HAEMOGLOBIN LEVEL AMONG THE REGULAR VOLUNTARY BLOOD DONORS

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Abstract:

Context: *The need for blood is great and health of the blood donors is also the prime importance for the medical profession. The present study conducted to find out the pattern of haemoglobin level among the regular voluntary blood donor.*

Methods*: The present cross sectional study included 200 consecutive regular voluntary blood donors. The study conducted in the Department of Transfusion Medicine, Dhaka Medical College Hospital, Dhaka, between July 2010 and June 2011. The level of haemoglobin in donated blood was estimated by cyanmethaemoglobin method.*

Results: *Age of the respondents was 29.5±12.2, with a range of 18 to 56 years. Most common age group of respondents was 21 to 30 years and male and female ratio was 7.3:1. Among the male 90.3% had required haemoglobin level for blood donation and 9.7% had haemoglobin level less than required. Among the female only 37.5% had required haemoglobin level for blood donation and 62.5% had haemoglobin level less than required. Out of 118 respondents aged less than 30 years, 89.8% had required haemoglobin level for blood donation and 10.2% had haemoglobin level less than required. Out of 82 respondents aged more than 30 years, 75.6% had required haemoglobin level for blood donation and 24.4% had haemoglobin level less than required.*

Conclusion: *The high frequency of decreased haemoglobin level among the regular voluntary blood donors found in this study suggests a need for a more accurate laboratory trial, since hemoglobin alone is not sufficient for detecting and excluding blood donors with iron deficiency without anemia.*

Key words: *Haemoglobin, Cross Sectional Study, Voluntary Blood Donors.*

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Introduction:

Blood transfusion is an essential component of health care which saves millions of lives each year. Donation of blood, the humanitarian act has been steadily declined while the demand for transfusion continues to rise[1,2]. Recruitment and retention of donors to sustain and increase the donor base are critical for blood banks[3]. Blood transfusion service is an integral and indispensable part of the healthcare system. The priority objective is to ensure safety, adequacy, accessibility and efficiency of blood supply at all levels[4].

Anaemia is a condition characterized by a reduction in red cell mass and a decrease in the concentration of haemoglobin in the blood[5]. A large majority of the donor population in a developing country is deferred due to temporary

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but easily correctable cause, anaemia[5]. Hemoglobin assessment is an important criterion for blood donor selection[7]. In Canada and the United States, the minimum values for donors haemoglobin concentration is set at 12.5 g/dl for all blood donors[8], while in European countries the cut-off level is 12.5 g/dl for women and 13.5 g/dl for men[9]. In 1999, FDA finalized the current rule establishing a minimum hemoglobin requirement of 12.5g/dL or hematocrit of 38% for both male and female allogeneic donors. This rule also established an inter donation interval of eight weeks which is done to ensure both donor safety and appropriate hemoglobin content in the donated unit[7-11]. A recent report by Karp and King[12] showed the variation in eligibility criteria for volunteer whole blood donors. Bangladesh Government has passed "Safe Blood Transfusion Law 2002" in the Parliament and in June'08 "Safe Blood Transfusion Rules 2008", was published[4]. In Bangladesh the minimum values of haemoglobin concentration for donors is set at 12.5 g/dl for men and 11.5 g/dl for women[13].

Iron deficiency is the commonest cause of anemia worldwide[6,14]. Iron has a central role in erythropoiesis and is also involved in many other intracellular processes in all the tissues of the body[15]. A study from the United States suggested that up to 8.0% and 23.0% of male and female donors respectively may be iron deficient[14]. A healthy blood donor loses about 200-250 mg of iron per unit of blood donated[7, 14]. The body compensates for this loss by mobilizing iron stores in the form of ferritin[14-16]. If the lost iron stores in these donors are not replenished and they continue to donate blood, it results in iron deficiency anaemia and deferral of these donors in the future and a considerable number of regular donors who at present are the best source of safe blood will be lost[16-18]. In fact, iron deficiency anaemia is the main limiting factor in regular donors[18-19]. To the best of our knowledge no systematic study has been conducted in Bangladesh to assess the pattern of haemoglobin level in regular voluntary blood donors. The present study was conducted to find out the pattern of haemoglobin level among the regular voluntary blood donors in our population.

