

# To Assess the Iron Reserves in Blood Donors by Measuring Serum Ferritin and Hemoglobin in the Children Hospital Lahore

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## ABSTRACT

**Introduction:** Frequent contribution of blood can cause iron exhaustion in blood donors along with the problems related to it. Curtailing the proportion of iron reduction among blood donors is a crucial plan for boosting donor's well-being.

**Aim & objectives:** The aim of this analysis is to determine iron stocks by measuring serum ferritin in pre-donation male blood donors along with their relation with the hemoglobin concentration and frequency of blood donations.

**Study design:** Cross-sectional study.

**Place and duration:** Pathology (immunohematology) department and blood bank of University of Child Health Sciences, The Children Hospital Lahore from Aug 2021 to July 2022

**Material and Methods:** A total of 350 serum samples were processed to determine hemoglobin and serum ferritin concentrations. The study involved was performed on healthy blood donors. The method used was chemiluminescence for the simultaneous measurement of serum ferritin.

**Results:** An aggregate of 350 serums were collected from the contributors in blood bank. Among them, 154 were the first-time donor and 196 were the frequent donors; the serum ferritin was markedly reduced in constant contributors. The mean value 105ng/mL was found in infrequent donors and 79.35ng/mL was found in frequent donors. There was no notable variance in hemoglobin of newbie and regular blood givers. However, a momentous variation in the pervasiveness of iron depletion between first-time and regular donors is found.

**Conclusion:** Blood donation has a noteworthy impact on iron stores and is one of the most important factors for iron shortage in contributors, specifically in those who donate blood again and again. Serum ferritin measurement ought to be incorporated in the blood donor preference especially in the evaluation of consistent blood givers to assure enough iron pools in the donor community in order to sustain a pertinent potential donor.

## INTRODUCTION

The demand for blood donation has been meeting through voluntary blood donations. Consequently, an absolutely fit blood donor population is essential.

Healthy, strong, active huge young population is potential source of blood contribution. Blood can secure millions of life and the young people are the ultimate hope and future of a secure blood provision<sup>1</sup>.

Blood contribution is a compassionate deed towards the unwell sick people by the healthy ones; however, the maintenance of wellbeing of donors is important for medical professionals. Enough money is being spent on screening of the donors for protection of recipient but least attention is paid on the robustness of the donors as the chronic iron deficiency anemia results from frequent blood donations and the depletion of iron stores ultimately leads to a downturn in blood donors<sup>2,3,4</sup>.

The only downside of blood donation is the possibility of having iron deficiency anemia. However, blood donations affect the value of Hb % and serum ferritin of donors. Safely four times per year a healthy blood donor can donate the blood. The iron stores can replete within the period of three months. All the donors should be screened for anemia before blood donations. The cut off value of hemoglobin is 13.5g/dl. However, the consequence of blood donations on the status of iron stores has been analyzed by the changes in the proportion of hemoglobin and the iron stores. Mostly the hemoglobin (Hb) concentration is the main concern. But serum ferritin estimation is rather more important in estimation of iron deficiency anemia in donors as even with reduced iron stores the value of hemoglobin concentration might be normal<sup>5,6,7</sup>.

One blood donation depletes 4 to 10 percent of body iron and fall in hemoglobin concentration. Short intervals between the blood donations increase the chances of iron depletion; however, the long intervals between the donations are at lower risk of iron deficiency anemia<sup>7,8,9</sup>.

The regular monitoring of serum ferritin along with the provision of ferrous supplements is practicable and efficacious approach to minimize the percentage of donors with low ferritin and hemoglobin levels<sup>10,11</sup>.

