Prevalence of falciparum malaria together with acute diarrhoea in children residing in a malaria endemic zone

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SUMMARY

To investigate an association between diarrhoea and malaria in children, a study was conducted in Buea on 215 children ranging from 0 – 5 years of age attending the Buea District hospital as out patients. Out of this number 118 (54.9%) had acute diarrhoea. The control group without diarrhoea comprised 97 children. Thick blood smears were examined to detect malaria parasites. The prevalence of malaria in the study population was 60% and mean parasite density was 4460.4 parasites/µl of blood (SD±3047.8). There was no significant difference in parasitaemia in children with and without diarrhoea (p>0.5). The prevalence of concurrent malaria and diarrhoea was 20% compared with 40% malaria prevalence in children without diarrhoea. We conclude that there was no association between malaria and diarrhoea in the study population.

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Introduction

Malaria transmission in Cameroon is influenced by climate, geography, increased drug resistance and the lack of adequate vector control measures [1]. Both malaria and diarrhoea in children are important causes of morbidity and mortality in the same environment [2]. Clinical malaria can present with a range of symptoms such as fever, vomiting and convulsions, which are all associated with other infections [3]. It has been suggested that malaria might influence the incidence of acute gastroenteritis due to impairment of humoral immunity in children, which leads to increased susceptibility [4].

In developing countries, improvement in management of severely ill children demands a set of criteria for simple indicators that can identify children at risk of severe illness, and suggest appropriate treatment. This has previously been done mainly via vertical programmes with each focusing on one particular disease such as malaria, diarrhoea or pneumonia [5]. More integrated approaches have resulted in guidelines for treatment of common childhood infections, which present with similar signs and symptoms. This has been the case in the treatment of fever with cough and fever with convulsions [6]. However, no guidelines have been published on the relationship between fever and diarrhoea.

There is the tendency for health personnel in most areas endemic for malaria to prescribe antimalarials to children with acute diarrhoea. We have investigated in this study the prevalence of malaria in children

with diarrhoea and a comparable non-diarrhoea control group.

Study design and population

This study was a case control study carried out at the Buea District Hospital on out patients from March to October 2001. The study period (rainy season) coincided with the high transmission of malaria. A questionnaire was administered to parents or guardians who brought in their children (0-5 years old) for consultation and information was obtained on onset of symptoms, frequency of bowel movements in the preceding 24 hours, age, sex and drugs taken including oral dehydration therapy. The use of antimalarials in the preceding two weeks was an exclusion criterion. A total of 215 children 0 – 5 years old were enrolled in the study of which 97 comprised children without diarrhoea. The rectal temperature of each child, weight and height were recorded. The parent or guardian of each child signed an informed consent form. Ethical clearance was obtained from the Provincial Delegate of Health in the South West Province.

Detection of malaria parasites

Blood from finger pricks was used to prepare thick and thin blood films, which were air-dried and stained with giemsa solution. The slides were examined by microscopy for malaria parasites. Absolute parasite counts were obtained from thick smears by counting the number of parasites among 200 leucocytes and multiplying the count by the patient's total leukocyte count divided by 200. Thick smears were recorded as negative only after at least 100 high-powered microscope fields had been scanned.

Assessment of diarrhoea management

An interview was conducted on 122 health personnel (medical doctors and nurses) to obtain information on the drugs they prescribed to children presenting with diarrhoea. The questionnaire administered to parents (specifically mothers) carried a component to assess knowledge on home management of diarrhoea.

Statistical analysis

The X^2 test with Yates correction was used to determine the existence of a relationship between diarrhoea and malaria by comparing the frequencies of parasitaemia and absolute parasite counts between cases and control groups.

Results

Study population

A total of 215 patients were studied. The age range of the children was 0-5 years and the mean age was 27 months (SD=18.57). The majority of children (65) were in the 0-1 age group.

Diarrhoea in the study population

Of the 118 children presenting with diarrhea, 61(51.7%) and 57 (48.3%) were males and females respectively. Diarrhoea in the sample population was not sex-related and both males and females had equal chances of having diarrhoea (X^2 = 0.19; $p>0.05$). Children with diarrhoea were generally given oral dehydration therapy (ORT).

Prevalence of malaria

The prevalence of malaria in the study population was 60% (129/215; **Table 1**). Generally, children in the 1-2 year age group had the highest prevalence (20.5%) while the lowest prevalence (4.2%) was recorded in the 2-3 year old age group. There was a significant difference in the prevalence of malaria between the age groups (X^2 = 0.16.3; $p<0.05$). All cases diagnosed with malaria were treated with amodiaquine using a standard dose of 10mg/kg/day for 3 days.

