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Research Article

Evaluation of Hematological Parameters of Sickle Cell Anemia Patients with Osteomyelitis in A Tertiary Hospital in Enugu, Nigeria

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Abstract

Sickle cell anaemia is a single point mutation in the globin chain of position 6 resulting from valine replacing glutamic acid leading to sickling and polymerization of the red cells causing the crisis in the patients. The study was done to determine the changes in haematological parameters of sickle cell anaemia patients with osteomyelitis. The study was done in a tertiary hospital in Enugu State, Nigeria. A total of one hundred subjects were recruited for the study (50 subjects were sickle cell anaemia with osteomyelitis and 50 subjects were apparently healthy individuals. The haematological parameters were determined using automation. The results showed decrease in RBC, Haemoglobin, PCV, lymphocytes and increase in WBC and monocytes. The osteomyelitis in the sickle cell anaemia patients could suppress the bone marrow resulting the observed changes in the haematological parameters studied.

Key words: sickle cell anaemia; osteomyelitis; haematological parameters; haemoglobin; WBC; red blood cells; PCV

Introduction

Sickle cell disease refers to a set of inherited haemoglobin problems characterized through a predominance of extraordinary sickle haemoglobin in erythrocytes (Rees et al., 2010; Obeagu et al., 2015; Obeagu, 2018).

Sickle cell anaemia, which ends up from homozygous inheritance of sickle haemoglobin from each parent, is the maximum not unusual place and intense shape of sickle cell sickness. On deoxygenation, sickle haemoglobin undergoes a conformational alternate that promotes intracellular polymerization, which results in distortion of the everyday biconcave erythrocyte disc into the extraordinary and pathological crescent shape (Swem et al., 2018; Obeagu, 2018; Obeagu et al., 2022). The ensuing haemolytic anaemia manifests as recurrent vaso-occlusion and organ harm that collectively motivate good sized morbidity and early mortality (Rees et al., 2010).

Worldwide, sickle haemoglobinopathies cause a good-sized burden of sickness that isn't effectively addressed (Weatherall, 2010; Weatherall, 2011; McGann, 2014).

Accurate facts are lacking, however the international estimate for neonates born with sickle cell sickness every 12 months is 400 000, inclusive of 300 000 with sickle cell anaemia.

The finest burden is visible in sub-Saharan Africa, wherein greater than 75% of all sickle cell sickness occurs, with this share projected to boom through 2050 (Piel et al., 2013).

In Africa, sickle cell sickness contributes extensively to mortality in youngsters more youthful than five years and, therefore, limits development closer to accomplishing UN Sustainable Development Goal 3, Good Health and Well-Being, which incorporates the discount of adolescence mortality (Grosse et al., 2011; Ware, 2013).

Osteomyelitis can happen if a bacterial or fungal infection enters the bone tissue from the bloodstream, due to injury or surgery (Schmitt, 2017). Staphylococcus is the organism responsible for 90% of cases of acute and chronic osteomyelitis (Kalinka et al., 2014). Other organisms include, Haemophilus influenzae and salmonella infection with the latter may occur as a complication of sickle cell anaemia.

Haematogenous osteomyelitis begins with entry of bacteria through a break in the skin or mucosa from otitis, pharyngitis, respiratory tract infections, or urinary tract infections, the physiological status of the host is a determinant factor (Marais et al., 2014). Most often the bacteria are staphylococcus, but in sickle-cell children, both salmonella and staphylococcus are implicated. The bacteria are haematogenously disseminated and deposited in the trabecular bone or marrow, usually in the metaphysis of the proximal tibia or distal femur. Sluggish blood flow in the metaphysis provides an ideal milieu for bacterial replication (Obeagu, 2023).

Materials And Methods

Study area

The study was done in National Orthopaedic Hospital, Enugu, Nigeria. This hospital is located in in Enugu State in Nigeria. The hospital serves many people from all over Nigeria with Orthopaedic cases.

Study Design

The study adopted cross-sectional hospital-based design with purposive sampling technique where sickle cell anaemia patients with osteomyelitis who attended the hospital were selected for the study and the haematological parameters were evaluated with the apparently healthy individuals who attended the hospital on other issues not for disease issues.

Subjects

A total of 100 subjects were selected for the study comprising of 50 subjects of sickle cell anaemia patients with osteomyelitis with mandibular fracture and 50 apparently healthy individuals attended National Orthopaedic Hospital, Enugu, Nigeria.

Ethical issues

Ethical approval was obtained from the institution and informed consent obtained from the subjects. The details of the study were fully explained to the subject before they gave their consent and they willingly participated in the study and confidentiality assured to them.

Blood Collection and Laboratory Investigations

About 3ml of venous blood was collected from antecubital fossa following asceptical techniques into EDTA containers for FBC determinations. The full blood counts of the subjects were determined using MIndray BC-3000 Plus.

Data analysis

The data were analysed using student t-test and present as mean ± standard deviation using SPSS version 20 and level of significance set at $P<0.05$

Results

Parameters	SCA	CONTROL	P-Value
RBC (X 10^{12}/L)	2.43±0.19	4.80±0.43	0.000*
Haemoglobin(g/dl)	7.28±0.57	14.43±1.28	0.000*
PCV (%)	22.00±2.06	43.25±3.86	0.000*
WBC (X 10^{9}/L)	16.00±0.91	4.73±0.22	0.000*
Neutrophil (%)	59.50±2.08	60.00±3.65	0.820
Lymphocytes (%)	33.50±1.73	38.25±3.30	0.044*
Monocytes (%)	7.00±1.63	1.75±0.50	0.005*

Table 1: Haematological Parameters of Sickle Cell Anaemia with Osteomyelitis

Discussion

Sickle cell anaemai is a single point mutation (Obeagu et al., 2015). It brings multi-systemic disturbances and affects even the bone marrow resulting in different changes in the red cell lines and white blood cells (Obeagu, 2018). Sickle cell anaemia affects the bones especially in the patients with osteomyelitis which may suppress hamatopoiesis. The bone marrow architecture and the functionalities of the cells produced will be threatened (Obeagu, 2018). There were reduced levels of haemoglobin, red blood cell, packed cell volume, lymphocytes and increase in white cell count and monocytes in the sickle cell anaemia patients with osteomyelitis. It shows that sickle cell anemia patients with osteomyelitis will be aneamic due to decreased bone marrow activities (Swem et al., 2018). The white blood cells are increased which may induce release of inflammatory cytokines and results to vaso-occlussive crisis (VOC). The diagnosis should be done at early stage of the manifestations of the disease as it may compound the challenges faced by sickle cell anemia patients.

Conclusion

The study revealed decrease in red blood cell lines and increase in white blood cell lines. These changes are significant in the management of sickle cell anaemia patients with osteomyelitis. The patients should be monitored to avert the crisis of anaemia and inflammation.

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