

A Study of Hematological and Lipid Profile Status of Apparently Healthy Donors in Blood Bank at a Tertiary Care Centre in North India: A 2 Year Experience

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Abstract

Introduction: Blood donation is a noble act and it saves the life of four patients, as one whole blood is divided into four components. Blood donation is a noble act for survival of the sick and needy patients during emergency. Numerous studies have been conducted and they have reported, the mean haemoglobin level, serum iron, serum ferritin and cholesterol level were significantly low in repeat donors compared to first time donors. Iron deficiency was more common in high frequent donors compared to low frequent donors [4]. There is strong evidence of the role of red cell indices as early indicators of iron diminution in frequent blood donors by measuring serum ferritin or soluble transferrin receptor levels.

Methods: This two year prospective study was done in the blood bank of J.N. Medical College and Hospital, AMU, Aligarh from 2018 to 2020. This study was conducted on first time donor, repeat donor and repeat donor on subsequent donation. Statistical analysis of Haematological parameters, Iron Profile and Lipid Profile was done.

Results: In present study, there was decrease in value of haemoglobin in repeat donors (13.4g/dL) which further decreases on subsequent donation (13.36g/dL). Mean iron in first time donor was 92.67µg/dL which reduces on repeat donation and on subsequent donation. The value of mean iron reduces from 90.9µg/dL in repeat donors to 83.3µg/dL in repeat donors on subsequent donation. Mean ferritin value in first time donor was 59.47 ng/mL and in repeat donors it was 51.17 ng/mL which further reduces to 43.08 ng/mL on subsequent donation. LDL cholesterol in first time donor was 74.77 mg/dL and it decreases in repeat donors and in repeat donor on subsequent donation to 70.7 mg/dL and 65.5 mg/dL respectively. LDL/HDL ratio in first time donor was 2.19 and it reduces to 2.15 in repeat donors and on further donation it falls to 2.11.

Conclusion: Blood donation is beneficial as it reduces LDL cholesterol and increases HDL cholesterol.

Keyword: Haematological parameters, Blood donors, Voluntary blood donation, Lipid Profile

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Introduction

“Safe blood starts with me, Blood saves lives” was the WHO theme for 2000 AD. Blood donation is a noble act and a single whole blood unit can save the life of four patients, and is also used in numerous therapeutic and preventive etiologies [1].

In 1667, the very first animal to human transfusion of blood was conducted [2] and James Blundell in 1818, conducted the first human to human transfusion. The first blood donation facility in the world was established in London by Percy Oliver in 1921. Most of the respondents stated that adequate information and the knowledge that a unit of blood donated will save life would encourage them to be voluntary donors [3]. Numerous studies conducted and they have reported, the mean haemoglobin level, serum iron, serum ferritin and cholesterol level were significantly low in repeat donors compared to first time donors. Iron deficiency was more common in high frequent donors compared to low frequent donors [4]. There is strong evidence of the role of red cell indices as early indicators of iron diminution in frequent blood donors by measuring serum ferritin or soluble transferrin receptor levels [5]. Serum ferritin level indicates body iron stores can be reduced to halved through donation of single unit of whole blood [6].

Therefore donation of whole blood reduces risk of atherosclerosis in donor [7]. There is beneficial effects of blood donation in its relationship with ischemic heart disease. Blood donors compared to non-donors

seemed to have more favourable lipoprotein concentrations, like lower LDL cholesterol concentration or apoB, lower triglyceride levels, elevated HDL cholesterol concentration, and lengthened lag times (oxidative resistance or oxidative potential) of VLDL [8]. Among regular blood donors the level of serum cholesterol, phospholipids, and esterified fatty acid levels are significantly lower compared to non-donors [9].

Materials and Methods

A two year prospective study was done in the blood bank in north India from 2018 to 2020. The study was conducted on first time donor, repeat donor and repeat donor on subsequent donation. Statistical analysis of Haematological parameters, Iron Profile and Lipid Profile was done.

