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Paediatric chronic osteomyelitis at a government referral hospital in the Gambia

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Summary

Data on the epidemiology of paediatric osteomyelitis in sub-Saharan Africa is scarce. Children with chronic osteomyelitis (CO) were identified from a prospective paediatric surgery database at the main government referral hospital in Banjul, The Gambia. Hospital reported incidence of childhood osteomyelitis for Banjul and the Kanifing Municipal Area (two urban areas close to the hospital) was estimated from hospital records. From January 1996 - May 1998, 315 children aged 0 – 14 yrs were treated for CO accounting for 5.7% of paediatric surgical admissions and 15.4% of total paediatric surgical inpatient days. Eighty-five percent underwent sequestrectomy. The tibia (43%), femur (20%), and humerus (12%) were the commonest sites. Hospital reported incidence of paediatric chronic osteomyelitis in Banjul and the Kanifing Municipal Area (KMA) was 100 and 52 per 100,000 children, respectively. The incidence in Banjul is five times that reported for industrialized nations. CO is common in The Gambia and places a significant burden on the limited resources. Patients typically require sequestrectomy or debridement. While efforts at disease prevention include improving the general health of children in the region, early diagnosis and treatment is essential to reducing the burden of disease, the public and health professionals within each community need to be aware of the importance of early diagnosis and treatment of acute osteomyelitis which commonly preceeds the development of chronic osteomyelitis.

Keywords: *Burden of disease, children, developing countries, incidence, chronic osteomyelitis, The Gambia*

Résumé

Les données épidémiologiques de l'ostéomyélite pédiatrique au sub-sahara Africain est rare. Les enfants ayant l'ostéomyélite chronique (OC) étaient identifiés dans une banque de données prospectives à l'hopital general de Banjul, en Gambie. L'hopital reportait l'incidence de l'ostéomyélite infantile à Banjul et dans la municipalité de Kanifing (deux zones urbaines proche de l'hôpital. Entre janvier 1996 – Mai 1998, 315 enfants âgés de 0-14 ans étaient traités pour l'ostéomyélite chronique s'estimant pour 5.7% des admissions en pédiatrie chirurgicale et 15.5% des chirurgies totales en pédiatrie. 85% ont eu de sequestrectomie. Le tibia (43%), fémur (20%), et humérus (12%) étaient les sites communs. Cette hôpital enregistrait une incidence d'ostéomyélite chronique a Banjul et la municipale de Kanifing de 100 et 52 pour 100,000 enfants, respectivement L'incidence a Banjul était cinq fois plus élevé que dans les nations industrialisées. L'ostéomyélite chronique est commune en Gambie et cause un problème significatif de sante publique. Bien que les efforts dans la prévention inclus l'amélioration de la sante général des enfants dans la région, le diagnostic précoce et traitement est essentiel dans la réduction de ce fléau, les personnels de sante dans cette communauté ont besoin d'être sensibiliser sur l'importance des soins précoces contre l'ostéomyélite.

Introduction

Acute osteomyelitis which is commoner in the paediatric age group is most often acquired through haematogenous seeding [1]. The infection may be treated by antibiotics when the diagnosis is made early. If treatment is delayed, acute haematogenous osteomyelitis progresses to chronic osteomyelitis resulting in avascular bone and draining sinuses [2]. The infection typically arises within the metaphysis of a long bone (femur and tibia most commonly). A deficiency of reticuloendothelial cells and the sluggish flow through capillary venules, predispose to the deposition of bacteria in this region. The infection leads to an increase in intramedullary pressure, and the infection decompresses spontaneously through the porous metaphyseal bone and vascular channels,

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creating a subperiosteal abscess. The loss of local blood supply caused by an increase in intramedullary pressure and the stripping of periosteal blood supply by the abscess, results in segments of avascular bone (sequestrae). Sequestrae vary in size and location, and may involve the entire shaft of a long bone. These devitalized fragments may give rise to recurrent episodes of clinical infection. Mortality from untreated acute haematogenous osteomyelitis has been estimated to be between 10 and 50% [3]. In the past few decades, acute haematogenous osteomyelitis in children has become much less common in high income countries. In the USA, the incidence of childhood osteomyelitis is 20 per 100,000 between age 0-14 years [1]. In Great Britain and Scotland, the annual incidence ranges from approximately 10-20 per 100,000 children [3]. Furthermore, studies from the UK and New Zealand have demonstrated a steady decline in the disease [3].

