

## *Klebsiella* Septicaemia with associated Osteomyelitis and Arthritis in Neonates

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### Summary

Akindele JA. *Klebsiella* Septicaemia with associated Osteomyelitis and Arthritis in Neonates. *Nigerian Journal of Paediatrics* 1986; 13:59. A study of *Klebsiella* septicaemia with osteomyelitis/arthritis in 10 neonates (two preterm and eight full-term) seen over a three-month period at the Neonatal Unit, University College Hospital, Ibadan, is reported. The incidence of neonatal osteomyelitis during this period was 83.3 per 1,000 admissions. Seventy per cent of the patients had multiple bone involvement while 60% had associated arthritis. All the neonates recovered without any residual damage. The probable nosocomial acquisition of the infecting organism is highlighted.

### Introduction

NEONATAL osteomyelitis is a relatively uncommon infection and has been the subject of many reviews.<sup>1-7</sup> Most cases have reportedly been due to *Staphylococcus aureus* and *Streptococcus pyogenes*. However, osteomyelitis due to *Klebsiella* species appear to be extremely rare. Prior to 1969, only 11 of such cases had been reported in the literature and all of them occurred in adults.<sup>3</sup> Furthermore, outbreaks of *Klebsiella* osteomyelitis or arthritis appear not to have been reported previously, while septic arthritis is uncommon in the newborn.<sup>4,5</sup>

The present report was prompted by the occurrence of a relatively large number of cases of neonatal osteomyelitis and arthritis seen at

the Special Care Baby Unit (SCBU), University College Hospital (UCH), Ibadan, over a short period. The report highlights the important clinical and radiological features of the disease, as well as its management and outcome.

### Materials and Methods

The patients were among the sick newborn infants born in UCH and admitted to the SCBU between June and August 1984, a period of 3 months. All the neonates studied had septicaemia and developed osteomyelitis; in addition, some had arthritis. The diagnosis of osteomyelitis or arthritis was based on characteristic physical findings and radiological changes. None of the patients had femoral taps done prior to the development of the lesions. Subsequent follow-up radiographs were performed as and when indicated.

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### Results

During the 3-month period, 10 neonates (5 males and 5 females) developed *Klebsiella* septicaemia associated with osteomyelitis/arthritis. There were 120 admissions in the three-month period; the incidence of osteomyelitis/arthritis was thus 83.3 per 1000 admissions during the period. The mean age at onset of infection was 17.1 days (range 6–28 days). The means and ranges of birth weights and gestational ages were 3.36kg (1.75–4kg) and 38.6 weeks (35–41 weeks) respectively.

#### *Clinical features and Laboratory data*

The clinical features and laboratory data are summarised in Tables I and II. Nine (90%) of the 10 patients had pyrexia and the temperature was swinging in all of them. Seven patients (70%) failed to thrive. All the patients had pallor and jaundice as well as tenderness of the affected limb and limitation of limb movement. Six patients (60%) had features of associated arthritis; these features

**TABLE I**  
*Clinical Features in 10 Neonates with Klebsiella Septicaemia and Osteomyelitis/Arthritis*

Clinical Features	No of Patients		
	Preterm	Term	Total
Pallor	2	8	10
Jaundice	2	8	10
Tenderness	2	8	10
Limitation of limb movement	2	8	10
Fever (> 37.5°C)	1	8	9
Irregular temperature pattern	1	8	9
Failure to thrive	2	5	7
Joint swelling	2	4	6

consisted of inflamed, tender and swollen joints with limitation of movement at the affected joints.

All the patients had anaemia (PCV <35%), thrombocytopenia (platelet count of < 150,000/

**TABLE II**

*Laboratory Data in 10 Neonates with Klebsiella Septicaemia and Osteomyelitis/Arthritis*

Laboratory Data	No of Patients		
	Preterm	Term	Total
<i>Haematology</i>			
Thrombocytopenia	2	8	10
Increase in ESR	2	8	10
Anaemia	2	3	5
Leucocytosis	0	5	5
Leucopenia	1	1	2
<i>Bacteriology</i>			
Klebsiella isolated from the blood	2	8	10
Klebsiella isolated from the site (knee joint/bony exudates)	0	3	3

mm<sup>3</sup> and <100,000/mm<sup>3</sup> in term and preterm infants respectively) and raised erythrocyte sedimentation rates, as determined by the Westergreen method (Table II). Five of the patients had leucocytosis and two had leucopenia. *Klebsiella species* was isolated from the blood of all the patients and from the bone or joint lesions in three patients in whom the affected bones or joints were aspirated. However, the phage-typing of the organism could not be done. All the isolates were sensitive to cefoxitin and colobomycin (*colistin*); this sensitivity pattern was similar to that being reported for *Klebsiella species* in the hospital during the period.