All results were statistically analysed by software SPSS 20 (Statistical Package for the Social Sciences) by applying paired t test and unpaired t test and p value of less than 0.05 was considered statistically significant.

Results

Total number of 200 cases collected in which 120 (60%) were first time donors and 80 (40%) were repeat donors. Out of these 80 repeat donors, 31 (38.75%) were those donors who were followed up for subsequent donation. In our study, most of the donors were those who came to donate blood to their relatives during emergency and were first time donors.

Haemoglobin of donors

Table 1

| First time donor (n=120) | | Repeat donor (n=80) | | Repeat donor on subsequent donation (n=31) | |
|--------------------------|----------------|---------------------|----------------|--------------------------------------------|----------------|
| Range of Hb (g/dL) | Mean Hb (g/dL) | Range of Hb (g/dL) | Mean Hb (g/dL) | Range of Hb(g/dL) | Mean Hb (g/dL) |
| 12.6-15.3 | 13.513±0.64 | 12.6-15.9 | 13.4±0.83 | 12.6-15.4 | 13.36±0.9 |

Mean haemoglobin of first time donors is 13.5 which reduces on repeat donation and further reduces on subsequent donation as shown in table 1.

Iron of donors**Table 2**

| First time donor (n=120) | | Repeat donor (n=80) | | Repeat donor on subsequent donation (n=31) | |
|------------------------------------|--------------------------------|------------------------------------|--------------------------------|--------------------------------------------|--------------------------------|
| Range of Iron ($\mu\text{g/dL}$) | Mean Iron ($\mu\text{g/dL}$) | Range of Iron ($\mu\text{g/dL}$) | Mean Iron ($\mu\text{g/dL}$) | Range of Iron ($\mu\text{g/dL}$) | Mean Iron ($\mu\text{g/dL}$) |
| 39-176 | 92.67 \pm 25.97 | 42.8-145 | 90.09 \pm 18.7 | 40.8-114 | 83.3 \pm 18.04 |

Mean value of iron in first time donors is 92.67 which reduces on repeat donation and further reduces on subsequent donation as shown in table 2.

Range and mean LDL of donor**Table 3**

| First time donor (n=120) | | Repeat donor (n=80) | | Repeat donor on subsequent donation (n=31) | |
|--------------------------|-------------------|----------------------|------------------|--------------------------------------------|------------------|
| Range of LDL (mg/dL) | Mean LDL (mg/dL) | Range of LDL (mg/dL) | Mean LDL (mg/dL) | Range of LDL (mg/dL) | Mean LDL (mg/dL) |
| 30-145 | 74.77 \pm 22.76 | 34-145 | 70.7 \pm 22.0 | 31.7-119 | 65.5 \pm 20.39 |

Mean LDL of first-time donors is 74.77 which reduces on repeat donation and further reduces on subsequent donation as shown in table 3.

Range and MEAN HDL of donor**Table 4**

| First time donor (n=120) | | Repeat donor (n=80) | | Repeat donor on subsequent donation (n=31) | |
|--------------------------|-------------------|----------------------|------------------|--------------------------------------------|------------------|
| Range of HDL (mg/dL) | Mean HDL (mg/dL) | Range of HDL (mg/dL) | Mean HDL (mg/dL) | Range of HDL (mg/dL) | Mean HDL (mg/dL) |
| 19-62 | 34.84 \pm 188.2 | 18-54 | 33.2 \pm 8.48 | 15-50 | 36.54 \pm 5.66 |

Mean HDL of first time donors is 34.84 which reduces on repeat donation but increased on repeated donation as shown in table 4 which is beneficial to donor.

LDL/HDL Ratio**Table 5**

| First time donor (n=120) | | Repeat donor (n=80) | | Repeat donor on subsequent donation (n=31) | |
|--------------------------|-----------------|---------------------|-----------------|--------------------------------------------|----------------------|
| Range of LDL/HDL | Mean LDL/HDL | Range of LDL/HDL | Mean LDL/HDL | Range of LDL/HDL (mg/dL) | Mean LDL/HDL (mg/dL) |
| 4.53-1.03 | 2.19 \pm 0.63 | 3.5-1.2 | 2.15 \pm 0.60 | 3.5-1.0 | 2.11 \pm 0.41 |

Mean LDL/HDL ratio of first time donors is 2.19 which reduces on repeat donation and further reduces on subsequent donation as shown in table 5.

