

COMPARATIVE ANALYSIS OF HAEMATOLOGICAL PARAMETERS, CD4 AND CD41 COUNTS AMONG THREE CATEGORIES OF BLOOD DONORS IN IBADAN, NIGERIA

ABSTRACT

Blood transfusion is a life-saving practice, necessary for a variety of health conditions and the primary goal of blood transfusion is to ensure safety, adequacy, accessibility, and efficiency of blood supply at all levels. Safety of blood transfusion is anchored on well screened donors. Unfortunately, inaccessibility of timely, well screened, safe blood for blood transfusion has resulted in many otherwise avoidable deaths in Nigeria. This study determined and compared the values of demographical characteristics, some haematological and immunological parameters (CD4 and CD41) to serve as basis for reviewing blood transfusion policy in Nigeria at the Blood bank unit of University College Hospital (UCH) Ibadan among the three categories of blood donors which includes commercial donor (CD), family replacement donor (FRD) and voluntary non remunerated blood donor (VNBD) that was recommended by some studies to be the safest which was used as control in this study, 360 apparently healthy blood donors were recruited for this study at UCH, Ibadan. Haematological parameters analysis was carried out by Sysmex haematology auto analyzer (CELL-DYN/ EMERALD 22), CD4 count was carried out by BD FACSPresto™ CD4 Auto analyzer and CD41 was carried out by Human CD41 ELISA KIT REAGENT. Data obtained was analyzed through Statistical Package for the Social Sciences (SPSS) Version 25.0. Comparison of haematological parameters analysis among the three categories of blood donors showed decrease in mean value of wbc, platelet count, rbc and its red cell indices in FRD when compared with VD with no significant difference but there was significant decrease in mean value of wbc count (p-0.012), platelet count (p-0.044), PCV (p-0.024), HB, (p-0.009), MCV, (p-0.013), MCH, (p-0.042) and MCHC (p-0.004) in CD when compared with VD. CD4 showed decrease value in FRD compared to VD, and also in CD when compared with VD with no significant difference. Decrease value of CD41 was detected in FRD when compared with VD, also in CD when compared with VD with no significant difference. In conclusion, this study detected the ineffective erythropoiesis process due to multiple donations in

CD as well as compromised immune status coupled with possible poor platelet product donation. Since there are no adequate VNBDs to donate sufficient blood for most of our patients in Nigeria and with some detected clinical abnormalities in CD that are readily available in Nigeria for donation, family replacement donors that are non-remunerated donor detected to have similar haematological and immunological parameters with the Voluntary and first-time donors should also be encouraged for donation. Stringent haematological screening that includes determination of full haematological parameters rather than haemoglobin alone and immunological parameters like CD4 would certainly improve donor safety and quality product for the recipient.

Keywords: Blood donor, Voluntary donor, Commercial donor, Family replacement donor, Hematological parameters, immunological parameters.

INTRODUCTION

Blood donors are people who appear healthy and provide their blood for the treatment of others who need blood transfusions. They can also be people who have undergone medical laboratory testing as well as physical screening, and have been deemed suitable and eligible to donate

blood. Blood donors are classified as voluntary, non-remunerated, family replacement, and commercial (paid) donors. Also, they are grouped into first-time and old (repeat) blood donors (Benedicts *et al.*, 2012). Donors classified as commercials are those who exchange their blood donations for cash or other benefits. They might be malnourished, in poor condition, or at risk of diseases that could compromise the lives of those receiving their blood during transfusions (WHO, 2012). Family replacement blood donors are donors who are called upon by a hospital or relative to repay back the blood that a hospitalized friend or family member needs due to a blood shortage. Good-hearted people who donate blood for the treatment of patients without having the mind of receiving anything are known as voluntary non-paid or non- remunerated donors (Allain, 2010).