Methods:

The study was conducted in the Department of Transfusion Medicine, Dhaka Medical College Hospital, Dhaka, between July 2010 and June 2011. Total 200 consecutive regular voluntary blood donors were included in the study. Relevant history, clinical examination and sociodemographic data were collected from every respondent. The level of haemoglobin in donated blood was estimated by cyanmethaemoglobin method. Cut-off value of haemoglobin of 12.5 g/dl for male and 11.5 g/dl for female is used as described by Bangladesh Gazette, (2008)[13]. All data were analyzed by standard statistical software version 16.0 (SPSS, Chicago, IL, USA). The chi-square test was used for analysis of categorical data. A p value <0.05 was considered significant.

Results:

The mean age of the respondents was 29.5±12.2 years, with a range of 18 to 56 years. Most common age group of respondents was 21 to 30 years followed by 31 to 40 years. Among the respondents 176 (88%) were male and 24 (12%) were female. Male to female ration was 7.3:1. In education highest number were in the level of higher secondary followed by graduate and above. In occupation 98 (49%) were student, 46 (23%) were service holder, 23 (11.5%) were businessman and rest 33 (16.5%) were unemployed. ABO blood grouping of 96 (48.0%) was 'O', 48 (24%) was 'B', 40 (20%) was 'A' and rest 16 (8%) was 'AB' blood group. Rh positive and Rh negative were 184 (92%) and 16 (8%) respectively. Among the male, 159 (90.3%) had haemoglobin level e"12.5 gm/dl and 17 (9.7%) had haemoglobin level <12.5 gm/dl and among the female 9 (37.5%) had haemoglobin level >11.5 gm/dl and 15 (62.5%) had haemoglobin level <11.5 gm/dl. Out of 118 respondents aged less than 30 years, 106 (89.8%) had required haemoglobin level for blood donation and 12(10.2%) had haemoglobin level less than required. Out of 82 respondents aged more than 30 years, 62 (75.6%) had required haemoglobin level for blood donation and 20 (24.4%) had haemoglobin level less than required.

Table-I

Distribution of characteristics of the respondents

Variable	Frequency	Percentage
Age group		
<20	23	11.5
21-30	95	47.5
31-40	65	32.5
41-50	12	06.0
>50	05	02.5
Mean ±SD (Range)	29.5± 12.2(18-56)	
Sex		
Male	176	88.0
Female	24	12.0
Male Female ratio	7.3:1	
Educational status		
No education	08	04.0
Primary	12	06.0
Secondary	36	18.0
Higher secondary	92	46.0
Graduate and above	52	26.0
Occupation		
Student	98	49.0
Service	46	23.0
Business	23	11.5
Unemployed	33	16.5

Table -II

Distribution of ABO blood grouping and Rh typing

ABO grouping	Rh typing		Total
	Rh positive	Rh negative	
O	92	04	96(48.0)
B	41	07	48(24.0)
A	36	04	40(20.0)
AB	15	01	16(08.0)
Total	184	16	200(100.0)

Table -III

Distribution of haemoglobin level according to cutoff value required for blood donation of the respondents

Haemoglobin level	Frequency	Percentage
>12.5 gm/dl for male & > 11.5 gm/dl for female	168	84.0
<12.5 gm/dl for male & < 11.5 gm/dl for female	032	16.0
Total	200	100.0

Table -IV

Relationship of haemoglobin level with sex

Haemoglobin level	Sex		P value*
	Male	Female	
> 12.5 gm/dl for male & > 11.5 gm/dl for female	159(90.3)#	09(37.5)	0.000
<12.5 gm/dl for male & < 11.5 gm/dl for female	017(09.7)	15(62.5)	
Total	176(100.0)	24(100.0)	

*Chi-square test was done to measure the level of significance.
#Figure within parentheses indicates in column percentage.

Table-V

Relationship of haemoglobin level with age

Haemoglobin level	Age group		P value*
	<30	>30	
ed 12.5 gm/dl for male & ed 11.5 gm/dl for female	106 (89.8)#	62 (75.6)	0.007
<12.5 gm/dl for male & < 11.5 gm/dl for female	012 (10.2)	20 (24.4)	
Total	118 (100.0)	82(100.0)	

*Chi-square test was done to measure the level of significance.
#Figure within parentheses indicates in column percentage.