In contrast, paediatric chronic osteomyelitis is much more common in low and middle income countries, which may be due to the greater frequency of associated medical problems which decrease host immunity, such as malnutrition, coexisting chronic infectious diseases, and sickle cell disease [4-8]. Sometimes, the cause may not be apparent. Acute osteomyelitis may lead to the chronic form of the disease with persistent bone infection, chronic discharging sinuses and sometimes loss of limbs if not adequately managed [3].

The prevention of progression of acute osteomyelitis to the chronic stage depends on the early recognition, diagnosis and adequate treatment of the disease. In the developed world, chronic osteomyelitis is relatively rare as the economy of the nations, living standards and the health care of the people have improved tremendously [4].

However, in the developing world, chronic osteomyelitis is very common. The problem of lack of early recognition of the acute form of this disease culminates in the high frequency of the chronic phase of this disease. The median duration of complaints prior to presentation of patients in Nigeria was 8 days compared with 4 days in a retrospective study of acute osteomyelitis in children in Norway, hence lack of recognition of the acute form cannot be the only reason for chronicity in sub saharan Africa [5]. In Dar es Salaam, paediatric chronic osteomyelitis accounted for 3.2% of all admissions [4].

In this report, we examined in detail our experience with chronic osteomyelitis in children at the Royal Victoria Hospital in Banjul, The Gambia.

Materials and methods

Background

The Gambia (population of 1.04 million, total land area of 10,689 km^2) is situated in West Africa, and is surrounded on three sides by Senegal, and the Atlantic Ocean on the West. In 1997, the country was ranked among the least developed in the world, ranking 165 out of 168 on the Human Development Scale [5]. The estimated per capita income is US $302 per year. The infant and under five mortality rates are 85 and 137 per thousand respectively (UNICEF) [5]. The population growth rate in 1993 was 4.2%.

The Royal Victoria Hospital (RVH) in Banjul is the national referral hospital, and it is the sole provider of surgical care in the western one-half of the country. The 150 bed RVH Paediatric Unit is located adjacent to the main hospital. The paediatric surgical unit has 35 beds.

Descriptive study

Cases of chronic osteomyelitis were identified from a prospectively recorded paediatric surgery database at RVH. The database included all children aged 0 – 14 years treated for surgical problems at RVH from January 1996 to May 1998. The database included inpatient, outpatient, and procedure registry. For each visit, the patient's name, age, sex, address, and diagnosis were recorded. A combination of inpatient and outpatient records were used for the descriptive study. Inpatient records alone were used to describe the anatomical sites of infection as they provided the most detail on the bones involved and the procedures preformed. Length of stay, and total inpatient days were calculated from admission and discharge dates.

Incidence of chronic osteomyelitis

We estimated the incidence of chronic osteomyelitis (CO) for the Greater Banjul Area (pop. 270,540, 32.3% aged 0-14 years). The Greater Banjul area includes the city of Banjul (pop. 42,326) where RVH is located, and the Kanifing Municipal Area, within 25 km of the hospital. Population statistics were obtained from the 1993 government census.

Statistical analysis

We compared the incidence of chronic osteomyelitis in Banjul to the incidence in KMA using chi-squared analysis. A similar method was used to compare the incidence of chronic osteomyelitis in Banjul to the rate reported for industrialized countries.

Results

From January 1996 to May 1998, 315 children aged 0-14 years were treated for chronic osteomyelitis at the RVH. Eighty-eight (28%) of these children were identified from the inpatient database, and 227 (72%) were recorded in the outpatient registry. Limited resources prevented admission of all children who presented with clinical evidence of chronic osteomyelitis (ie. a draining sinus) who required care.

The average age of children treated for chronic osteomyelitis was 8.23 years (95% CI, 7.80 – 8.67). The age distribution of these children is shown in Figure 1. A bimodal distribution was noted in age, with a peak at approximately 2 and 9 years of age. There were 184 males and 129 females (male to female ratio 1.4).

Chronic osteomyelitis accounted for 5.7% of paediatric surgery admissions and 15.4% (5181 days) of total paediatric surgical hospital days. The average length of stay for a child admitted with chronic osteomyelitis was 59 days (95% CI, 46 - 72). The length of stay ranged from 2 to 568 days. The child with the longest stay in the hospital had chronic osteomyelitis of the femur and pelvis. Eighty-five percent of children admitted for the treatment of chronic osteomyelitis underwent sequestrectomy,

