Original Article

Exploring the Link between ABO Blood Groups and Obesity among Young Adults

Shakil Ahmed Shaikh[1]*, Nazia Azam Yousfani[1], Muhammad Muqeem Mangi[1], Salma Farukh Memon[2], Keenjhar Rani Laghari[2], Arsalan Ahmed Uqaili[2]

[1]Suleman Roshan Medical College, Tando Adam, Sindh, Pakistan

[2]Liaquat National University Medical and Health Sciences, Jamshoro, Sindh , Pakistan

*Corresponding Author

Shakil Ahmed Shaikh

sshakilonly@hotmail.com

Submission: 22nd July, 2024
First revision: 15th September, 2024
Second revision: 10th October, 2024
Accepted: 28th October, 2024

DOI:https://doi.org/10.51846/jucmd.v4i1.3416

OPEN ACCESS

This is an open access article distributed under the Creative Commons Attribution 4.0 Inter- national License CC-BY. Users are allowed to read, download, copy, distribute, print, search, or link to the full texts of the articles, or use them for any other lawful purpose, without asking prior permission from the publisher or the author as long as they cite the source.© The Author(s) 2025

Abstract

Objective: To explore the link between the ABO blood groups and obesity among young adults of Hyderabad district, Sind, Pakistan.

Methodology: This cross-sectional study was conducted from February 2021 to January 2022, and included 582 randomly selected participants, including 301 males and 281 females, aged between 18 to 40 years, from various institutions of district Hyderabad, including students, faculty members, and employee of universities, colleges, hospitals. A simple random sampling technique was used for the collection of data. Before induction, verbal consent was taken from all the participants. Data was collected by a self-structured questionnaire including sociodemographic characteristics. A brief history was taken relevant to the parameters of the study followed by measuring Body Mass Index, waist circumference, and waist-hip ratio. BMI was categorized with South Asian standards. Data collected through structured questionnaires and anthropometric parameters were analyzed by SPSS version 20.

Results: In this study, the data of 582 participants were included out of 600 participants, as the remaining 18 could not provide complete data. The mean age in male participants was 27.83 ± 5.478 and in females was 22.27 ± 4.730. The average BMI in male participants was 25.81 ± 5.08 and in females was 24.00 ±4.90. Overall, 205 B blood group participants were found obese, which included 111 male participants and 94 female participants, followed by blood 197 group O participants, 130 A blood group participants, and 50 AB group individuals. In total, there were 536 Rh positives, and only 42 Rh negatives. Individuals with blood group B and Rh-positive status were identified at being greater risk of developing higher BMI, waist-hip ratio, and waist circumference.

Conclusion: The evidence found in this study proved the positive association of the types of blood groups with BMI, waist-hip ratio, and waist circumference.

Keywords: ABO blood group, Obesity, Waist circumference, Waist-hip ratio.

Introduction

The relationship between ABO blood groups and obesity has been investigated in numerous studies with conflicting results. While some studies suggest an association between specific blood types particularly O and B with a higher prevalence of obesity, others indicate that factors such as ethnicity and gender play more significant roles.[1] Obesity is a complex medical problem defined by the World Health Organization as the abnormal and extreme deposition of fats in the body that has negative impacts.[2]

The most common causes of obesity are increased intake of food, physical inactivity, and genetic predisposition.[3] However, it may be caused by endocrine disorders, medications, or mental disorders. Obesity is a prevenTable condition by a combination of changes in social life and personal choices. It can be treated through healthy food and exercise.[3]

Obesity is a prevenTable cause of death around the world, with a higher prevalence in children and adults. According to WHO, urban areas of Pakistan have a burden of obesity ranging from 22 to 40%.[4] A study reported that approximately 600 million adults and an estimated 100 million children were found obese in 195 countries in 2015.[5] Young adults aged between 18 to 40 years are at critical life stages where lifestyle habits are mostly stiff making it a vital time for preventing obesity.[6] A sedentary lifestyle and consumption high-calorie diet and processed food have been found to be key contributors to obesity.[7]