According to some studies, it was recommended that out of the three categories of blood donors, safe blood can only be obtained from willing, unpaid donors (Islam, 2009.,Osaro *et al.*, 2011). Also, World Health Organization (WHO) recommends that blood donation should in all cases be absolutely voluntary as a way of attaining safe blood transfusion (WHO, 2010),likewise considerable pressure is applied by richer countries and international transfusion bodies to establish voluntary, non-remunerated blood donors (VNRD) as the only source of blood, excluding the traditional family/replacement donors and paid donor on the grounds of a higher level of safety (Allain, 2010).However, there is increase in the demand for blood on daily basis in Nigeria and voluntary donors are seriously scarce and unaffordable to supply the blood required on daily basis for blood transfusion (Ahmed *et al.*, 2004; Allain, 2010). Nigeria as a member of WHO has made a little progress with voluntary donor recruitment and only about 5% of donors' blood used in Nigeria come from voluntary donors; family replacements and paid donors are still the major sources of donor blood procurement (Ahmed *et al.*, 2004; Osaro and Charles, 2011).

Haematological parameters include the measuring of Haemoglobin (Hb), Haematocrit (Hct), red blood cell, white blood cell and platelet cell counts and some haematological indices which are widely used clinical indicators of health and disease. The haematology parameters of individuals assess health and disease conditions (Kone *et al.*, 2017). CD41 is an Integrin alpha-IIb which is a protein in humans that is encoded by the *ITGA2B* gene. Also, a glycoprotein (Gp) receptor found on the surface of platelet and few other heamatopoetic cell. It is a family of IIb/IIIa integrin, a receptor for fibrinogen and several other extracellular matrix molecules which its' major role is

in platelet aggregation (Boisset and Robin, 2012). Platelet aggregation plays a central role in platelet clotting activities. Platelet aggregation plays a central role in platelet clotting activities. The cellular events leading to platelet aggregation are mediated by the binding of fibrinogen to the glycoprotein (GP) IIb/IIIa receptor of platelets as a final common pathway (Nurden *et al.*, 2013). Its' expression was evaluated among the three categories of donors to evaluate the prevalence of Glanzmann thrombasthenia (GT). GT is a rare, inherited autosomal recessive disorder characterized by qualitative or quantitative deficiency of CD41/CD61 which is associated with increased bleeding (Bellucci and Caen, 2002; Franchini *et al.*, 2010). It is usually diagnosed by absent or reduced platelet aggregation (Canul *et al.*, 2014).

Despite the fact that previous studies have established the family replacement donors to be closer to voluntary donors in prevalence of viral markers and background safety (Osaro *et al.*, 2011), unfortunately, paid donors provide the bulk of blood donations in developing countries, like Nigeria (Ahmed *et al.*, 2004; Osaro and Charles, 2011). In view of the above, there is need to establish a scientific basis for holistic screening of potential blood donors and specifically to re-evaluate CD for other area that is not currently being screened for since they are the donors that provide the bulk of blood donations in Nigeria. Therefore, this study aimed to determine the values of some haematological and immunological parameters (CD4 and CD41) and compare the results among the three categories of donors in order to serve as basis for reviewing blood transfusion policy in Nigeria.

2. MATERIALS AND METHOD

2.1 SAMPLE COLLECTION AND SAMPLE SELECTION

A total of 360 apparently healthy prospective blood donors (120 family replacement, 120 commercial and 120 voluntary (302males and 58females) from University Teaching Hospital Blood Bank, Ibadan with the age range between 18 and 60 years were recruited for this study.

After their consent was seek with the aid of informed consent form, data of these donors with the aid of Questionnaire was obtained after which 5ml of antecubital venous blood sample of 360 different donors was collected and dispensed inside EDTA Bottles.

2.2 SAMPLE ANALYSIS.

Transfusion Transmitted Infection

5ml blood of these 360 blood donors was collected inside EDTA bottles and was used to screen them for transfusion transmissible infections (TTIs) tests with Determine rapid test kit (ABBOTT). Confirmatory Antibodies were determined by Enzyme linked immunosorbent assay (ELISA) (GenscreenTMULTRA HIV Ag-Ab) for confirmation. Some Haematological and immunological parameters was also assayed.

