



ORIGINAL RESEARCH PAPER

Physiology

ASSOCIATION BETWEEN ABO BLOOD GROUP AND OBESITY IN MEDICAL STUDENTS

KEY WORDS: ABO blood group, Body Mass Index (BMI), Waist hip ratio

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ABSTRACT

Background — Over the past years, there seems to have been good attention paid to the connection between some diseases and the ABO blood group type. To our knowledge, no study has been done to determine the association between obesity and ABO blood group. **Aims** — To find the prevalence of obesity in medical students and to determine the association between obesity and ABO blood group. **Materials and methods** — A cross sectional study was carried out among 745 medical students. Height, weight, waist circumference, hip circumference was measured. BMI and waist-hip ratio was determined. Blood group was determined by slide agglutination method. **Results** — The findings of the present study reported that the most prevalent blood group was B+ whereas the blood group AB was least prevalent. 25.5% of the total study subjects were overweight and 7.2% were obese. Overweight and obesity were more common among students with blood group B. It was also observed that WHR statistically associated with ABO Blood group system. **Conclusion** — Participants with blood group B+ had higher prevalence of overweight and obesity. ABO Blood group system showed statistically significant association with WHR.

INTRODUCTION –

One of the most significant health issues in the globe is obesity. Over the past 20 years, most developed and developing countries have seen a significant rise in the prevalence of overweight and obesity [1]. The relationship between energy intake and work productivity is thrown off by playing video games indoors, playing computer games, watching TV, and living a sedentary lifestyle [2]. Researchers are very interested in identifying the risk factors for obesity. Numerous research have revealed a connection between some obesity co-morbidities, including Diabetes Mellitus II, hypercholesterolemia, hypertension, myocardial infarction, and some cancers. [3 -9]. Over the past few decades, the link between certain diseases and ABO blood group type appear to have got a lot of attention. The ABO blood group has been linked to stomach ulcer, duodenal ulcers, thyroid diseases and diabetes mellities in studies.

There is a proven link between ABO blood group and metabolic and malignant illness. Excess body weight is thought to increase the risk of variety of diseases, including coronary heart diseases, diabetes. Despite the fact that ABO blood group and BMI have been identified as risk factors for specific diseases. A few research have looked into whether ABO blood group antigen may predispose someone to have a higher BMI. Overweight and obesity may be defined by BMI. BMI has limitation as it does not distinguish between fat and muscle mass. To estimate abdominal obesity anthropometric measures such as waist circumference and waist-hip ratio can be used. To best of our knowledge no research is available on North India to investigate the relationship between ABO blood group and Obesity. Hence the present study was planned to find the prevalence of obesity in medical students and to find if any association between ABO blood group and obesity

MATERIALS AND METHODS –

A cross-sectional study was conducted on 745 MBBS students aged 19-24 years. Before commencement of study, approval was taken from Institutional Ethics committee. After explaining the procedure to students informed consent was taken. Subjects were asked to report to the department of Physiology in the morning after light breakfast. Relevant history was taken, involving history of present illness, past illness, personal, and family history. The following parameters

were recorded-

1. Height was measured without shoes using stadiometer to nearest of 0.5 cm.
2. Weight was measured by Krups weighing machine
3. Waist circumference was measured using flexible and non-stretching measuring tape at level of umbilicus
4. Hip circumference was measured using flexible and non-stretching measuring tape around widest portion of buttock. Following obesity indices were estimated :

a) Indices of general adiposity:

body mass index (BMI in kg/m²) BMI was classified according to criteria of WHO [10, 11]

- <18.5kg/m² -underweight,
- 18-24.9kg/m² -normal weight
- 25-29.9 kg/m² -overweight,
- >30kg/m² -obesity

b) Indices of abdominal adiposity:

waist-hip ratio (WHR) was estimated [10, 12]. WHR - >0.9 in Males and >0.85 in females were considered as obese ([10, 12]

ABO blood group typing was done by slide agglutination method using Antisera A, Antisera B and Anti-D antibodies [13]

Data analysis:

The data was collected and subjected to following statistical analysis using software SPSS version 22. The prevalence of obesity and different blood groups among the medical students were expressed in terms of frequency and percentage. To test the association between blood group and obesity, Chi-square test was used and P value <0.05 was considered statistically significant.

