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Study of hematological parameters among blood donors in Duhok city

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Abstract

Background and objective: Changes in peripheral blood parameters are commonly seen in physiological, stressful and pathological conditions. The aim of this research was to study the abnormalities in hematological parameters of the blood donors in Duhok blood banking center.

Methods: This study was carried out at Duhok blood banking center, from 20th February, 2022, to July 1, 2022. The study included 1168 adult blood donors of both genders. A Complete blood count was performed by a three-part hematology analyzer and hematological parameters (Hb, HCT, PLT, WBC) were obtained from 1168 random blood donor samples. Open Epi program was used for data analysis; statistical significance was set at *P* <0.05 and 95% CL was accepted.

Results: Out of 1168 donors, 243 donated for the first time and 925 donors were repeated donors and 1148 (98.29%) were male with females constituting only 20 (1.71%) of all donors. The donors' age was between 18 and 68 years. Age is generally divided into five groups G1= (< 20 years) and G2= (20-29 years), G3= (30 -39 years), G4= (40- 49 years) and G5= (> 50 years). Most of the donors (31.21%) were in the age group (30 – 39 years) meanwhile the deferral rate was higher in this age group.

Conclusion: It is evident from this study that abnormalities in hematological parameters are frequently seen amongst the blood donor population and frequently contributed to donor deferral and there is a need to maintain and keep hematology analyzer in the donor acceptance criteria.

Keywords: Donation; Deferral; Blood; Hematological Parameters.

Introduction

The Duhok Blood Bank center depends on voluntary and replacement blood donations. Blood donor selection depends on a specific questionnaire form filled out by the health care profession, physical examination and are then tested for blood group determination and screening for infectious diseases, the blood is then collected, processed and separated into different components for storage and later uses according to requests and needs.

Blood comes from blood donors defined as "persons who donates either whole blood or blood products for transfusion". WHO provide a global estimate of 112.5 million blood donations yearly, Persons donating blood may be voluntary non-remunerated blood donors or replacement donors as required by a member of their own family or community.[1]

The World Health Organization has also recommended collection rate of 10-20 whole blood units per 1000 inhabitants to meet the transfusion requirements.[2] As the medicine continues to develop blood demand is also increasing rapidly.[3] An efficient blood transfusion service is critical to good health care delivery.[4]

Blood donation is regarded as an important life-saving measure in medicine, particularly in medical emergency

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situations to correct losses due to surgery, major trauma, hematological diseases and neoplasms, and management of complications related to pregnancy.[5]

The effects of stress on some of the hematological parameters had been investigated by some authors and they found significant effects on some parameters like WBC, Platelets.[6] Some researchers have found that some hematological parameters increase after regular exercises.[7]

Complete blood count (CBC) parameters can change in certain viral infections like (SARS- COVID19)[8,9] and medical conditions like thyroid diseases.[10]

The present study is, therefore, designed to assess hematological parameters used to evaluate blood donors and imply these parameters as a marker for keeping or deferring blood donors.

Methods

Study design

This is a cross-sectional study carried out at Duhok Blood Banking center in Duhok city, Kurdistan region, Northern Iraq. The study was carried out after obtaining ethical approval from the Duhok Directorate of General Health. The data was collected between the periods from 20th February, 2022, to July 1, 2022.

Data collection

A total of 1168 donors of both genders selected with appropriate interview and sampling method were included in the study. Blood samples were obtained by taking 2 ml of (K2EDTA) Ethylenediaminetetraacetic acid anti coagulated blood for complete blood count (CBC). EDTA blood samples were put ona mixer instrument for gentle mixing for 5 min. Complete blood count (CBC) analysis was performed by an Automated blood analyzer (Swelab).

The hematological parameters which were studied include hematocrit (HCT), hemoglobin (Hb), white blood cells (WBC) and Platelets.