2.3HAEMATOLOGICAL PARAMETERS ANALYSIS

Haematological parameters (White blood cells count, Neutrophil, Eosiniphils, Basophils, Lymphocytes, Packed cells volume, heamoglobin level, Platelet/ Lymphocytes ratio, red blood cell, Mean cell volume, Mean cell haemoglobin, Mean cell haemoglobin concentration, Mean platelet volume) were determined by haematology auto analyzer (CELL-DYN/ EMERALD 22)

2.4IMMUNOLOGICAL ANALYSIS

ABSOLUTE CD4 Analysis: CD4 T lymphocyte was carried out by **BD FACSPresto CD4 Auto analyser counter** with flow cytometry method.

2.5CD41 (Glycoprotein11b) Counts Analysis

Human CD41 ELISA KIT REAGENT (CAT# EKHU-2309 LOT#: p2022613, MELSIN) was used which works on the principle of flow cytometry.

2.6STATISTICAL ANALYSIS

Statistical Package for the Social Sciences (SPSS) version 25.0 was used for all data analysis in this study. Frequency and percentage were used to summarize categorical variables and mean/ standard deviation (SD) was used to summarize the quantitative variables. Chi-square

was used to test the association of categorical variables while one- way Anova was used to determine the mean level of the quantitative variables and pearson correlation was used to determine the association between haematological parameters, CD4 and CD41. $P < 0.05$ was considered to be statistically significant.

4. RESULTS

The basic characteristics of enrolled participants are presented in **Table 4.1**. A total of 360 apparently healthy blood donors voluntarily participated in this study. They were categorized into three based on the manner and reasons for their donation. The three groups were; Voluntary non-remunerated donor (VD) ($n = 120$), family replacement donor (FRD) ($n = 120$), and commercial donor (CD) ($n = 120$). The mean age for the three groups were determined,

participants in VD and FRD appeared older in respect to CD. Majority of the participants (above 80% in each group) were between 18 and 50 years. They were predominately males; CD were 100% male, while that of VD and FRD were 80% and 71.7% male respectively. Majority of them were civil servants (46.7%) and artisans (76.7%) based on their occupation analysis.

Table 4.2 shows the outcome of comparison of the entire hematological parameters assay between VD and FRD. Result showed no significant differences in the levels of all the hematological parameters in VD compared to FRD.

Table 4.3 shows the comparison of the hematological parameters between VD and CD. Significant increase was observed in NLR, PCV, MCV, MCH, MCHC levels in CD compared to VD. The levels of WBC, Platelet, PCV, HBG, RBC and red cell indices significantly decreased in VD compared to CD. However, there were no significant differences in parameters such as lymphocytes, Basophils, Eosinophils, monocytes, neutrophils, PDW, P-LCR, PRL, and MPV levels.

The outcome of the incidence of low CD4⁺ count among different categories of donor in **Figure 4.1** shows that commercial donor has the highest incidence of low CD41 count compared to FRD and VD, with VD having the lowest incidence.

Figure 4.2 shows the distribution of low CD41 expression among the three categories of donors with CD having the highest distribution of low CD41 count compared to FRD and VD, with VD having the lowest distribution

DISCUSSION

Comparative analysis of demographic characteristics, some haematological parameters, CD4 and CD41 counts among three categories of apparently healthy blood donors in U. C. H. Ibadan, Nigeria was carried out in this study. In line with the standard laid down by WHO and National Blood Transfusion Services (NBTS), that blood for transfusion service should be sought from non-remunerated volunteer donors (Benedict *et al.*, 2012), therefore Voluntary Donors was

considered as the control to compare the remaining two groups of donors in this study. Unfortunately, the number of pints of blood donated from Voluntary donors is far from satisfying high demand for blood transfusion in Nigeria. Whereas, paid donors (Commercial) are still the major sources of blood procurement, those that in the act of getting paid to donate are always ready and willing to donate as many times as possible (Ahmed *et al.*, 2004; Osaro and Charles, 2011). However, the quality and safety of commercial blood are seriously put to question (Benedict *et al.*, 2012). A total of three hundred and sixty (360) potential donors (120 commercial donors, 120 family replacement donors, and 120 voluntary donors) eligible for blood donation at University College Hospital in Ibadan, Southwest Nigeria. All the blood donors in this study were recruited at blood bank unit of University College Hospital, Ibadan.

