

## Original Articles

### EPIDEMIOLOGICAL STUDY ON RESIDUAL PARALYSIS DUE TO POLIOMYELITIS AMONG PRIMARY SCHOOL CHILDREN IN KHARTOUM PROVINCE

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**Abstract** A school lameness survey was done on a sample of primary school children of the age 7 - 13 years in Khartoum province during late 1982. The main objectives were to calculate the prevalence of residual paralysis due to poliomyelitis among the study population and to evaluate some of the disease determinants such as age of onset; sex, urban rural differences and seasonal variation.

The method used depended mainly on screening of lame children by class tutors and a detailed history and medical examination by the investigators.

Poliomyelitis was found to be the major cause of lameness among primary school children in Khartoum province (63% of all causes of lameness). The prevalence of residual paralysis due to poliomyelitis was found to be 3.5/1000. Rural urban and sex differences were statistically not significant. The mean age of onset was 17 months. About a third of the cases seen (67.4%) had their acute attack in winter and 60% of all cases gave a history of one or more injection given shortly before the onset of the paralysis.

**Key words** Poliomyelitis; Epidemiology; School; Urban population; Rural population, Khartoum.

### INTRODUCTION

Official reporting systems in the African countries have for a long time been responsible for the low prevalence and annual incidence of poliomyelitis which appears in WHO reports. This led to the convention that paralytic poliomyelitis is not a major health problem in these countries. Recently however, and after using school lameness surveys, the picture of the disease has changed and the results showed that poliomyelitis is a major health problem in many of these countries.

Belcher et al<sup>1</sup> from surveys done in Ghana reported an estimated prevalence of 5.8/1000 school age children and an estimated mean annual incidence of paralytic poliomyelitis of 23/100 000 - while official reporting system ranged between 0.1/100 000 and 2.1/100 000 - thus indicating that at least 90% of cases were not reported. Also in the Ivory Coast, while surveys have shown that annual incidence is 53/100000, the official reporting system stated the incidence to be 1.6/100000 for the same period<sup>2</sup>. The above examples show that depending on official reporting system will not reflect the magnitude of the disease in developing countries.

Few studies have been done, so far, to quantify the problem of poliomyelitis in Sudan. Of these were two surveys carried by the Expanded Programme on Immunization Office revealing a prevalence ranging between 3.5 and 5.6/1000 children<sup>3,4</sup>.

It is the purpose of this study to through light on the prevalence and pattern of poliomyelitis in Khartoum province.

## MATERIAL AND METHODS

### Sampling design

The total number of primary schools in the study area was stratified according to rural, urban and administrative divisions (i.e Omdurman, Khartoum and Khartoum North; West Bank and Between Niles). They were stratified according to sex (boys, girls or mixed types of school). The schools were arranged in a frequency distribution to take into consideration the difference in school size; taking primary schools of less than 300 pupils as a category, 301 to 600 as another category and schools of 601 and more as a third category. Then a sample of 5% of each category was obtained and the desired number was selected by means of random table numbers. In this way 18 schools were chosen in the urban area (7 in Khartoum, 6 in Omdurman and 5 in Khartoum North) having a total population of 8307 in the age group 7-13. In the rural area, 13 primary schools were selected containing a total number of 4450 children in the same age group

For control purposes a sample of each class in any selected school in the sample, both in urban and rural areas, was chosen by random table numbers -excluding

lame children in the same class - for comparison of some socioeconomic aspects of the family. The total number of controls thus chosen was 653.

