Original article

Correlation of ABO and Rh Blood Groups with BMI among Medical Students of Nishtar Medical University, Multan

Ghulam Mujtaba Nasir[1], Ghulam Dastgeer[2], Adeena Muqadas[2], Iqra Javed[2], Muhammad Umar Khan[2], Hamza Umair[2]

[1]Assistant Professor, Community Medicine Department, Nishtar Medical University, Multan. [2-6]Final year MBBS, Nishtar Medical University, Multan. ***Correspondence to:*** Dr. Ghulam Dastgeer, Email: g.dastgeer001@gmail.com

ABSTRACT

Background: ABO and Rh blood groups are associated with the predisposition of several diseases (pancreatic cancer, breast cancer, cardiovascular diseases, obesity, and some psychiatric illness) but their association with BMI is still inconclusive. This study aimed to find any possible correlation between the ABO and Rh blood groups and BMI.

Subjects and methods: A cross-sectional descriptive study was conducted, among medical students from the first year to the final year of MBBS at Nishtar Medical University. The slide agglutination method was used to determine the blood groups of study participants. BMI of students was divided into the following categories <18.5kg/m^2, 18.5-24.9kg/m^2, 25-29.9kg/m^2, >30kg/m^2. Chi-square test was performed to find the correlation between blood groups and BMI categories of students. One-way-ANOVA test was applied to see any significant difference in BMI (mean) among students with blood groups A, B, AB, and O.

Results: A total of 313 students, comprising 152 (48.56%) males and 161 (51.14%) females, with a mean of age 21.75 years and BMI of 22.37 kg/m^2 presented an insignificant association between BMI, ABO, and Rh blood groups (p>0.05). The frequency of blood groups was reported as A in 81 (25.88%), B in 124 (39.62%), AB in 33 (10.54%), O in 75 (23.96%), Rh-positive 275 (87.86%), and Rh-negative 38 (12.14). Blood group "B" was found most prevalent: in males 58 (38.2%) and in females 66 (41%). The distribution of BMI categories <18.5kg/m^2, 18.5-24.9kg/m^2, 25-29.9kg/m^2 and >30kg/m^2 was reported as 37 (11.82%), 153 (48.89%), 93 (29.71%) and 30 (9.59%) respectively. Out of 152 males 75 (49.3%) were reported with BMI >25kg/m^2, while only 48 (29.8%) female students reported with BMI >25kg/m^2.

Conclusion: An insignificant association was found between the BMI and ABO and Rh blood groups. Students with blood groups AB and B were found to have higher mean BMI. Male students showed inclination towards high BMI.

Keywords:

Medical students, ABO blood group, Rh factor, BMI, Blood group

INTRODUCTION

The Blood group system refers to a systemic differentiation of human blood in different categories (ABO, Rh, MNS, Kell, Lewis, etc.) based on red blood cell surface antigens. Among these ABO and Rh blood group systems have gained worldwide acceptance.[1] Blood group B is more prevalent in Asia as compared to other blood group categories.[2]

Previous studies show that each ABO blood group is associated with genetic predisposition factors for a variety of diseases such as cardiovascular disorders, obesity, and many other neoplastic diseases.[3] A study in eastern India shows that people with blood group O are more prone to cardiovascular diseases while the AB blood group is a protective factor against heart diseases.[4]

An Indian study concluded, that blood group B is one of the predisposition factors for obesity and hypertension.[5] A study, conducted on medical students, reported that blood group B enhances the inclination of a person towards obesity and high blood pressure.[6] In a study, conducted in Saudia Arabia, no significant correlation was found between obesity and ABO blood group.[7] A study reported that blood group "O" was associated with high BMI among pregnant women in eastern Sudan.[8]

The existing data is inconclusive in explaining the association between blood group and BMI. This study aimed to find any possible association between ABO and Rh blood groups and BMI in the undergraduate medical students. This study will determine the frequency and gender-based distribution of blood groups and its correlation with BMI to evaluate the ABO and Rh blood groups as predisposition factors for obesity.

Conflict of interest: The authors declared no conflict of interest exists. **Citation:** Nasir GM, Dastgeer G, Muqadas A, Javed I, Khan MU, Umair H. Correlation of ABO and Rh Blood Groups with BMI among Medical Students of Nishtar Medical University, Multan. J Fatima Jinnah Med Univ. 2023; 17 (4):160-164.