Based on the manner and intention for donation, they were categorized into three groups. A standard questionnaire and interview method were used to gather relevant information from the participants after an informed consent has been sought (Mohammed and Essel., 2018) consent template was slightly modified and used for this study. Questionnaire has the advantages of easy administration and gathering of enormous information (Martinez-Mesa *et al.*, 2016). The age of the participants was in the range of 18 and 60 years. It is a common practice all over the world that it is adult that usually involved in blood donation exercises, which indicates that donors' age is one of the determining factor to be considered in any blood donors' screening; establishing that age of donors' to be screened must be within the WHO accepted age which is between 18 and 60 years and this is in line with few past studies that showed statistical significant in age of some healthy individuals (WHO, 2012; Benedict *et al.*, 2012). CD were 100% male, while that of VD 80% male, 20% female and FRD were 71.7% male, 28.3% female respectively. This is confirming that male donors dominate female donors in this study. Blood donation exercise is considered to be a male affair and this fact is also supported by previous studies (Jeremiah *et al.*, 2011; Zheng *et al.*, 2011; Osuji *et al.*; 2019) that showed that most blood donors recruited were males with 193 (91%) this could be one of reasons why women are not deeply involved in blood donating process which could be due to their regular monthly menstruation. Often, it is either they are in the process of recovering from previous menstrual blood loss or they are preparing for another menstruation. In most cases their hemoglobin level is not usually optimal to warrant donating a pint of blood. Also, it was discovered in this study that majority of donors though not significant among the three categories of donors were Artisans 52 (44.8) (p=0.059) and this is

similar to a study of Lugoset *et al.*, 2019) And this showed that most blood donors in this study were artisans and that blood donors recruitment in Nigeria should be tailored towards going to businessmen/traders, market to recruit both types of donors.

Blood is a complex fluid consisting of different blood cells suspended in yellowish liquid called plasma. The blood cells comprise a mixture of red cells (erythrocytes), white cells (leukocytes) and platelets (thrombocytes) and Haematological parameters are widely used clinical indicators to assess individuals health and disease conditions (Kone *et al.*, 2017) On the other hand, WBC which is one of the blood cells, consists of granulocytes, lymphocytes, and monocytes (WHO, 2015) and the primary function of white blood cells is body defense against foreign bodies and this is often achieved through antibody production. White blood cell (WBC) parameters, both differential population and absolute counts were evaluated. As evident from this study, there were no significant differences in the WBC of VD when compared with FRD subjects ($p = 0.382$). However, WBC was significantly lowered in CD when compared with VD ($p = 0.012$). This finding is contrary to what was reported by Benedict *et al.*, 2012).

Notwithstanding, the finding is in line with that of (Okpokamet *et al.*, 2016) who reported a significantly lowered WBC among CD. The reasons for variation in outcomes could be attributed to probable existence of immune deficiency among CD, which increased the rate of WBC apoptosis or decrease rate of cells formation (Rajab *et al.*, 2005). Both absolute and mean percentage of lymphocytes were estimated and compared between the groups. There were no significant differences in the mean values of lymphocytes percentages between VD and FRD ($p = 0.796$). Conversely, the percentage of Lymphocytes was severely reduced in CD in respect to VD ($p = 0.087$). This result is in agreement with the study of abnormal low values of haematological values (Balogun *et al.*, 2023; Osujiet *et al.*, 2019), (Lugoset *et al.*, 2019) who recorded low values of haematological parameters of blood components among healthy blood donors in Jos, Nigeria. However, the finding of this study is contrary to that of (Okpokamet *et al.*, 2016), who reported significantly increased lymphocytes among commercial donors with repeated donation. The finding here, though not significant, but the percentage was severely reduced. The pathogenesis or probable causes of lymphocytopenia in this group could be attributed to under nutrition. Most commercial donors are not mindful of their health status and nutrition (Rajab *et*

al., 2005). As well, it could be traced to immune deficiency/immune compromise in CD since lymphocyte is one of the major immune system.