The conventional factors of obesity, such as the imbalance between intake of calories and expenditure of energy, are well understood.[8] The ABO blood group system has been previously associated with various metabolic and cardiovascular conditions.[2,9] These blood groups influence biological processes such as inflammation, lipid metabolism, and insulin sensitivity; all of these play major roles in the development of obesity.[9]

Research conducted in the local population that focuses on a specific region is more valuable for gaining insights into genetic, environmental, and cultural factors that affect both obesity and the distribution of the ABO blood groups. Therefore, this study aims to find out the frequency of the ABO blood group with obesity among young adults aged between 18 to 40 years, from Hyderabad, Sindh, Pakistan.

Methodology

After approval from research ethics committee letter No: DRGS/1601, University of Sindh, this cross-sectional survey was conducted to record the relationship of the ABO blood groups with obesity in the young population aged between 18 to 40 years, living in district Hyderabad. Verbal consent was taken from all the participants. The study was conducted from February 2021 to January 2022. The sample size was calculated by Rao-soft online calculator, Random Sampling was used to collect data. A total of 600 individuals were contacted finally 582 participated in this study, the response was 97 %, and the remaining 18 (3%) of individuals refused to provide necessary information Questionnaires were filled by all authors while collecting data in hard copies.

In this study, participants were healthy and had no illnesses that could have significantly changed either their lifestyle habits or physiological measures. Individuals who participated were selected on the criteria to achieve close to accurate results. Participants included knowing their blood groups, without any cardiovascular diseases, non-pregnant, non-smoker, and non-addict. Participants who were not residents of district Hyderabad, who were > 40 years of age, diagnosed with any heart disease, pregnant, active smokers, a genetic disorder linked with obesity, conditions including hypothyroidism, polycystic ovary syndrome or Cushing syndrome linked with obesity and drug addicts, were excluded from this study.

Physiological Variables: There were two types of physiological variables taken into account; those that were physically measured, including;

Anthropometric Measurements: including height, weight, waist circumference, and hip circumference were measured with a balanced beam scale, porTable stadiometer, and flexible, non-stretchable measuring tape.

Basal Metabolic Index (BMI) is a measure used to assess an individual's body weight with relevance to their height. BMI was calculated by dividing the weight in kgs of individuals by their height in meters. Individuals were classified as underweight, normal or optimal, overweight, and obese, depending upon the BMI range they fell in, and calculated with formula: weight in kgs/ (height in meters).[2] The normal South Asian range of BMI is >23 kg/m^2.[10] Waist Circumference refers to the measurement of the distance around a person's waist. It is typically measured at a point just above the hip bone and below the rib cage. The normal South Asian range of waist circumference is ≥ 90 cm (Male), and≥ 80 cm (Female).[11]

Statistical Analysis

Data was analyzed with a statistical package for the social sciences (SPSS Version 23.0). Descriptive statistics (mean, standard deviation, frequencies) were calculated for the baseline characteristics. Chi-square was used to assess the association between the ABO blood group and the prevalence of increased blood pressure. Logistic regression analysis was performed to determine the odds ratio, accounting for confounders such as age and BMI, in order to assess the strength of the association between ABO blood groups and elevated blood pressure. A p-value of less than 0.05 was considered statistically significant.

Results

Basic characteristics of participants including, age, BMI, mean waist circumference, mean waist-hip ratio, mean blood sugar fasting, and mean systolic and diastolic blood pressure are shown in Table 1.