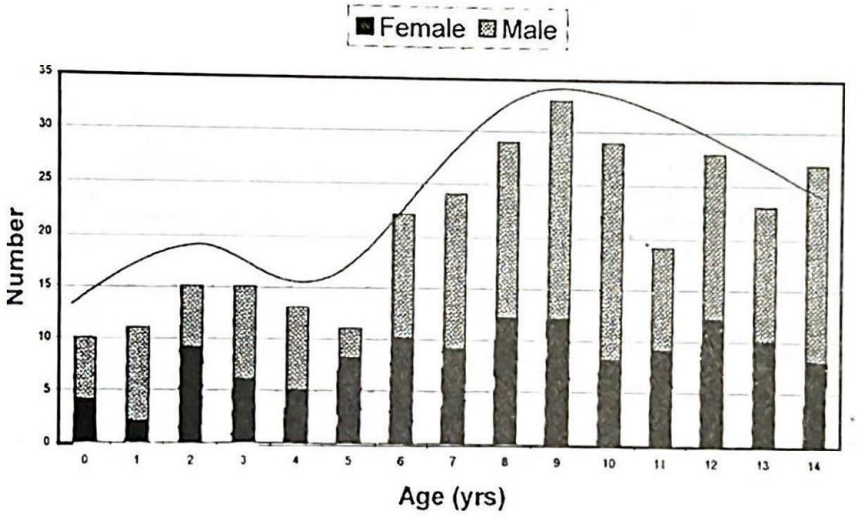

Fig. 1: Age distribution of children with chronic osteomyelitis in Banjul, The Gambia

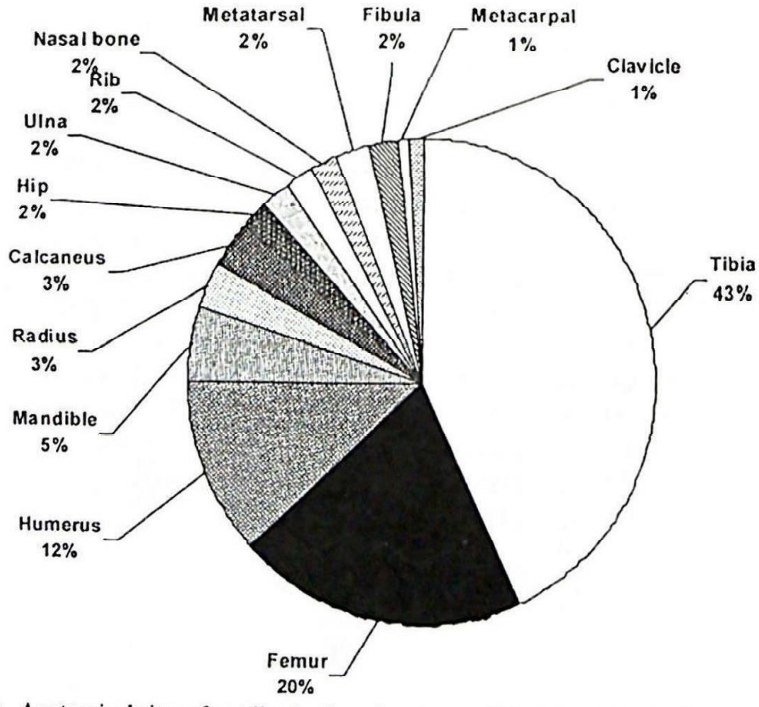

Fig. 2: Anatomical sites of paediatric chronic osteomyelitis in Banjul, The Gambia.

with 23.8% requiring multiple operations and the overall readmission rate was 8%.

The anatomical sites of osteomyelitis among inpatients is shown in Figure 2. The most common sites of infection were the tibia (43%), femur (20%), and humerus (12%). Seventy-two percent of osteomyelitis occurred in the lower extremities.

Our estimate for the hospital reported incidence of chronic osteomyelitis in The Gambia is shown in Table 1. The hospital reported incidence of childhood chronic osteomyelitis in Banjul and KMA was 100 and 52 per 100,000 children, respectively (chi-squared, p=0.00083. The rate of chronic osteomyelitis in Banjul was five times that reportedfor high income countries (chi-squared p<0.0001).

Table 1: Comparison of chronic osteomyelitis rates in two urban areas in The Gambia with those for the USA, Scotland and England

Location	Number of cases by age group			Incidence (per 100,000 children by age group)		
	0-4	5-14	Total	0-4	5-14	Total
The Gambia						
Banjul	6	27	33	52	127	100
KMA	20	87	107	26	68	52[1]
United States*				-	-	20[2]
Scotland**				9 –14	10 – 20	9 – 20
England**				11– 13	11 – 20	11 – 20

1. Chi-squared, p=0.00083
2. Chi-squared, p< 0.000.01
**From Gilespie [3]*
***From Sonnen [1]*

Discussion

Previous reports from African hospitals have cited a high prevalence of paediatric chronic osteomyelitis among their inpatient populations [4-10]. However, few recent studies have described in detail the pattern of the disease in sub-Saharan Africa. Moreover, there has been no hospital based incidence estimates for paediatric populations living in developing regions of Africa.