As revealed in this study, the mean PCV and HBG values were compared between the three categories of donors. There was no significant recorded in the values of PCV and HBG between VD and FRD. However, the mean values of HCT and HBG were significantly reduced in CD ($P = 0.024$) ($P = 0.009$) respectively in respect to VD. These findings are in line with that of Benedict *et al.*, 2012; Erhaboret *al.*, 2013), whose finding revealed significant decrease in both HBG and PCV of CD when compared with VD (p -value = 0.16) and ($p = 0.023$) respectively and this could be as a result of frequent donation of CD. Anaemia has been defined as Hb level <11g/dl for both males and females based on the WHO cutoff value (WHO, 2013). The finding of this study simply indicates inadequate bone marrow response to drive erythropoiesis (Rajab *et al.*, 2005) coupled with the possible frequent donation of CD more than four times in a year

RBC and its' indices were estimated and compared among the three categories of blood donors, the outcome was tabulated. Comparison of RBC count, MHC, MCV, and MCHC between VD and FRD revealed no significant differences; ($p = 0.479$), ($p = 0.954$), ($p = 0.989$) and ($p = 0.795$) respectively. On the other hands, comparison of RBC count, MCV, MCH and MCHC between VD and CD were significantly decreased ($p = 0.019$), ($p = 0.013$), ($p = 0.042$), and ($p = 0.004$) respectively. Similar observation had been reported by (Hoqueet *al.*, 2012).

Platelet and platelet indices were also evaluated in this study, there were no significant differences in platelet count between VD and FRD groups ($p=0.345$), but platelet count was significantly reduced in CD ($p = 0.044$) when compared with VD which could also be due to frequent donation of CD. The implication of this finding is that low value of platelet count in CD indicates that if this blood unit is donated by such donor and transfused to recipients, it is not serve the purpose of solving the intended problem of thrombocytopenia that the blood transfusion of such donated blood is designed for. Thrombocytopenia consequentially leads to bleeding disorder which eventually leads to Anaemia which is one of the most common consequence of prolong bleeding, it has substantial negative effects on the health and economic wellbeing (Bakhubaira, 2013). This is in line with the study of abnormal low values of haematological values (Balogunet *al.*, 2023; Osujiet *al.*, 2019), (Lugoset *al.*, 2019) who recorded

low values of haematological parameters of blood components among healthy blood donors in Jos, Nigeria and this outcome is in contrary with (Hoque *et al.*, 2012).

Absolute CD4 T-lymphocyte count determines the state of immunological matter of every individual which some studies generally connected to monitoring of HIV infections without considering some other infections that also affect immune status.

CD4⁺ lymphocytes were enumerated among the three categories of donors in UCH, Ibadan to evaluate the impact of blood donation on body immunity. The comparison of CD4⁺ cell count between VD and FRD, CD and VD both yielded no significant differences ($p = 0.879$) and ($p = 0.064$) respectively. Despite the fact that all the categories of blood donors recruited in this study were negative for HIV 1&2, yet CD4⁺ count, though not significant was severely reduced in CD donors in this study, the reason which is not within the scope of this study but could be related to immune deficiency or compromise of CD. This result is in agreement with the study of (Joseph *et al.*, 2020) in a study of prevalence and predictors of CD4 T- lymphocytopenia among HIV Negative patients in uganda, also similar to a study of (Babatunde *et al.*, 2014) in a study where it was established that adult residents of Ilorin had significantly lower absolute mean CD4 count. It is also similar to a study of (Mishra *et al.*, 2020) with low CD4 count in healthy Nepalese male adults. However, the outcome is contrary to earlier finding of Bainbridge *et al.*, (2012), who's finding revealed enhanced level of CD4 sequel to plasmapheresis. In the same vein, Stricker *et al.* (1995) had earlier established that repeated plasma donation is beneficial and contribute to healthy HIV-infected people by enhancing CD4⁺ count.