RESULTS-

In our study 50.5% participants were females and 49.5% were males. Of the total participants, 93.69% were Rh +ve and 6.31% were Rh-ve. The most prevalent blood group was B+ (37.7%) followed by O+ (27.4%), A+ (19.7%) and AB+ (8.9%). 8.2% females were obese and 6.2% male students were obese [Table 1]. Out of 745 students 62 (8.3%) were underweight, 441 (59.2%) were normal weight, 188 (25.2%) were overweight and 54 (7.2%) were obese [Table 1].

8.5%Female and 8.1%of male students were underweight, 60.1%female and 58.1%male students were normal weight, 23.1%females students and 27.4%male students were overweight, 8.2% females and 6.2% male students were obese [Figure-1].

Blood group B are more prone to be overweight (9.3%) and obese (2.7%) followed by blood group O (7.2%overweight, 1.7%obese), blood group A (4.6%overweight, 2.1% obese) and blood group AB (3.2% overweight0.5% obese) [Table 2]. There are 137 females with blood group B+ out of which 35 are overweight and 12 areobese. Out of 144 male students with B+ blood group 34 are overweight and 8 obese [Table 3 (a) and 3 (b)].In female medical students WHR >0.85 was found in B+ blood group followed by blood group O, A and AB. Same trend was noticed in male medical students with WHR >0.9 in B+ blood group followed by O, A and AB. WHR is important indices of abdominal obesity. Out of 376 female students WHR >0.85 was found in 262 and<0.85 in 112 students . In male medical students WHR>0.9 was found in 348 and <0.9 in 21 [Table 4]. In our study no association between BMI with respect to different blood group was observed. A statistically significant association (P<0.05) was observed between WHR and different blood groups [Table 5].

DISCUSSION –

Obesity is becoming an important public health problem in whole world. In this study we found that blood group B+ was most prevalent followed by blood group O, A and AB . Similar to our study Shireen Jawed etal also found blood group B (42.7%) prevalent followed by O, A and AB[14]. Simiar findings are reported in several other studies [15,16,17] . Blood group AB was least prevalent in our study and similar findings report in other studies also[14,16] We did not found any association between ABO blood group and BMI. Blood group B subjects were more overweight and obese followed by blood group O. Jaya kumar Papanna etal reported more obese persons belonged to blood group O (19.01%) followed by blood group B (5.54%) , blood group A (3.29%) and blood group AB (1.38%). Maximum number of overweight persons belonged to blood group O(14%) [18]. Study done by G.V SivaKrishnakanth found overweight and obese children in blood group O[19]. Similar results were observed in study conducted by Shireen Jawed etal [14]. Many studies have shown prevalence of obesity in blood group O [14,18,19]. In study conducted by Chandra T etal blood group B was associated with obesity [20]. On other hand study done by Jafari E etal showed prevalence of obesity in blood group A(7%) [21]. In our study we did not found any correlation between ABO bloodgroup system and BMI. Similarly study done by G.V Siva also didn't find any correlation between ABO blood group and BMI [19]. In our study we found statistically significant association between ABO blood group system and WHR. There are none studies to best our knowledge showing association between WHR and ABO blood group . WHR is a better indicator of abdominal obesity. Abdominal obesity is associated with increased risk of cardiovascular diseases.

How ever few studies show an association between anthropometric measures and ABO blood group. In one study conducted among young males reported that blood group B subjects were taller [22]. In another study on Brazilian children ,weight of female with blood group A was higher than other blood group [23].A cross sectional study conducted in Turkey evaluated the association between ABO phenotype and risk of obesity among men with air borne occupational exposure [24]. Rapidly and dangerously increasing trend of overweight and obesity in medical students is a matter of concern . Medical education requires long hours of studies with less time for physical activity Further multicentre studies is recommended in which participants of different profession and location need to be included.

CONCLUSION –

Understanding the link between the ABO blood group and obesity can aid in developing a healthy lifestyle. These healthy lifestyle choices can be adopted by those who are at risk of developing obesity and its problems early in life.