Discussion:

The present cross sectional study was conducted to find out the pattern of haemoglobin among the regular voluntary blood donors. In the present study the most common age group of respondents was 21 to 30 years followed by 31 to 40 years and the mean age of the respondents was 29.5±12.2 years. Agnihotri[20] in a study showed that the majority (57.7%) of the donors presenting for the donation were between 25 and 39 years of age. Olokoba et al.[21] in a study found the age range of blood donors was 18 to 61 years with a mean of 31.3 years. This is similar to that in the study of Khan et al.[22] and Muktar et al.[23]. However the study conducted by Egah et al.[24] showed the age range 21 to 50 years. Kimani et al.[25]

in a study showed that the majority of voluntary donors were less than 25 years old. Ray et al.[1] in their study showed that 48% donors belonged to the age group 16-25 years with a range of 19 to 53 years. Studies by Sullivan et al.[26] and Kandle et al.[27] showed that the most of the voluntary blood donors belong to the younger age group.

In the study 176 (88.0%) were male and 24 (12.0%) were female. Male to female ration was 7.3:1. Studies by Olokoba et al.[21] and Egah et al.[24] showed that male blood donors were 96.0% and 95.0% respectively. Muktar et al.[23] found 98.0% of their donors were male while Nwokediuko et al.[28] found that 91.8% donors were male. However, all the donors were male in the studies of Elfaki et al.[29] and Khan et al.[22]. In a study Agnihotri[20] showed that of the total donors who presented for blood donation 10% were female, however majority of them were deferred so that they contributed only 5.2% of selected donors. Ray et al.[1] in a study of 300 voluntary donors showed that 89.3% were males and 10.7% females.

In education highest number was in the level of higher secondary followed by graduate and above. In occupation 98 (49.0%) were student, 46 (23/-%) were service holder, 23 (11.5%) were businessman and rest 33 (16.5%) were unemployed (Table 1). Gao et al.[30] in a study reported that the occupation of blood donors was widely distributed.

Among the male donors 90.3% had haemoglobin level e" 12.5 gm/dl and among the female only 37.5 had haemoglobin level e" 11.5 gm/dl that required for blood donation according to Save Blood Transfusion Rules[13]. There is statistically significant difference observed in haemoglobin level between male and female donor ($p<0.05$). Rushton et al.[31] found that of all the primates, only in humans do females have lower blood haemoglobin concentrations than males. Mahida et al.[32] in a study showed that, 9.5% male and 26.7% female regular voluntary blood donors developed anaemia, defined as Hb below 12.5 g/dl. Sunder and Vivekanand[33] conducted a study in Bangalore, South India and reported the incidence of anaemia as 2.4% in male and 19.7% in female donors. All the female participants of the present study were in pre-menopausal age group; hence, they may have developed anaemia. Significant correlation between the number of donations and hemoglobin level ($r^2 = 0.061$) was noted in a study by Norashikin et al.[14]. Alvarez-Ossorio et al.[19] reported that 30% and 26% of women regular blood donors had respectively iron deficiency and iron deficiency anaemia. Among the respondents aged less than 30 years, 89.8% had haemoglobin level required for blood donation and 10.2% had less haemoglobin level than required. In the present it was found that haemoglobin level less than required for blood donation more prevalent among the donor aged more than 30 years. Among the respondents aged more than 30 years, 75.6% had haemoglobin level required for blood donation and 24.4% had haemoglobin level less than required for blood donation. There is statistically significant difference observed in haemoglobin level between age group more and less than 30 years ($p<0.05$).

Blood centers should establish expanded donor health screening programs in improving donor health, donor recruitment, and donor retention[34]. Taken together, a declining donation rate and an increase in the consumption of blood components require novel approaches on both sides of the blood supply chain[35].

Conclusion:

The high frequency of decreased haemoglobin level among the regular voluntary blood donors suggests a need for a more accurate laboratory trial. Predicted haemoglobin levels for blood donation may be normal in the presence of reduced iron stores, individuals potentially at risk for developing iron deficiency anaemia can be detected only by serum ferritin estimation. Therefore iron status of the donors needs to be identified and necessary steps for iron supplementation need to be taken, which is especially relevant with the global and national drive to recruit and retain regular repeat voluntary blood donors.

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