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SOCIO-DEMOGRAPHIC AND HAEMATOLOGICAL PARAMETERS OF BLOOD DONORS IN A TERTIARY HOSPITAL IN SOUTHERN NIGERIA

by

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Abstract

The safety of blood transfusion practice is anchored on collection of safe blood from a healthy donor, while also protecting the donor from harm. World Health Organisation (WHO) recommends that only those with good health status should be accepted as blood donors. Full blood count (FBC) is a standard haematology test that evaluates a blood sample for a variety of basic parameters and partly applicable in the general screening of health, better assessment of donors and standardisation of blood donor selection. The study aimed to evaluate and compare the prevalence, socio-demographic pattern and haematological parameters among voluntary, professional and family replacement donors in Delta State University Teaching Hospital (DELSUTH), Oghara, Delta state. This is a hospital based cross-sectional study conducted at the Delta State University Teaching Hospital, Oghara, Delta State. Ninety-five blood donors participated in the study. FBC was done using automated blood cell counter (Sysmex Haematology Autoanalyser). Data were analyzed using the statistical package for Social Sciences (SPSS) version 23. 70.5% of donors were adults below 30 years old while 3.2% were above 40 years. The mean white blood cell count (WBC) was $7.3 \pm 1.5 \times 10^3 \mu l$ and the difference in WBC between the three types of donors was not statistically significance ($p=0.842$). Family replacement donors had the highest mean haemoglobin of 14.8mg/dl and professional donors had the least value of 13.2mg/dl. There was significant statistical difference in haemoglobin concentration with $p < 0.001$. The mean platelet count was $202.6 \pm 59.5 \times 10^3 \mu l$ and it was highest in professional donors ($209.2 \pm 60.8 \times 10^3 \mu l$) but the difference was not statistically significant ($p=0.183$). Majority of blood donors in the study were professional donors. The younger age groups, males, singles, individuals with tertiary level of education, smokers, and persons who take significant quantities of alcohol constitute the significant proportion of blood donors in Oghara, Delta State. In addition, professional donors had a significant lower haemoglobin concentration in comparison to other types of donors.

Keywords: Donors, Oghara, Blood, Transfusion, Health

INTRODUCTION

Blood transfusion is a therapeutic infusion of blood or blood components from one person to another.[1] It is a vital component in delivering quality health care and plays a pivotal role in both medical and surgical management of patients.[2] The World Health Organization (WHO) places blood transfusion in its list of essential medications.[3] This is due to the fact that it considers blood transfusion a lifesaving therapy.

Blood transfusion saves lives and improves health.[3] A blood service that gives patients access to safe blood and blood products in sufficient quantity is a key component of an effective health system. Patients need blood for transfusion in both normal and emergency situations.[4] About 118.5 million units of blood are donated globally every year.[4]

Factors that drive blood demand differ between high-income countries and low-and middle-income countries.[3] They are best illustrated when the pattern of usage of blood and blood products in the two regions is analyzed.[3] In low- and middle-income countries, it is used more often for management of pregnancy-related complications, childhood malaria complicated by severe anaemia and trauma-related injuries.[5] Others include chronic anaemia as a result of micronutrient deficiencies prevalent in these regions and sickle cell anaemia.[5] Young children and women of reproductive age in these regions have the highest demand for blood and blood products.[6]

In high-income countries, the most frequently transfused patient age group is over 65 years of age, accounting for up to 76% of all transfusions.[4] The transfusion is commonly used for supportive care in cardiovascular surgery, transplant surgery, massive trauma and therapy for solid and haematological malignancies.[4]

