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Full Length Research Paper

Haematological profile of sickle cell anaemia in children with human parvovirus B19 infection in Jos, North Central Nigeria

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The recognition and characterization of haematological alterations accompanying viral infections could serve as tools for diagnosis, assist in disease prognosis and improve patient management. This paper aims to evaluate the haematological profile of parvovirus B19 antibody positive sickle cell patients, who are inherently prone to morbidity and mortality from parvovirus infection. A total of 200 sickle cell patients aged 1 to 18 years were recruited into the study. Screening for IgG and IgM parvovirus B19 antibodies were done using Elisa Kit (Institut Viron/ serion GMbH Wurzbury, Germany). Complete blood count (PCV: Packed cell volume, WBC: White cell count, Platelet count) and reticulocyte count were carried out on all subjects using automated coulter machine. The mean Platelet count was significantly lower among IgM antibody seropositive children compared to those who are seronegative ($p < 0.05$). Children who were IgM antibody seropositive had a significantly higher mean reticulocyte count and index ($P < 0.05$). IgG seropositivity was not associated with any significant alteration in these haematological parameters. Haematological alterations could occur in sickle cell anaemia children during acute infection with the human parvovirus B19. It is recommended that clinicians caring for these patients be made more aware of the existence of this virus as well as the possible haematological alterations that could accompany it in our environment. Hospital laboratories should be encouraged to introduce diagnostic tests for parvovirus B19 infection.

Key words: Haematological profile, sickle cell anaemia, parvovirusB19, antibody status.

INTRODUCTION

The laboratory, and especially haematological manifestations and alterations resulting from viral infections have been described in many studies (Maiga et al., 1997; Rice and Resar, 1998; Patton, 1999; Coyle, 1997; Giller and Groce, 1989; Sloand, 2005; Alao et al., 2010). Although infection with parvovirus B19 can occur in any patient, sufferers of sickle cell anaemia, a condition characterized by chronic haemolysis, are known to be at increased risk of severe morbidity and mortality attributable to the various haematological and other systemic complications of parvovirus B19 (Brown, 2000).

Perhaps the commonest among the known haematological complications of parvovirus B19 in sickle cell anaemia patients is a transient cessation of erythropoeisis, characterized by anaemia and reticulocytopaenia, a phenomenon described as aplastic crisis (Goldstein and Anderson, 1987).

Aplastic crisis affects mainly the paediatric age group with the median age of onset of 8 years in a particular study (Serjeant et al., 1993). It is very rare after the age of 15 years. The mechanism by which parvovirus B19

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Table 1. Age and sex distribution of subjects.

Characteristic	Frequency (%) n = 200
Sex	
Male	108(54.0)
Female	92(46.0)
Total	200(100)
Age group (in years)	
1 - 5	92(46.0)
6 - 10	76(38.0)
11 - 15	18(9.0)
Above 15	14(7.0)
Total	200(100)

[A] Actual numbers are given in brackets.

causes aplastic crisis is believed to be due to its selective tropism for erythroid precursors which it infects and destroys (Serjeant, 1992). Although it is mainly the erythroid precursors that are affected, often presenting as pure red cell aplasia, concurrent thrombocytopaenia, neutropaenia or pancytopaenia is found infrequently, suggesting that other precursors might also be affected (Rao and Miller, 1992).

Characteristically following an episode of aplastic crisis, reticulocyte counts begin to fall from about 5 days after exposure and continue to fall for about 7 - 10 days (Serjeant et al., 2001). The presence of significant number of nucleated red blood cells in a peripheral blood film heralds marrow recovery. Other documented laboratory findings of parvovirus B19 infection are non specific and include increased foetal haemoglobin and serum iron. However, the mean cell volume remains unaltered (Serjeant et al., 1981).

The authors are not aware of any study on the haematological profile of sickle cell patients who are seropositive for human parvovirus B19 antibodies in North Central Nigeria. The objective of this study is to evaluate the haematological profile of parvovirus B19 antibody positive sickle cell patients, who are inherently prone to morbidity and mortality from parvovirus infection.

MATERIALS AND METHODS

The study was conducted at the Jos University Teaching Hospital (JUTH), Jos from January to November 2009. Two hundred children with sickle cell anaemia attending the paediatric clinic of JUTH were recruited consecutively into the study. Their samples were taken and analyzed for the presence of anti parvovirus B19 IgG and IgM antibodies. All tests were done using kits manufactured by Institut Virion Germany (Institute Virion Serion, 2009). The kit is based on ELISA methodology. The manufacturer's procedures were strictly followed. Full blood counts were done using automated coulter machine. With the aid of a questionnaire, relevant personal, social and demographic information were obtained from subjects. Ethical approval was obtained from the research and ethical committee of JUTH, Jos. Informed consent was obtained from all the participants. The data were analyzed using Epi info computer software version 3.3.2. Means of haematological parameters were cross tabulated against IgG/IgM serological status to determine if there was any relationship. Probability (p) values of < 0.05 was taken as significant.