Table 1: The basic characteristics of participants

Variable	Male (n=301)	Female (n=281)
Distribution of the Participants' Blood Group		
A	72	58
B	111	94
AB	22	28
O	96	101
Age	27.83 ± 5.478	22.27 ± 4.730
Body Mass Index (BMI)	25.81 ± 5.08	24.00 ±4.90
Blood Sugar Fasting (BSF)	104.25 ± 36.42	90.31 ± 19.65
Systolic Blood Pressure (SBP)	122.60 ± 13.38	113.22 ± 16.65
Diastolic Blood Pressure (DBP)	83.38 ± 8.762	76.31 ± 9.49
Waist Circumference	90.11 ± 13.327	73.25 ± 12.644
Waist Hip Ratio	0.7342 ± 0.442	0.9203 ±0.2713

Table 2 indicates that participants with B blood group were established more vulnerable to develop increased BMI. Rh-positive subjects were also found in increased BMI category, Waist circumference and Waist hip ratio.

Table 2: The association of ABO blood group with BMI, waist circumference, and waist hip ratio

Variable	**Normal Weight < 23 Kg/m²**		**Increased Weight > 23 Kg/m²**		**(P-Value)**
Body Mass Index	N	%	n	%	
O (197)	177	89.84	20	10.15	(0.000)
A (130)	116	89.23	14	10.76	(0.778)
B (205)	155	75.60	50	24.39	(0.001)
AB (50)	43	86	7	14	(0..692)
Rh +ve (536)	449	83.76	87	16.23	(0.000)
Rh -ve (46)	42	91.3	4	8.69	(0.236)
Waist Circumference	Normal < 102 cm (Males) 80 cm (Females)		Increased > 102 cm (Males) 80 cm (Females)		(P-Value)
O (197)	178	90.35	19	9.64	(0.000)
A (130)	113	86.92	17	13.07	(0.013)
B (205)	167	81.46	38	18.53	(0.000)
AB (50)	43	86	7	14	(0.048)
Rh +ve (536)	459	85.63	77	14.36	(0.000)
Rh -ve (46)	42	91.3	4	8.69	(0.004)
Waist Hip Ratio	Normal < 90 cm (Males) 85 cm (Females)		Increased > 90 cm (Males) 85 cm (Females)		(P-Value)
O (197)	111	56.34	86	43.65	(0.000)
A (130)	60	46.15	70	53.84	(0.000)
B (205)	85	41.46	120	58.53	(0.000)
AB (50)	21	42	29	58	(0.000)
Rh +ve (536)	253	47.2	283	52.79	(0.000)
Rh -ve (46)	24	52.17	22	47.83	(0.000)

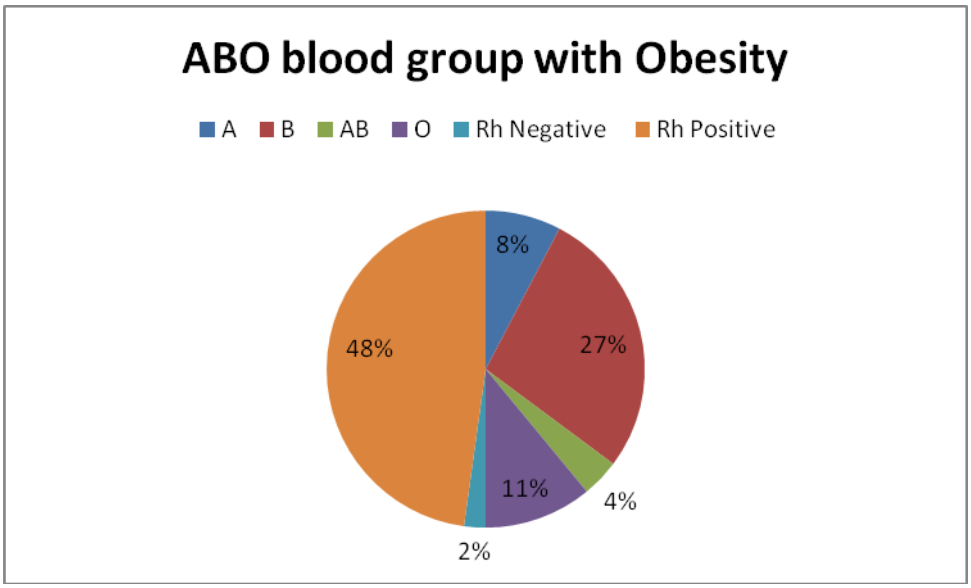

Figure 1: Association of ABO blood group with Obesity, showing that B blood group have higher tendency to develop obesity

