Relationship of ABO Blood Groups and Rhesus Factor with Body Mass Index among Students of Technical Institute of Karbala

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Abstract
Background: Increased body mass index leads to fatness and is a preeminent risk factor for hypertension and diabetes. Blood groups are known to be associated with various diseases and recent studies have shown that a specific blood group with the highest body mass index appeared to be more susceptive to tendency to hypertension.**Aims:** To find out the relationship of body mass index with different blood groups in technical students in Karbala Technical Institute. **Study Design:** Cross-sectional study. **Setting:** Karbala Technical Institute. **Period:** February 2016 to June 2016. **Materials and Methods**: Weight, height and ABO blood groups were performed on 292 Technical students with 136 males and 156 females and age ranging from 18-30 years. **Results**: Mean age of the contributors was 21.40 ± 2.23 years. Mean BMI of subjects with blood group A, B, AB and O were found to be 23.17 ± 2.96, 23.84 ± 2.63, 23.37 ± 3.52 and 23.59 ± 2.59 kg/m2 respectively. The highest BMI was found in subjects with blood group "B" 23.84 ± 2.63 kg/m2 and lowest in blood group "A" 23.17 ± 2.96 kg/m2. Blood group "O" was found to be most prevalent (33.2%) while blood group "AB" was found to be the least (11%). The Rhesus-D negative and females students had greater body mass index 23.53 ± 2.77 than male 23.48 ± 2.88. **Conclusion:** Blood group "B" and Rhesus-D negative subjects especially females were found to be the high hazard blood type with predisposition to morbidity associated with increased body mass index.
Keywords: Blood groups, body mass index, Technical students.

1. Introduction
All human peoples share the same systems of blood groups; although they differ in the proportions of specific species.The rate of incidence of ABO and Rh group varies significantly in different races, ethnic groups, and socio-economic groups in different part of the world (Sidhu & Sidhu 1980). According to the International Society of Blood Transfusion (ISBT), there is now most than 270 antigens prorated over 30 differentiated blood group systems (Daniels & Reid 2010; Lögdberg *et al.* 2011). Nine of these systems namely ABO, Rh, Kell, Kidd, Duffy, MNS, P, Lewis and Lutheran are considered to be clinically important. Among them, the ABO and Rh systems are the most important systems during blood transfusion due to the fact that their antigens are more immunogenic and active at body temperature (Mohamed & Muna 2013). Blood group antigens play very important role in transfusion safety, genetics, understanding inheritance pattern, paternity testing and disease susceptibility. In order to avoid danger of mismatched transfusion it is important to determine the blood group of those involved prior to transfusion (Khurshid *et al.* 1992). Knowledge of availability and distribution of different blood groups at various levels is momentous in efficient management and service of blood banks across various regions of the country. Among the different blood groups, ABO system was the first to be professed and has been characterized as a genetic marker for obesity.

Morever, various blood groups are associated with different types of diseases. According to World health organization, body mass index (BMI) is defined as a simple index of weight-for-height that is generally used to codify underweight, overweight and obesity in adults. It introduces a reasonable measure to evaluate distribution of fat in children and adults. The precision of measurements of height and weight suggests that a variant of weight-for-height provides a more reliable measure of adiposity within populations (D'Adamo 2006; Ilyas 2015). Body mass index being an adjustable risk factor can be evaluated in time, and blood groups being non modifiable risk factor, should be identified as being beveled to developing obesity, so that young adults can be accordingly counseled for the life style modifications and thus be prevented from major diseases associated with increased BMI (Mohamed & Muna 2013). Hence, the objective of this research is to aim high hazard blood type with the greatest mean body mass index and accentuate them on the importance of primordial prevention from the morbidity seamed with obesity in the population.