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Conflict of interest – None

Table 1: Distribution of the study subjects with respect to Gender, Blood Group and Body Mass Index (BMI)

Variable	Frequency	Percentage	
Gender	Female	376	50.5
	Male	369	49.5
Blood group	O+	204	27.4
	O-	15	2
	A+	147	19.7
	A-	8	1.1
	B+	281	37.7
	B-	15	2
	AB+	66	8.9
	AB-	9	1.2
	Rh+	698	93.69
	Rh-	47	6.31
BMI	< 18.5 (underweight)	62	8.3
	18.5-24.9 (normal)	441	59.2
	>24.9 (overweight)	188	25.2
	>29.9 (obese)	54	7.2

Table 2: Frequency and percentage of overweight and obese subjects in different blood group

Blood group	Underweight	Normal weight	Overweight	Obese	Total
O+	15 (2%)	122 (16.4%)	54 (7.2%)	13 (1.7%)	204 (27.4%)
O-	4 (0.5%)	8 (1.1%)	3 (0.4%)	0 (0%)	15 (2%)
A+	12 (1.6%)	85 (11.4%)	34 (4.6%)	16 (2.1%)	147 (19.7%)
A-	0 (0%)	7 (0.9%)	1 (0.1%)	0 (0%)	8 (1.1%)
B+	26 (3.5%)	166 (22.3%)	69 (9.3%)	20 (2.7%)	281 (37.7%)
B-	1 (0.1%)	12 (1.6%)	2 (0.3%)	0 (0%)	15 (2%)
AB+	4 (0.5%)	34 (4.6%)	24 (3.2%)	4 (0.5%)	66 (8.9%)
AB-	0 (0%)	7 (0.9%)	1 (0.1%)	1 (0.1%)	9 (1.2%)

Table 3 (a): Distribution of ABO Blood groups in Males and Females subjects

Blood group	GENDER		Total
	F	M	
O+	110	94	204
O-	9	6	15
A+	75	72	147
A-	3	5	8
B+	137	144	281
B-	8	7	15
AB+	28	38	66
AB-	6	3	9
Total	376	369	745

Table 3 (b): Distribution of Males and Females subjects based on BMI in different blood group

Blood group	Body Mass Index (BMI)							
	Females (N=376)				Males (N=369)			
	Under weight	Normal weight	Over weight	Obese	Under weight	Normal weight	Over weight	Obese

O+	8	72	22	8	7	50	32	5
O-	2	5	2	0	2	3	1	0
A+	8	41	16	10	4	44	18	6
A-	0	2	1	0	0	5	0	0
B+	11	79	35	12	15	87	34	8
B-	1	6	1	0	0	6	1	0
AB+	2	15	10	1	2	19	14	3
AB-	0	6	0	0	0	1	1	1
Total	32	226	87	31	30	215	101	23

Table 4: WHR in Males and Females subjects in different blood groups

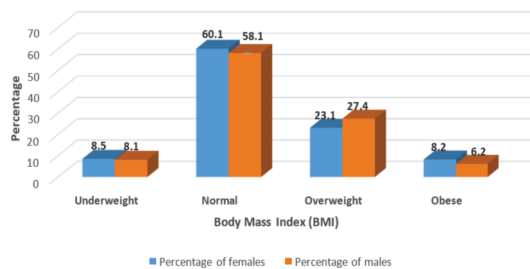
Blood group	Female		Male	
	non-obese<0.85	Obese>0.85	non-obese<0.9	Obese>0.9
O+	24	85	5	89
O-	2	7	0	6
A+	27	48	8	64
A-	1	2	1	4
B+	47	89	7	137
B-	5	3	0	7
AB+	5	23	0	38
AB-	1	5	0	3
Total	112	262	21	348

Table 5 : Association of BMI & WHR with respect to different blood group

Variable	categories	Blood group								p-value
		O+	O-	A+	A-	B+	B-	AB+	AB-	
BMI	underweight	15	4	12	0	26	1	4	0	0.30
	normalweight	121	8	85	7	165	12	34	7	
	Overweight	54	3	34	1	69	2	24	1	
	Obesity	13	0	16	0	20	0	4	1	
WHR	non-obesity	29	2	35	2	54	5	5	1	0.04
	Obesity	174	13	112	6	226	10	61	8	

Fisher Exact Chi-square test, P value< 0.05 statistically significant.

