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Evaluation of Haematological Parameters in Blount's Disease in Enugu, Nigeria

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Abstract: Blount's disease known as bow leg affects the tibia bone and leads to retarded growth most times. There is paucity of information on haematological parameters of the patients. The study was done to evaluate the haematological parameters of Blount's disease patients in a tertiary hospital in Enugu, Nigeria. Fifty (50) subjects with mean age of 17.5±2.4 years were recruited for the study, 20 subjects were Blount's disease patients and 30 subjects were apparently healthy persons age matched as the control. A 2ml of venous blood samples were drawn into EDTA anticoagulated containers for full blood count test. The results were presented as mean ± standard deviation. The results were analysed with student t-test and level of significance set at $P<0.05$. The results showed significant decrease ($P<0.05$) in all the parameters and significant decrease ($P<0.05$) in lymphocytes of Blount's disease subjects compared to the control. It shows that the bone deformity affects bone marrow development and leads to depressant effects on the haematological parameters studied. They will be more predisposed to infections because of decreased white cells and anaemia. Mothers and children are advised to eat natural foods containing enough vitamins and minerals for proper bone development and exercise from early stage of their life.

Keywords: Blount's disease; Bone deformity; Haematological parameters; Enugu.

1. Introduction

Blount's disease is a neglected in this part of the world. Blount's disease is a developmental disorder characterized by disordered growth of the medial aspect of the proximal tibial physis resulting in progressive lower limb deformity. The disease usually results in a multiplanar deformity of the limb [1]. The deformity consists of varus, procurvatum, and internal rotation of the tibia. This pattern is a result of the asymmetry of disordered physeal growth most pronounced in the posteriomedial aspect of the proximal tibial physis. Blount disease can also be associated with a limb length discrepancy and, in some patients, deformity of the distal femur as well [2, 3].This deformity could affect bone marrow development that invariably affect the haematological parameters.

Blount disease most likely is caused by a combination of excessive compressive forces on the proximal medial metaphysis of the tibia and altered enchondral bone formation [4].

The combination of mechanical and biologic factors in tibia vara most likely influences the disease to varying extents. The mechanical forces contributing to the disease are the weight of the child, age at walking, and the varus deformity.

Damaged cartilage ossifies in a delayed fashion [5]. As growth is selectively inhibited at the medial side of the knee due to these compressive forces, a resultant varus deformity progresses. The posteriomedial aspect of the physis is most suppressed, contributing to the procurvatum deformity also seen in the disease. However, it is important to note that histologic changes are seen in the entirety of the growth plate, but the medial side is most affected [6].

A dynamic component to the overload also has been described, due to the large thigh girth of these patients. The resultant "fat thigh gait" has been implicated as causing a varus movement on the knee contributing to medial overload [7]. The result is a progressive varus angulation below the knee and an increase in the compressive forces on the physis, which changes the direction of the weight bearing forces on the upper tibial epiphysis from perpendicular to oblique. The obliquity of this force tends to displace the tibial epiphysis laterally. In addition to the

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delayed growth of the physis, pressure on the adjacent epiphysis leads to delayed ossification and intra-articular anomalies.

The epidemiology of Blount disease is not well documented. Large series of patients with Blount disease indicates the estimated prevalence is less than 1% in the United States [8]. In South Africa, it was estimated by Bathfield and Beighton to be 0.03% [9]. There is an increased incidence of disease in the African American population for both early- and late-onset Blount disease [10].

Predisposition for Blount disease has been attributed to race, genetics, age at walking, and obesity. Blount disease has increased prevalence in the overweight African American population and in the Scandinavian population. Increased occurrence has been seen in South Africa [9]. Studies on the haematological parameters of persons with Blount's disease have not been carried out in this part of the world and attention should be drawn to improve the lives of those affected because they are part of the society.

1.1. AIM

To evaluate changes in haematological parameters in Blount's disease patients.

2. Materials and Methods

2.1. Study Area

The study was done in National Orthopaedic Hospital, Enugu, Nigeria.