*Radiological features*

The radiological features consisted of soft tissue swellings, periosteal reaction and bone destruction in all the cases. Six patients had widened joint spaces. None of the patients had subluxation, dislocation or pathological fractures. The radiograph of the shoulders in one of the patients (Fig 1) showed soft tissue swelling,

periosteal reaction and bone destruction of both humeri. A radiograph of the upper arm in another patient (Fig 2), showed periosteal reaction and rarefaction.

*Sites of involvement*

Table III summarizes the number of bones or joints involved. The humerus and femur were the commonest long bones while the shoulder was the commonest joint involved. Multiple sites were involved in 7 of the 10 patients, with the largest number of sites involved per patient being 3. In the latter case, the involved joints were the shoulder, elbow and knee.

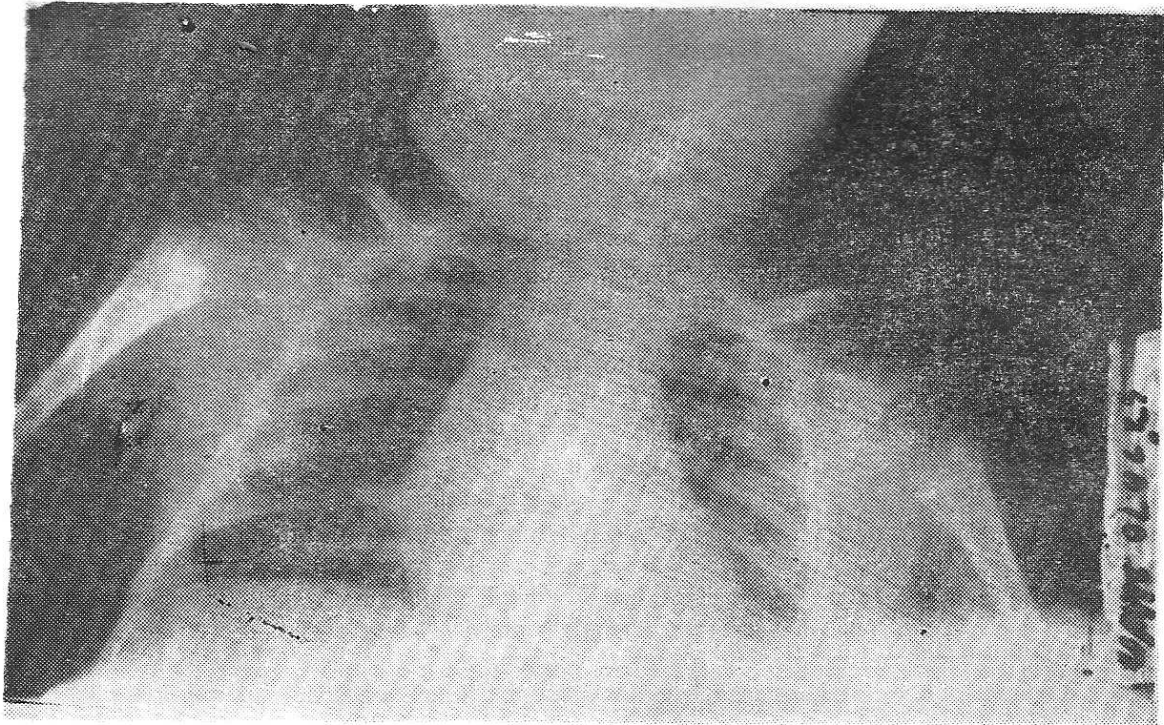
*Management*

Initial antibiotic therapy on suspicion of the diagnosis of septicaemia consisted of intravenous cloxacillin (100 mg/kg/day) and intramuscular gentamicin (7.5mg/kg/day). However, as a result of poor clinical response to therapy in most cases and based on sensitivity reports, cloxacillin was changed to cefoxitin (*mefoxin*) and was given in

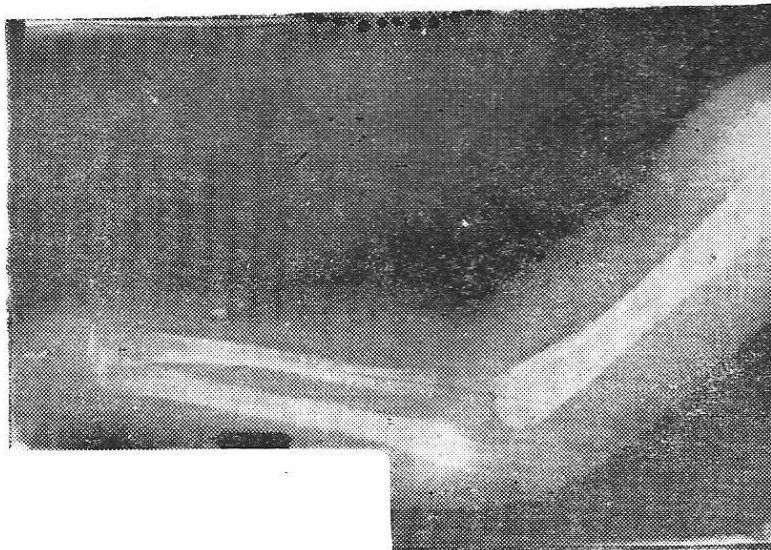
TABLE III  
*Sites of Involvement in 10 Neonates with Klebsiella Osteomyelitis/ Arthritis*