DOI: http:/doi.org/10.37018/JFJMU/GUL/3546

SUBJECTS AND METHODS

This was a cross-sectional descriptive study conducted over three month period (December 2022- February 2023) within the premises of the Nishtar Medical University and Hospital Multan (NMU). Data were collected after obtaining the institutional ethical approval and fully informed consent from the subjects. All authors of this study participated in data collection under supervision of community medicine department (NMU). A convenient sampling method was used. Age and Ethnicity matched. A convenient sampling method was used**.** The sample size was calculated with a power of 95%, and an alpha level of 5%, Total 313 MBBS students of NMU comprising 157 male students and 156 females and age between 18-23 years belonging to Southern Punjab region of Pakistan were included in the study population. Students who had started heavy physical exercises and dieting to reduce their weight, at least one month before the data collection, were excluded. Students with history of any bleeding disorder, chronic illness (Type 1 diabetes, Neoplasia, or any autoimmune disorder), and psychiatric eating disorder (Anorexia Nervosa or Bulimia Nervosa) were excluded.

To measure weight, a portable weighing machine was used, on a firm, flat surface. The weight was recorded in kilograms. To measure height measuring tape was used. Height was measured in centimeters but it was put in a datasheet in form of meters. The following mentioned formula was used for the calculation of the Body Mass Index. BMI=Body weight in kg/m^2. The BMI was categorized as <18.5, 18.5-24.9, 25-29.9, and>30 into Underweight, Normal weight, Overweight, and Obese respectively. The slide agglutination method was used to determine the blood groups of medical students. On a labeled slide a drop of each finger prick blood was placed onto which a drop of anti-A, anti-B, and anti-D are added and the Results of agglutination were recorded immediately. Agglutination with anti-A showed group A, with anti-B showed group B, with both anti-A and anti-B, showed group AB and neither of these showed O group. The blood samples were also classified as Rh positive or Rh negative according to the presence or absence of the anti-D antibodies. Screening for Rh type was conducted by using anti-D sera. The Data was analyzed by using SPSS version 27. To test any significant correlation among the different relevant variables, e. g., between male and female students for different blood groups and body mass index (BMI), Pearson Chi-Square ($\chi 2$) test was used. To find any significant difference in BMI among ABO blood groups One-way-ANOVA test was applied.

RESULTS

A total of 313 students –10 (3.3%) the first year, 63 (20.1%) the second year, 63 (20.1%) the third year, 115 (36.7%) the fourth year, and 62 (19.8%) final year students-- with a mean (SD) of age 21.75 (1.448) years, weight 59.92 (11.992) kg, height 1.63 (0.099) m^2 and BMI 22.37 (3.57) kg/m^2 participated in the study. The mean (SD) of BMI in male and female students was calculated as 22.957 (3.28) kg/m^2 and 21.865 (3.79) kg/m^2 respectively. There was no significant association between BMI and ABO blood groups ($p>0.05$, $\chi 2=7.8$). The distribution of the ABO blood group, based on gender and different BMI categories, is mentioned in Table 1.

The frequency distribution of ABO blood groups among gender is given in figure 1c. Blood group "B" was most prevalent among the study population. The frequency of A, B, AB and O blood groups was 25.88%, 39.62%, 10.54% and 23.96% respectively. In male students, the prevalence of ABO blood groups was reported as B>A>O>AB; in female students, it was reported as B>O>A>AB. Rh blood groups were distributed as 87.86% Rh positive and 12.14% Rh negative.

Table 1: ABO blood group distribution in males/females and in different categories of BMI

ABO Blood Group	BMI kg/m^2 Mean (SD)	Male N (%)	Female N (%)	Total N (%)
A	21.46 (2.75)	44 (28.9)	37 (23)	81 (25.88)
B	22.59 (3.50)	58 (38.2)	66 (41)	124 (39.62)
AB	23.13 (4.27)	16 (10.5)	17 (10.6)	33 (10.54)
O	22.42 (3.29)	34 (22.4)	41 (25.4)	75 (23.96)
Rh Factor				
Rh-Positive	22.26 (3.27)	130 (47.3)	145 (52.7)	275 (87.86)
Rh-Negative	22.48 (3.28)	22 (57.9)	16 (42.1)	38 (12.14)
BMI (Kg/m^2)				
<18.5		10 (6.6)	27 (16.8)	37 (11.82)
18.5-24.9		67 (44.1)	86 (53.4)	153 (48.89)
25-29.9		61 (40.1)	32 (19.9)	93 (29.71)
>30		14 (9.2)	16 (9.9)	30 (9.58)

