A total of 393 blood donors, out of which 111 first time donors and 282 repeat donors were screened for Complete blood count, ESR and other tests for iron status like S.Iron level, serum ferritin levels, TIBC, ZPP.

In first time donors 105 were males and 6 were female donors. In repeat donors 279 were male and 2 were female donors.

The donors were between 18 and 58 years of age. Most of the donors (43.77%) were between the age group of 21 to 30 years followed by 31 to 40 years of age groups (28.24%). The mean age of first time donors group and repeat donor group was 26.9 and 33.17 years respectively.

Repeat donors were divided as per their donation frequency into 4 types: Group A to D which includes donation frequency 1 to 5 times, 6 to 10 times, 11 to 20 times and > 20 times and the number of donors in all these groups were 125, 84, 45 and 28 respectively. Highest number being in donation frequency of 1 to 5 times, that is Group A.

Repeat donors were also divided as per their last donation interval into 4 types: Group I to IV which includes last donation interval 3 to 5 months, 6 to 9 months, 10 to 20 months and > 20 months and the number of donors in all these groups were 94, 134, 45 and 9 respectively. Highest number being in last donation interval 6 to 9 months that is Group II.

The data shows that maximum number of were in group 1-5 times donation frequency with 6 -9 months donation interval.

Not a single donor with donation frequency >20 times donated after > 20 months.
Iron status in voluntary blood donors

- Up to 20 times donation frequency donors were maximum fall in 6-9 months donation interval.
- In comparison of all female donors with all male donors show that the mean hemoglobin level in female donor is 11.48 g/dl and that of male donors is 13.57 g/dl. The mean value of serum ferritin is 32.16 µg/L in female donors and 57.04 µg/L in male donors. The mean value of serum iron is 67 µg/dL in female donors and 85.13 µg/dL in male donors, but the difference is not statistically significant. Only data of Hb, RBC count and serum ferritin level are showing statistically significant difference between female and male donors groups.
- In comparison of all first time donors with the repeat donors show that the mean hemoglobin level in first time donors is 13.58 and that of repeat donors is 13.15 g/dl. The mean value of serum ferritin is 85.81 µg/L in first time donors and 44.88 µg/L in repeat donors. The mean value of serum iron is 91.31 in first time donors and that of 44.88 in repeat donors but the difference is not statistically significant. All hematological parameters including Hb, MCV, MCH, RBC count and all iron status parameters like serum ferritin, serum iron level, TIBC, transferrin saturation and ZPP level show statistically significant difference between first time and repeat donors groups.
- In comparison of first time female donors with first time male donors show that the mean hemoglobin level in female donor is 10.98 g/dl and that of male donors is 13.72 g/dl. The mean value of serum ferritin is 23.55 µg/L in female donors and 89.37 µg/L in male donors. The mean value of serum iron is 50 µg/dL in female donors and 93.67 µg/dL in male donors but the difference is not statistically significant. Data of Hb, MCV, MCH, RBC count, Serum iron, serum ferritin level and transferrin saturation level are
showing statistically significant difference between first time female and first time male donors groups.

- The data from repeat female donors and repeat male donors show no marked difference in hematological or iron status parameters except difference in RBC count is statistically significant.

- The data from first time female donors and repeat female donors comparison shows no statistically significant difference, however the data were too small to reach to any reliable conclusion.

- The data from first time male and repeat male donors comparison shows marked reduction in mean value of hematological parameters in repeat donors with all hematological parameter difference show statistical significance. Mean value of serum ferritin was 89.37 µg/L in first time donor males and it was 44.83 µg/L in repeat male donors. Except hemoglobin, all other parameters show statistically significant difference between first time and repeat male donors.

- In iron deficiency stages, iron deficient erythropoiesis, iron deficiency anemia, and low MCV[<80fl] all were more in repeat donors as compared to first time donors and the data are statistically significant. Only anemia with normal ferritin more common in first time donors.

- Negative iron balance, iron deficient erythropoiesis and iron deficiency anemia most common in first group I that is last donation between 3-5 months interval followed by group II. The last group IV did not show any donor with iron deficiency. Only anemia with normal iron store more common in group IV followed by group III that is with increased last donation interval. In all the repeat donor groups iron deficient
erythropoiesis is the commonest stage of iron deficiency followed by iron deficiency anemia. **The data shows significant impact of donation interval on iron status.**

- Negative iron balance more common in first group A that is the frequency of donation 1-5 times followed by group B (6-10 times). Iron deficient erythropoiesis more common in group D followed by group C. Iron deficiency anemia is more common in Group D and group B, that may be because the reason that the maximum number of group B donated within six months of last donation interval. In all the repeat donor groups iron deficient erythropoiesis is the commonest stage of iron deficiency followed by iron deficiency anemia. **The data finally conclude that as the donation frequency increases the chances of developing iron deficiency increases.**

- The mean serum ferritin level in donation Group I to IV show 36.85 µg/L, 41.43 µg/L, 58.94 µg/L, and 109.57 µg/L respectively, suggestive of marked reduction in ferritin with decreased donation interval. Marked reduction in ferritin level in donors with donation interval 3 to 5 months.