Statistical analysis

Calculations were performed using the (Open Epi program), the significance limit was set at 0.05 and Chi square test with Yates correction was used to determine statistically significant association between variables with the P <0.05 was considered to be statistically significant.

NORMAL RANGES:[11,12]

Hemoglobin concentration: Men 13- 17 g/dl and Women 12- 15 g/dl

Anemia: if Hb < 13 gm/dl in Men and Hb< 12 gm/dl in women

Polycythemia: if Hb > 18.0 g/dl in Men and > 16.0 gm/dl in Women

Hematocrit (Hct): Men 0.45 ± 0.05 l/l and Women 0.41 ± 0.05 l/l

White blood cell counts 4.0–10.0 ×10^9 /l: Leukocytosis if WBC > 11×10^9 /l and leucopenia if WBC < 3×10^9 /l

Platelet (PLT) count 150 – 450 ×1^9 /l: Thrombocytopenia if platelet count< 150×10^9 /l, Thrombocytosis if count is > 450×10^9 /l

Results

A total of 1168 donors participated in this cross-sectional study, 224 donors were deferred due to various causes with abnormal hematological parameters observed and contributed to deferral in 63 (5.39%), the hematological parameters recorded were (Hb, HcT, PLT, WBC abnormalities). The variables are not normally distributed and data is summarized by median and range. The mean age of the study participants was 37.22±9.565 years while the median was 29 years. Mean values for each Hb, WBC, Platelets and Hematocrit are shown in table 1.

Out of 1168 donors, 243 donated for the first time and 925 donors were repeat donors and 1148 (98.29%) were male with females constituting only 20 (1.71%) of all donors. The donors' age was between 18 and 68 years. Age generally divided in to five groups G1= (< 20 years) and G2= (20-29 years), G3= (30 -39 years), G4= (40- 49 years) and G5= (> 50 years).

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Most of the donors (31.21%) were in the age group (30 – 39 years) mean while the deferral rate was higher in this age group as shown in Table 2.

The qualified donors were divided into two main groups, first time donors and recurrent blood donors. The hematological changes are tabulated in Table 3.

Abnormality in hematologic parameters as shown was more in males compared to females, however no statistically significant correlation was seen between anemia and polycythemia donors and their genders. Anemia was observed more commonly followed by polycythemia and leukocytosis in Table 3.

Table 1 Age and Hematologic data of the study participants

	Age	HcT	Hb	WBC	Platelet
Mean	37.22	46.38	15.89	7.75	200.23
Median	37.00	46.40	15.90	7.30	198.00
Std. Deviation	9.56	4.52	1.29	2.26	56.60
Range	52	53.10	9.10	18.10	474
Minimum	16	4.80	10.60	3.10	69
Maximum	68	57.90	19.70	21.20	543
Percentiles 25^{th}	31.00	44.00	15.20	6.40	158.00
75^{th}	43.00	49.525	16.70	8.70	228.00

Table 2 Distribution of blood donors based on the age groups

Age groups	Frequency	Percent
< 20	24	2.1
20 - 29	222	19.0
30 - 39	458	39.2
40 - 49	340	29.1
≥ 50	124	10.6
Total	1168	100.0

Table 3 The correlation of hematological abnormalities with blood donors' gender

Cases of deferred donors N=63			Gender		
	Deferred		Male	Female	*P*-value
Variables	No.	(%)	No. (%)	No. (%)	
Anemia	22	(34.92)	20 (33.90)	2 (50.0)	0.911
Polycythemia	21	(33.33)	20 (33.90)	1 (25.0)	0.855
WBC abnormality	14	(22.22)	13.0 (22.03)	1 (25.0)	0.628
Low Platelets	5	(7.94)	5.0 (8.47)	0 (0.00)	0.727
Abnormal WBC + Platelet	1	(1.59)	1 (1.70)	0 (0.00)	0.071
Total	63	100.0	59 (100.0)	4 (100.0)	

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Analysis of risk factors for polycythemia is shown in Table 4 and demonstrates the correlation between deferral due to high hemoglobin and its studied risk factors with no significant association observed between smokers regardless of their genders and polycythemia, while out of 21 polycythemia donors only 7 persons provideda history of waterpipe use, furthermore, alcohol drinking observed in only 4 donors with polycythemia. Most of the donors with high hemoglobin were younger than 30 years.

