



IRON BALANCE IN YOUNG BLOOD DONORS: IS THE LATENT IRON DEFICIENCY SYNDROM (LIDS) UNIVERSAL?

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Background:

More than half of the total body iron is complexed in haemoglobin (Hb). The mean iron loss by a 450ml blood donation is 242 ± 17 mg in men and 217 ± 11 mg in women. Regular blood donation increases demand of iron and can lead to depletion of iron stores with consecutive development of various degree of iron deficiency. In absence of co-morbidities, the serum ferritin level correlates with total body iron stores; thus, the serum ferritin level is the most convenient laboratory parameter to estimate iron stores. In conditions of depleted iron stores, the ferritin falls to <15 ng/ml. Decreasing serum ferritin levels are regarded to be an important laboratory sign for negative iron balance although the Hb may remain normal. It has been suggested, that iron deficiency without anemia is associated with a variety of constitutional symptoms (Latent Iron Deficiency Syndrome, LIDS) and might require aggressive iron replacement therapy.

Study objectives:

1. Epidemiologically: frequency of LIDS in young blood donors according to gender, number and frequency of blood donation, the eating habits and menstruation cycle.
2. Diagnostically: efficiency of standardized, questionnaire based interview searching for specific signs of LIDS in young blood donors.

Design:

Open controlled epidemiological study of young blood donors with voluntary participation. Donation eligibility criteria were in accordance with the requirements of Swiss Red Cross.

Methods:

Definition of prelatent iron deficiency (PID): ferritin <15 ng/ml and HB concentration compatible with whole blood donation as required by Swiss Red Cross. The lowest accepted Hb level for study entry was for males >135 g/l and for females >125 g/l using microhematocrit measuring of capillary blood from fingerprick. Serum ferritin was measured by ELISA in all 1539 participants (participant's age <40 years, 698 women and 844 men). A standardized questionnaire for predonation inquiry was applied asking for constitutional symptoms, eating habits and relevant points of the menstruation cycle.

Results:

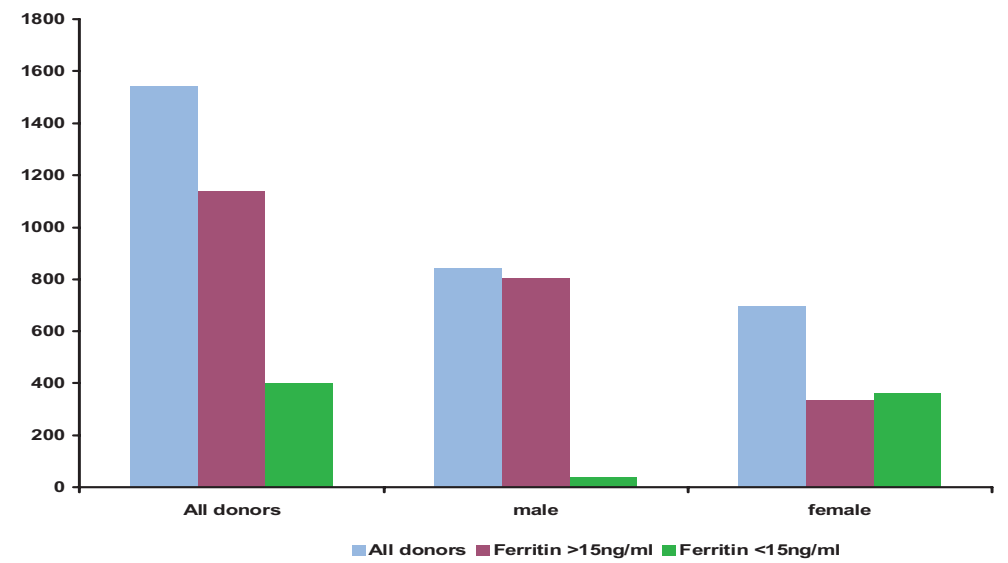
Systematic search for phenotypical stigma of LIDS by standardized questionnaire did not proof significant association between hypoferritinemia (ferritin <15 ng/ml) and any of the inquired symptoms.