Blood safety is a major global concern because of the complications associated with blood transfusion.[5] One of the most critical steps used to ensure blood safety is donor selection.[7] A blood donor is an apparently healthy person who donates blood to be used for the treatment of other people.[3] The primary categories of blood donors include commercial blood donors (professional donors), family replacement donors and voluntary blood donors.[3] The WHO recommends that blood donation should in all cases be entirely voluntary driven by the altruistic motive of saving the life of recipients.[8] Blood donor eligibility is determined by a detailed medical interview, based on national guidelines for donor selection.[7] The criteria for selection of donor include the donor's age, weight, body temperature, pulse rate, systolic and diastolic blood pressures and haemoglobin (Hb) level.[7] The potential blood donor must not be a sufferer of acute respiratory diseases, cardiovascular disease, epilepsy and Central Nerves System (CNS) disorders. He or she must not be at risk of contracting or carrying any blood transfusion transmissible diseases.[7] Pregnant women and lactating mothers must be deferred.[7]

In Nigeria, blood banks routinely test prospective donors for infections, such as hepatitis B and C, HIV and syphilis.[9] The only haematological analysis routinely performed for screening prospective donors is haemoglobin (Hb) concentration or packed cell volume (PCV)/haematocrit.[9] The effectiveness of the transfusion process depends on the quality of the blood transfused and the safety of the donor.[9] To access these qualities, one needs to go beyond Hb /PCV estimation to access other haematological parameters that will give information on some latent physiological processes in the prospective donor. For instance, the Hb estimation is less sensitive in the early stages of iron deficiency.

A haematological profile determines the concentration of Hb and the counts of red blood cells (RBC), white blood cells (WBC) and platelets. While assay for haemoglobin and red blood cells are essential ways to identify anaemia, the WBC and platelet count can reveal numerous haematological and non-haematological conditions. The red cell indices (Mean cell volume, mean cell haemoglobin and mean cell haemoglobin concentration) and red cell distribution width are useful tools in assessing an early onset of anaemia.[7]

To maximize the benefit of safe blood transfusion services, the evaluation of the blood donor's haematological parameters is essential in the assessment of suitable blood donors. Indolent or early blood diseases could be first suspected in apparently healthy blood donor with the resultant benefits of early follow up for diagnosis and intervention.[7] Also, studies have reported variations in haematological parameters amongst different ethnicities,[10] therefore the objective of this study was to evaluate and compare haematological parameters (total WBC count and differentials, platelet (PLT) count , Hb concentration, haematocrit level and red cell differentials) among the types of blood donors in Delta State University Teaching Hospital (DELSUTH), Oghara, Delta State and to also evaluate the socio-demographic patterns amongst these categories of blood donors. The study would also highlight the prevalence of each type of donor.

Materials and Methods

Study design

The study was a cross-sectional study.

Study area

Samples were collected at the donor Clinic of the Delta State University Teaching Hospital (DELSUTH), Oghara, Delta State, Nigeria. DELSUTH is a state government owned teaching hospital with over 300 bed capacity, located in Ethiope-West Local Government Area of Delta State. It is affiliated to Delta State University, Abraka and it boast of over 20 different medical disciplines.

Study population

The study population comprised of apparently eligible blood donors who gave written consent to participate in the study. We excluded eligible donors who were not willing to participate in the study.

Sample size estimation

Minimum sample size was determined using the formula:[10] $\mathbf{n = N/1+N\,(e)^2}$ with 95% confidence interval level.

Where: **n=** minimum required sample size

N = number of blood donors per month (estimated to be 124)

e = allowable error (%) which was set as 0.05.

Substituting in the formula: $n = 124/1+124(0.05)^2 = 95.4$

Thus, a minimum of 95 blood donors were required to enrolled in the study.

Sampling technique
A consecutive sampling procedure was used in this study.

Study definition
Voluntary blood donor: A person who gives blood, plasma or other blood components of his/her own free will and receives no payment for it, either in the form of cash or in-kind which could be considered a. substitute for money.

Professional/Paid blood donor: A person who gives blood, plasma or other blood components in exchange for money or any other form of payment.

Family replacement donor: These are individuals who donate blood to be used for their relatives/friends who need blood/blood product transfusion.

