



Acute Haematogenous Osteomyelitis in Childhood

G TINDIMWEBWA,* AA ADEYOKUNNU† AND CE EFFIONG**

Summary

Tindimwebwa G, Adeyokunnu AA and Effiong CE. Acute Haematogenous Osteomyelitis in Childhood. *Nigerian Journal of Paediatrics* 1983; 10: 93. Twenty-eight children (21 males, 7 females), aged between 15 days and 11 years with acute haematogenous osteomyelitis, were studied, over a period of three years. Twenty-two (75%) of the cases were under 3 years of age. Haemoglobin genotype was recorded in 21 cases. Fifteen of these cases (71.5%) had Hb SS; 3 (14.2%) had Hb AA; 2 (9.5%) had Hb AS and in the remaining one case (4.8%), the haemoglobin genotype was AC. There were 34 bacterial isolates either from blood and/or pus. Ten were due to *Staphylococcus*, 5 to *Proteus*, 3 to *Klebsiella*, 2 to *E. Coli* while the 14 isolates due to *Salmonella* species were obtained from patients with Hb SS disease. The results have shown that acute haematogenous osteomyelitis was mainly an early childhood disease and that children with abnormal haemoglobin were more prone than their counterparts with normal haemoglobin, with *Salmonella* being the predominant causative agent in this group.

Introduction

ACUTE haematogenous osteomyelitis (AHO) has been shown to be a predominantly childhood disorder in Nigeria,^{1,2} but in contrast to reports from

North America,³ patients with sickle cell anaemia seem to be particularly more susceptible. Controversy however, surrounds the commonest causative organisms when individuals with abnormal haemoglobin genotypes are compared with those with normal genotype. The present prospective study documents the causative organisms in acute haematogenous osteomyelitis among children admitted to the paediatric wards, University College Hospital (UCH), Ibadan, within a period of three years.

Ahmadu Bello University, Zaria
Department of Paediatrics
* Lecturer

University College Hospital, Ibadan
Department of Paediatrics
† Reader

University of Calabar Teaching Hospital, Calabar
Department of Paediatrics
** Professor

* Formerly, Senior Registrar, Department of Paediatrics University College Hospital, Ibadan

** Formerly, Professor, Department of Paediatrics, University College Hospital, Ibadan

Correspondence to Dr AA Adeyokunnu, Department of Paediatrics, College of Medicine, University College Hospital, Ibadan

Materials and Methods

The study population consisted of patients admitted to the paediatric wards, University College Hospital (UCH), Ibadan, between August 1977 and August 1980 and in whom

acute osteomyelitis had been suspected. Provisional diagnosis, based on a history of fever, pain in the affected limb, tenderness and loss of function was made in each case and this was followed by radiological confirmation. Apart from physical examination, laboratory investigations carried out included a full blood count, haemoglobin electrophoresis, Widal agglutination tests, culture of blood and any specimen of pus. Patients with positive culture from blood and/or pus and radiological evidence of osteomyelitis in the course of management were admitted into the study.

Results

A total of 28 patients, consisting of 21 males and 7 females (male to female ratio 3:1) fulfilled the above criteria.

Age distribution and haemoglobin genotype

The ages ranged between 15 days and 11 years (Fig.) Twenty one (75%) of the 28 cases were less than three years of age; four were aged