Table 1: Significance of targeted questions for prediction of PID in eligible blood donors

	Efficiency [%]	Sensitivity [%]	Specificity [%]
Chronic fatigue (tiredness, weariness)			
all donors	66,6	19,7	82,9
multiple donors	68,4	21,9	82,2
Acute fatigue			
all donors	68,9	16,6	87,1
multiple donors	77,1	35,6	88,9
Vegetarian live style			
male donors	92,9	15,4	96,7
female donors	51,5	14,3	94,2
all donors	74,9	14,4	95,9
Menstruation			
Length of cycle			
<28 days	45,3	37,2	54,5
>28 days	45,3	44,5	37,2
Intensity of bleeding			
normal	47,4	93,5	6,3
intensive	47,2	63,0	93,5

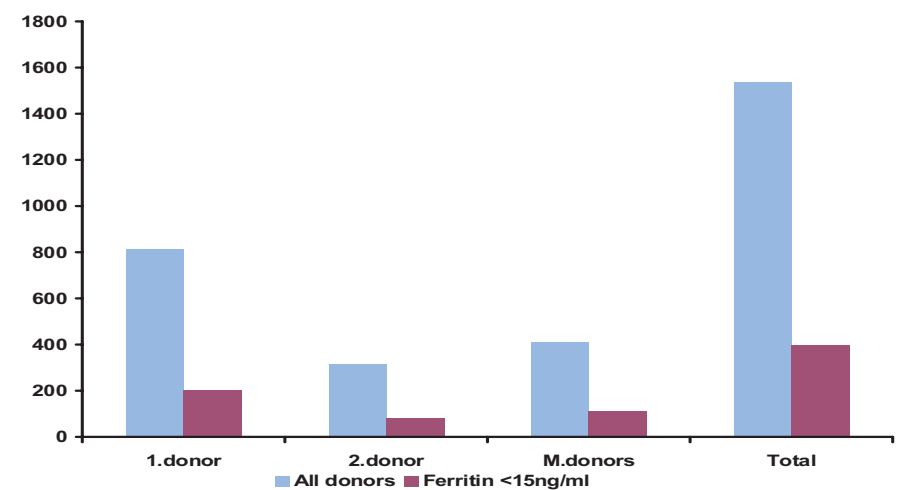
About one-fourth of all donors (399/1539) had ferritin levels below 15ng/mL. These findings were highly dependent on the gender: 51.7% of female donors, but only 4.7% of male donors, according to a ratio of female:male = 9:1

Figure 1: Serum ferritin <15 ng/ml by gender of blood donors



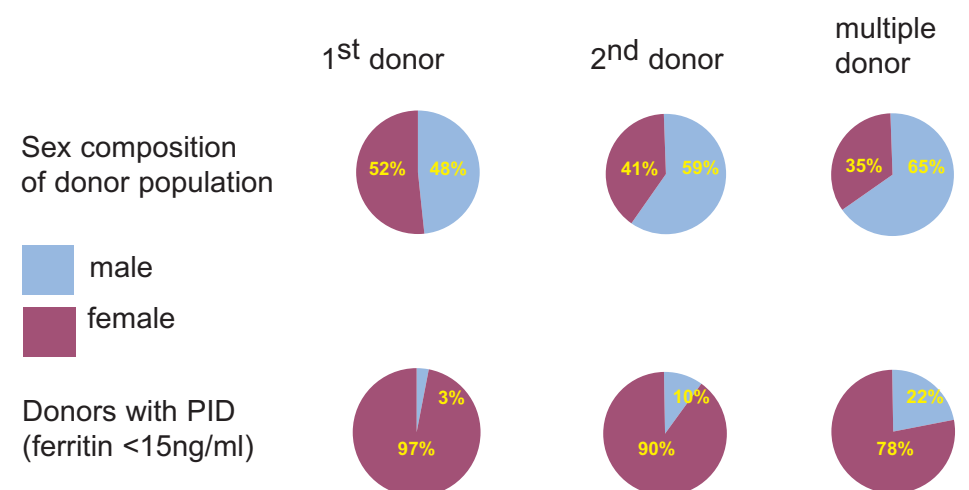
Remarkably, 25.1% of first time donors, already revealed ferritin levels below 15 ng/mL. The frequency of prelatent iron deficiency did not change with increasing number of donations and remained stable at about 25% in donors with multiple donations.

Figure 2: Serum ferritin <15 ng/ml in blood donors by donation status



Repetitive whole blood donation promotes the development of PID, especially in male blood donors. However, in 1st time donors PID is almost exclusively found in female donors.

Figure 3: Sex composition and frequency of PID by donation status



Conclusions:

1. PID is highly prevalent in healthy, young blood donors. The vast majority are female 1st time donors.
2. Despite hypoferritinemia is prevalent in blood donors, symptoms of iron deficiency (LIDS) are rarely seen.
3. The absence of constitutional symptoms does not exclude PID.
4. Thus, iron replacing therapy for blood donors in the absence of clinical symptoms remains controversial.