Figure 1: Gender-wise distribution of the study subjects with respect to BMI



REFERENCES:

- 1) Malekzadeh R, Mohamadnejad M, Merat S, Pourshams A, Etemadi A. Obesity Pandemic: An Iranian Perspective. Arch Iranian Med 2005;8:1-7.
- 2) De Onis M and Blossner M. Prevalence and trends of overweight among preschool children in developing countries. Am J Clin Nutr 2000;72:1032-9.
- 3) Edgren G, Hjalgrim H, Rostgaard K, Nordsa R, Wikman A, Melbye M, Nyren O. Risk of gastric cancer and peptic ulcer in relation to ABO blood type. A cohort study. Am J Epidemiol 2010;172:1280-5.
- 4) Clark P, Wu O. ABO blood group and thrombosis: a causal association, but is there in screening? Future Cardiol 2011;7:191-201.
- 5) Nemesure B, Wu SY, Hennis A, Leske MC. Hypertension, type II diabetes, and blood group in population of African ancestry. Ethn Dis 2006;16:822-9.
- 6) Borecki IB, Elston RC, Rosenbaum PA, Srinivasan SR, Berenson GS. ABO associations with blood pressure, serum lipids and lipoproteins and anthropometric measures. Hum Hered 1985;35:161-70.
- 7) Sari I, Ozer O, Davutoglu V, Gorgulu S, Eren M, Aksoy M. ABO blood group distribution and major cardiovascular risk factors in patients with acute myocardial infarction. Blood Coagul Fibrinolysis 2008;19:231-4.
- 8) Gillum RF. Blood groups, serum cholesterol, serum uric acid, blood pressure and obesity in adolescents. J Natl Med Assoc 1991;83:682-8.
- 9) Medalie JH, Levene C, Papier C, Goldbourt U, Dreyfuss F, Oron D et al. Blood group, myocardial infarction and angina pectoris among 10,000 adult males. N Engl J Med 1971;285:1348-53.
- 10) Colberg SR, Swain DP, Vinik AI. Use of heart rate reserve and rating of perceived exertion to prescribe exercise intensity in diabetic autonomic neuropathy. Diabetes care. 2003;26(4):986-90.
- 11) Laederach-Hofmann K, Mussgay L, Ruedel H. Autonomic cardiovascular

- regulation in obesity. J Endocrinol. 2000;164(1):59-66.
- 12) WHO. Waist circumference and waist-hip ratio: Report of WHO expert consultation. Geneva: WHO; 2008:8-11.
- 13) Manual of practical Physiology. 6th ed. New Delhi: Arya Publication; 2021.
- 14) Jawed Shiren, Atta Komal, Tariq Saba, Amis Farah. How good is the obesity associated with blood groups in cohort of female university going students. Pak J Med. Sci. 2018;34(2):452-456.
- 15) Khan MN, Khaliq I, Baksh A, Akhtar MS, Amin-ud-Din M. Distribution of ABO and Rh blood groups in population of Poonch district, Azad Jammu and Kashmir. East Mediterr J. 2009;15(3):717-721.
- 16) Ilyas SM, Iftikhar M, Rasheed U. Frequency of ABO and Rh blood group in Gujranwala Punjab Pakistan. Biologia (Pakistan). 2013;59(1):107-114.
- 17) Khan BH, Attallah S, Khan AH. Frequency of ABO and Rh blood group involving volunteer donors in district Nowshera. J Postgrad Med Inst 2017;31(2):135-137.
- 18) Papanna Jayakumar, Bettogowda Shruthi. ABO blood groups and risk for obesity: A retrospective study from rural tertiary care hospital of south Karnataka. Calore International journal of health sciences and research. 2019;vol4(3):16-18.
- 19) Sivakrishnakanth GV, Prathadrao Lad Umesh, Satyanarayana P. Correlation between obesity and ABO blood group in school going children in India. Indian J of basic and applied Medical research. 2012;vol1(4):280-84.
- 20) Chandra T, Gupta A. Association and distribution of hypertension, obesity and ABO blood groups in blood donors. Iran J Pediatr Hematol Oncol. 2012;2(4):140-145.
- 21) Jafari Elham, Sebghatollahi Vahid, Kolahdoozan Shadi, Elahi Elham, Pourshams Akram. Body mass index and ABO blood groups among different ethnicities of Golestan cohort study subject. Govareh. 2012;17(1):50-54.
- 22) Borechi IB, Elston RC, Rosenbaum PA, Srinivasan SR, Berenson GS. ABO association with blood pressure, serum lipids and lipoproteins and anthropometric measures. Hum Hered. 1985;35:161-170.
- 23) Kelso AJ, Siffert T, Maggi W. Association of ABO phenotypes and body weight in sample of Brazilian infants. Am J Human Biology. 1992;4:607-611.
- 24) Suadicani P, Hein HO, Gyntelberg F. Airborne occupational exposure, ABO phenotype and risk of obesity. Int J Obes. 2005;29:689-696.