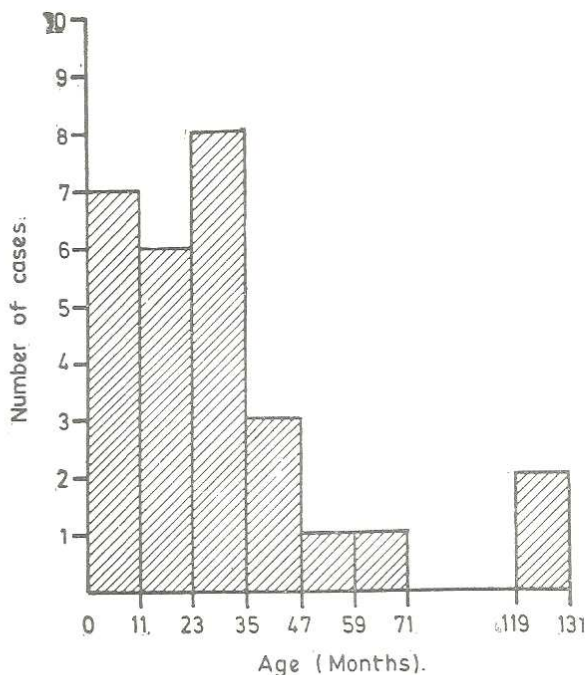


Fig. Age Distribution in 28 cases of Acute Haematogenous Osteomyelitis

between three and six years and three were between 10 and 11 years. The youngest patient was 15 days old. The haemoglobin genotype was available in 21 cases and of these, 15 (71.4%) had Hb SS, while the genotypes of the remaining six patients were AA (3), AS (2) and AC (1).

Causative Organisms

There were 34 isolates, 24 from pus and 10 from blood. *Salmonella* organisms accounted for 14 of these and *Staph aureus* for 10, while *Proteus*, *Klebsiella* and *Escherichia Coli* (*E. Coli*) were the isolates in five, three and two instances, respectively.

Organisms, haemoglobin genotypes and sensitivity

Salmonella organisms were the initial organisms recovered from blood and/or pus in 12 (80%) of the 15 patients with Hb SS disease. In the remaining three cases, *Staph aureus*, *E. Coli* and *Klebsiella* were isolated (Table 1). Subsequent culture for pathogens from blood or pus yielded mixed organisms. The *Salmonella* species were all sensitive to chloramphenicol *in vitro*. *Staph aureus* was sensitive to chloramphenicol, erythromycin and cloxacillin, while *Proteus* and *E. Coli* were sensitive to ampicillin and the *Klebsiella species* to cotrimoxazole, ampicillin and gentamycin.

Course

Multiple bone involvement was the rule among patients with Hb SS genotype. The long bones of the lower extremities and the small bones of the upper limbs were mostly involved especially in patients aged between 24 and 35 months (Table II). The sternum and iliac bones were each involved in two older patients with sickle cell anaemia, aged 10½ and 11 years, respectively. In two cases (Hb SS) and in one other case with unknown genotype, there was pyogenic arthritis of the joint adjoining the affected bone. Sixteen (57%) of the 28 patients who were managed conservatively with bed rest, splinting of affected parts and drugs, recovered fully within three to eight weeks. Ten (62.5%) of these patients had Hb SS

TABLE I
Causative Organisms in 28 Patients with AHO and their Relationship with Haemoglobin Genotype

	Haemoglobin genotype					Source of culture	
	SS	AC	AS	AA	UG*	Blood	Pus
<i>Salmonella species</i>	12	-	-	-	2	4	10
<i>Staph aureus</i>	3	-	2	2	3	3	7
<i>Proteus mirabilis</i>	2	1	-	1	1	2	3
<i>Klebsiella</i>	2	-	-	1	-	1	2
<i>E. Coli</i>	1	-	1	-	-	-	2
Total	20	1	3	4	6	10	24

* UG = Unknown genotype

TABLE II
Hb Genotype and Multiple Bone Involvement in AHO

Genotype	Number of Bones involved*						** ALLB
	1	2	3	4	5	6	
SS	-	1	5	1	1	2	1
AS	2	-	-	-	-	-	-
AC	1	-	-	-	-	-	-
AA	3	-	-	-	-	-	-
Unknown	5	-	1	-	-	-	-

** ALLB = All long bones. *Anatomical sites not stated here

genotype. Twelve (43%) cases required additional management consisting of needle aspirations or open drainage of the pus. Four patients, including two with haemoglobin SS disease, who required needle aspiration of the pus alone, recovered completely within six to ten weeks, while three cases, all with sickle-cell anaemia, out of the eight with open drainage, developed chronic

osteomyelitis with only one recovering completely after 12 weeks of treatment. Twenty-one patients kept follow-up appointments, while seven were lost to follow-up and were presumed to be well. Apart from three cases with residual deformities, mainly of cosmetic nature, recovery was complete in the others.