Discussion

This study was conducted to explore whether a person's blood group could be a risk for obesity. As obesity is a growing global health concern, especially in younger populations, identifying any potential biological marker like blood group, could aid in predicting the risk of obesity and developing personalized prevention strategies. The findings in our study suggest that participants in the B blood group were prone to develop obesity followed by A and AB blood group participants. Waist circumferences were found increased in B blood group participants followed by AB and A blood group participants. The waist-hip ratio was also found higher in participants in the B blood group followed by AB and A blood group participants. In this study, the mean body mass index of subjects was 24.945 ± 5.0765, however, no significant gender-wise difference was found in body mass index. In this study, blood group B had a higher prevalence of increased body mass index followed by A, O, and AB blood group, and subjects with Rh D positive were more prone to develop obesity compared to Rh D negative. This finding indicates that participants with B blood group might be genetically prone to develop obesity than other blood groups.

A study from India on 200 medical students by Bhattacharyya et al. found in consistent with our result that blood group B participants were more prone to develop obesity than other blood groups.[12] Another Malaysian study on the Punjabi population of Selangor, conducted by Kumeshini et al. showed agreement with our findings.[13] Parveen et al. conducted a study on 181 medical students of Karachi which were inconsistent with our findings and determined that blood group A had a higher prevalence of increased BMI.[14] This difference might be due to the reduced sample size of the study conducted in India and Karachi.

The distribution patterns of BMI differ within and between populations around the world. These changing patterns of BMI in different populations are recognized and related to changes in socioeconomic status.[15] Both overweight and obesity are considered to be harmful to a person's health and several studies reported the link of higher BMI with the development of certain diseases.[16] Increased body weight is related to an increased risk factor for the development of various diseases and clinical disorders including coronary artery disease, hypertension, stroke,[17] malignancies, diabetes type II,[18] liver diseases,[19] asthma, allergies,[20] and psychological problems.[16] Some studies conducted around the world found an insignificant relationship between the ABO blood group with body mass index.[21-25] These variable findings concerning the relationship of the ABO blood group with body mass index may be due to local factors, which change population phenotype, or may be due to sampling size difference rather than actual genetic influence.

In our study, waist circumference was found normal in 501 (86.08%) subjects and increased in 81 (13.91%) subjects. Waist circumference was increased in subjects with B blood group followed by O, A, and AB blood group subjects (Table 2). However, Rh-positive subjects had increased waist circumference compared to Rh-negative subjects. Many studies proved the association of blood groups with different diseases, yet it is not clear whether its role is big or small related to lifestyle and heredity. However, the concept of fitness has changed. Several studies showed that body mass index is not the correct parameter of health or obesity. It is the amount of body fat, which determines the health condition of the individual. Waist-hip ratio was normal in 277 (47.59%) subjects and increased in 305 (52.40%) subjects. Waist Hip Ratio was increased in B blood group subjects followed by A, AB, and O blood group subjects. Subjects with Rh-positive were found to have an increased waist-hip ratio compared to Rh-negative subjects. Behera et al. [26] conducted a study that found a relationship between blood group with waist-hip ratio and males, indicating AB and Rh-negative blood group individuals were prone to develop increased waist-hip ratio, while in females, AB and Rh-positive were found more prone.

Limitations

Geographic and ethnic variability including ABO blood group distribution, and obesity prevalence can vary significantly by region and ethnicity. Confounding factors like obesity are dependent on diet, physical activity, socioeconomic status, and environmental influences. The cross-sectional study can only show indication, not causation. The study focuses on young adults, the findings may not be generalizable to another age group.

