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## **Study of body mass index (BMI) and lipid profile of blood donors of north Indian population: a cross sectional study**

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### **Abstract**

**Background:** In developed countries with advanced healthcare systems collect blood equivalent to 5 to 10% of their population. In India, very less percentages of its population donating blood. Therefore, the aims of our study was to study the anthropometric parameter and lipid profile in blood donors and rule out the body weight and BMI in psyche of blood donation.

**Methods:** This cross-sectional study was performed on 165 healthy male blood donors. Physical parameters of donors were measured using standard protocol. After 350 ml of blood donation, 5 ml blood was collected in plain vial, total Cholesterol, TG, HDL, LDL, were estimated by reagent kit method.

**Results:** Out of 165 subjects, 36% lies in the range of 50-60 kg whereas remaining 64% subjects were with weight of 60 to 70 kg. According to Body Mass Index only 38% have a BMI between 18.5 and 22.9 kg/m<sup>2</sup> and remaining 62% subjects have BMI >24 kg/m<sup>2</sup>

**Conclusion:** Female health should be taken into account to improve it. Strict screening should be done to check the general health status of the donors. We also concluded that BMI as well as waist circumference does not significantly relate with dyslipidemia.

**Keywords:** Blood donation, Female, BMI, Waist circumference

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## **1. Introduction**

Blood, the liquid connective tissue, has an essential role in management of various emergencies in our health care systems[1]. Advancement of plasma expanders, synthetic and semi synthetic products do not reduce the importance of biological blood. The shortage of blood in the country remains a big question in our Indian society[2]. It is now obvious that donating blood is a noble cause for the human being. The blood donors are the key person for the blood transfusion facilities. It is reported by authors that blood donation stimulate the generation of new red blood cells. Blood donation also prevents the accumulation of iron. The amount of toxic chemicals (e.g. mercury, pesticides, fire retardants) circulating in the blood stream is reduced by the

amount contained in given blood. Though blood donation is relatively safe, there are few potentially harmful complications associated with it[3]. These may manifest with mild symptoms like weakness, nausea, sweating, etc or with severe symptoms like total loss of consciousness, seizures etc[4]. These complications are an important reason why the donors fail to return for repeat blood donation. Yet, misunderstandings and fears often prevent people from donating much-needed blood that could save someone's life[5]. Bhatia *et al* suggests that more than 40% of blood donations in India are voluntary[6]. In developed countries with advanced healthcare systems collect blood equivalent to 5 to 10% of their population[7]. In India, very less

percentages of its population donating blood. Therefore, the aims of our study was to study the anthropometric parameter and lipid profile in blood donors and rule out the body weight and BMI in psyche of blood donation.

## 2. Material and Methods

This cross-sectional study was performed on 165 healthy male blood donors. Subjects were taken from the department of Transfusion Medicine, King George's Medical University Lucknow. Written informed consent of each participant was taken and study protocol was approved by the institutional ethics committee. Subjects with age between 18 and 65 years were enrolled for the study. The inclusion criteria for the subject selection were: haemoglobin level  $>12.5\text{gm/dl}$  and weight 45 kg or more, Pulse Rate: 60 to 100 per minute and regular, Blood Pressure: Systolic 100 to 180 mm of mercury; Diastolic 50 to 100 mm of hg[8]. Exclusion criteria were: donors with previous transfusion within 6 month or previous donation within 3 month. Donor with known cardiac problem, endocrinal disorder, thyroid disorder, diabetes (on insulin therapy), hypertension, subjects undergoing medication like NSAIDs, steroids, anticancer drugs, were also excluded from the study. Physical parameters of donors were measured using standard protocol: Height (in meter), weight (in Kilogram) waist

circumference (in centimetre) and body mass index ( $\text{kg/m}^2$ ) was calculated using the following formula.  
 $\text{BMI} = \text{weight (kg)} / (\text{height in meter})^2$

After 350 ml of blood donation, 5 ml blood was collected in plain vial, serum was separated after centrifugation and different parameters of lipid like total Cholesterol, TG, HDL, LDL, were estimated by reagent kit method. Statistical analysis was done by Pearson correlation coefficient.