The method followed was basically the same for school lameness survey used in a number of similar studies<sup>1,5,6</sup>. Some modifications, however, were done to facilitate obtaining more information on other disease determinants. The details of which were as follows:

- a. Screening of school children age 7-13 in the selected schools by class tutors for lameness of any cause.
- b. Detailed history, clinical examination including neurological evaluation of each child thus selected by the investigator to detect residual paralysis attributable to a former attack of poliomyelitis. The criteria for diagnosing the disease was the presence of flaccid paralysis and atrophy of muscles, absences of sensory loss and a history of acute attack with no progression<sup>17</sup>.
- c. Direct interviews of fathers or mothers of any child found to have residual paralysis attributable to poliomyelitis concerning some disease determinants, socioeconomic status and attitude towards immunization.
- d. Direct interview of mothers or fathers of a sample of 5% of non-lame children in each class of the selected school, as controls, for socioeconomic factors and attitude towards immunization.

Each selected school in the sample was visited twice. In the first visit the purpose of the study and the role of the class tutors was explained. In the second visit, scheduled 5-7 days from the first one, lame children, screened by class tutors, were examined and parents of both lame children and controls were interviewed.

## RESULTS AND DISCUSSION

The prevalence of residual paralysis due to poliomyelitis among the study population was found to be 3.5/1000 with rural prevalence slightly higher than urban prevalence (4 and 2.9/1000 respectively; Table I). It has been suggested that infants in rural areas where sanitary conditions are assumed to be worse than in urban sittings- get exposed to the freely circulating

poliovirus early in life. Since they are partially protected by maternal antibodies, most of them would acquire immunity through subclinical or minor infections and so the risk of developing paralytic poliomyelitis is insignificant among them<sup>8</sup>. However, this study has found that the rural, urban difference is statistically not significant.

**Table I: Prevalence of Residual paralysis due to poliomyelitis among primary school children (Khartoum Province, 1983)**

Scholl children population	Urban			Rural		
	Total No. enrolled	No of cases	Rate 1000	Total enrolled	No of cases	Rate 1000
Boys	4425	13	2.9	2063	9	4.4
Girls	3880	11	2.8	2699	10	3.7
Total	8305	24	2.9	4762	19	4.0

Other workers-including Sabin<sup>9</sup>- have refuted the above-mentioned argument of early protection.

Considering the correcting factor suggested by La Force and his associates<sup>5</sup> to include those children who had their affection in upper limbs only and would be missed by such a lameness survey, the prevalence will then be in the range of 4.4/1000. The annual incidence cannot be calculated in this study for lack of information on total number of children (7-13 years) in the community or their percentage compared to the total population of Khartoum Province.

Most of the cases seen (79%) had their affection in one leg while 21% had their paralysis in both legs. Male to female ratio was statistically not significant.