Discussion

In present study, haemoglobin reduces on repeat donation 42 and subsequent donation, though mean haemoglobin does not go below the normal limit of 12.5g/dL. It implies that repeat donation does not effect haemoglobin significantly. In addition this can be compensated by giving iron supplementation to the donors, if required. In a study done by Naidu *et al.*, 2013 [2] and Tailor *et al.*, 2017 [4] there was reduction in haemoglobin in repeat donor, the finding of which was similar to our study. However, Norashikin *et al* in 2006 [8], conducted study and he found out that haemoglobin increases on repeat donation which was discordant with our study.

Mean iron in first time donor was 92.67 μ g/dL which reduces on repeat donation and on subsequent donation. The value of mean iron reduces from 90.9 μ g/dL in repeat donors to 83.3 μ g/dL in repeat donors on subsequent donation, which was significant. It implies that with increase in number of donation, iron level falls down, but it does not reduces to the deficiency range. It means repeat donors which are donating regularly have reduced mean iron, which can be beneficial to the donors in terms of free radical injury and cardiovascular disease [10]. Similar study with similar findings that is reduction in iron on repeat donation was conducted by Tailor *et al* in 2017 [4], Abdullah *et al.*, 2011 [11].

In our study, LDL cholesterol in first time donor was 74.77 mg/dL and it decreases in repeat donors and in repeat donor on subsequent donation to 70.7 mg/dL and 65.5 mg/dL respectively. This reduction in LDL cholesterol was significant. In a study done by Bharadwaj R.S *et al* in 2005 [12], there was decrease in LDL cholesterol on repeat blood donation which was similar to the present study. Diminished release of nitric oxide into the arterial wall is associated with atherosclerosis, either because of reduced synthesis or excess degradation. Nitric oxide synthase is

controlled by iron through an iron regulatory protein: a cytoplasmic protein which regulates ferritin translation (Weiss G *et al.*, 1994).

We already know that, when body iron decreases, LDL particle become resistant to oxidation, so there is reduction in formation of oxidised LDL. Hence, there will be double benefit for the repeat donors in terms of both iron and LDL reduction, which will prevent donor from atherosclerosis and cardiovascular diseases. The progression of atherosclerosis involves inflammation of arteries and healing processes in a hyperlipemic environment, where low density lipoprotein (LDL) oxidation is the causal factor [14]. In our study HDL cholesterol was low in repeat donors (33.2 mg/dL) compared to first time donors (34.84 mg/dL). However, it increases to (36.54 mg/dL) on subsequent donation . So, repeat blood donation was beneficial, as it increases good HDL cholesterol and can prevent donors from atherosclerosis. Similar finding, to our study was found by Bharadwaj R.S., (2005) [12] in which HDL cholesterol increases on repeat blood donation which was concordant with our study.

LDL/HDL ratio in first time donor was 2.19 and it reduces to 2.15 in repeat donors and on further donation it falls to 2.11. Among all the parameters, plasma LDL/high-density lipoprotein (HDL) ratio was a better indicator of risk for coronary heart disease than either plasma LDL or HDL alone [15]. In a study done by Kinoshian B *et al.*, 1995 [16] he found out that change in LDL/HDL ratio was a better predictor for coronary heart disease risk than separate isolated levels of LDL and HDL. So by these findings we conclude that donating blood repeatedly reduces haemoglobin and other haematological parameters, but not to the level of deficient stage. And if any mild deficiency occur, we can counteract that by providing supplements. Repeat donation also reduces iron level, hence less free radical injury occur in body. It also

decreases total and LDL cholesterol (bad cholesterol), and increases HDL cholesterol (good cholesterol). Hence, repeated and frequent blood donation protect against the cardiovascular event by making the blood profile healthier.

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