



## ***LIPOPROTEIN METABOLISM OF REGULAR BLOOD DONORS***

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**Abstract :** A few reports have linked regular blood donation to the lowering of parameters of lipid profile. Estimating the lipid profile is an accepted method of assessing an individual's risk for coronary heart disease, particularly if there is evidence of lipid peroxidation. Regular blood donation may lower iron stores, and this in turn lowers lipid peroxidation. This study was carried out to determine the effect of blood donation on lipid profile.

**Keywords:** blood donation, lipid profile, hematologic parameters, National Blood Bank Service of Ethiopia, chronic inflammation, total cholesterol, low-density lipoprotein

### **INTRODUCTION**

Blood is an important element of human life, and there is no compensation for its Nubila. Blood donation is a life-saving process for people who have lost large volumes of blood from serious accidents, obstetric and gynaecological haemorrhages and during various surgical procedures. The blood taken from donors could be either whole blood or blood products.

WHO gives a global rate of 117.5 million blood donations annually, of which 60% are voluntary donors and the rest are for family or paid donors. Although blood is very essential to save every life, acute shortage of blood and blood products encountered even in big cities with high populations fail to supply 50% of their demand. Blood transfusions in sub-Saharan Africa have emphasized areas of concern, yet there have been very few studies of its history. Record found that



transfusions were first reported in Africa in the early 1920s and organized transfusion practices were established before the Second World War and then blood transfusion grew rapidly after 1945. However, there is a great shortage of blood and blood products in sub-Saharan Africa.<sup>4</sup> In Ethiopia, there has been inadequate and inequitable access to blood. According to a report from the Ethiopian Ministry of Health, Ethiopia, collected 223,000 units of blood in 2019/20, meeting only 22% of its requirements as per the standard of the World Health Organization. Blood donation makes blood less viscous and lowers LDL-c and TC due to loss of fibrinogen, albumin and lipid loss during donation; Therefore, evaluating lipid profile is very important to assess risk factors for chronic illnesses like diabetes mellitus, hypertension, heart disease, and so on. Oxidized LDL-c directly delivers various lipid oxides and hydroperoxides to target cells. These compounds variably act as cytotoxins, monocyte, chemoattractant, and stimulators of cholesterol ester accumulation by macrophages. The accumulation of LDL-c in the vessel wall contributes to the formation of fatty strikes. According to a study, blood donation was to reduce the enzyme responsible for the oxidation of LDL-c, which is linked with the development of atherosclerosis.

The study conducted in Argentina reported that HDL-c of regular blood donors were higher than irregular or nondonors.<sup>11</sup> HDL-c associated enzyme protects LDL-c from oxidizing because oxidized LDL-c facilitates the formation of platelet activation factor and production of free radicals that are potential to produce pro-inflammatory cytokine. HDL-c also inhibits platelet-activating factor (PAF) synthesis in the endothelial cell by inhibiting PAF acetyltransferase. A comparative study done on various hematologic parameters among voluntary first-time and regular blood donors in India, Indicated that the level of Hb, MCV, MCH, RBC and serum ferritin were significantly decreased in regular blood donors. Another study conducted on CBC in Sudan Hospitals Blood Bank showed that 70% with the normal range, 26% increased, and 4% decreased in RBCs count. On WBCs count, 82% and 18% were in the normal range and decreased, respectively. In addition, when 90% of the PLTs count is in the normal range, 8% and 2% were increased and decreased in PLTs count, respectively. Some studies have reported that blood donation decreases the risk of cardiovascular and other chronic diseases.

However, limited studies were conducted worldwide and to our knowledge, there were no studies in Ethiopia that compared the lipid profile and hematologic parameters among regular and first-time blood donors.