Conclusion

This study concluded that participants having the B blood group are more susceptible to developing obesity. This association indicates a possible genetic tendency that may relate to environmental and lifestyle factors, increasing the chances of obesity in this population. The observed increased incidence of obesity among B blood group individuals may be associated with differences in metabolic processes, such as lipid metabolism and insulin sensitivity, which are influenced by blood group antigens.

Funding: Self-funded project.

Conflict of Interest: The authors declare no conflict of interest.

Authors' Contributions: SAS designed the study and did the write up; NAY, MMM did data collection; KRL and AAU critically analysed the results; SFM supervised the project and gave final approval.

References

1. Anekwe CV, Jarrell AR, Townsend MJ, Gaudier GI, Hiserodt JM, Stanford FC. Socioeconomics of obesity. Current Obesity Reports.2020;9:272-9.https://doi.org/10.1007/s13679-020-00398-7.

2. Afolabi HA, Zakaria Z, Salleh SM, Ch'ng ES, Nafi S, Aziz A, et al. Obesity: a prerequisite for major chronic illnesses. Obesity-Recent Insights and Therapeutic Options: IntechOpen. 2023.DOI: 10.5772/intechopen.111935

3. Shaikh SA, Memon SF, Rahu NH, Laghari KR, Laghari ZA,

Shah H. Association of ABO blood group with lipid Profile in young adults of Hyderabad sindh. Clinical Epidemiology and Global Health. 2024;29:101746.https://doi.org/10.1016/j.cegh.2024.101746

4. Ahmed B, Konje JC. The epidemiology of obesity in reproduction. Best Practice & Research Clinical Obstetrics & Gynaecology. 2023;89:102342.https://doi.org/10.1016/j.bpobgyn.2023.102342.

5. Sashindran VK, Dudeja P. Obesity in school children in India. Public Health in Developing Countries-Challenges and Opportunities. 2020.DOI: 10.5772/intechopen.89602

6. Flor CR, Moura ICG, Baldoni AO, Loureiro P, Teixeira CM, Carneiro-Proietti AB, et al. Obesity and ABO blood group: Is there an association? Obesity Medicine. 2020;18:100209.https://doi.org/10.1016/j.obmed.2020.100209

7. Zhu S, Li Z, Hu C, Sun F, Wang C, Yuan H, et al. Imaging-based body fat distribution in polycystic ovary syndrome: A systematic review and meta-analysis. Frontiers in Endocrinology. 2021;12:697223. https://doi.org/10.3389/fendo.2021.697223

8. Pandey A, Patel KV, Lavie CJ, editors. Obesity, central adiposity, and fitness: understanding the obesity paradox in the context of other cardiometabolic parameters. Mayo Clinic Proceedings. 2018: Elsevier.DOI: 10.1016/j.mayocp.2018.04.015

9. Shaikh SA, Memon SF, Rahu HN. Association of ABO blood group with blood pressure in healthy adults of districts Hyderabad Pakistan. Discover Public Health.(2024);21:141. https://doi.org/10.1186/s12982-024-00255-1

10. Tham KW, Abdul Ghani R, Cua SC, Deerochanawong C, Fojas M, Hocking S, et al. Obesity in South and Southeast Asia—A new consensus on care and management. Obesity Reviews. 2023;24(2):e13520. https://doi.org/10.1111/obr.13520

11. Sureka B, George T, Garg MK, Banerjee M, Deora S, Sukhla R, et al. Cutoff values of body fat composition to predict metabolic risk factors with normal waist circumference in Asian Indian population. European Radiology. 2023;33(1):711-9. https://doi.org/10.1007/s00330-022-09009-6

12. Bhattacharyya S, Ganaraja B, Bhat R. Correlation between the blood groups, BMI and pre hypertension among medical students, Journal of Chinese Clinical Medicine. 2010;5(2): 78–82.

13. Sukalingam K, Ganesan K. Rhesus blood groups associated with risk to obesity and Diabetes Mellitus: A report on Punjabi population in Selangor, Malaysia. International Journal of Medical Sciences. 2015;2(4):105-9.DOI: http://dx.doi.org/10.16965/ijims.

