National Journal of Physiology, Pharmacy and Pharmacology

RESEARCH ARTICLE

Relationship of blood group with body fat percentage, visceral fat, and waist-hip ratio

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Received: June 10, 2016; **Accepted:** June 24, 2016

ABSTRACT

Background: Researches have found that individuals of certain blood types may be at a higher risk for certain diseases. Studies have been conducted to establish the relationship between ABO blood group, rhesus (Rh) antigen and obesity. However, none has taken body fat percentage (BFP), visceral fat, or waist-hip ratio (WHR) into consideration. **Aims and Objective:** Objective of this study was to find out the relationship of blood group and Rh antigen with modern and trending obesity parameters such as BFP, visceral fat percentage, and WHR. **Materials and Methods:** This study was conducted on 100 healthy MBBS students. BFP, visceral fat percentage was obtained by bioelectric impedance method. WHR was calculated after measuring waist and hip circumference using Myo Taf body tape measure. **Result:** From our study, we observed, in males, blood group AB and Rh-negative participants have the highest propensity of increased BFP (>21%) and WHR (>0.9). Rh-positive males and blood group A have higher number of participants having visceral fat >10%. In females, over fat participants (>34%) are highest in number in O blood group and Rh-positive phenotype. Increased WHR (>0.85) is seen in AB and Rh-positive females. Females of blood group A and Rh-positive phenotype have the highest percentage of participants having higher visceral fat percentage (>10%). **Conclusion:** Relation with body composition parameters may be helpful to assess the disease incidence and risk assessment according to ABO and Rh blood groups.

KEY WORDS: ABO Blood Group; Rh Blood Group; Body Fat Percentage; Visceral Fat Percentage; Waist-hip ratio

INTRODUCTION

There have been several studies to determine a potential relationship between ABO, Rh blood groups, and various metabolic and malignant diseases. Studies done on patients with gastric cancer,[1] duodenal ulcer,[2] colorectal cancer,[3,4] thyroid disorders,[5] ovarian tumors,[6] upper urinary tract tumors,[7] small cell carcinoma of lung,[8] breast cancer,[9] pancreatic cancer,[10] coronary heart disease[11,12] hypercholesterolemia,[13] diabetes mellitus,[13,14] and osteoporosis[15] have shown association with ABO blood groups. These correlations have directed to the assumption that there is some definite correlation of various metabolic disorders with ABO blood group. These correlations help to recognize the vulnerability of the diseases and support possible preventive actions and diminish the incidence.

Obesity has become a pandemic which is increasing rapidly due to changing food habits and sedentary life style. Obesity is defined as an excess of body fat.[16] A surrogate marker for body fat content is the body mass index (BMI = body weight/height in metres^2). BMI has a limitation of not distinguishing

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Website: www.njppp.com	Quick Response code
DOI: 10.5455/njppp.2016.6.0615624062016	

between fat and muscle mass. So, our study seeks to find any correlation between ABO blood group and rhesus (Rh) antigen with fat percentage and waist-hip ratio (WHR) which is now believed to be the real culprit and is known to cause several metabolic as well as endocrinal disorders.

MATERIAL AND METHODS

This study was conducted on 100 apparently healthy, first year MBBS students (54 - females, 46 - males) aged 18-20 years of Konaseema Institute of Medical Sciences and Research Foundation, Amalapuram, in the year 2015-2016. Healthy participants having no history of current or past chronic illness were included in the study. Students, with fever, swelling, highly trained athletes, and having age <18 years were excluded from the study. After explaining the test procedure to the students, informed consent was taken. Height was measured using a stadiometer to the nearest of 0.1 cm. Height was measured without shoes.

Body weight, body fat percentage, (BFP) and visceral fat percentage were assessed using by "bioelectric impedance" analysis technique using OMRON HBF - 385 (Karada Scan). Measurement was conducted between 9 am and 12 noon to avoid any circadian variation. Measurement was done before lunch and about 2 h after breakfast. Measurement was avoided immediately after a meal, bath, or rigorous exercise. The participant was asked to stand barefoot so that foot is evenly placed on measurement platform. The display unit was held by the subject firmly, with arms horizontally raised and elbows extended straight.

Waist and hip circumferences were measured using measuring tape. Keeping the measuring tape parallel to the floor, waist circumference was measured at the level of the umbilicus. Hip circumference measurement was taken around the widest portion of the buttocks. WHR was calculated.

