10(15.6)	0(0)	25(39.1)	3(4.7)	7(10.9)	1(1.6)	14(21.9)	4(6.3)
Total		64(100.0)		64(100)							
				Age range							
High group	64	28(43.8)	36(56.3)	Minimum	Maximum		Mean			Std. Deviation	
				17.00	28.00		21.1875			2.20299	
Total		64(100.0)		64(100)							
				BMI range							
High group	64	28(43.8)	36(56.3)	Minimum	Maximum		Mean			Std. Deviation	
				16.48	31.14		22.8428			3.43215	
Total		64(100.0)		64(100)							

Table 6: Descriptive statistics of low cognitive group according to roll number (from 6 to 10)

Category	N. Of students	Gender %		Blood type %							
		Male	Female	A+	A-	B+	B-	AB+	AB-	O+	O-
Low group	61	26(42.6)	35(57.4)	16(26.2)	2(3.3)	13(21.3)	3(4.9)	10(16.4)	1(1.6)	14(23.0)	2(3.3)
Total		61(100.0)		61(100)							
				Age range							
Low group	61	26(42.6)	35(57.4)	Minimum	Maximum		Mean			Std. Deviation	
				17.00	29.00		21.3607			2.57574	
Total		61(100.0)		61(100)							
				BMI* range							
Low group	61	26(42.6)	35(57.4)	Minimum	Maximum		Mean			Std. Deviation	
				16.42	30.10		23.1111			3.31910	
Total		61(100.0)		61(100)							

* *BMI = Body mass index*

Table 7: Comparative statistic finding between the high and low cognitive groups

Category	N. Of students	Gender		P-Value	Blood type		P-Value	Mean average of age	P-Value	Mean average of BMI	P-Value
		Male	Female		B+ O+ A+	A+ O+ B+					
High	64(51.2)	28(22.4))	36(28.8)	P<1.00	25(20.0) 14(11.2) 10(8.0)	-	P<0.390	21.18	P<0.690	22.84	P<0.735
Low	61(46.8)	26(19.94)	35(26.85)		-	16(12.28) 14(10.74) 13(10.0)		21.36		23.11	
Total	125(100)	54(43.2)	71(56.8)		49(39.2)	43(33.02)					
		125(100)			92(72.22)						

V. DISCUSSION

This prospective descriptive cross sectional study is conducted during (5) months on 125 top 10 undergraduated medical students in Ahmad shah Abdali Higher Education Institute of Khost province of Afghanistan. The basic aims of this study were to declare and evaluate the correlation of age, gender, blood type and BMI on cognitive ability among the top 10 ungraduated medical students. Our study results

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indicated that, age, gender, blood type and BMI factors has no significant impact on cognitive ability of undergraduated students, therefor, this issue needs to further investigations in socialeconomical, cultural, political, genetics, environment and geographical areas to confirm these findings. Statistic description shows that male participants 54(43.2), female 71(56.8) with (mean age: 21.27 ± 2.38; range: 17-29 years) are included in this study. Statistic description of all participants, according to blood type shows that (B+) blood type was more prevalent 38(30.4), but in the second grade was (O+) blood type 28(22.4). For comparison we divided all participants into two groups, high cognitive group according to roll number (from 1 to 5) and low cognitive group according to roll number (from 6 to 10). In the high cognitive group included 64 students. Statistic description of the high cognitive group shows that more prevalent of female 36(56.3) than male 28(43.8). More prevalent was (B+) blood type 25(39.1) but in the second grade was (O+) blood type 14(21.9). Mean age: 21.18 ± 2.20; range: 17-28 years. Mean BMI; 22.84± 3.43, range: 16.48-31.14. In the low cognitive group included 61 students. Statistic description of the low cognitive group shows that more prevalent of female 35(57.4) than male 26(42.6). More prevalent was (A+) blood type 16(26.2), but in the second grade was (O+) blood type 14(23.0). Mean age: 21.3607 ± 2.57; range: 17-29 years. Mean BMI; 23.11± 3.31, range: 16.42-30.10. From comparison between high and low cognitive groups we detected following findings. In high cognitive group the more prevalent was female 36 (28.8) and also in low cognitive group the more prevalent was female 35 (26.85). The (B+) blood type was the more prevalent 25(20.0), and the second grade was (O+) blood type 14 (11.2) and the third grade was (A+) blood type are gradually decreased, but in comparison of the blood type in low cognitive group the (A+) blood type was more prevalent 16 (12.28), and the second grade was (O+) blood type 14(10.74) that was equal to the high cognitive group, finally, the third grade was (B+) blood type 13(10.0) was lower than the high cognitive group . It is also not significant $P<0.390$. Mean average of age and range in the high cognitive group were: 21.18 ± 2.20; range: 17-28 years, but in low cognitive group the mean average of age and range were: 21.3607 ± 2.57; range: 17-29 years. Mean average of BMI and BMI range in the high cognitive group were; 22.84 ± 3.43, range: 16.48-31.14, but in low cognitive group were 23.11 ± 3.31, range: 16.42-30.10, it is not significant $P<0.735$. Frequency and percentage were described in the total participants.