Heavy alcohol intake: The National institute on alcohol abuse and alcoholism (NIAAA) defines heavy drinking as follows:

- For men, consuming more than 4 drinks on any day or more than 14 drinks per week
- For women, consuming more than 3 drinks on any day or more than 7 drinks per week

Sample collection and analysis
Approximately 3 milliliters of venous blood were drawn aseptically from the antecubital vein of each subject with minimal stasis and dispensed into commercially prepared ethylene di-amine tetra-acetic acid (EDTA) bottle for full blood count (FBC). The sample was mixed gently but thoroughly to prevent cell lysis and ensure adequate anticoagulation. All specimens were labelled with personally generated identification numbers and analysed within one hour of collection using automated blood cell counter (Sysmex Haematology Autoanalyser). The basic principle underlying this technique is electronic impedance and light scatter.

Study duration
The study was carried out within a period of two months. The first month was data and sample collection and the other for analysis and discussion.

Data analysis
Data obtained was analysed using Statistical Package for the social sciences (SPSS) version 23. Continuous variables were tested for normality. Comparison of mean between the groups will be done with the student test. Probability values less than 0.05 ($p < 0.05$) would be considered as significant. Results will be presented in tables and charts.

Results

Socio-demographic distribution

A total of 95 blood donors were recruited in this study comprising of 10 voluntary donors, 16 family replacement donors and 69 professional donors.

Most of the donors were below 30 years old (70.5%) and the fewest were above 40 years of age (3.2%). Most donors below 30 years and between 30- 39 were professional donors (84.1% and 11% respectively). The only group of donors above 40 years were family replacement donors (3 donors). The difference in age group amongst the three groups of patients was statistically significant ($p < 0.001$).

As regards the proportion of males in the various categories; all (100%) participants in the professional donor's category were males, while the family replacement and voluntary donors categories had 12(75%) and 6(66%) respectively. There was a significant difference between the sex groups in the study ($p < 0.001$).

Thirty-eight (40%) of the donors had tertiary level of education, thirty-two (33.7%) had secondary levels and twenty- five (26.3%) had primary education. No voluntary nor family replacement donor had primary level of education but 2(20%) and 3(18.8%) reached secondary level of education respectively. Most professional donors (39.1%) had secondary level of education, closely followed by (36.2%) and (24.6%) with primary and tertiary education respectively. The difference in level of education reached statistical significance ($p<0.001$).

Seventy- four (77.8%) of donors were single and twenty-one (22.1%) were married. Most family replacement donors were married (62.5%) while most of the voluntary and professional donors were single (70% and 88.4%) respectively. The difference in marital status was statistically significant ($p<0.001$).

Sixty participants (63.2%) drink significant quantity of alcohol and fifty-two (54.7%) smoke tobacco. Fifty- eight (55.0%) of professional donor's drink alcohol and 1person from the other two groups takes alcohol. Forty-five (55.2%) professional donors smoke tobacco as against 5 family replacement donors and 2 voluntary donors. The p value for smokers and significant alcohol use is statistically significant ($p= 0.003$ and $p< 0.001$ respectively).

Table 1: Socio-demographic pattern of blood donors

	FR n = 16	PD n = 69	VD n = 10	Total n = 95	P-value
Age group (Years)					
<30	4 (25.0)	58 (84.1)	5 (50.0)	67 (70.5)	
30 – 39	9 (56.3)	11 (15.9)	5 (50.0)	25 (26.3)	<0.001
40 – 49	3 (18.8)	0 (0.0)	0 (0.0)	3 (3.2)	
Sex					
Male	12(75.0)	69(100)	8(80)	89(93.7)	<0.001
Female	4(25.0)	0(0.0)	2(20)	6(6.3)	
Education					
Pry	0 (0.0)	25(36.2)	0(0.0)	25(26.3)	
Sec	3 (18.8)	27(39.1)	2(20)	32(33.7)	<0.001
Tertiary	13 (81.2)	17(24.6)	8(80)	38(40)	
Marital status					
Single	6 (37.5)	61 (88.4)	7 (70.0)	74(77.8)	,<0.001
Married	10 (62.5)	8 (11.6)	3 (30.0)	21(22.1)	
Religion					
Christians	16(100.0)	69(100.0)	10(100.0)	95(100.0)	
Alcohol use	1 (6.3)	58 (55.0)	1 (10.0)	60(63.2)	<0.001
Smoking	5 (31.3)	45 (65.2)	2 (20.0)	52(54.7)	0.003

