

**HEMATOLOGICAL PARAMETERS OF VOLUNTARY AND REPLACEMENT  
DONORS –A COMPARATIVE STUDY**

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**ABSTRACT**

The objective was to determine the basic hematological parameters of voluntary and replacement blood donors presenting to Blood Bank JLNH hospital Srinagar. A prospective study was conducted in a secondary tier hospital of Srinagar city. Pretransfusion samples were obtained from blood bags after mixing. The hematological parameters were analyzed using ACCUREX 3 part hematology analyzer. A total of 120 samples were obtained comprising of 60 voluntary donors and 60 replacement donors. In the voluntary donors the mean hemoglobin concentration was  $14.5 \pm 2.5$ . This was significantly higher than replacement donors who had mean hemoglobin of  $13.0 \pm 0.9$  and hematocrit of  $43.3 \pm 3.3$  with P-value of  $<0.001$ . The mean values of red cell counts (RBC), mean cell volume (MCV), mean corpuscular hemoglobin concentration (MCHC) were significantly higher in voluntary donors. No significant difference was found in platelet counts. Voluntary blood donors have significantly higher hematological parameters than replacement blood donors.

**KEYWORDS:** Anemia, Voluntary Blood Donors, Replacement Blood Donors.

**INTRODUCTION**

Blood donation is required for various surgical and emergency procedures in a secondary care hospital. Blood donation is arranged by supplying blood either from voluntary donation blood pool or arranged on replacement basis. Blood banking is highly regulated to ensure to both donor and receipt safety. The goal of blood banking is to provide adequate and safe blood to recipients at no risk to donors. Baseline hemoglobin of 12g/dl and 13g/dl is recommended for potential female and male donors respectively, with a donation interval of 12 weeks for safety (Cavcado R D et al 2001). Voluntary non-remunerated blood donation is encouraged. The WHO has set a target of achieving 100% voluntary non-remunerated blood

donation by year 2020 (WHO Fact Sheet N 279, 2012). In India, the practice of paid donors is discouraged. In Kashmir, replacement donors from family members form the bulk of blood donations. The aim was to compare the hematological parameters of voluntary and replacement blood donors.

#### **Materials and Methods:-**

A prospective cross – sectional study was conducted in a secondary health centre Srinagar J&K, India. The centre has a blood bank and utilizes around 1000 blood units annually. Voluntary blood donors are the major source of blood through the conduction of voluntary blood donation camps every 2 months. In spite of that replacement donors need to be used as some blood groups are always in short supply. Blood was collected from donor blood bags within 48 hrs of donation. After homogenization of the blood, the tubing was cut and 2 – 3 ml of blood was collected in a plain tube. The tube was again resealed using tube sealer (Terumo Penpol x s1010).

One hundred and twenty samples were collected from donor bags comprising 60 voluntary and 60 replacement donors. To avoid bias, only male donors were selected from both the groups. The samples were analyzed by ACCUREX 3 part hematology analyzer.

#### **Results:-**

A total of 120 samples were analyzed comprising 60 voluntary and 60 replacement donors. The voluntary donor samples had mean hemoglobin of 14.5g/dl  $\pm$  2.5, hematocrit of (HCT) 35%  $\pm$  7.5, red blood cell count of  $4.0 \times 10^6/\mu\text{L} \pm 1.06$ , white blood cell count of  $4.14 \times 10^3/\mu\text{L} \pm 1.60$ , RBC Mean corpuscular volume of 80.1fl  $\pm$  4.5, mean corpuscular Hemoglobin concentration 30 g/dL  $\pm$  3.4 and platelet count of  $2.28 \times 10^3/\mu\text{L} \pm 1.03$ . The replacement donors had significantly lower parameters as shown in *table 1*.