#### Population and Eligibility Criteria

The source population for this study was all blood donors who have voluntarily donated their blood at the National Blood Bank Service of Ethiopia, whereas all blood donors who have visited the National Blood Bank Service of Ethiopia during the study period were considered as the study population. All regular and first-time blood donors between the ages of 18–65 years were included in this study; however, donors who were smokers, alcohol drinkers, on lipid-lowering medication, weight less than 45 Kg, pregnant and lactating women, hypertensive, diabetic, cardiovascular and anaemic patients were excluded from the study.

#### Blood Collection and Processing

About 6 mL of blood sample was drawn by qualified health care professionals and divided into two (3 mL for lipid profile and 3 mL for CBC). While the haematological analysis was performed right away at the time of sample collection, lipid profiles were performed one time after we reached our sample size. Three-milliliter blood was added in SST and allowed to stand for 30 minutes at room temperature for complete clotting and clot retraction. Then, Serum was separated by centrifugation at 3500 rpm for 15 minutes by Megafuge r 1.0 Heraeus centrifuge (Germany, 2017). The serum was used to determine the levels of TC, HDL-c and TG by a Cobas 6000



Chemistry Analyzer (Germany, 2020). LDL-c cholesterol was calculated using the Fried-Wald formula ( $LDL-c = TC (TG/5 + HDL)$ ). Finally, serum lipid profile ratios (TC/HDL-C, TG/HDL-C and LDL-C/HDL-C) were calculated. Another 3 mL for CBC was added to the EDTA tube to determine hematologic parameters by Beckman haematology Analyzer (Germany, 2018).

#### Study Variables

Serum lipid profile (TC, LDL-c, HDL-c and TG) and CBC were dependent variables, whereas socio-demographic factors and anthropometric indicators were our independent variables.

#### Operational Definition

**Lipid Profile:** is a panel of blood tests that serves as an initial broad medical screening tool for abnormalities in lipids, such as cholesterol, HDL-c, LDL-c, and triglycerides. **Regular blood donors:** individuals who had donated blood every three months, at least for the last consecutive two years. **First-time blood donors:** an individual who has donated blood for the first time with no history of blood donation previously.

#### Data Quality Control and Management

Data collection tools were prepared to meet the highest quality and monitored at the time of sampling. Professional laboratory technologists handled all the experimental procedures and all instruments were operated according to the manufacturer's instructions. High-quality standards were used as a control and calibration was used to calibrate the instruments and no analyses were done if the control is out of normal range.

#### Data Processing and Analysis

Data obtained from the questionnaire and laboratory analysis were checked for completeness and refined. It was coded and entered into the Epi-Data statistical software version 3.1 and exported to SPSS software version 25 package and different variables were tested and analyzed. Simple descriptive statistics were used to present the socio-demographic characteristics of the study subjects. While the Chi-square ( $\chi^2$ ) test was used to compare categorical variables, the continuous variable was present as mean  $\pm$  SD and compared using the Student's t-tests for groups. A p-value of less than 0.05 at a 95% confidence level was considered to be statistically significant.

#### Socio-Demographic Characteristics of the Blood Donors

The study included 104 study participants: 52 of each were regular and first-time blood donors. Among the regular blood donors, 84.6% and 15.4% were donated four and three times a year, respectively

#### Sampling Methods and Producers

A structured questionnaire translated to the local language, Amharic, was used for the socio-demographic data collection. Anthropometric measurements including weight, height, waist-circumference and hip-circumference were measured with the subjects wearing light clothing. Body mass index (Kg/m<sup>2</sup>) was calculated by dividing the weight in Kg by height in m<sup>2</sup> and waist-to-hip ratio (WHR) was calculated.

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In conclusion markers of increased cardiovascular risk appear to be lower in regular blood donors compared with non-donors as reflected by significantly lower total cholesterol and LDL levels. Although HDL appears to be significantly higher in the nondonor population, the LDL/HDL ratio – which is a better predictor of increased cardiovascular risk – is lower in regular blood donors. It thus appears that regular blood donation is associated with lowering of serum lipids. However, a larger study needs to be carried out to confirm these findings.

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