RESULTS

A total of 200 children aged 1 to 18 years with a diagnosis of sickle cell anaemia presented to the sickle cell clinic in the period were screened. The age and sex distribution of subjects is shown in Table 1. The group comprised 54% males and 46% females, giving a male: female ratio of 1.17:1. Most of the children, 93%, were under 15 years. The mean age of the study population was 6.8 (± 4.6) years. Table 2 shows the mean haematological values of IgG seropositive and IgG-seronegative subjects. There are no significant statistical differences between the two groups ($p > 0.05$). Table 3 shows the mean haematological parameters in children who were seropositive for parvovirus B19 Ig M compared to those who were negative. Children who were seropositive had lower haemoglobin and haematocrit values, although this is not statistically significant ($p > 0.05$). The mean platelet count was significantly lower in children who were positive compared to those who were negative ($p < 0.05$). Also, children who were seropositive had significantly higher mean reticulocyte count index ($p < 0.05$).

DISCUSSION

Sickle cell anaemia patients are known to be at great risk of morbidity and mortality from parvovirus B19 infection because of the various complications that this virus produces in patients with chronic haemolytic conditions. Although infection with parvovirus B19 has been linked to many clinical outcomes in patients with sickle cell anaemia, the most well known is transient aplastic crisis

Table 2. Comparison of mean haematological values between I gG seropositive and I gG-seronegative subjects.

Variable	Seropositive (n = 79) mean (S.D)	Seronegative (n = 121) mean (S.D)	P value
Haemoglobin (g/dl)	8.1 (0.8)	8.1 (0.7)	> 0.05
Haematocrit (%)	25.8 (2.5)	25.0 (2.1)	> 0.05
Total WBC count (×10^9/L)	6.3 (2.5)	6.5 (2.8)	> 0.05
Platelet count (× 10^9/L)	365.6 (94.6)	346.8 (121.3)	> 0.05
Neutrophils (%)	57 (9.0)	59.4 (9.9)	> 0.05
Eosinophils(%)	0.6 (1.1)	0.6 (1.1)	> 0.05
Basophils (%)	0.0 (0.0)	0.0 (0.0)	> 0.05
Lymphocytes (%)	41.9 (8.9)	39.8 (9.6)	> 0.05
Monocytes(%)	0.5 (1.0)	0.4 (0.6)	> 0.05
Reticulocyte Index	1.6 (0.6)	1.7 (0.3)	> 0.05

S.D: Standard Deviation. WBC: White Blood cell.

Table 3. Comparison of mean haematological values between I gM seropositive and I gM seronegative subjects.

Variable	Seropositive (n = 7) mean (S.D)	Seronegative (n = 121) Mean (S.D)	P value
Haemoglobin (g/dl)	7.8(0.6)	8.4(0.60)	> 0.05
Haematocrit (%)	20.3(2.4)	23.0(2.7)	> 0.05
Total WBC count (× 10^9/L)	8.3 (2.5)	8.5(2.8)	> 0.05
Platelet count (× 10^9/L)	201.6 (94.6)	306.8(121.3)	< 0.05
Neutrophils (%)	51(9.7)	57.3(6.5)	> 0.05
Eosinophils(%)	0.8(1.4)	0.7(1.8)	> 0.05
Basophils (%)	0.0(0.0)	0.0(0.0)	> 0.05
Lymphocytes (%)	45.9(6.3)	43(7.9)	> 0.05
Monocytes(%)	0.8(0.1)	0.7(0.1)	> 0.05
Reticulocyte Index	2.4 (0.5)	1.8 (0.5)	< 0.05

WBC- White Blood cell.

which is self limiting (Goldstein and Anderson, 1987). The finding in this study was that no significant association existed between haematological parameters and IgG seropositivity. The presence of this class of antibody is generally indicative of either the later stages of a current infection, or of a past infection. Thus the findings are in keeping with the well documented observation that if a patient survives the transient marrow aplasia, recovery is usually complete and no clinical or haematological traces of previous infection are found (Army, 2000; Haegaard and Brown, 2002; Young and Brown, 2004.)

The haemoglobin and haematocrit values found in children who were IgM seropositive, indicative of a current B19 infection, though not statistically significant may be suggestive of marrow suppression which occurs with acute parvovirus infection. However, the fact that the platelet count was statistically significantly lower in these children also supports this argument. The higher mean reticulocyte index in the seropositive subjects may also suggest the recovery phase of recent transient marrow suppression (Serjeant et al., 1993). However, the low number of children found to be acutely infected (IgM seropositive) in this study may limit the significance of such inferences from these findings. A prospective cohort study, with a larger number of people, is required to fully elucidate the clinical consequences of acute infection with parvovirus B19 in children with sickle cell anaemia.

In conclusion, this study has shown that haematological alterations could occur in children with sickle cell anaemia during acute infection with the human parvo-virus B19. It is recommended that clinicians caring for these patients be made more aware of the existence of this virus as well as the possible haematological alterations that could accompany it in North Central Nigeria. Our hospital laboratories should be encouraged to introduce diagnostic tests for parvovirus B19 infection.

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