Donor deferral due to anemia: A tertiary care center-based study

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Abstract:

Background: The minimum hemoglobin cutoff for blood donation in India is 12.5 gm% for both male and female donors and the minimum donation interval is 3 months. Donation of one unit of blood results in decrease in hemoglobin by 1 gm% and loss of 200–250 mg of iron. Donor deferral due to anemia is one of the major reasons of temporary rejection of blood donors. In the absence of further workup or advise, it results in loss of valuable donor base. Aim and Objective: To provide baseline information regarding the prevalence and spectrum of anemia in prospective blood donors to help plan a future strategy for donor management. Materials and Methods: Hemoglobin testing of donors was performed using Hemocue and Copper sulfate specific gravity method. Ethylene diamine tetraacetic acid sample of all the donors who failed either or both the screening tests was tested on automated analyzer for evaluation of hemoglobin and red blood cell indices. Results: Of all the donors, 15.5% were deferred due to anemia. Prevalence of anemia in prospective blood donors was 1.8%. It was significantly higher in female donors compared with male donors (34.2% vs 1.2%). The most common type of anemia was normocytic normochromic. Key words: Anemia, donor deferral, hemoglobin

Introduction

Whole blood donors are deferred due to several reasons, either temporarily or permanently. Deferrals can be characterized as temporary short term (1–56 days), long term (57–365 days), and multiple years/permanent (more than 365 days).[1] A large majority of the donor population in a developing country, like India, is deferred due to temporary but easily correctable cause—Anemia.[2] The causes of anemia could be nutritional deficiency, anemia due to blood loss, anemia of chronic disease, and so on. Nutritional anemia is a worldwide problem with the highest prevalence in developing countries like India. By far the most common cause of nutritional deficiency is iron deficiency. It can be either due to inadequate intake or poor bioavailability of dietary iron (only 5%–10% is absorbed) or due to excessive losses of iron from the body (malaria/hookworm infestation). Losses related to seropositivity for infectious markers are well established. Donor losses due to other reasons, however, have not been extensively quantified. In this study we aim to assess the prevalence of anemia in our otherwise healthy donor population by estimating the frequency of donor deferral due to anemia. We have also assessed the severity and morphologic type of anemia. The short-term temporary deferral due to anemia can have a very negative impact on blood donor return rate and subsequent blood donations, so we have also suggested some remedial measures, which would help prevent the loss of a large chunk of our ever decreasing pool of donors.

Materials and Methods

This is a retrospective, single center-based study assessing the donor deferral due to anemia. During the study period (January 2009 to December 2009), 6817 prospective blood donors were screened according to the criteria laid down by the Drug and Cosmetic Act of India.[3] Of the 6817 donors, 6780 were replacement donors and 37 were voluntary donors. Almost all the donors were from a low socioeconomic background. Hemoglobin estimation was performed by 2 methods: Copper sulfate specific gravity method and Hemocue. The minimal hemoglobin cutoff for donor selection was set at 12.5 gm% for both male and female donors.[4] A venous blood sample in ethylene diamine tetraacetic acid (EDTA) was collected from all the blood donors who failed both or either of the 2 screening tests. This sample was run on automated hematology analyzer, Sysmex-KX 21 (Transasia, Mumbai, India), which is considered the gold standard for hemoglobin assessment as well as for morphologic typing of anemia (Mean Corpuscular Volume MCV, Mean Corpuscular Hemoglobin MCH, Mean Corpuscular Hemoglobin Concentration MCHC). The general profile of blood donors is shown in Table 1. Table 2 depicts the severity of anemia in donor population, and Table 3 depicts the morphologic typing of anemia.

Results

Of the 6817 donors who presented for blood
lower in blood donors than in nondonors and studies have shown ferritin. For this reason, the mean ferritin levels are significantly lower in female donors (34.2% vs 1.2%). This is in accordance with the prevalence rate of anemia in the adult population in the community. The prevalence of anemia in our study population was much lower than reported in our general population (1.8% vs 25%), probably due to the fact that our donors were first time donors it is also a reflection of the prevalence of anemia in the adult population. In our study, the percentage of donors deferred due to anemia was estimated to be 15.5%. This is in accordance with blood donor deferral rates found in the literature, which range from 3% to 15%. In a blood donation program where the majority of blood donors were first time donors it was observed to be 43%, whereas in the first time donors it was observed to be 14%. Similarly, the prevalence of iron deficiency anemia in Iranian donors was found in a study to be 55.6% in female donors and 43% in male donors. While conventional screening programs based on hemoglobin are adequate to prevent the development of progressive iron deficiency anemia, they provide no indication of the development of tissue iron depletion. Recent literature has suggested that serum ferritin levels appear to be a reliable indicator for body iron stores that can be mobilized and provide screening methods, but the results were ultimately confirmed by running the EDTA venous sample of the subject on an automated analyzer.