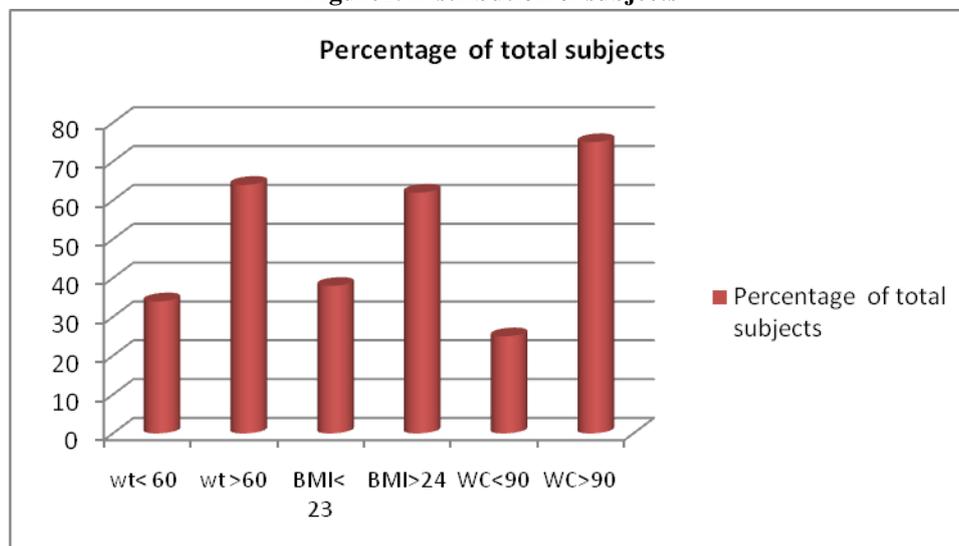
## 3. Observation and Results

Out of 165 subjects, 36% lies in the range of 50-60 kg whereas remaining 64% subjects were with weight of 60 to 70 kg. According to Body Mass Index only 38% have a BMI between 18.5 and 22.9  $\text{kg/m}^2$  and remaining 62% subjects have BMI  $>24\text{kg/m}^2$ . Subjects based on waist circumference 25% of the subject having waist circumference (WC) equal to 85-90 cm and remaining 75 % of the subjects were with WC  $>90\text{cm}$  (figure-1). Our data revealed that there was no significant difference ( $p>0.05$ ) in the serum level of total cholesterol, TG and HDL between subjects with BMI less than 23  $\text{kg/m}^2$  and greater than 24 $\text{kg/m}^2$ . The subjects with higher waist circumference showed significantly ( $p<0.05$ ) higher cholesterol levels. No significant change in TG and HDL was observed in subjects with higher waist circumference (Table-1).

Table-1: Lipid Profile in the study subjects

Parameters	BMI ( $\text{kg/m}^2$ )					Waist Circumference (cm)				
	<23		>23			<90cm		>90cm		
	Mean	SD	Mean	SD	p	Mean	SD	Mean	SD	p
Cholesterol mg/dl	177	29.45	173.7	28.76	<b>0.474</b>	173.1	25.29	183.4	39.71	0.04
Triglycerides mg/dl	129.4	38.84	136.1	35.58	<b>0.259</b>	131.6	36.53	138	39.73	0.28
HDL mg/dl	46.97	7.99	46.58	7.81	0.755	47.02	7.46	45.77	9.32	0.34

Figure1: Distribution of subjects



wt: weight; BMI : body mass index; WC: waist circumference

#### 4. Discussion

A total of 165 male subjects were enrolled for the study, astonishingly none female volunteer donor was recorded in the study. It may not be that women do not want to donate blood, perhaps they want to do, but most of them are not eligible to donate due to very low hemoglobin levels or suffer from various types of anemia[9,10]. Many even weigh less than 45 kg. This study has documented prevalent rates of normal weight (BMI <23), overweight (BMI>24) subjects voluntarily come to donate the blood in blood bank of government setup. Frequency distribution of subjects based on body mass index (BMI) showed that 44% of donors were had normal BMI, 27% and 24% were overweight and obese respectively. It signifies that the subjects who come for donation were mostly overweight or obese. It's may be due to the fact that many donor having lesser weight do not come for donation due to myth that blood donation make them weak. Unfavorable plasma lipid profile was documented among subjects in the higher BMI groups[11]. In our study, association total cholesterol, TG and HDL with body mass index (BMI) showed that subjects with greater BMI carry more cholesterol and TG but this difference was not statistically significant. It reveals that just increase in BMI may not alter the lipid profile or it may take more time to develop dyslipidemia. Previous study showed that higher BMI was inversely associated with HDL and directly associated with TG[12,13]. Although the association between BMI and both HDL and TG may be explained by insulin resistance[14], the lack of a significant association between BMI and high cholesterol remains an unexpected finding that requires further investigation. In his study he found that prevalence of blood donation was more in subjects with more BMI and waist circumference for men. Prior epidemiologic studies have shown that increasing body mass index (BMI) is associated with higher total cholesterol and low-density lipoprotein cholesterol (LDL)[15,16]. However, these studies were limited by underrepresentation of obese subjects. In our study, waist circumference was directly correlated with higher cholesterol may be one of the predictor of dyslipidemia.