FR: Family replacement donor, **PD:** Professional donor, **VD:** Voluntary donor

Full blood count parameters

The mean white blood cell count (WBC) was 7.3 ± 1.5 x10^3µl and the difference in WBC between the three groups of donors did not reach statistical significance (p=0.842). The mean haemoglobin was 13.6±1.3mg/dl with a range of 13.3-13.9mg/dl at 95% confidence interval. Family replacement donors had the highest mean haemoglobin of 14.8mg/dl and professional donors had the lowest value of 13.2mg/dl. There was statistical difference in haemoglobin concentration with p <0.001. The mean platelet count was 202.6 ± 59.5x 10^3µl. The mean platelet count was highest in professional donors (209.2 ± 60.8x10^3µl) but the difference was not statistically significant (p=0.183).

Table 2: Haematological Parameters of Donors

	FR n = 16 Mean ± SD (95% CI)	PD n = 69 Mean ± SD (95% CI)	VD n = 10 Mean ± SD (95% CI)	Total n = 95 Mean ± SD (95% CI)	P-value
WBC (x 10^3/uL)	7.5 ± 1.6 6.7 – 8.4	7.3 ± 1.3 7.0 – 7.6	7.2 ± 2.4 5.6 – 9.0	7.3 ± 1.5 7.0 – 7.6	0.842
Granulocyte (x 10^3/uL)	4.7 ± 1.2 4.1 – 5.3	4.6 ± 1.1 4.4 – 4.9	4.6 ± 1.6 3.5 – 5.7	4.6 ± 1.1 4.4 – 4.9	0.986
Lymphocyte (x 10^3/uL)	2.5 ± 0.7 2.1 – 2.9	2.3 ± 0.6 2.1 – 2.4	2.2 ± 0.7 1.7 – 2.7	2.3 ± 0.6 2.2 – 2.4	0.292
MID (x 10^3/uL	0.3 ± 0.3 0.2 – 0.5	0.4 ± 0.3 0.3 – 0.4	0.5 ± 0.4 0.2 – 0.8	0.4 ± 0.3 0.3 – 0.4	0.374
Hg (g/dll)	14.8 ± 1.4 14.0 – 15.5	13.2 ± 1.1 13.0 – 13.5	14.3 ± 1.4 13.3 – 15.4	13.6 ± 1.3 13.3 – 13.9	<0.001
HCT (%)	44.7 ± 5.1 42.0 – 47.5	39.6 ± 3.3 38.8 – 40.4	43.0 ± 4.7 39.6 – 46.3	40.8 ± 4.3 40.0 – 41.7	<0.001
PLT (x 10^3/uL)	190.8 ± 58.1 159.8 – 221.8	209.2 ± 60.8 194.6 – 223.8	176.4 ± 45.8 143.6 – 209.2	202.6 ± 59.5 190.5 – 214.8	0.183

FR: Family replacement donor, PD: Paid donor, VD: Voluntary donor, WBC: White blood cell count, Hg: Haemoglobin, HCT: Haematocrit, PLT: Platelet

Discussion

Most donors in this study were adults less than thirty years old and just a few close to and above the middle age group. This was similar to findings by Ugwu et al, Nwagu et al and Durosinmi et al.[11-13] This indicates that the younger age group are more involved in the practice of blood donation. The reason for this could be as a result of the target group in various blood drives done at Oghara. Most awareness campaigns on blood donation are carried out in schools within the town especially in the Polytechnic and the University where the students are in their 20's and 30's. Oghara is a semi-urban community with a rich cultural heritage and traditional beliefs. The belief

in myths and superstitions surrounding blood donation would be a probable reason why the middle aged and elderly seldomly donate blood. In addition, temporary deferral due to chronic diseases like cardiovascular diseases and anaemia of chronic disease could be a reason why this age group does not donate blood.
Also, most of the adults and adolescents in the study were professional donors. This trend is likely due to the economic and unemployment rate in the country and particularly in the locality. This age group has found a lucrative business in donating blood for financial remunerations.