According to World Health Organization there are different criteria for blood donor selection. Any individual with good health can be a donor. The eligibility criteria depend on the screening of Hepatitis B and C, age, weight and height of a person, blood pressure, temperature, hemoglobin level, diabetic status and screening of sexually transmitted diseases. The selection of blood giver is outlined in such a way that the donations do not cause any harmful effect to the donors as well as the recipients. Whole blood donors can donate blood in every 8 weeks and frequent donors are at risk of iron depletion<sup>12</sup>. Serum Ferritin also decreases in association with the blood donations<sup>13</sup>. This is why donor iron check gained much recognition in the last decade. In spite of the importance for donor health, global agreement on a pertinent strategy for iron monitoring is still lacking. Therefore, we conduct a trial to evaluate the importance of iron store measurements in apparently healthy looking blood donors.

## MATERIALS AND METHOD

Healthy donors are selected for research work by verbal consent. Before taking samples of donors' complete medical history along with physical examination, vitals and screening tests are conducted according to WHO criteria. The sample is taken in heparinized serum vial. After the centrifugation measured volume of serum is stored for testing and the level is analyzed by IMMULITE 2000 XPI. Sample for hemoglobin level in EDTA vial and analyzed by SYSMAX XN-1000. SPSS version 16 is used to enter the data. After entering with the help of descriptive statistics, data is analyzed. Tabulated and graphical representation is also obtained.

## RESULTS

A total of 350 samples were aggregated from blood bank. All the donors were male. Among them 154 contributed blood for the first time and 196 gave more than once or were frequent givers. The age range was between 18 and 58 years and mean age found was 29.8 years. There was no striking change in the average age of newbie and regular donors. However, the study showed that the serum ferritin was markedly reduced in frequent donors than the first-time donor. The mean value of first-time donors was 105ng/mL and frequent donor was 79.35ng/mL. There was no noteworthy variation between hemoglobin quantity of first time and frequent contributors. The mean value of hemoglobin of first-time donor was 14.5g/dl and the mean value of frequent donor was 14.9g/dl.

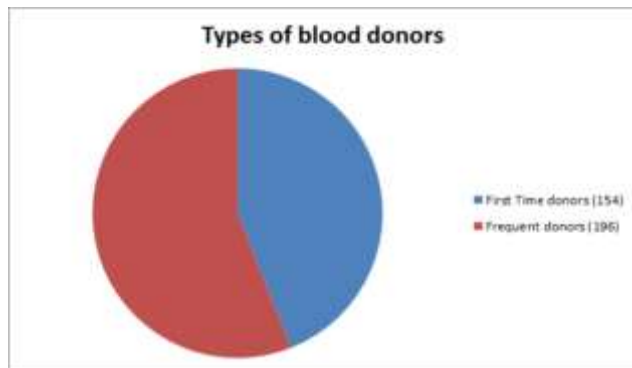


Figure 1:

Table 1: Comparison of serum ferritin among newbie and periodic blood contributors

Donor type	Number and percentage	Mean value of Ferritin obtained
First time donors	154 (44%)	105.86
Frequent donors	196 (56%)	79.3571

Table 2: Hemoglobin quantity of newbie and periodic donors

Donor type	Number and percentage	Mean value of Hemoglobin
First time donors	154 (44%)	14.5455
Frequent donors	196 (56%)	14.9286

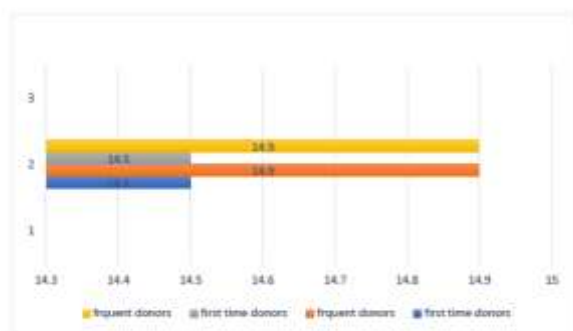


Figure 2: Graphical representation of Hemoglobin percentage of first time and frequent donors

## DISCUSSION

Blood donation is a frequent routine healthcare procedure utilized in numerous life sustaining therapeutic situations. It is impossible to ignore the significance of blood transfusion as billions of individuals have been rescued with detection of blood groups<sup>14</sup>.