WHR = Waist circumference/hip circumference

Blood samples of the students were collected by finger prick method, and blood typing did by slide agglutination method using Anti sera-A, Anti sera-B, and anti-D antibodies, marketed by Span Diagnostics Ltd. (Spanclove).

Statistical Analysis

Statistical analysis was done using Microsoft Windows Excel software. Data were analyzed and given as percent and absolute number of frequency.

RESULTS

The correlation of blood group and body composition was studied separately in males and females as ideal body composition is different for both genders. The distribution of blood groups is shown in the Figures 1-4.

Healthy BFP varies in males and females. In males, healthy BFP is 10-21%, whereas, in females, it is 20-34% in the age group <20 years.[17-19] WHR is also believed to be different in

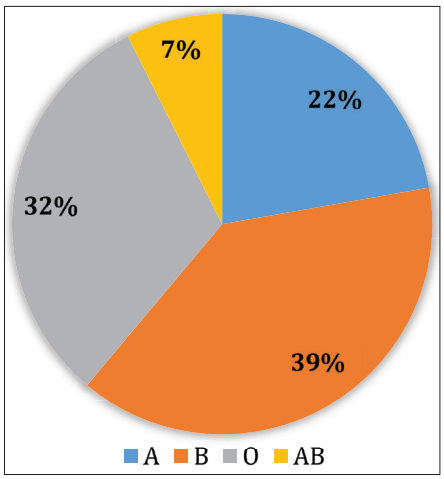

Figure 1: Distribution of females according to ABO blood group

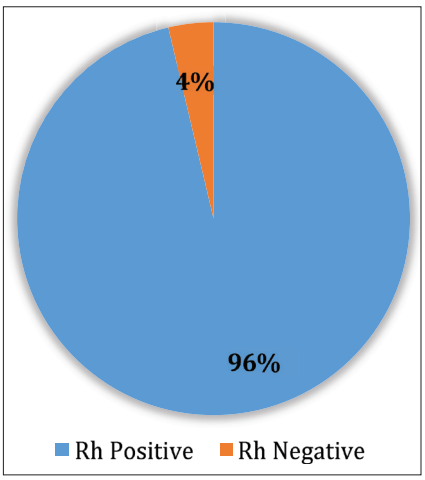

Figure 2: Distribution of females according to rhesus blood group

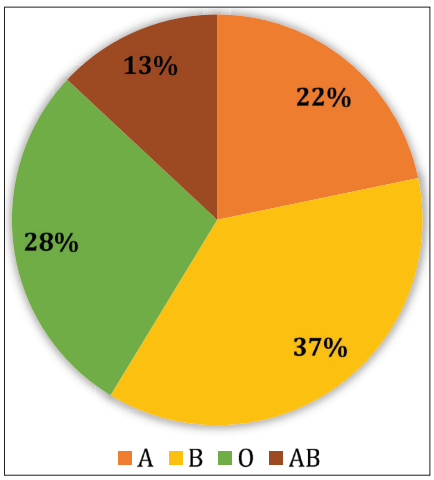

Figure 3: Distribution of males according to ABO blood group

males and females. WHR >0.9 in males and >0.85 in females is considered to be obese.[20] Visceral fat is a risk factor in several metabolic disorders and has been taken into account. Students having visceral fat percentage more than normal range (1-10%)[17] were considered.

Distribution of various body composition parameters in accordance to the blood groups in males is presented in Table 1 and females in Table 2.

DISCUSSION

While it seems from several studies that blood type plays a role in your disease risk, it is not clear if that role is big or small, related to lifestyle or genetics. Moreover, the concept of fitness has changed. Several studies have proved that BMI is not the correct measurement of health or obesity. It is the amount of body fat which determines the health condition of the individual.[19,21-23] Hence, this study was conducted to find out the relation between the blood group and the fat percent and WHR.

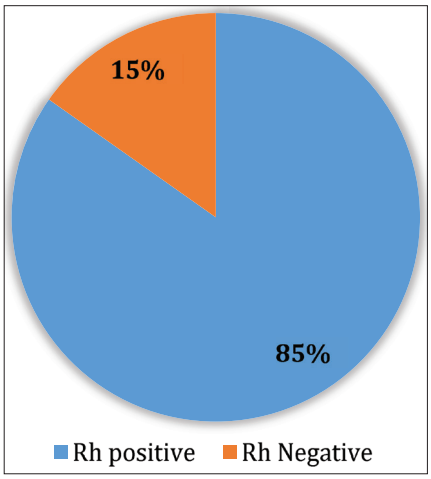

Figure 4: Distribution of males according to rhesus blood group

In our study, we have divided the study results into two groups based on gender (male and females). In males, blood group AB has shown the highest number of students having BFP above 21%. Rh-negative males have shown more percentage of body fat. Visceral fat percentage above the normal range of 10% was seen in 1 participant each in all ABO blood groups except "AB." Rh-positive males have more chances of having higher visceral fat percentage than Rh-negative males. Increased WHR (>0.9) incidence is seen more in blood group AB (66.667%) and Rh-negative males (57.142%)