Fig 1 shows the degree of disability following the

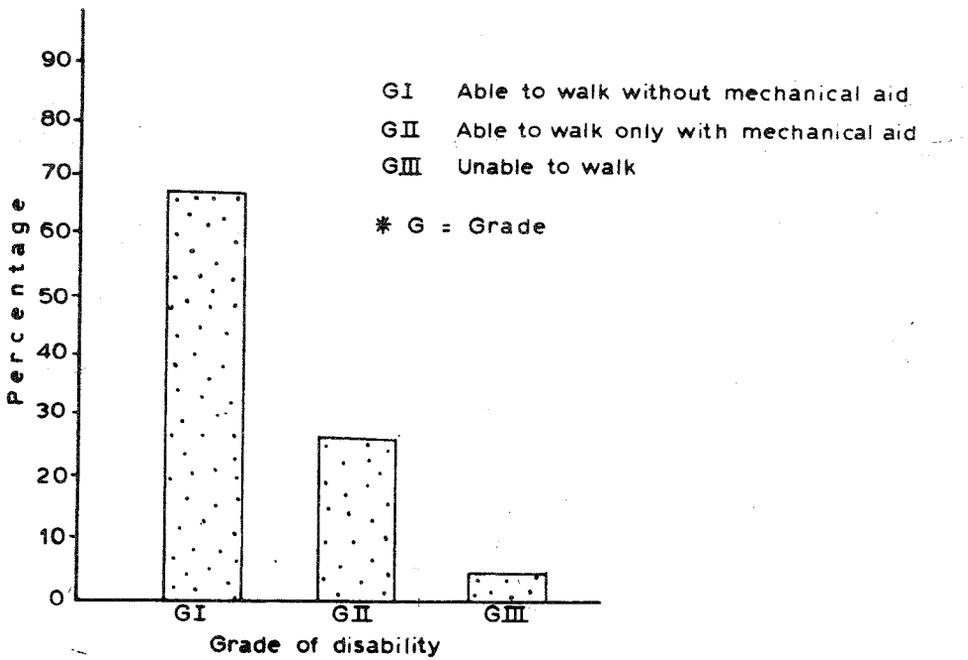


Figure 1 Distribution of grades of paralytic poliomyelitis among the total of primary school children seen in Khartoum province, 1983

attack of poliomyelitis among the cases examined. Sixty seven percent of paralytic cases were able to walk without mechanical or other aid (GI: grade I disability). A few of them, however, showed marked scoliosis and had to lean to support their trunks by putting their hands on the knees of the affected leg in order to walk. Twenty eight percent of the cases could only walk with the help of a stick, prothesis or both (G II: grade II disability). Only 5% were unable to walk and had to depend on wheel-chairs (GIII: grade III disability).

The observed percentage of affection in two legs and the still lower percentage of grades II and III disabilities seen among the study population may not reflect the actual picture in the community. A high percentage of those severely affected by the paralytic poliomyelitis - although not mentally handicapped by the disease - may either not enroll in schools at all, have died or otherwise drop out of school for problems of transport and inaccessibility to wheel-chairs or other aids. Those are missed by such school based study. A community based study might have revealed, not only a higher prevalence, but also a different pattern of distribution of grades & disabilities. A similar pattern of disability showing low percentages of grades II and III disabilities has been reported in Gambia<sup>6</sup> and Ghana<sup>7</sup>.

Considering the various causes of lameness among the study population (Table II), poliomyelitis was found to be the major cause amongst primary school children. Similar results have been found in Gambia<sup>6</sup> where poliomyelitis constituted 66.9% of all causes of lameness among school children.

As regards the age at onset of the disease, all cases seen in this study have had their illness by the third year of life (Table III). Some of them however had the disease as early as the third month of life. These findings conform with the already recognized fact that poliomyelitis in tropical countries is almost exclusively a disease of infants and young children<sup>5</sup>. A study in Egypt<sup>2</sup> showed that 91.5% of cases had their acute attack before the third year of life. Another one in Nigeria<sup>10</sup> stated that 90.8% of cases had their acute attack between the third and fourth year of life: similar results were obtained in Cameron<sup>11</sup>, Ivory Coast<sup>2</sup> and Yemen<sup>12</sup>.

The mean age of onset was found to be 17 months among the study population. Crossponding figures for Yemen<sup>12</sup> and Ivory Coast<sup>2</sup> were 19 and 16 months of age respectively. The age of onset in this series is clearly different from what is usually encountered in temperate countries where the disease tends to occur in older age groups and may inflict even elderly people<sup>13</sup>.

Since it was difficult to ascertain the exact month of onset of the disease from the parents, the three district seasons of Sudan (Winter, Summer and rainy seasons) were used as landmarks.

**Table II: Causes of lameness Among primary school children in Khartoum Province, 1983**

Causes of Lameness	No (%)
Poliomyelitis	43 (62)
Upper motor neurone lesions (encephalitis, cerebral palsy etc	9 (13)
Trauma	8 (12)
Congenital deformity (club foot geno varum etc..	5 (7)
Uncertain	4 (6)
<b>Total</b>	<b>69(100)</b>