#### 5. Conclusion

Our study emphasizes on the fact that though blood donation is safe, it still has ales donor and population ratio nearly 0.6%. Every possible measure should be taken in order to encourage people to donate blood at a regular basis. This starts right from spreading awareness about the safety and

importance of blood donations along with the discussion of the process with the donors, to alleviate their anxiety related to it. Female health should be taken into account to improve it. Strict screening should be done to check the general health status of the donors. We also concluded that BMI as well as waist circumference does not significantly relate with dyslipidemia.

#### References

- [1] Meena M, Jindal T, Complications Associated with Blood Donations in a Blood Bank at an Indian Tertiary Care Hospital. *Journal of Clinical and Diagnostic Research*. 2014 Sep; 8(9): JC05-JC08.
- [2] Sharma R. South East Asia faces severe shortage of safe blood. *BMJ*. 2000 Apr 15; 320(7241): 1026.
- [3] Kim J, Na S, Transfusion-related acute lung injury; clinical perspectives. *Korean J Anesthesiol*. 2015 Apr; 68(2):101-5.
- [4] Crocco I, Franchini M, Giovanni Garozzo G, Gandini AR, Gandini G, Bonomo P, and Aprili G. Adverse reactions in blood and apheresis donors: experience from two Italian transfusion centres. *Blood Transfus*. 2009 Jan; 7(1): 35–38.
- [5] Beth H. Shaz, Derrick G. Demmons, Colleen P. Crittenden, Claudine V. Carnevale, Mark Lee, Miriam Burnett, Kirk Easley, and Christopher D. Hillyer , Motivators and Barriers to Blood Donation in African American College Students, *Transfus Apher Sci*. 2009; 41(3): 191–197.
- [6] Bhatia R. Blood transfusion services in developing countries of South-East Asia. *Transfus Today* 2005; 65: 4-5.
- [7] Abdel Galil M. Gader A, Abdel Moniem A. Osman, Furgah H. Gahtani AL, Mohamed N. Farghali, Ali H. Ramadan, and Abdel Kareem M. Al-Momen, Attitude to blood donation in Saudi Arabia. *Asian J Transfus Sci*. 2011 Jul-Dec; 5(2): 121–126.
- [8] Blood donor selection. Guidelines on assessing donor suitability for blood donation. Annex 3. Geneva: World Health Organization; 2012. [17 August 2012].
- [9] Girija PLT. Anaemia among women and children of India *Anc Sci Life*. 2008 Jul-Sep; 28(1): 33–36.
- [10] Bentley ME and Griffiths PL. The burden of anemia among women in India, *European Journal of Clinical Nutrition*, 2003 ;57:52–60
- [11] Ugwuja EI, Ogbonna NC, Nwibo AN, and Onimawo AI. Overweight and Obesity, Lipid Profile and Atherogenic Indices among Civil Servants in Abakaliki, South Eastern Nigeria *Ann. Med Health Sci Res*. 2013 Jan-Mar; 3(1): 13–18.
- [12] Misra A, Pandey RM, Devi JR, Sharma R, Vikram NK, Khanna N. High prevalence of diabetes, obesity and dyslipidaemia in urban

- slum population in northern. *India. Int J Obes Relat Metab Disord* 2001; 25:1722-9.
- [13] Shamai L, Lurix E, Shen M, Novaro GM, Szomstein S, Rosenthal R, Hernandez AV, Asher CR. Association of body mass index and lipid profiles: evaluation of a broad spectrum of body mass index patients including the morbidly obese. *Obes Surg*. 2011; 21(1):42-7.
- [14] Halpern A, Mancini MC, Magalhães ME, Fisberg M, Metabolic syndrome, dyslipidemia, hypertension and type 2 diabetes in youth: from diagnosis to treatment. *Diabetol Metab Syndr*. 2010; 2: 55.
- [15] Hauner H, Bramlage P, Losch C, Jockel KH, Moebus S, Schunkert H, et al. Overweight, obesity and high waist circumference: regional differences in prevalence in primary medical care. *Dtsch Arztebl Int*. 2008; 105(48):827–33.
- [16] Yang WY, Li GW, Xin XY. Prediction of metabolic syndrome with combination of waist-to-hip ratio or waist circumference and blood pressure measurements. *Chin J Endocrinol Metab*. 2005; 21(3):227–9.