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Haematological Parameters in Adults with Sickle Cell Disease, Visiting the University College Hospital, Ibadan, Nigeria

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ABSTRACT

Generally, most of the hematological and biochemical parameters in SCD patients are different from that of the other population. Hence, the importance of laboratory reference values for SCD has received a wide attention lately. However, there is a few reliable data to serve as reference values for hematological and biochemical parameters in patients with SCD in most African countries [3]. This study aimed at determining the hematological parameters in adults with sickle cell disease visiting the University College Hospital, Ibadan, Nigeria, with a view to providing a predictive data of SCD patients hematological parameters, as well as contributes to effective management of the disease. 131 participants were studied, 95 were sickle celled while 36 were healthy controls. Plasma was separated from collected blood and used to determine the haematological parameters. Results showed that the mean age was 35.4years ±SD=7.54years with a range of 19 to 56years for sickle cell subjects and 36.8years ±SD=9.11years with a range of 19 to 58years for control. The male to female ratio was approximately 2:1 and 2.4:1 in control and sickle cell subjects respectively. All respondents (100.0%) had abnormal haemoglobin, (78.9%) had abnormal leucocytes and 21.1% had abnormal platelets. Student's t-test revealed that there was no significant relationship between the haematological parameters assessed in the HBSS patients (Haemogloblin vs Leucocytes, 093(.369), Haemogloblin vs platelets, 031(.767), Leucocytes vs platelets, .023(.825). It is therefore advisable to always check for each parameter and never use one to predict the other, for effective management of sickle cell disease.

Keywords

Sickle Cell Disease (SCD), Platelets, Leukocytes, Haematological parameters.

Introduction

Sickle cell disease (SCD) is a worldwide public health problem that affects people in millions across the world. It is a monogenic problem caused by an A-to-T point mutation in the β-globin gene that produces abnormal hemoglobinS (HbS) which join together in the deoxygenated state, causing physical change in shape or sickling of red blood cells. Sickled red cells promote vaso-occlusion and hemolysis, which are the two major cellular hallmarks of the disease [1].

Sickle cell disease (SCD) is the most common hereditary disease in Africa that results in to public health issues in different African settlements. It is a major determining factor of disease prevalent and death in the African populations. Two percent are sickle celled at birth in Ghana [2]. Generally, most of the hematological and biochemical parameters in SCD patients are different from that of the other population. Hence, the importance of laboratory reference values for SCD has received a wide attention lately. However, there is a few reliable data to serve as reference values for hematological and biochemical parameters in patients with SCD in most African countries [3].

SCD is actually a red cell disorder, but it is an established fact that leukocytes and platelets play a significant role in the pathophysiology of this disease. In the same direction, leucocyte and platelet counts in the stable state can be used together with other parameters to project the outcome of this disorder. Using widely evaluable parameters to predict outcome would ensure

effective personalized treatment for a condition with clinical severity that varies markedly between affected persons [4].

The current study aimed at determining the hematological parameters in adults with sickle cell disease visiting the University College Hospital, Ibadan, Nigeria, as well as healthy controls in the same hospital with a view to providing a predictive data of SCD patients' hematological parameters, as well as contribute to the improvement in managing the disease.

Materials and Methods

Study Location

The study was carried out in the Haematology Day Care Unit, University College Hospital, Ibadan, Nigeria.

Study Subjects

Informed consent was obtained from 131 individuals aged above 18 years. Ninety-Five (95) of them were known sickle cell diseased patients. While the control group were Thirty-Six (36) Haemoglobin A individuals, whom were students and workers in the study hospital.

Inclusion and Exclusion Criteria

Only individuals who gave their written consent, were between 18-60 years old, confirmed Sickle Cell Disease patients and HbA controls with no previous history of any chronic illness were recruited for the study, while Patients with infection, chronic inflammatory condition other than Sickle Cell Disease, renal disease unrelated to Sickle cell Disease, symptomatic heart disease, rheumatoid arthritis or other autoimmune diseases, hypothyroidism, diabetes mellitus, or steroid therapy were excluded. Also, non-consenting individuals, and those who do not meet up with the selection criteria were excluded.

Sample Collection and Storage

3ml of blood samples were collected from each participant into Lithium Heparin bottle, spunned, and plasma separated and aliquoted in 2 vials and stored at -80oC.

Chemistry Analysis

Haemoglobin electrophoresis was done using the cellulose acetate method in order to reconfirm the sickle cell status of the participants. Analysis of Haemoglobin (HGB), total white blood cell count (WBC) and platelets were done using Haematology analyzer (Sysmex XT 1000i) which is a fully automated 5-part haematology analyzer. It is based on the standard principle and procedures described by Drasar et.al [5].

Statistical Analysis

Data analysis was done using the Statistical Package for Social Sciences (SPSS) version 21.0. The data were summarized in tables and figure, discreet variables expressed as percentages, while continuous variables were expressed as means. Normally distributed continuous variables were compared using the student's t-test.

Ethical Consideration

A letter for ethical approval was sought and obtained from ethical committee of the Oyo state Hospital Management Board, Ministry of Health, Ibadan. Also, consent from all the participants was obtained before their inclusion into the study.

Results

Table 1 showed socio demographic characteristics of subjects and controls. The mean age was 35.4years ±SD=7.54years which ranges from 19 to 56years for sickle cell subjects and 36.8years ±SD=9.11years which ranges from 19 to 58years for control. The male to female ratio was approximately 2.4:1 in sickle cell subjects and 2:1 in control, where there were 67(70.0%) male and 28(29.5%) female in the sickle cell subjects and there were 24(66.7%) male and 12(33.3%) female in the control.