Almost two third of cases (67.4%) had their acute attack in the Winter season (Table IV) less than one quarter (23.3%) had it in summer and only about one tenth (9.3%) in the rainy season. This phenomenon was encountered both in rural and urban areas in almost the same proportions. The peak incidence of the disease in Europe is said to be in summer<sup>14</sup>. Summer in temperate regions is comparable with Winter in our tropical region with a mean temperature of 24°C. This high Winter incidence may be due to climatological or social factors. The colder temperature of Winter (24°C mean) may help to preserve the potency of the virus and prolong longevity. The relative humidity for the survival of the virus is known to be 40% or above<sup>16</sup>. Although Winter is usually dry in

in the Sudan—except in the Red Sea Coast, relative humidities close to 40% are encountered<sup>15</sup>. On the other hand, the social impact of Winter leading to overcrowding and close contact may enhance transmission of the virus.

**Table III: Age of onset of Poliomyelitis reported in primary school children of Khartoum Province, 1983**

Age in months	< 6	6 -	12-	24-	36-	Total
Males	1	4	7	9	1	22
Females	1	5	11	2	2	21
Total No of cases (%)	2(5)	9(21)	18(42)	11(25)	3(7)	43(100)
Commulative percentage	5%	26%	67%	93%	100%	100%

**Table IV: Cases of Paralytic Poliomyelitis seen among study population by season of onset**

Season OF Onset	Urban	Rural	Total
	No (%)	No (%)	No (%)
Winter	16 (67)	13 (68)	29(67.4)
Summer	6 (25)	4 (21)	10 (23.3)
Rainy season	2 ( 8)	2 (11)	4 ( 9.3)

A relationship has been observed between giving injections at the acute stage and the occurrence of paralysis; an effect often referred to as provoking effect<sup>14</sup>. A case control study confirmed this statistically and even showed that children who received multiple injections are twice as likely to develop the paralytic form of the disease than those who received a single

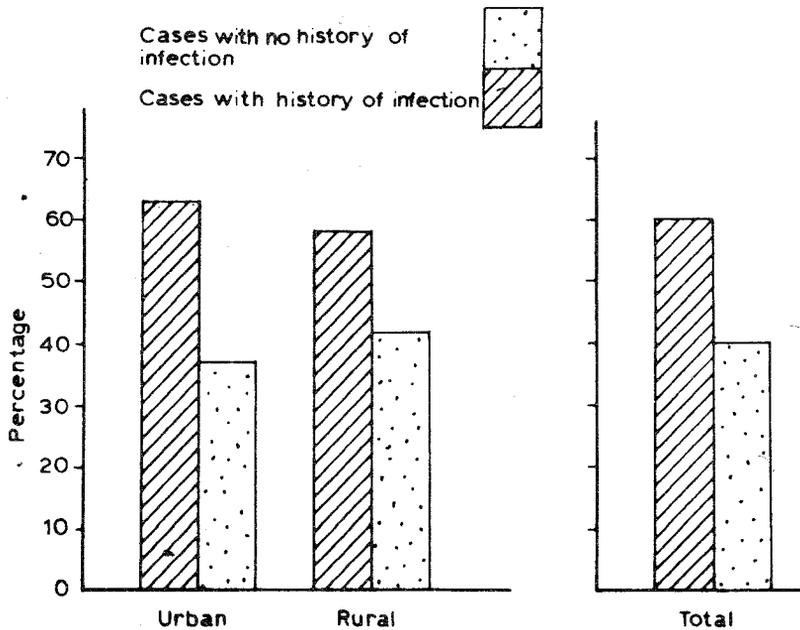


Figure 2 History of injections reported in cases of paralytic poliomyelitis among primary school children in khartoum province

injection<sup>17</sup>. In this series (Fig 2), over 60% of paralytic cases have had one or more injections during the acute stage - usually penicillin or choroquine-which has been prescribed for a febrile illness. This practice might have added to the risk of paralysis. Unfortunately, it is a common practice here as it is the case with other African and developing countries.<sup>6</sup> Culturally, patients and parents believe more in injections; So they are used rather freely-even by paramedical staff in villages - in the presence of an oral substitute.

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