Discussion

The present study has confirmed previous reports^{1,2} that, in Ibadan, acute haematogenous osteomyelitis (AHO) occurs commonly in early childhood and that patients with sickle cell disease were particularly more susceptible than children with normal haemoglobin genotype.³ The study has also demonstrated that the *Salmonella* organisms are the commonest causative organisms in the sickle cell anemia patients. The peculiar predisposition of sickle cell patients with AHO to multiple bone involvement reported by Hook *et al.*,⁴ Hughes and Carrol,⁵ Hendrickse and Collard,⁶ and Barret-Connor,³ has been confirmed in the present study. The sequence of events leading to multiple bone involvement is difficult to explain either on the basis of the peculiarity of the sickle cell disease itself or the characteristics of the infecting salmonella organisms. For instance, one of the cases in the present series, a 3-year old girl with sickle cell anaemia had *Staph aureus* cultured from multiple sites—the humerus, tibia and fibula while in the series reported by Adeyokunnu and Hendrickse,² salmonella was recovered from multiple sites in a patient with normal haemoglobin genotype. Both observations seem to suggest that multifocal osteomyelitis can be caused by various infective organisms irrespective of the haemoglobin genotype in childhood. The incidence of such multifocal lesions is however, higher in those with Hb SS.

In spite of the fact that 15 out of the 21 children with known haemoglobin genotype had Hb SS and only 3 had Hb AA, a valid deduction cannot be made from the present study on the relative susceptibility of children with the various haemoglobin genotypes, to osteomyelitis. We believe the problem has arisen because only very few children, usually the very ill ones and mostly

those with Hb SS and osteomyelitis ever get admitted into the UCH.

Satisfactory response of AHO in patients with sickle cell disease to conservative management has been reported by previous workers.^{1,2,7} In the present series, 62.5% of the patients recovered fully on conservative management. Thus, aggressive surgical intervention would appear to be unnecessary in a majority of patients with AHO and sickle cell disease.

There is some controversy among workers in Nigeria as to whether *Salmonella* or *Staph aureus* is the commonest causative organism in sicklers with AHO. In the present study, *Salmonella* was the causative organism in 80%, while *Staph aureus* caused AHO in 20% of the patients with sickle cell disease. Similar findings have been reported previously from the same institution.^{2,6} It may thus be concluded that, at least in Ibadan, *Salmonella* is the commonest causative organism in sicklers with AHO. By contrast, the preponderance of staphylococcal AHO among non-sicklers has been reported by others.^{1,8} Prospective study of causative organisms among sicklers with AHO in many centres in Nigeria will identify the commonest organisms in the different geographical zones. Such a study will be to the benefit of the sickle cell patient who will then receive prompt and appropriate antibiotic treatment. In the present series, both *Salmonella* and *Staph aureus* were sensitive to chloramphenicol; therefore, it is reasonable to suggest that sicklers with AHO should be treated initially with this drug until the sensitivity results in individual patients dictate otherwise.

Acknowledgements

We acknowledge the contributions of the resident doctors in the Department of Paediatrics and colleagues in the Orthopaedic Unit, University College Hospital, Ibadan.

References

1. Ebong WW and Oyemade GAA. Acute haematogenous osteomyelitis in Nigeria. *Trop Geogr Med* 1978; **30**: 451-61.
2. Adeyokunnu AA and Hendrickse RG. Salmonella osteomyelitis in childhood. A report of 63 cases seen in Nigerian children of whom 57 had sickle cell disease. *Arch Dis Childh* 1980; **55**: 175-84.
3. Barret-Conor E. Bacterial infections and sickle cell anaemia. An analysis of 250 infections in 166 patients and review of literature. *Medicine* 1971; **36**: 428-60.
4. Hook EW, Campbell CG, Weens HS and Cooper RG. Salmonella osteitis in patients with sickle cell anaemia. *New Eng J Med* 1957; **257**: 403-7.
5. Hughes JG and Carrol DS. Salmonella osteomyelitis complicating sickle cell disease. *Pediatrics* 1957; **19**: 181-91.
6. Hendrickse RG and Collard P. Salmonella osteitis in Nigerian children. *Lancet* 1960; **1**: 801-2.
7. Huckstep RL. The management of osteomyelitis in East Africa. *East Afr Med J* 1968; **45**: 429-61.
8. Anderson JR. Acute haematogenous osteitis. *Arch Dis Childh* 1980; **55**: 953-7.

Accepted 21 July 1983