Table 4 The Correlation of polycythemia risk factors with genders

		Gender		
Variables	**Polycythemia = 21**	**Male = 20**	**Females =1**	***P*-value***
Smoking				
Smoker	15	14 (70.0)	1 (100)	0.626
Non smoker	6	6 (30.0)	0 (0.0)	
Waterpipe				
Use	7	6 (30.0)	1 (100)	0.717
Not use	14	14 (70.0)	0 (0.0)	
Alcoholism				
Yes	4	4 (20.0)	0 (0.0)	0.419
No	17	16 (80.0)	1 (100)	
Total	21 (100.0)	20 (100.0)	1 (100.0)	

*By Chi square test.

Discussion

Most blood banking centers still depend on Complete blood parameters as indicators for selecting donors. The present study was done by testing various parameters such as hemoglobin, RBC indices, WBC and Platelets. Among 1168 donors (98.29%) were male and 20 (1.71 %) were females, which is comparable to finding reported in a study in Mosulcity done by Al-Nuri where he stated that male was (99.43%) and female (0.57).[13] Male donors constituted the majority (98.29%) of the prospective donors in the present study. This finding is in keeping with previous reports in Nigeria,[14,15] India,[16] and Pakistan,[17] but was different from those reported by other researchers who found higher numbers of female donors.[18,19]

A total of 1168 persons enrolled in this study with 224 donors being deferred due to various causes, abnormality in hematological parameters was observed and contributed to deferment in 63 (5.39%) subjects. Most of the blood donors were younger than 40 years and are represented in the age group 30 -39 years, the finding is in keeping with those reported by Dayalaxmi et al.[20] The probable reason for such finding was most of the donors belonged to this age group.

Generally, the deferral of blood donors due to anemia is higher than due to polycythemia.[21] The prevalence of anemia among prospective blood donors was 1.8% and was similar to that reported by Birjandi et al.[22] The prevalence of anemia in female donors was significantly higher than in male donors (10% vs 1.74%), these findings are similar to those reported by Bahadur, Kumari et al.[23,24] While higher rates of anemia have been reported by Erhabor et al [25] where they recorded the prevalence of anemia as 16%.

In the current study, the subjects were considered as having polycythemia if the Hb level is ≥ 16.5 g/dL, PCV of ≥ 48 % in women and Hb is ≥ 18.0 g/dL, PCV

of ≥ 52 % in men, according to the WHO criteria to diagnose polycythemia. The prevalence of erythrocytosis in our study was detected by Coulter Counter among blood donors of 1.79%.

The incidence of erythrocytosis among our blood donors is very close to the previous local studies done in Mosul where they reported a prevalence rate of 1.65%,[13] and another study in Malaysia[21] where the prevalence of deferred blood donors due to a high Hb was 1.7%. However, our results were different from those reported by authors from neighboring countries; Iran and Turkey where blood donor deferral due to a high Hb was higher, at 2.8% and 2.4% respectively.[22,26]

Leucopenia and thrombocytopenia are commonly reported during winter and spring seasons due to common cold or may be related to SARS- COVID outbreak and these may be the causes of abnormal findings in some blood donors attended to Duhok blood banking center during the COVID-19 pandemic and contributed to their deferment.

Conclusion

The study found changes in peripheral blood indices are frequent in blood donors and contributed to deferral in a significant proportion of these people. Careful history taking, blood sampling for the analysis of CBC and a need to maintain and keep hematology analyzer are important to determine and select healthy donors.

Funding

Not applicable.

Competing interests

The author declares that he has no competing interests.

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