In this study, more males donated blood than females. The predominant male blood donation is similar to the findings by Quader et al, Nwagu et al, and Orukma et al but different from Andrade et al and Lattimore et al who had higher prevalence of female donors.[12,14,17] For low female donation many reasons have been deduced including pre-donation temporary deferral due to anaemia resulting from menstruation, and uncompensated blood losses as a result of child birth and lactation. Socio-cultural and superstition also plays a role in female participation.

Educational level plays a role in blood donation. Most donors had a tertiary level of education (40%) as compared to those with secondary and primary level of education who accounted for 33.7% and 26.3% respectively. Orukma et al in their study had a similar prevalence of tertiary donors (38.4%).[14] Although, in that study most donors had secondary level of education (45.7%). This study showed a positive correlation between level of education and blood donation. The index study showed that most of the donors were unmarried (77.8%). This is similar to findings by Quader et al, Pule et al and Orukma et al.[12,14,18] sixty- one of the seventy-four single donors were professional donors. 63.3% and 54.7% of blood donors in this study take significant quantities of alcohol and smoked tobacco respectively. Those with such unhealthy habits and lifestyles were predominately professional donors. These values were significantly higher than those reported by Mousavi et al amongst Norwegians (5% and 26% respectively).[19]

Overall, professional donors were more in the study (72.6%). This is similar to numerous studies done in Nigeria but not as high as in the study by Nwagu et al (89.8%).[12] This trend may be attributable to the high unemployment rate in the country, poverty and the high demand for blood which makes many health facilities depend on blood vendors and paid donors. Also, a lack of coordinated blood donation in many health facilities in the country further deepens the reliance on paid donors. Good blood donation practice entails measures that ensure safe blood, as well as donor safety. This could be undermined as professional donors are more likely to give blood more often than recommended, be undernourished and more at risk of having Transfusion Transmissible Infections (TTI).

The total white cell count (WBC) for blood donors were significantly within the normal local reference range. There was no significant difference in the WBC and differentials amongst the three categories of donor in this study. The findings is in discordance with reports from Lugos et al in Jos and Nubila et al in Enugu who found significantly higher values of total WBC and its differentials amongst blood donors.[7,20]

The haemoglobin concentration and haematocrit levels were within normal range in the study. This is due to the fact that only donors with adequate packed cell volume (PCV) was included in the study. However, family replacement donors had significantly higher PCV than paid donors. A similar finding was reported by Nwogoh et al.[21] This is possibly due to the increased frequency of donation amongst professional donors and nutritional differences. In addition, professional donors often patronize more than one blood vendor in an attempt to earn more money. The

platelet count for donors was within normal range and there was no significant difference between the different types of blood donors.

In conclusion, this study showed that the younger age groups, males, unmarried people, individuals with tertiary level of education, smokers, persons who take significant quantity of alcohol and professional donors constitute the significant proportion of blood donors in Oghara, Delta State. In addition, there was significant difference in the haemoglobin and haematocrit level amongst the three categories of donors.

Recommendations

Our study showed that more than two-third of blood donors are paid donors hence reduction of unemployment and alleviation of poverty by the government will go a long way in correcting this anomaly. Also, transfusion service and all stakeholders in transfusion service should increase their awareness campaign towards voluntary non-remunerative blood donation. 16.8% of the donors in this study were family replacement donors, these individuals may be willing to convert to voluntary donors if properly and adequately informed.

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