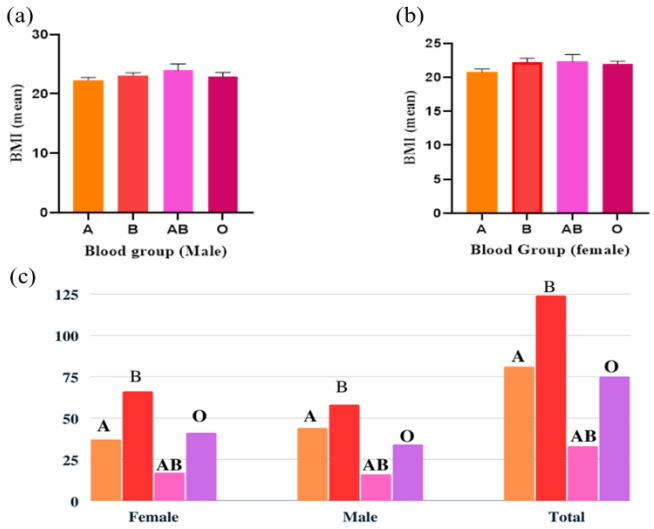

Figure 1: (A) BMI (MEAN) in abo blood groups of male students, (B) BMI (Mean) in abo blood groups of female students, (C) distribution of abo blood group among gender

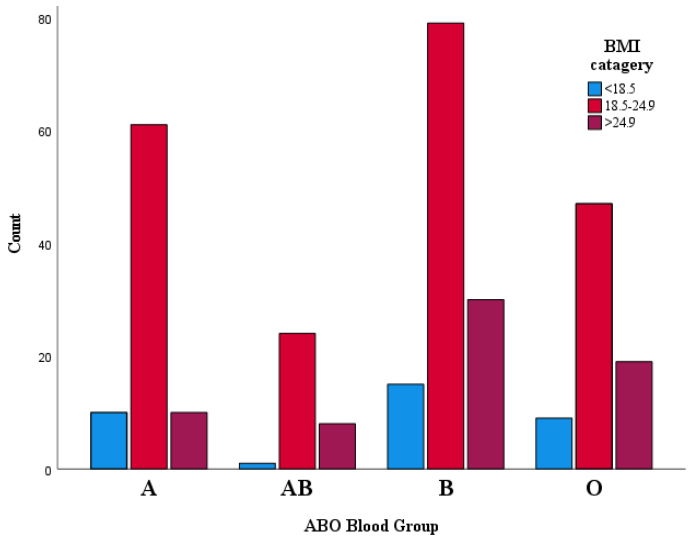

Figure 2: Distribution of BMI Categories in Students with A Different Type of ABO Blood Group

One-way-ANOVA test was applied to compare the mean of BMI among students with different blood groups; no significant difference was found ($p>0.05$). The BMI (mean) of male and female students in different blood groups is shown in Figure 1 (a, b).

The BMI distribution of students, irrespective of their gender, was reported as Underweight (11.82%), Normal weight (48.89%), Overweight (29.71%) and Obese (9.59%). The BMI categories distribution across different blood groups is shown in Figure 2.

DISCUSSION

This cross-sectional descriptive study was conducted among medical students from the first year to the final year and no significant correlation was found between the BMI and ABO blood groups. Recently a study in Saudi Arabia showed no correlation between obesity and ABO blood groups.[9] In present study blood group "B" was more prevalent in the Southern Punjab undergraduate medical students while a study--in Saudi Arabia-- showed that the blood group "O" was more prevalent than type "B" in the Abha population.[10] The least common blood group in all the recent studies has been described to be the AB blood group which also supports the result of our study.[9-11]

In this study, authors didn't find any significant correlation between the Rh factor and BMI. A study conducted among female medical students of Faisalabad proved that there is a high percentage of Pre-hypertension among the Rh-positive blood group than

the Rh-negative blood group.[12] Rh factor is also a determinant of obesity and many cardiovascular diseases proved by many studies.[13] One previous study demonstrated that all ethnicities showed a greater population of RH positive as compared to RH negative, which is similar to finding of the present study.[14]

In this study female participants have less BMI mean as compared to male students' BMI (mean). A study conducted on young females concluded that girls consuming more snacks, and cold drinks; lacking in physical activities; spending much of their time watching TV dramas were more prone to become obese.[14] A different study outcome showed that group O followed by AB have more protective effects against hypertension and thrombosis than group B and A illustrating the highest risk for thrombosis and hypertension in both males and females.[15] Obesity is associated with cancers such as liver cancer. A study conducted in the US stated that BMI greater than 35 is associated with 4 times increased risk of Hepatocellular carcinoma compared with a normal BMI population.[16] Over the past few decades, the relationship between ABO blood groups and various diseases achieved considerable importance. Studies suggest that ABO antigens play a role in the pathogenesis of some diseases including cardiovascular, cancers, malaria, and some endocrine disorders.[17] In one study, obesity was defined using BMI classification and it has poor sensitivity for visceral fat. A study from Rural Tertiary Care Hospital of South Karnataka explained that although blood group is a non-modifiable risk, knowing the correlation between blood groups, BMI, and obesity we can modify our lifestyles.[18] In previous studies, many attempts were made to explore the correlation between ABO blood type and obesity, but the results of all studies were diverse.[19-20] Although the results of this study do not reflect a correlation between the ABO blood group and obesity still further research with a larger sample size and multicentre studies are proposed to find significant evidence against blood antigen as a predisposing factor of obesity.