2. Materials and Methods:
This cross sectional study was conducted at Technical Institute of Karbala after approval from ethical review committee recruiting a total of 292 technical students from February 2016 to June 2016. The participants included 136 males and 156females with the age ranging from 18-30 years. After the apprised consent, height and weight of the all the subjects were recorded by using stadiometer with weighing machine and their BMI was calculated by the standard formula. BMI= Weight in kilograms / Height in meter Square. The normal range of BMI is 18.50-24.99 kg/m2.Cut off value for overweight is 25 kg/m2 while 30kg/m2 is the cut off for obese

(Ilyas 2015). The blood specimens were pooled by finger pricks with a sterilized lancet. Each drop of blood was reposed on a slide containing a drop of each of the antisera, anti A, anti B and anti D (The following monoclonal antibodies were used: SPINREACT Anti-A, Anti-B and Anti-A+B monoclonal of Citra Santa Coloma (Spain) for the ABO blood type; SPINREACT Anti-D of Citra Santa Coloma (Spain) for the Rh Group from Blood Research and Fractionation Co) was added and mixed with each blood specimen. Adhesion of the blood drop with the three test sera was then appraised by soothly achieving through the mixture using a lancet. Blood drops displaying a clotting reaction with the test sera were regarded positive for that termed blood grouping reagent. Doubtful cases were confirmed by tube agglutination method and reverse grouping using known pooled A and B cells. Final blood group is confirmed only if both forward group (cell group) and reverse group (serum group) are identical. Statistical analysis was done by using SPSS 21. Descriptive statistics was done to determine the frequency and means with standard deviation. Chi square was applied to determine the significant difference (P-value < 0.05) between the BMI among different blood groups and gender.

3. Results

In 292 students, with 136 males and156 females mean age was 21.40 ± 2.23years. Mean BMI of subjects with blood group A, B, AB and O were found to be 23.17 ± 2.96, 23.84 ± 2.63, 23.37 ± 3.52 and 23.59 ± 2.59 kg/m2 respectively. The highest BMI was found in subjects with blood group "B" 23.84 ± 2.63kg/m2 where as the lowes value in blood group "A" 23.17 ± 2.96kg/m2. Mean BMI of subjects with Rh –ve was found to be 23.66 ± 3.14 while those with Rh +ve blood had mean BMI 23.49 ± 2.78kg/m2 (Table-I). The Rh –ve subjects were found to have higher BMI as compared to Rh+ve (Table-I). BMI with respect to individual blood group and gender is shown in Table1&2.The blood group "O" was found to be most prevalent (33.2%) while blood group "AB" was found to be the least (11%). Details of frequencies and percentages of ABO blood groups and Rh factor with BMI as groups showed in table-3.

Table-1 Distribution of Blood Groups ABO & Rh with their mean BMI

Blood group	Frequency(N)	Percentage (%)	Mean BMI ± SD (kg/m²)
A	84	28.3	23.17 ± 2.96
B	79	27.4	23.84 ± 2.63
AB	32	10.9	23.37 ± 3.52
O	97	33.3	23.59 ± 2.59
Rh+	259	88.6	23.49 ± 2.78
Rh –	33	11.4	23.66 ± 3.14

Table-2: Mean with SD deviation of BMI with gender

Gender	Frequency (n)	Percentage (%)	Mean BMI ± SD (kg/m2)
Male	136	46.5	23.48 ± 2.88
Female	156	53.5	23.53 ± 2.77
Total	292	100	23.51 ±2.82

Table-3: Distribution of blood groups ABO& Rh factor with BMI as groups

BMI	Blood group								Rh factor			
	A		B		AB		O		Rh +		Rh -	
	N	%	N	%	N	%	N	%	N	%	N	%
low weight	2	2.4	0	0	2	6.25	3	3.1	7	2.7	0	0
normal weight	55	65.5	48	60.8	16	50	56	57.7	157	60.62	18	54.55
over weight	25	29.7	29	36.7	13	40.63	38	39.2	91	35.14	14	42.42
obese	2	2.4	2	2.5	1	3.12	0	0	4	1.54	1	3.03
Total	84	100	79	100	32	100	97	100	259	100	33	100