CD41 is a glycoprotein (Gp) receptor found on surface of platelet and few other heamatopoetic cell. It is a family of IIB/IIIa integrin, a receptor for fibrinogen and several other extracellular matrix molecules (Boisset and Robin, 2012). Its expression was evaluated among the three categories of donors to evaluate the value of CD41 which its' deficiency lead or responsible to absent or reduced platelet aggregation that could lead to Glanzmann thrombasthenia (GT) disease which is an inherited autosomal recessive disorder that is characterized by qualitative or quantitative deficiency of CD41/CD61 (Franchin *et al.*, 2010). It is usually diagnosed by absent or reduced platelet aggregation to physiological agonists, such as collagen, epinephrine and arachidonic acid (Canulet *et al.*, 2014). The outcome of this study revealed no significant differences in the plasma level of CD41 between VD and FRD ($p = 0.564$). Notwithstanding, the expression of CD41 was moderately reduced among CD, though the difference was not

significant in relation to VD ($p = 0.067$). Low CD41 in each category were as follow; VD (7), FRD (11), and CD (10), this resulted to prevalence of 5.8%, 9.2% and 8.3% respectively. There is paucity of information on prevalence of low expression of CD41 among donors to support this finding. Patients of inherited disorders of platelets are characterized by a prolonged clinical history of mucocutaneous bleeding (Boisset and Robin, 2012).

Conclusion

Since there are no adequate voluntary donors (that believed to be the safest) to donate sufficient blood for most of our patients in dire need of blood in Nigeria and paid donors and family replacement donors are readily available, family replacement donor that are usually non-remunerated donors should be encouraged for donation based on comparable or similar haematological and immunological parameters to the voluntary and first-time donors.

Some abnormal haematological parameters, immune compromise with low value of immunological values discovered in commercial donors (CD) in this study when compared well with VD and RFD has demonstrated limitations of commercial blood donation with regards to the suitability of donors, therefore, there is need to establish a scientific basis for holistic screening of potential blood donors and specifically to re-evaluate CD for other area that is not currently being screened for since they are the donors that provide the bulk of blood donations in Nigeria. Stringent haematological screening that includes determination of full haematological parameters rather than haemoglobin alone and immunological parameters like CD4 would certainly improve donor safety and quality product for the recipient. By doing so, units of blood in our blood banks will be boosted to accommodate unexpected and emergency cases associated with massive blood loss and thereby reducing hemorrhagic-associated mortality significantly.

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Table 4.1: Demographic and clinical characteristics of three categories of blood donors

Characteristics	VD	FRD	CD
Number (Prevalence)	120 (100%)	120 (100%)	120 (100%)
Mean age (years)	48.0 ± 9.26	46.1 ± 6.69	32.4 ± 13.26
Age (years): 18 – 30	46 (38.3)	34 (28.3)	14 (11.7)
31 – 40	36 (30)	44 (36.7)	36 (30)
41 – 50	24 (20)	38 (31.7)	46 (38.3)
51 – 60	14 (11.7)	4 (3.3)	24 (20)
Gender: Male	96 (80)	86 (71.7)	120 (100)
Female	24 (20)	34 (28.3)	0
Occupations: Student	18 (15)	26 (21.7)	4 (3.3)
Civil servant	56 (46.7)	42 (35)	24 (20)
Artisan	46 (38.3)	52 (43.3)	92 (76.7)

VD = voluntary donors, FRD = family relative donors, CD = Commercial donors,

Table 4.2: Comparison of Heamatological Parameters, between voluntary and family replacement donors in UCH, Ibadan

Parameters	Voluntary donor	Family replacement	P-value
WBC (x 10⁹/L)	7.99 ± 2.97	6.65 ± 1.74	0.382
Neutrophil (%)	50.77 ± 9.49	52.47 ± 9.95	0.755
Lymphocytes (%)	37.23 ± 14.50	36.47 ± 13.10	0.796
Monocytes (%)	3.79 ± 1.64	4.21 ± 2.29	0.376
NLR	1.02 ± 0.52	1.01 ± 0.74	0.963
Eosinophil (%)	2.11 ± 1.36	2.05 ± 1.19	0.440
Basophil (%)	1.32 ± 0.66	1.40 ± 0.68	0.121

Platelet (x 10⁹/L)	202.02 ± 56.4	192.13 ± 57.1	0.204
MPV (fL)	14.43 ± 9.46	13.68 ± 8.36	0.643
PDW (%)	14.27 ± 2.43	13.32 ± 1.67	0.051
P-LCR (%)	20.09 ± 4.78	19.00 ± 5.27	0.335
PLR	13.32 ± 1.15	12.04 ± 1.89	0.205
PCV (%)	40.85 ± 5.33	38.12 ± 4.96	0.724
HBG (g/dL)	14.79 ± 1.89	13.08 ± 1.69	0.765
MCV (fL)	81.62 ± 5.92	81.01 ± 7.15	0.954
MCH (Pg)	32.01 ± 3.31	32.28 ± 6.88	0.989
MCHC (g/dL)	34.08 ± 7.01	32.66 ± 18.89	0.795
RBC (x 10¹²/L)	5.00 ± 3.30	5.13 ± 3.28	0.479