14. Parveen N, Rehman J, Hassan SH, Hassan Z, Rehman m. Different blood groups: association with body mass index in medical students of karachi. The Professional Medical Journal. 2016;23(08):1001-4.: 10.17957/TPMJ/16.3215

15. Reyes Matos U, Mesenburg MA, Victora CG. Socioeconomic inequalities in the prevalence of underweight, overweight, and obesity among women aged 20–49 in low-and middle-income countries. International Journal of Obesity. 2020;44(3):609-16 https://doi.org/10.1038/s41366-019-0503-0

16. Sarma S, Sockalingam S, Dash S. Obesity as a multisystem disease: Trends in obesity rates and obesity-related complications. Diabetes, Obesity and Metabolism. 2021;23:3-16. https://doi.org/10.1111/dom.14290.

17. Katta N, Loethen T, Lavie CJ, Alpert MA. Obesity and coronary heart disease: epidemiology, pathology, and coronary artery imaging. Current Problems in Cardiology. 2021;46(3):100655. https://doi.org/10.1016/j.cpcardiol.2020.100655.

18. Lega IC, Lipscombe LL. Diabetes, obesity, and cancer—pathophysiology and clinical implications. Endocrine Reviews. 2020;41(1):33-52.https://doi.org/10.1210/endrev/bnz014.

19. Eslam M, El-Serag HB, Francque S, Sarin SK, Wei L, Bugianesi E, et al. Metabolic (dysfunction)-associated fatty liver disease in individuals of normal weight. Nature Reviews Gastroenterology & Hepatology. 2022;19(10):638-51.https://doi.org/10.1038/s41575-022-00635-5.

20. Miethe S, Karsonova A, Karaulov A, Renz H. Obesity and asthma. Journal of Allergy and Clinical Immunology. 2020;146(4):685-93.https://doi.org/10.1016/j.jaci.2020.08.011.

21. Smith S, Okai I, Abaidoo CS, Acheampong E. Association of ABO blood group and body mass index: A cross-sectional study from a Ghanaian population. Journal of nutrition and metabolism. 2018;2018. https://doi.org/10.1155/2018/8050152.

22. Jafari E, Sebghatollahi V, Kolahdoozan S, Elahi E, Pourshams A. Body Mass Index and ABO Blood Groups amongDifferent Ethnicities of the Golestan Cohort Study Subjects. Govaresh. 2012;17(1):50-4.http://ojs.hbi.ir/index.php/dd/article/view/831.

23. Aboel-Fetoh NM, Alanazi AR, Alanazi AS, Alruwili AN. ABO blood groups and risk for obesity in Arar, Northern Saudi Arabia. The Journal of the Egyptian Public Health Association. 2016;91(4):169-73.DOI: 10.1097/01.EPX.0000508457.31670.20.

24. Ammara A, Sarfraz H, Tusneem K, Qureshi TM, Muhammad N, Farhat R. Studies on comparison of body mass index (BMI) of school going children having different blood groups (A, B, Ab and O) of Sargodha district. Pakistan Journal of Nutrition. 2014;13(3):164-7. http://pjbs.org/pjnonline/fin2897.pdf

25. Chuemere AN, Olorunfemi OJ, Nwogu JU, Mmom O, Agbai E, Vurey V. Correlation between blood group, hypertension, obesity, diabetes, and combination of prehypertension and pre-diabetes in school aged children and adolescents in Port Harcourt. IOSR Journal of Dental and Medical Sciences. 2015;14(12):83-9.DOI: 10.9790/0853-141268389.

26. Behera S, Sahoo A, Satyanarayana P. Relationship of blood group with body fat percentage, visceral fat, and waist-hip ratio. National Journal of Physiology, Pharmacy and Pharmacology. 2016;6(6):591.DOI: 10.9790/0853-141268389.