- The mean serum ferritin level in donation Group A to D show 48.93 µg/L, 43.76 µg/L, 39.52 µg/L, and 38.58 µg/L respectively, suggestive of marked reduction in ferritin with increased donation frequency. Marked reduction in ferritin level in donors with increased donation frequency > 20 times.

- Statistical analysis shows no significant impact of different diet pattern on iron status parameters.

- Out of total 393 donors, low MCV were detected in 58 donors [14.75%]. In microcytic donors 1 female [first time donor] and 57 male donors. Total 9 first time donor and 49 repeat donors. Maximum number of microcytic donors fall in short donation interval.
In the present study, total 12 samples were tested by HPLC to know the cause of low MCV, out of which 6 cases were turn out to be Beta thalassemia trait [1.53% of total number of donors] and 5 cases were normal and one case was in diagnostic dilemma situation with ? sickle cell anemia trait/ ? Hb D trait which requires further family screening and repeat testing for confirmation.

In six diagnosed beta thalassemia trait cases 3 cases show normal ferritin value, 2 cases show low ferritin level that is associated with iron deficiency and one case of high ferritin level. Both low ferritin level cases were frequent donors with one case donated 20 times and the other donated 3 times.

In microcytic donors [<80fl], negative iron balance is seen in 6.9% of microcytic donors while iron deficient erythropoiesis and iron deficiency anemia was seen in 18.97% and 24.14% of cases respectively.

In microcytic donors [<80fl] anemia that is Hb <12.50 g/dl seen in 41.38% cases. Iron deficiency in the form of serum Iron <50 µg/dl seen in 18.97% of cases. TIBC increased [>380 µg/dl] in 46.55% cases. Iron store depletion in the form of serum ferritin ≤15 µg/L seen in 44.83% of cases. Ferritin level < 12 µg/L equivalent to almost zero iron storage seen in 41.38% of cases.

This study shows that there is high prevalence of reduced iron stores, especially among repeat blood donors, despite these donors being eligible to give blood according to the current guidelines (haemoglobin >12.5 g/dL). It may, therefore, be necessary to review the screening criteria used at the time of donation.
It also seems logical to include serum ferritin measurement in the assessment of regular blood donors. The use of parameters that reflect iron status more accurately (serum iron concentration and ferritin level) would ensure a safer blood donation process for donors.

The results may well support a policy of limiting blood donation to twice a year in men and to once a year in women. Both men and women blood donors require medicinal iron after each donation. Food iron in present-day diets should be supplemented.

Blood donation has a profound influence on iron stores and is a very important factor for iron deficiency in blood donors, particularly in multi-time donors and, especially in female donors. Therefore it seems reasonable to secure adequate iron reserves in the donor population in order to maintain an appropriate donation potential and to avoid possible non-hematological side-effects of iron deficiency, i.e. changes in immune function, energy metabolism and work performance.

The high frequency of blood donors with iron deficiency found in this study suggests a need for a more accurate laboratory trial, since hemoglobin measurement alone is not sufficient for detecting and excluding blood donors with iron deficiency without anemia.

The blood bankers may have following options to continue repeat donor retention programme and simultaneously to avoid making significant number of their donors iron deficient. These include

1) Modifying the donor Hb requirements and measurement of Hb.

2) Changing the inter donation interval like reduce the frequency of donation to twice a year

3) Educating the donors about having iron rich food items, supplementing iron tablets for a fixed time (2 wk) after blood donation, and

Summary and Conclusion
4) Measuring the ferritin level is the best test to evaluate the iron stores and can be used as a criterion to ascertain the donor's aptitude and either supplement with iron for those who are iron deficient or combine supplementation and temporary suspension of blood collection from the iron deficient donor for 4-6 month.

5) Measurement of serum ferritin is recommended when more than 1 donation is given per year. Furthermore, donors who donate more than once a year should receive iron supplement, except for those having multiple family members with cancer or a first-degree relative under the age of 60 years diagnosed with cancer.

要紧 研究需要在每个领域进行，由更多的血液银行专业人员参与，以便开发一个明确的战略在这个领域。

Studies are needed in each of these areas by larger number of blood bank professionals to develop a clear strategy in this area.