2.2. Subjects

The Blount disease patients were recruited from the National Orthopaedic Hospital Enugu, Nigeria and apparently age matched individuals also recruited from those that visited the hospital. Before the study the procedure were explained to the participant and their consents obtained before carrying out the study.

2.3. Ethical Consideration

Informed consents were obtained from the subjects before the samples were collected.

2.4. Statistical Analysis

The data were presented as mean ± standard deviation and results analysed with student t-test and level of significance set at $P<0.05$.

3. Result

Table-1. Showing comparism of haematological parameters Blount's disease patients and control

Parameters	BDP (20)	Control (30)	Level of significance
PCV (%)	41.0±3.2	47.2±4.1	P<0.05
Haemoglobin (g/dl)	13.7±0.8	15.7±0.5	P<0.05
RBC ($X10^{12}$/L)	4.6±0.1	5.2±0.2	P<0.05
WBC ($X10^{9}$/L)	3.7±0.2	5.6±0.3	P<0.05
Neutrophil ($X10^{9}$/L)	48.0±12.1	62.5±10.5	P<0.05
Lymphocyte($X10^{9}$/L)	52.0±8.3	34.5±5.2	P<0.05

BDP= Blount's disease patients
PCV= Packed Cell Volume
RBC= Red Blood Cell
WBC= Total White Blood Cell

The results showed significant decrease ($P<0.05$) in PCV haemoglobin, RBC, WBC, Neutrophil (41.0±3.2%, 13.7±0.8g/dl,4.6±0.1 $X10^{12}$/L,3.7±0.2 $X10^{9}$/L,48.0±12.1%) of the Blount's disease patients compared to the control (47.2±4.1%, 15.7±0.5g/dl, 5.2±0.2 $X10^{12}$/L, 5.6±0.3 $X10^{9}$/L, 62.5±10.5%) and significant increase ($P<0.05$) in lymphocytes of the Blount's disease patients (52.0±8.3%) compared to the control (37.5±5.2%).

4. Discussion

This deformity could affect bone marrow development that invariably affect the haematological parameters. Blount disease most likely is caused by a combination of excessive compressive forces on the proximal medial metaphysis of the tibia and altered enchondral bone formation [4]. Damaged cartilage ossifies in a delayed fashion [5]. The resultant "fat thigh gait" has been implicated as causing a varus movement on the knee contributing to medial overload [7]. The result is a progressive varus angulation below the knee and an increase in the compressive forces on the physis, which changes the direction of the weight bearing forces on the upper tibial epiphysis from perpendicular to oblique. The obliquity of this force tends to displace the tibial epiphysis laterally. In addition to the delayed growth of the physis, pressure on the adjacent epiphysis leads to delayed ossification and intra-articular anomalies.

The results showed significant decrease ($P<0.05$) in all the haematological parameters studied except lymphocytes that showed significant increase ($P<0.05$) in Blount's disease. It is important to carry out this study to find out the effect of the deformity on the haematological parameters of the subjects. This could affect the bone marrow development and function and the general well being of the subjects as seen among the patients' haematological parameters. This condition brings discomfort to the subjects. More attention should be given to pregnant women in achieving improved diets during pregnancy and the children as well as the entire society. The people are encouraged to take more natural foods and taking enough water. Natural foods that contain vitamins and minerals should be encouraged. This condition is more in women and in children. Adequate proper exercise should be encouraged for both mothers and their children. Corrective exercise should start at the early stage of life to correct the deformity.

5. Conclusion

Blount's disease known as bow leg is a neglected bone deformity that occurs more in children and in women. There is paucity of information on the haematological parameters of the patients that suppose to guide the orthopaedic doctors and physicians in their treatment. The bone deformity affects bone marrow development because of the compression force and leads to depressed haematological parameters. Adequate balanced diets with more attention on vitamins and minerals and proper adequate exercise could help to reduce the impact and prevalence of this disease especially in this part of the world.

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