4. Discussion

There are types of diseases such as blood pressure and diabetes linked to blood groups that are of great importance to researchers. The biggest risk factor for feeders is increased body mass index or obesity. Therefore, the main objective of the study is to identify the type of high-risk blood that causes the increase in body mass and inhibits the association with it. Generally in the study population, the most predominant blood group was

blood type O (33.3%; n=91) followed by A blood group (28.3%; n=84). This was consistent with the findings of study conducted by Benalla, *et al* (2017) and Getta *et al* (2016) who reported the pattern of distribution of ABO blood type as O>A>B>AB and agreeing with (Bhattacharyya *et al.* 2010), and this was variation with studies were reported in Bannu and Peshawar with ABO blood type distribution as B>A>O>AB and in Skardu as A>B>O>AB (Tabatabaie & Ali 2012; Bhatti & Shiekh 1999). Blood group B was found with a prevalence rate of 27.4% with blood type AB having the least prevalence (10.9%; n=32). These results were in variation to the study conducted by Mohammad Ilyas (2015) in which the most predominant blood group in all study themes was B type (World Health Organization, 2014). The ABO blood groups and Rh positivity in male and female donors showed that the blood group B positive was most prevalent in both male and female followed by group O, A and AB (Rao & Shetty 2014). Blood group A in Russian Federation (Tomilin & Gurtovaia 1999). The commonest groups in Australians are O and A, while in Africans B group is commonest (Mollison & Engelfriet 1993). In USA 46% show group O, 41% group A, 9% group B and 4% group AB (Frances 2002). In Saudi Arabia, 52% are group O, 25% group A, 19% group B and 4% group AB (Bashwari *et al.* 2001). Gender differences of mean BMI showed that females had greater mean BMI than males. This was in variation with the study conducted by Ji *et al* in which BMI of Chinese boys was found to be higher than BMI of Chinese females (Alam 2005). Different findings were found in a study by Ogden *et al* who found that US male children and adolescents had greater BMI than females (Haris *et al.* 2014).Percentage for Rhesus-D positive students was 66.8% as compared to Rhesus- D negative students with 11.4% which was close to the findings of the study conducted by Muhammad Ilyas (Anees & Mirza 2005). Amir Hossein Tabatabaie *et al* also found greater number of Rh(D+) subjects as compared to Rh(D —) (World Health Organization, 2014).The present results showed that highest mean BMI (23.84 ± 2.63) was found in subjects with blood group B. This was in identical with study by Bhattacharyya *et al.* and Haris *et al.* which revealed in their study that subjects with blood group B had greater BMI than other blood types (Ainee *et al.* 2014; PMRC 1982). Ainee *et al* study which reported highest BMI in AB blood group (D'Adamo 2006). In the present study, that the AB blood group seen more in the obesity3.12% followed by blood group B and A 2.5% and 2.4% respectively also found greater percent of Rh (D —) 3.03 % subjects as compared to Rh (D+) 1.54 %. In contrast Chandra *et al* found that the B blood group was more susceptible to hypertension and obesity as compared to blood group O and A; whereas AB blood group had less chance of getting hyper tension and obesity Current results showed no significant differences among blood groups regarding BMI (P>0.05). This was in consonance with the study conducted by Ainee *et al* in which comparison of BMI among different blood groups did not show significant difference (P> 0.05) (D'Adamo 2006) and in contrast with the study conducted by (Parveen *et al.* 2016).

5. Conclusion
The blood group "O" was found to be most prevalent while blood group "AB" was found to be the least. The highest BMI was found in subjects with blood group "B" where as the lowes value in blood group "A". The Rh – ve subjects were found to have higher BMI as compared to Rh+ve. Blood group "B" and Rhesus-D negative subjects, especially females, were found to be at high risk of increasing body mass index with predisposition to morbidity.

6. Acknowledgment

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