The values are mean ± standard deviation, Student t-test was used to compare the means and p = 0.05, WBC = white blood cells count, NLR = Neutrophil: Lymphocytes ratio, PCV = Packed cells volume, HBG = haemoglobin level, PLR = Platelet/ Lymphocytes ratio, RBC = red blood cell, MCV = Mean cell volume, MCH = Mean cell haemoglobin, MCHC = Mean cell haemoglobinconcentration , MPV = Mean platelet volume,

Table 4.3: Comparison of Haematological Parameters, between voluntary and commercial donors in UCH, Ibadan

Parameters	Voluntary donor	Commercial donor	P-value
WBC (x 10⁹/L)	7.99 ± 2.97	4.44± 1.84	0.012*
Neutrophil (%)	50.77 ± 9.49	56.52 ± 10.71	0.155
Lymphocytes (%)	38.69 ± 14.50	32.15 ± 8.93	0.087
Monocytes (%)	3.79 ± 1.64	4.43 ± 2.56	0.639
NLR	1.02 ± 0.52	1.41 ± 0.74	0.023*
Eosinophil (%)	2.11 ± 1.36	2.04 ± 1.38	0.440
Basophil (%)	1.32 ± 0.66	1.41 ± 0.77	0.673
Platelet (x 10⁹/L)	202.02 ± 56.4	165.14 ± 35.1	0.044*
MPV (fL)	14.43 ± 9.46	16.94 ± 9.09	0.059
PDW (%)	14.27 ± 2.43	13.58 ± 2.59	0.111

P-LCR (%)	20.09 ± 4.78	18.74 ± 5.76	0.151
PLR	13.32 ± 1.15	12.04 ± 1.89	0.205
PCV (%)	40.85 ± 5.33	31.20 ± 6.36	0.024*
HBG (g/dL)	14.79 ± 1.89	10.16 ± 1.05	0.009*
MCV (fL)	81.62 ± 5.92	73.57 ± 7.98	0.013*
MCH (Pg)	32.01 ± 3.31	24.15 ± 7.24	0.042*
MCHC (g/dL)	34.08 ± 7.01	26.83 ± 17.41	0.004*
RBC (x 10¹²/L)	5.00 ± 3.30	3.74 ± 1.68	0.019*

* represent significance P=0.05 compared to VD.

WBC = white blood cells count, NLR = Neutrophil: Lymphocytes ratio, PCV = Packed cells volume, HBG = heamoglobin level, MCH = mean corpuscular hemoglobin, MCHC = mean corpuscular hemoglobin concentration, PLR = platelet/ Lymphocytes ratio, RBC = red blood cell.