In India recent study of correlation between body mass index and cognitive performance of undergraduate medical students estimated that there was significant negative correlation between BMI and cognitive function score in overweight and obese category ($P < 0.05$). Proportion of study subjects with cognitive function score <26 was significantly more in overweight and obese group in comparison with BMI group within normal limit ($P < 0.01$). Study conclude that the elevated BMI is associated with decreased cognitive function even in very healthy individuals also. This is an indication of the implementation of public health measures to maintain appropriate lifestyle so as to maintain normal BMI.[1]

In India recent study has been conducted on Blood group and gender-wise comparison of big five models of personality among medical students. Study estimated that there were no significant differences of personality scores of the big five personality factors among students of different blood groups. Females had a higher score than male participants in agreeableness ($P = 0.002$). Scores of other personality factors were comparable in both groups. Study concludes that blood group-wise differences in personality factors may not be observed in medical students, but females may be more agreeable than male students.[4]

In Ghana study about association of ABO blood group and body mass index: A cross-sectional study from a Ghanaian population estimated that blood group O was the most prevalent (51.2%), while Rhesus-positive individuals constituted 90.3%. 6.3% of the participants were obese, while 18.7% were overweight. ere was significant ($p = 0.006$) higher prevalence of obesity in females (10.3%) than in males (3.4%). Study did not observe any significant difference by association of ABO blood group with gender ($p = 0.973$), BMI ($p = 0.307$), or Rhesus status ($p = 0.723$). Regarding gender ($p = 0.400$) and BMI ($p = 0.197$), no statistically significant difference was observed between Rhesus blood groups. Prevalence of overweight, obesity, blood type O, and rhesus positive observed among students in this study is largely similar to what has been reported in published studies in Ghana and from other countries. Overweight and obesity were not associated with ABO blood groups or Rhesus in this study.[12]

In Sri Lanka recent study about Height, Weight, Body Mass Index (BMI) and Academic Performance (AP) of University Students in Sri Lanka: With Special Reference to the University of Kelaniya estimated that the analysis of the data showed that BMI level and GPA of the Sample. 75 students were underweight (16.7%), 348 has normal weight (77.5%), 26 overweight (5.8)%. On academic performance,69 students were in 1st class (15.4%) 254 in 2nd class upper (56.6%), 107 in 2nd class lower(23.8%), and 19 had pass (4.2%).The result also showed that there are significant difference in the BMI and AP of the students as the calculated chi square value of 29.06 was significant as P.00 < .05 at 6 degree of freedom. Also, the result revealed that there are significant difference in the students as the calculated Cramer's V value of .180 was significant as P.00 < .05 at 6 degree of freedom.[15]

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VI. CONCLUSION

Overall, findings of our study indicated that, age, gender, blood type and BMI have no significant correlation with cognitive ability of undergraduated students. However, this issue needs to further investigations in socialeconomical, cultural, political, genetics, environment and geographical areas to confirm these findings.

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