CONCLUSION

There was no significant association between the BMI and ABO and Rh blood groups. There was no significant difference in BMI mean among ABO and Rh blood groups; students with blood groups B and AB were reported with relative high mean BMI. Male students showed inclination towards high BMI.

REFERENCES

1. Naveed MS. Correlation between ABO blood groups and proficiency in computer gaming. J Appl Environ Biol Sci. 2018;8 (6): 67- 73.
2. Qureshi HJ, Kanwal S, Rao M, Mahmood Q. Comparison of academic performance of students of different blood groups and gender. J Akhtar Saeed Med Coll. 2021;3 (1):13-6
3. Kaur D, Doda V, Kandwal M, Parmar I. ABO Rh (D) blood group distribution among whole blood donors at two different setups of tertiary care hospitals in North India. Int J Community Med Public Health. 2016;3 (10):2806-11.
4. Amirzadegan A, Salarifar M, Sadeghian S, Davoodi G, Darabian C, Goodarzynejad H. Correlation between ABO blood groups, major risk factors, and coronary artery disease. Int J. Cardiol. 2006;110 (2):256-8.
5. Chandra T, Gupta A. Association and distribution of hypertension, obesity and ABO blood groups in blood donors. Iran J. Hematol Oncol. 2012;2 (4):140.
6. Bhattacharya S, Gangaraja B, Bhatt R. Correlation between the blood groups, BMI and prehypertension among medical students. J Chin Clin Med. 2010;5 (1):78
7. Turki A, Alrasheed K, Omar B, Alfraidy MA. Relation between ABO blood groups and obesity in a Saudi Arabian population. J Taibah Univ Med Sci. 2017;12:407–41.
8. Bashir AO, Hassan AA, Mahdi EB, Adam GK, AlHabardi N, Adam I. The association between blood groups, Rhesus factors, body mass index and obesity among pregnant women at Gadarif Maternity Hospital, Eastern Sudan. BMC Pregnancy and Childbirth. 2023;23 (1):801.
9. AbdelMassih AF, Mahrous R, Taha A, Saud A, Osman A, Kamel B, Yacoub E, Menshawey E, Ismail HA, Aita L, Dous M. The potential use of ABO blood group system for risk stratification of COVID-19. Med. Hypotheses. 2020;145 (1):110343.
10. AlSuhaibani ES, Kizilbash NA, Malik S. Heterogeneity and diversity of ABO and Rh blood group genes in select Saudi Arabian populations Genet Mol Res, 2015; 14 (3)
11. Kanwal S, Qureshi HJ, Aslam MS, Masood S. Frequency of ABO and Rh blood groups in students of Akhtar Saeed Medical and Dental College, Lahore. Pak J Physiol. 2016; 12: 29-30.
12. Jawed S, Zia S, Tariq S. Frequency of different blood groups and its association with BMI and blood pressure among the female medical students of Faisalabad. J Pak Med Assoc. 2017;67 (8):1132-7.
13. Kaur M. Correlation between body mass index and blood pressure in adolescents. Pak J Physiol. 2016; 12 (1): 47-50
14. Jawed S, Atta K, Tariq S, Amir F. How good is the obesity associated with blood groups in a cohort of female university going students?. J Pak Med Assoc. 2018;34 (2):452.
15. EL-SAYED MI, AMIN HK. ABO blood groups in correlation with hyperlipidemia, diabetes mellitus type II and essential hypertension. Asian J Pharm Clinic Res. 2015:1 (1)236-43.
16. Oral A, Sahin T. Prognostic role of ABO blood group and Rhesus factor in cirrhotic patients with hepatocellular carcinoma. Sci. Rep. 2019;9 (1):1-6.
17. Siddiqui NI, Soni A, Khan SA. Association of ABO blood types and novel obesity markers in healthy adolescents. J Edu Health Promot. 2019;8 (1).
18. Papanna J, Bettegowda S. ABO Blood Groups and Risk for Obesity: A Retrospective Study from Rural Tertiary Care Hospital of South Karnataka. Galore Int j. health sci. res. 2019;4 (3):16-9.
19. Sukalingam K, Ganesan K. Rhesus blood groups associated with risk to obesity and diabetes mellitus: A report on Punjabi

population in Selangor, Malaysia. Int J Intger Med Sci. 2015;2:105–9.
20. Mmom FC, Chuemere AN. Study of incidence and prevalence of hypertension, diabetes and obesity with blood type in postmenopausal females in Port Harcourt. Saudi J Biomed Res. 2016;1:22–9.