Site of Involvement *	No of Patients		
	Preterm	Term	Total
<i>Bones</i>			
Humerus	0	7	7
Femur	0	5	5
Tibia	1	1	2
<i>Joints</i>			
Shoulder	0	6	6
Hip	0	5	5
Elbow	1	0	1
Knee	0	1	1

\* 7 term babies had multiple sites of involvement



*Fig 1. Radiograph of the shoulders showing soft tissue swelling, widening of joint spaces, periosteal reaction and bone destruction of both humeri.*



*Fig 2. Radiograph of the left humerus showing periosteal reaction and rarefaction.*

combination with gentamicin for 3–4 weeks. This was followed by oral cephalixin (*ceporex*) or flucloxacillin and amoxicil (*suprapen*) when the former was not available, for a further period of four weeks. Supportive therapy included management in a thermoneutral environment, adequate caloric intake and blood and platelet transfusions when indicated. Physiotherapy in the form of passive exercises, was provided after the acute stage of infection.

#### Outcome and Preventive measures

The average duration of stay in the hospital was 4.2 weeks, (range 4–6 weeks); there were no deaths. No resultant structural deformity was encountered during the outpatient follow-up which was for a period of 6–8 months in most cases.

A bacteriological survey during the outbreak of infection revealed that the humidifying equipment, the incubators and improper hand-washing were the sources of infection. Following this observation, appropriate steps were taken to reduce the prevalence of infection: these included the cessation of the use of extra humidification in the incubator as the atmospheric humidity was already high, improved handwashing techniques and performance of regular bacteriological surveillance. With these measures, there was reduced prevalence of neonatal septicaemia and no new case of *Klebsiella* osteomyelitis was seen in the nursery for the rest of that year.

#### Discussion

The incidence of 83.3 per 1000 admissions of osteomyelitis/arthritis during the 3-month period, compared with 3.5 per 1000 in the preceding 3 years (unpublished data), suggests that this infection was probably an outbreak. Reported incidences of osteomyelitis and arthritis from another part of Nigeria were 4.6 per 1,000 admissions<sup>1</sup> and 6.1 per 1000 admissions<sup>4</sup> respectively.

The significant predisposing factors of osteomyelitis and arthritis in the first few weeks of life include the changing pattern of immune status and response, the highly vascular and actively remodelling chondro-osseous skeleton, the increasing exposure to bacteria, invasive procedures and techniques of care during the perinatal period.<sup>8</sup> Thus, foetal monitoring, heel puncture, umbilical vessel catheterization and femoral venous or arterial punctures may cause chondro-osseous infection either by direct inoculation or haematogenous spread.<sup>9 10</sup> All the cases in the present series were ill babies who required frequent blood samplings, intravenous fluid therapy and frequent examinations. None of the babies however, had umbilical venous or arterial catheters and femoral puncture was not performed on any of them.

The clinical features of osteomyelitis as exemplified by our cases are the non-specific features of septicaemia in addition to the local features in the affected bones. There was no sex difference in the prevalence of the disease as opposed to the male preponderance reported in some series.<sup>1</sup> Peculiar to neonatal osteomyelitis are the multiple bone or joint involvement and subsequent skeletal deformity.<sup>8</sup> Seventy per cent of our cases had multiple bone involvement whilst 60% had associated arthritis. However, none of them has so far, developed skeletal deformity.

The *Klebsiella* infection in the present series, was probably hospital-acquired as borne out by the fact that the babies were admitted on the first day of life. Furthermore, the babies were ill and required intensive care which necessitated repeated venepunctures, incubator care and humidified oxygen. The fact that the *Klebsiella* species isolated from the blood had the same sensitivity pattern as those in hospital acquired infections also supports the hospital environment as the source of infection. Unfortunately, the *Klebsiella* could not be phage-typed and it could only be suspected to be a particular phage-type with predilection for the bone and the joint.

Following the bacteriological survey and the consequent infection control measures taken, the

number of cases of *Klebsiella* septicaemia in the Unit was reduced and no new case of *Klebsiella* osteomyelitis or arthritis was seen during the period of surveillance. The present study thus emphasizes the value of strict observance of aseptic procedures particularly in a neonatal unit, where the babies are particularly vulnerable to infection.

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