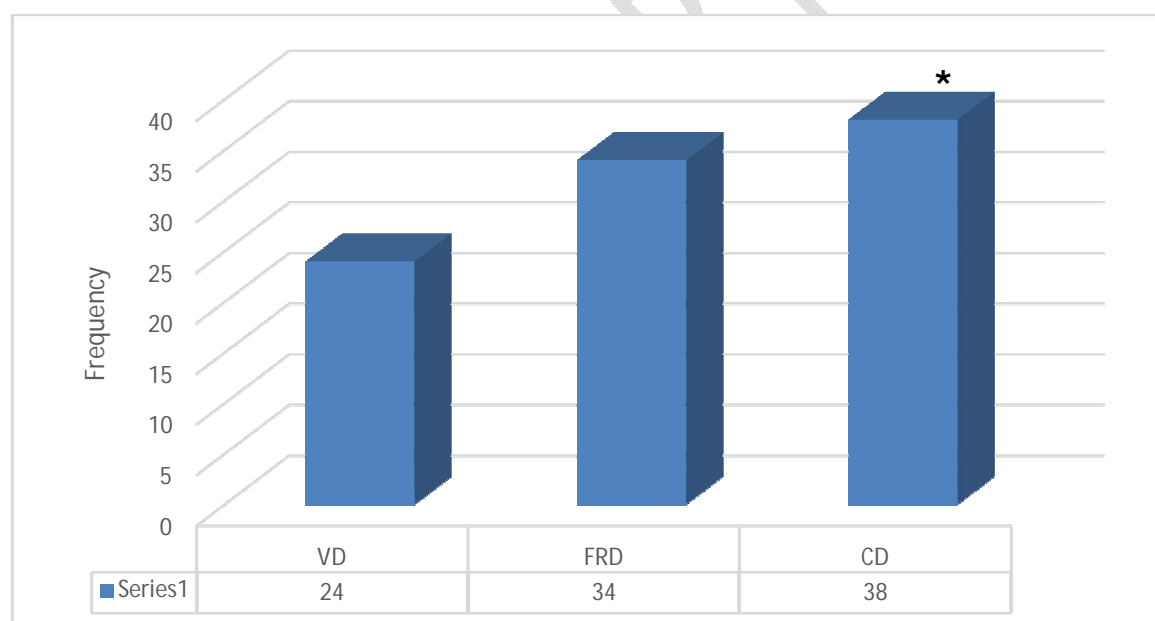


Fig. 4.1 Bar chart showing the incidence of low CD4⁺ count among different categories of donor (VD, FRD, and CD).

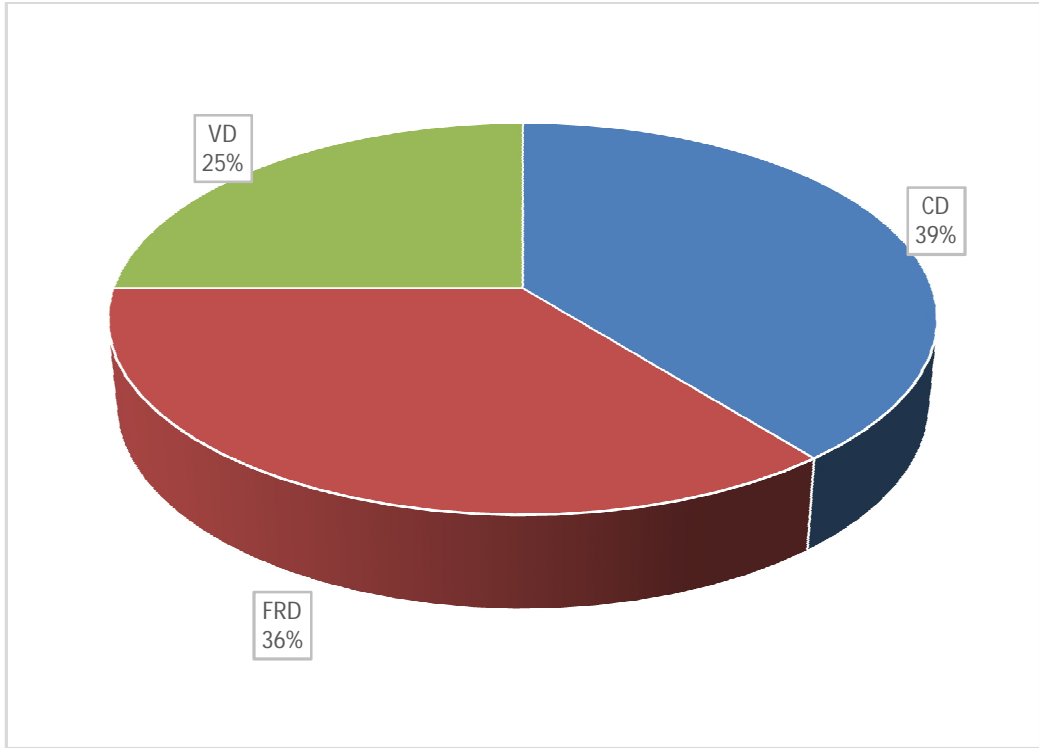


Figure 4.2: Pie chart showing the distribution of low CD41 expression among the three categories of donors.