Table 1: Hematological parameters in study population

Hematological parameter	Voluntary Donors N = 60, Mean + S.D	Replacement Donors N = 60, Mean + S.D	Reference range
RBC X 10 <sup>6</sup> /ul	4.0 + 1.06	3.71+1.06	5.0 ± 0.5 × 10 <sup>3</sup> /ul (M) 4.3 ± 0.5 × 10 <sup>3</sup> /ul (F)
WBC X 10 <sup>3</sup> /ul	4.14+ 1.60	4.34+1.60	4.0–10.0 × 10 <sup>3</sup> /ul
Hb g/dl	14.5+2.5	13.0+ 0.9	15.0 ± 2.0 g/dl (M) 13.5 ± 1.5 g/dl (F)
HCT	45.55±1.9	43.3±3.3	0.45 ± 0.05 (M) 0.41 ± 0.05 (F)
MCV fl	80.1± 4.5	78.1 + 11.0	92 ± 9 fl
MCH (pg)	30.1 + 2.7	26+3.2	29.5 ± 2.5 pg
MCHC (g/dl)	30±.9+3.4	28.5+2.5	33.0 ± 1.5 g/dl
Plt X 10 <sup>3</sup> /ul	2.30+0.95	2.10+0.30	2.80 ± 1.30 × 10 <sup>3</sup> /dl

The hemoglobin value, RBC count, HCT, MCH and MCHC were significantly lower in replacement donors as P-value was less 0.001. No significant difference in Platelet count was observed. The hemoglobin concentration in 91.2% (55 / 60) of voluntary donors was ≥ 13.5 gm/dl while 8.8% voluntary donors (5 /60) had hemoglobin concentration of <13.5g/dl.

In replacement group, 80% (48/60) had hemoglobin concentration of < 13.5g/dl whereas 20 % ( 12/60) had hemoglobin concentration of > 13.5g/dl (table 2). MCV of 70.2% (42/60) of voluntary donors was > 75 fl whereas in 29.8% (18/60) MCV was > 95fl. The MCV of 43.1 % ( 26/60) of replacement donors was ≥ 75fl, 8.1% had values > 95fl. The MCH of voluntary group was > 32pg in 86% ( 52/60) whereas 14% ( 8/60) had MCH of < 32pg. Majority of voluntary donors 98%(58/60) had MCHC ≥.30g/dl whereas in replacement group 90% (54/60) had MCHC ≥ 30gm/dl .

Table 2: Hemoglobin ranges in the study.

Hemoglobin gm/dl	Voluntary Donors No (%)	Replacement Donors No (%)
< 12	0	0
12 -13.5	5 (8.8)	48 ( 80)
13.5-17.0	55 (91.2)	12 ( 20)

**Discussion:-**

Transfusion of blood and blood products is a life saving measure and helps innumerable people worldwide. At the same time however, blood transfusion is an important mode of transmission of infection to the recipients. In developing countries the prevalence of transfusion transmitted infections is much higher and quite far from attaining a zero risk level at the present moment. (Hilda F et al 2010).

There is an ever increasing gap between supply and demand of blood. WHO and National AIDS Control Organization (NACO) guidelines have set a target of more voluntary than replacement donors. Professional paid donors have to be totally discouraged (Kaakar N et al 2004). This study reinforces the logic of stressing upon voluntary blood donors. It has been observed the voluntary blood donors are younger in age group, highly motivated & informed and also healthier. They thus have a very less chances of having any communicable blood transmitted diseases prevalent amongst professional donors (Asif N et al 2004, Nadarajan VS et al 2004, Sawke N et al 2010, Chandra T et al 2009). A lower hemoglobin concentration was observed amongst replacement donors who are selected mostly out of compulsion. Low hemoglobin value is the commonest cause for rejection of donors in this part of world especially woman donors.

As there is always gap between supply and demand, whole blood transfusion should be discouraged. In secondary tier institute as ours, component facility is not available as yet necessitating need for whole blood transfusion . It is observed that voluntary donations spiked during summer months and Muharram month of Muslim calendar for religious reasons . However due to lack of component extraction facility in secondary centers, a regular uniform supply of blood products cannot be maintained throughout the year . Components like FFP have a longer shelf life than whole blood thus reducing the dependence on replacement donors .

**Conclusion:-**

An adequate and reliable supply of safe blood can be assured by a stable base of regular voluntary , unpaid blood donors . These donors are also safest group of donors as the prevalence of blood borne infection is lowest in this group . The WHO goal is that all countries obtain blood supplies from unpaid voluntary donors by year 2020 (Rohit J et al 2012, Woodfield G 2007). The momentum for replacing replacement /paid donors has to be kept so that this goal is realized

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