In our series, osteomyelitis was an important cause for admission to the hospital, and patients typically presented with the chronic form of the disease. Chronic osteomyelitis accounted for 5.7% of paediatric surgical admissions and 15.5% of paediatric surgery inpatient days. Chronic osteomyelitis was second to only burns in total hospital days. Once admitted the average child with chronic osteomyelitis was in the hospital for an average of 59 days. Eighty-five per cent of children underwent sequestrectomy, and nearly 25% required more than one operation. Our patients did not have the benefit of undergoing the Belfast operations as this has been found to be very effective in Nigeria [7,8].

The long bones of the lower extremities were most frequently involved, which is consistent with previous reports from both industrialized nations and other parts of sub-Saharan Africa. In both Nigeria and Dar es Salaam, studies have cited that the most frequent sites of paediatric chronic osteomyelitis involved the tibia, followed by the femur, and then the humerus [4,5,8]. A Scottish study of acute and subacute paediatric osteomyelitis found a similar pattern [11]. Other studies, however, have cited the femur as the most frequent site of involvement followed by tibia and then the humerus [7,12,13]. It is thought that bacteria more often deposit in the metaphysis of long bone where there is a paucity of reticuloendothelial cells and where the blood flow through the capillary bed is relatively slow [1]. In our study, the male to female ratio was 1.45, which is similar to that reported for developed countries [1-3]. As a history of minor trauma is frequently encountered prior to the development of acute osteomyelitis, perhaps this gender difference is related to a higher incidence of trauma in boys, although there is little objective evidence to support this hypothesis. Another study from Nigeria revealed the often inadequate duration of antibiotic use in acute osteomyelitis which may explain the high prevalence of chronic osteomyelitis [5].

In our patients with chronic osteomyelitis, we noted a bimodal age distribution. An early peak was noted at approximately two years and another peak at 9 years. In the USA, some authors have noted that acute hematogenous osteomyelitis occurs most

commonly in children younger than 2 years of age and in children between 8 and 12 years of age [2]. It has been suggested that these variations relate to differences in blood supply and structure of bone.

Our data provides some insight into how the incidence of osteomyelitis can vary with geographical location. Chronic osteomyelitis was almost twice as common in the city of Banjul compared to the Kanifing Municipal Area. Different patterns of referral and differences in access to medical services between these areas may account for this, rather than a true difference in the rates of disease; moreover, in interpreting these statistics, it should be noted that the data was derived from a hospital-based study. Our experience has shown us that the clinical signs of acute osteomyelitis are often missed.

Our study also suggests that the incidence of chronic osteomyelitis is much higher in The Gambia than in the developed countries. The incidence of chronic osteomyelitis in Banjul was five times the rate reported for industrialized countries. Several factors may contribute to these differences. A higher prevalence of coexisting medical conditions which might predispose to osteomyelitis, such as malnutrition, infectious diseases (filariasis, HIV/AIDS, TB), and sickle cell disease lead to a greater risk of contracting haematogenous osteomyelitis and later chronic osteomyelitis. A high prevalence of sickle cell disease (2-3%) exists in sub-Saharan Africa [9,14] and these patients have poor tissue oxygenation with frequent bone infarction, both of which may provide good culture medium for bacterial growth [9]. Furthermore, patients with sickle cell anemia often present with multiple sites of involvement [6]. Their condition is difficult to treat and often progresses to a chronic form.

Conclusion

Paediatric chronic osteomyelitis is a common problem in The Gambia and poses a significant burden on an already resource-depleted environment. The incidence is not only greater than in industrialized nations, but also varies regionally within the country. A generalized decrease in host immunity, from malnutrition, chronic infectious diseases, and sickle cell disease, may explain the increased prevalence, in addition to increasing the complication rates and compromising the outcome. Patients present late, which further complicates the management and increases the costs to society. Affordable avenues to improving outcome include early detection of the acute form and prompt treatment, and a campaign to increase awareness amongst the public and the health care providers may be beneficial. Village-level Primary Health Centres (PHC) [15-18] represent one vehicle to improving detection and providing prompt referral for the treatment of osteomyelitis. On-going research aims to review the effects of community intervention on the prevalence of chronic osteomyelitis.

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