Figure 1 showed that all respondents (100.0%) had abnormal haemoglobin, (78.9%) had abnormal leucocytes and 21.1% had abnormal platelets.

In table 2, student's t-test revealed that there was no significant relationship between the haematological parameters assessed in HBSS patients (Haemogloblin,vs Leucocytes, 093(.369), Haemogloblin,vs platelets, 031(.767), Leucocytes vs platelets-.023(.825). This implies that a change in one parameter does not affect the other parameters.

Table 1: Socio-demographic characteristics of respondents.

Variables	SCD subjects (N=95)	Control(N=36)
Age (years)		
18-20	2(2.1%)	1(2.8%)
21-30	22(23.2%)	8(22.2%)
31-40	50(52.6%)	13(36.1%)
41-50	19(20.0%)	12(33.3%)
51-60	2(2.1%)	2(5.6%)
Mean (SD) range	35.4(7.54) 19-56	36.8(9.11) 19-58
Sex		
Male	67(70.0%)	24(66.7%)
Female	28(29.5%)	12(33.3%)
Male to female ratio	2.4:1	2:1

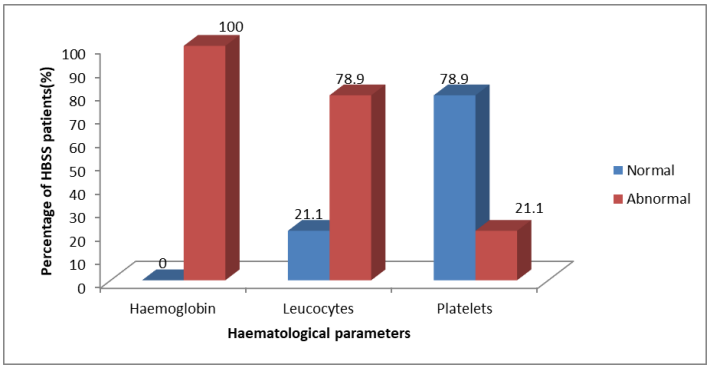

Figure 1: Distribution of status of subject (HBSS) relating to Haematological parameters, Serum Cardiac Troponin I and C - reactive protein.

Table 2: Relationship between some haematological parameters (in HBSS patients).

Parameters	Haemogloblin	Leucocytes,	Platelets
Haemogloblin,	1.000	.093(.369)	.031(.767)
Leucocytes,		1.000	-.023(.825)
Platelets			1.000

Discussions

This is a descriptive study of patients with sickle cell disease visiting the Haematology Day Care Unit of University College Hospital, Ibadan, Nigeria. 131 participants were studied, 95 were sickle celled while 36 were healthy controls. Mean age was 35.4years ±SD=7.54years with a range of 19 to 56years for sickle cell subjects and 36.8years ±SD=9.11years with a range of 19 to 58years for control. The male to female ratio was approximately 2:1 and 2.4:1 in control and sickle cell subjects respectively.

On the evaluation of the proportion of some haematological parameters, the study revealed that all adults with Sickle Cell disease in this study, 100.0% had abnormal haemoglobin, (78.9%) had abnormal leucocytes and 21.1% had abnormal platelets. Supporting the result of the study, [6] explained that several subtypes of HBSS exist, depending on the exact mutation in each haemoglobin gene. Keeping with proportion of abnormal white blood cell count and platelets, although, SCD basically alter red blood cells, Akinbami et al., [7] and Iheanacho [8] pointed out that white blood cells and platelets are also affected by the mutation in adults with Sickle Cell disease. According to Yousif, there is a lot of evidences that leukocytes take part in SCD development. Adults SCD patients with elevated white cell counts were more susceptible to utilization of the Emergency Department (ED) due to sickle cell crises. There is high correlation between severity of SCD and the number of neutrophils in the blood. In another study that related leukocytes count to pregnancy, Litos et al. [9] found that pregnant women who developed SCD-related complications in the early stage had significantly higher WBC including its subtypes compared to asymptomatic patients, except neutrophil, which was also higher, but not to the extent of significance. Shrikhande et al. [10] found that total hemoglobin was low in SCD patients particularly females. Echonwere-Uwikor et al. [11], Kosiyo et al. [12] and several other studies found that difference in platelets count was not statistically significant between SCD patients and normal healthy individuals. From this study, all the SCD patients had abnormal haemoglobin, larger percentage had abnormal leukocytes and less than average had abnormal platelets. The lower percentage of abnormal platelets may be due to the fact that it is not always significantly different across blood genotypes except due other underlying health conditions, but when it occurs, it leads to disease severity like other haematological parameters. Curtis et al. [13] discovered that SCD patients with low hemoglobin, elevated leukocytes count and elevated platelets count visit the Emergency Department (ED) more often.

Findings of this study showed that there is no significant relationship between some haematological parameters in HBSS patients (Haemogloblin,vs Leucocytes, 093(.369), Haemogloblin,vs platelets, 031(.767) , Leucocytes vs platelets-.023(.825). This implies that a change in one parameter does not affect the other haematological parameters. Supporting the study, José and Lori [14] found no correlation between markers of platelet activation and platelet count or white blood cell counts. Silva et al. [15] however found that there was a positive relationship between platelets count and number of total leukocytes, and patients with higher platelets seems to have lower hemoglobin.

Conclusion

Time to time monitoring of the haematological parameters in sickle cell patients is important if disease severity due to abnormal level of these parameters must be prevented. It was also found that change in any of the parameters may not necessarily mean there will be changes in other parameters. Hence, its is advisable to always check for each parameter and never use one to predict the other, for effective management of the disease.

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