Iron deficiency anemia is the commonest anemia seen in Pakistan and is frequently observed in those who donate blood especially on regular basis<sup>2,15</sup>

In routine, the blood donors are selected by checking hemoglobin %, but in reality many donors with normal Hb% could be having insufficient irons without anemia. This usually occurs when the body is not provided with adequate time interval between blood donations to reload iron reserves<sup>16</sup>.

In our study, only males are selected as blood donors because in Pakistan generally blood donors are males. We rarely receive female blood donors. The notable causes of this gender inequality comprise of lack of knowledge / reassurance, myths, false perceptions related to blood donation and relief from blood donation due to anemia, menstruation, gestation and breast feeding. Unlike, everywhere else in the world, females are usually demotivated to offer blood<sup>17,18</sup>.

The mean age of blood contributors in our research was 29.8 years (ranging from 18 to 58 years). This is in accordance with many other studies conducted worldwide<sup>17,19,20</sup>.

The impact of blood grant on donor's iron reserves has already been proved by several studies<sup>2,21</sup>.

Similarly, many studies have already manifested that a donor might have reduced iron stores with absolutely normal hemoglobin and blood counts<sup>22</sup> and that serum ferritin is a reliable marker that must be checked for donor selection along with hemoglobin especially in regular frequent blood donors<sup>16,23,24</sup>.

A study performed in Lagos, Nigeria revealed the incidence of iron exhaustion (serum ferritin <20 ng/ml) was more common among periodic blood givers (11.4%) contrary to newbie donors (2.9%) in spite of falling into the HB standard for donation<sup>25</sup>.

Thus, this study manifested that indicators of iron-affiliated ailments such as serum iron in periodic donors are appreciably small than in newbie givers. Despite the fact that various researches have demonstrated that continual periodic blood grant instigate iron exhaustion and iron inadequacy, almost every blood center still scrutinize only hemoglobin as a measure for picking blood contributor. The current survey that was completed by scrutinizing hemoglobin and serum ferritin levels revealed the magnitude of evaluating the iron stores and then lodged a policy to hamper extreme iron drain during incessant blood offerings. The probability for an individual contributor to give blood without developing iron-deficiency anemia is relied on plenty of aspects including dissimilarity in dietetic iron feasting, bleeding disorders, GI ulcers, drug intake like NSAIDS, the preponderance of iron deficiency etc.

Blood donor centers have the obligation to secure blood donors by preventing anemia among them. Numerous surveys illustrated that hemoglobin is not a benchmark to detect iron deficiency; however it is practical in sorting bulk of blood contributors with iron scarcity. Many apparently healthy looking blood givers are found to be iron deficient as exposed by Mittal R<sup>5</sup>.

In the current survey mean ferritin concentration of 105 ng/mL in newbie contributors outstandingly surpassed the mean value of 77 ng/mL found in periodic blood givers. Our study demonstrated a profound correspondence between the abundance of donations and the ferritin level.

The rationale for iron scarcity in contributors with periodic donations is that the iron requirement increases with extent of blood contributions. The incorporation of dietary iron among blood givers is significantly better than non-givers; still an annual contribution of 4-5 units cannot be remunerated by iron digestion and induce an iron paucity.

The improved provision of iron add-ons to blood contributors in consonance with their serum ferritin proportion is fundamental approach<sup>24</sup>.

Annual Quantification of serum ferritin is requisite to handle the iron add-ons<sup>26</sup>.

Blood givers with pre contribution serum ferritin levels of < 50 ng/mL must be rendered iron after every donation, while givers with serum ferritin > 80 ng/mL are not obligated for added iron. The contributors with ferritin quantity between above values ought to be scrutinized discretely. Routine ferritin assessment can verify iron overburden, that if found, is regarded as medical negligence<sup>27</sup>.

## CONCLUSION

Blood contribution has a convincing impact on iron reserves and it is a major element for iron scarcity in blood givers, vividly in consistent donors.

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