In females, blood group O has the highest number of participants having body fat percent >30%. Rh-positive females show an increased tendency toward increased BFP. Visceral fat percentage is 1 each for blood group A, B, and O. In females, none of the members of blood group AB has increased visceral fat percentage (>10%). Rh-positive females have more tendencies to have increased visceral fat percentage. Increased WHR >0.85 is seen in blood group O and Rh-negative females.

Several studies have been done to establish a relation between blood group and obesity. Kumar and Gani[14] have found

Table 1: Distribution of various body composition parameters in accordance to the blood groups in males

Blood group (males-46)	Number of participants	BFP <21%	BFP >21%	Percentage of high BFP	Visceral fat >10%	Percentage of increased visceral fat	WHR >0.9	Percentage of increased WHR
A	10	5	5	50	1	10	4	40
B	17	6	11	64.7	1	5.8823	11	64.7
O	13	6	7	53.8461	1	7.6923	3	20.076
AB	6	2	4	66.667	0	0	4	66.667
Rh-positive	39	16	23	58.974	3	7.6923	17	43.589
Rh-negative	7	1	6	85.714	1	14.28	4	57.142

BEF: Body fat percentage, WHR: Waist-hip ratio

Table 2: Distribution of various body composition parameters in accordance to the blood groups in females

Blood group (females-54)	Number of participants	BFP <34%	BFP >34%	Percentage of high BFP	Visceral fat >10%	Percentage of increased visceral fat	WHR >0.85	Percentage of increased WHR
A	12	7	5	41.667	1	8.333	0	0
B	21	14	7	33.333	1	4.7619	1	4.761
O	17	8	9	52.9411	1	5.8823	2	11.767
AB	4	3	1	25	0	0	2	50
Rh-positive	52	30	22	42.3076	3	5.76	4	7.692
Rh-negative	2	2	0	0	0	0	1	50

BEF: Body fat percentage, WHR: Waist-hip ratio

blood group O and Rh-positive members. Krishnakanth et al.[24] and Chuemere et al.[25] have found blood group O to have the highest number of obese members. Ganeshan and Sukalingam[26] found blood group B, and Rh-positive was more susceptible to get obesity as compared to blood group O and A, whereas AB blood group had a lesser chance of getting obesity. All the above researchers have used BMI to assess obesity and not the body composition.

CONCLUSION

Obesity has reached epidemic proportions worldwide and has more than doubled since 1980. According to the World Health Organization report,[27] in 2008, 1.5 billion adults 20 and older were overweight, defined as a BMI >25 kg/m^2. The health risks related to overweight and obesity may be defined by BMI, but increasing importance has been given to the central fat accumulation and BFP. There is abundant evidence that abdominal obesity is related to many adverse metabolic markers. To estimate abdominal obesity, many studies used anthropometric measurements such as waist circumference or WHR.[28,29]

Hence, our study was done to find if blood groups show any correlation to the BFP, visceral fat, and WHR. This classification may be helpful to assess the disease incidence and risk assessment according to blood groups that too separately in both genders.

In males, blood group AB and Rh-negative participants have shown the highest propensity of increased BFP (>21%) and WHR (>0.9). Rh-positive males and blood group A have higher number of participants having visceral fat >10%.

In females, over fat participants (>30%) are highest in number in O blood group and Rh-positive phenotype. Increased WHR (>0.85) is seen in AB and Rh-positive females. Females of blood group A and Rh-positive phenotype have the highest percentage of participants having higher visceral fat percentage (>10%).

This study is a pilot project to address the problem of over fatness in society and to point out the relation of fatness to the blood group. However, owing to small sample size and age group limitation, it is difficult to address the problem in a large community. A bigger sample size in relation to the present prevalence may provide the exact problem statement and its relation to different blood groups.

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How to cite this article: Behera S, Sahoo A, Satyanarayana P. Relationship of blood group with body fat percentage, visceral fat, and waist-hip ratio. Natl J Physiol Pharm Pharmacol 2016;6(6):591-595.

Source of Support: Nil, **Conflict of Interest:** None declared.