Copper sulfate method is a qualitative screening test based on specific gravity. The density of the drop of blood is directly proportional to the amount of hemoglobin it contains. A drop of finger prick blood dropped into copper sulfate solution (specific gravity, 1053) becomes encased in a sac of copper proteinate, which prevents any change in the specific gravity for about 15 s. If hemoglobin is more than 12.5 gm%, the drop will sink within 15 s and the donor is accepted. If the drop keeps floating above/ below the surface of the copper sulfate solution it is rejected.

Hemocue is a portable equipment that is able to spectrophotometrically determine hemoglobin. It uses 10 µL of capillary blood sample to determine hemoglobin by measuring the absorbance of azide methemoglobin, using a cuvette containing a dry reagent system and a dual wavelength photometer. In a comparative study conducted on 969 prospective female donors, this method was found more accurate in detecting anemia than the standard methods, but the results were ultimately confirmed by running the EDTA venous sample of the subject on an automated analyzer.

Table 1: General profile of donors in our study

| Total no. of donors | 6817 |
|---------------------|------|
| Gender distribution: |      |
| Males               | 6700 (98.3%) |
| Females             | 117 (1.7%)  |
| Total no. of deferrals | 787 (11.5%) |
| Deferrals due to anemia | 122 (15.5%) |
| Prevalence of anemia in donors | 1.8% |
| Prevalence of anemia in male donors | 1.2% |
| Prevalence of anemia in female donors | 34.2% |

Table 2: Grading of donors on the basis of severity of anemia

| Grading of anemia (according to severity) | Male donors | Female donors |
|------------------------------------------|-------------|---------------|
| Mild anemia (Hb 10–12.5 gm%)             | 68 (82.9%)  | 29 (72.5%)    |
| Moderate anemia (Hb 7–10 gm%)           | 14 (17.1%)  | 0 (0%)        |
| Severe anemia (Hb < 7 gm%)               | 0 (0%)      | 0 (0%)        |
| Total                                    | 82          | 40            |

Table 3: Morphologic typing of anemia among donors

| Morphologic type of anemia                  | Male donors | Female donors |
|---------------------------------------------|-------------|---------------|
| No. (%)                                     | No. (%)     |
| Normocytic normochromic anemia              | 61 (74.4%)  | 18 (45%)      |
| Microcytic hypochromic anemia               | 12 (14.6%)  | 12 (30%)      |
| Macrocytic anemia                           | 9 (11%)     | 10 (25%)      |
| Total                                       | 82          | 40            |

Discussion

Hemoglobin assessment is an important criterion for blood donor selection. The minimal hemoglobin cutoff is set at 12.5 gm%, which is the lowest level that is consistent with adequate oxygen delivery to tissues. A healthy blood donor loses about 400–500 ml of blood per donation. This is equivalent to 2.5% of total body iron, which prevents any change in the specific gravity for about 15 s. If the specific gravity of the blood drop is not affected by the addition of copper sulfate, the donor is accepted. If the drop keeps floating above/below the surface of the copper sulfate solution it is rejected.

There is no consensus among blood banks on the best method for blood donor anemia screening. In hospitals and laboratories, the gold standard for hemoglobin estimation is the use of automated hematocrit analyzer. Screening tests for potential blood donors, however, require quicker, easier, and more cost-effective testing methods that do not require a venipuncture and cause minimal discomfort to the donor. Three tests that are commonly used for primary screening are Copper sulfate method, Hemocue, and Microhematocrit, which uses a capillary tube and high speed centrifuge. Although these tests are quick, easy, and relatively inexpensive, their sensitivity, specificity, and accuracy are lower than that of an automated hematocrit analyzer. That is why at our center, we used Copper sulfate and Hemocue as primary
reliable measurements for determining iron deficiency at an early stage.\[16\] Currently there are no guidelines for management of these deferred donors. This results in loss of valuable part of donor pool who can donate blood if advised and treated appropriately for anemia. Studies indicate that ferrous sulfate supplementation therapy can be considered as one of the strategies to promote safe blood donation in woman.\[17\] Thus to conclude, deferred anemic donors should be informed and referred for further workup so that they can be appropriately treated. This shall be a major contribution toward improving public health and also enable and motivate prospective donors to return for blood donation.

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