Relationship between malaria and diarrhoea

There was a significant difference in malaria prevalence between children with diarrhoea and those with no diarrhoea ($p>0.05$) with a

higher prevalence recorded in children presenting with no diarrhoea (**Table 2**).

Parasite density

The parasite density of the sample population ranged from 500 – 25000 parasites/µl of blood. The mean parasite density in children with diarrhoea was 4490.4-parasites/µl blood (±3624.7) compared with 4429.7-parasites/µl blood (±1897.9) for children without diarrhoea and this difference was not significant (**Table 3**).

Analysis of Questionnaire

The majority of parents sought medical care for their children after the onset of fever, cough, earache, diarrhoea or abdominal pain. None of the children with diarrhoea had received oral dehydration therapy at home although 30% of the parents (65/215) had knowledge of oral dehydration therapy. The majority of mothers whose children were excluded from the study admitted frequent purchase of antibiotics (amoxicilline, chloramphenicol and flagyl), antimalarials (fansidar, chloroquine and quinine sulfate) and antipyretics from street vendors. Of the health personnel interviewed, 68% (83/122) reported prescribing antimalaria drugs to children who presented with acute diarrhoea even in the absence of fever or appropriate diagnosis of malaria.

Table 1. Prevalence of malaria in children with and without diarrhoea

Age Group (years)	Cases vs. Controls Diarrhoea +	Diarrhoea-
0 - <1	12/41 (29.3%)	23/24 (95.8%)
1 - <2	15/31 (48.4%)	29/30 (96.7%)
2 - <3	02/10 (20.0%)	07/09 (77.8%)
3 - <4	05/11 (45.5%)	10/14 (71.4%)
4 - <5	09/25 (36.0%)	17/20 (85.0%)
	43/118(36.4%)	**86/97(88.7%)**

Table 2. Association between malaria and diarrhoea

Diagnosis	Malaria+	Malaria-	Total
Diarrhoea+	43 (20%)	75 (34.9%)	118
Diarrhoea-	86 (40%)	11 (5.1%)	97

Table 3. **Mean parasite density in diarrhoea patients and controls**

Age group (Years)	Diarrhoea (n = 118)	Controls (n = 97)
0 -<1	4266.7(±5155.7)	4100.0(±4781.7)
1-<2	5750.1(±3946.7)	4445.2(±3720.3)
2-<3	3821.4(±1651.1)	3154.5(±2380.2)
3-<4	4437.5(±2718.2)	5437.5(±2508.6)
4-<5	4178.6(±2258.4)	5012.0(±1051.7)

Discussion

Several studies on individuals with clinically suspected malaria have reported an association between malaria and diarrhoea [7,8,9]. It has been reported that a particular geographic or clinical setting could influence results. In the work reported here, similar investigations on malaria were carried out but the study populations were children with and without diarrhoea. Our results show that there is no association between malaria and diarrhoea. In a related study on Nigerian children [10] it was also concluded that diarrhoea is neither a symptom nor cause of malaria.

In our study 118 children presenting with acute diarrhea were recruited alongside 97 children who served as the control group. The overall prevalence of malaria in the study population was high (60%) because parasite transmission in Cameroon is perennial with seasonal increases during the rainy season [11,12]. The prevalence of malaria was higher in the control group indicating that malaria is not necessarily associated with diarrhoea.

We reported a prevalence of 20% for concurrent malaria and diarrhoea (**Table 2).** Results from a previous study, which we conducted, in an older population showed a prevalence of 30% for malaria occurring with nontyphoidal *Salmonella* [11]. While we report on no association between uncomplicated malaria and diarrhoea in the present study, our results reiterate the need for the public health sector in malaria endemic areas to review its malaria treatment policies particularly in children with diarrhoea. As reported in a previous study it was observed that the recourse to medical help was largely due to unsuccessful attempts at treatment with self – prescribed drugs [11]. Analysis of the questionnaire administered to 122 health care personnel (medical doctors and nurses) in the study area revealed that children presenting with diarrhoea at health care facilities are often prescribed antimalarials even in the absence of fever. Other prevailing factors such as poor hygiene, change in diet and physiology, fungi, parasites, viruses and bacteria, which were not investigated in this study, may cause diarrhoea that is not as a result of malaria infection. It is also indicative that mothers still need to be educated on home management of diarrhoea in order to reduce morbidity due to infections by diarrhea causing organisms.

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