

ORIGINAL ARTICLES

A STUDY ON THE AETIOLOGY OF DIARRHOEL DISEASES IN KHARTOUM METROPOLITAN AREA

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Abstract In a study of 298 children reporting with diarrhoea to 31 health centres in Khartoum metropolitan area, 55% were found to be in the age group 6 months to 2 years. Of those who were investigated bacteriologically (216 patients), 23 (10.7%) showed bacterial pathogens whereas 51 of 245 children (20.6%) had giardia in the stools. The commonest organism was enteropathogenic *Escherichia coli* (EPEC) which showed remarkable resistance to most of the currently used antibiotics.

Key words Diarrhoea; Children; Etiology; Bacterial; Giardiasis

INTRODUCTION

Diarrhoea in children under five years of age is a major health problem in developing countries. A child may have two to five episodes of diarrhoea per year¹. In 1970 about 500 million episodes of diarrhoea have occurred in Africa, Asia and Latin America². The Sudan is no exception. The case fatality from the disease was found to be 11.7% in the Children's Emergency Hospital³. In El Hag Yousuf village (about 10 kilometers from Khartoum), diarrhoea accounted for 32.1% of the causes of death and was the leading cause of mortality⁴. Abdalla⁵ reported it

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to be the greatest problem in paediatric practice in the Sudan; whereas Ibrahim and Gupta⁶ found that 31% of patients presenting to the out-patient clinic at Khartoum Civil Hospital had diarrhoea and vomiting. In a study by Shazali⁷, the disease was found to constitute 29.9% of the total admissions.

It is the purpose of this study to highlight the role of bacterial and parasitic infections as a cause of diarrhoea and vomiting in Sudanese children.

MATERIAL AND METHODS

This study was conducted between September and November 1981. Eight health centres were randomly selected from 31 in Khartoum metropolitan area (Khartoum, Khartoum North and Omdurman). All children under five years of age presenting with diarrhoea to any of these health centres were included regardless of any other associated symptom or disease. Seven to 10 days were spent in each health center. A qualified technician examined stool specimens under a light microscope immediately at the health center. Rectal swabs were taken for bacteriological investigations. Platings were made within a maximum of two hours.

298 patients reported to us. Stool microscopical examination could be made for 245 patients. We could not obtain stool specimens in 53 patients and their mothers declined taking rectal swabs from them. Bacteriological investigations were done for 216 patients at the National Health Laboratory (Khartoum). The rest of the stool specimens were discarded because they were brought late to the laboratory due to transport problems.

Stool specimens were cultured in Mc Conkey, Deoxycholate and Selenite F media. Organisms grown in Selenite F medium were sub-cultured in Mc Conkey and Deoxycholate media. Sugar and biochemical tests were carried out for non-lactose fermenters. Further confirmation was obtained by serological tests.

The colonies of lactose fermenters were recultured in blood agar for serological identification.

All stool specimens were cultured in TCBS to isolate vibrio cholerae.

Toxicity tests for enteropathogenic *Escherichia coli* (EPEC) as well as virological investigations were not done due to lack of facilities.

RESULTS

The majority of children presenting with diarrhoea were between 6 months and 2 years of age. 164 of 298 (55%) were in this age group. Of these who were investigated bacteriologically (216 patients), 23 (10.7%) showed bacterial pathogens whereas 51 of 245 children (20.6%) had giardia in their stools (Table I).

Table I. Age distribution of patients under five years of age presenting with diarrhoea at Khartoum health centers (1981)

Age group (years)	Total		Pathogen			
	No	%	Bacteria (in 216 patients)		Giardia (in 245 patients)	
			No	%	No	%
< ½	29	(9.7)	0	(0)	1	(0.4)
½ -	76	(25.5)	7	(3.24)	3	(1.21)
1 -	88	(29.5)	11	(5.09)	14	(5.65)
2 -	59	(19.8)	2	(0.93)	20	(8.06)
3 -	24	(8.1)	3	(1.39)	8	(3.23)
4 - 5	22	(7.4)	0	(0)	5	(2.01)
Total	298	100.0	23	10.65	51	20.56

The commonest bacterial organism was EPEC which could be identified in 19 (8.8%) of the 216 patients who had a recta swab. This was followed by *Salmonella typhi* (1.4%) and *Shigella boydii* (0.5%) (Table II). EPEC serotypes 0114, 0127 and 0128 predominated (Table III).

Table II Bacterial organisms isolated in 23 positive rectal swabs

Bacteria	No of positive cultures	(%)
Enteropathogenic		
<i>Escherichia coli</i>	19	(8.8)
<i>S typhi</i>	3	(1.4)
<i>S boydii</i>	1	(0.5)
<i>vibrio cholerae</i>	0	(0)
Total	23	(10.7)

Table III. Serotypes of enteropathogenic *Escherichia coli* isolated from children under 5 year of age

Serotype	No	(%)
0114	5	(26.3)
0127	4	(20.1)
0128	3	(15.8)
0119	1	(5.3)
0126	1	(5.3)
055	1	(5.3)
0111	1	(5.3)
Untypable	3	(15.8)
Total	19	100.0

Sensitivity of the isolated bacterial organisms showed the EPEC had remarkable resistance to most of the currently used antibiotics, whereas *S typhi* and *S boydii* were sensitive to the majority of them (Table IV).

DISCUSSION

"It is very difficult to give a precise definition of diarrhoea as this depends very much on diet which varies much between different cultures"⁸. In this report, diarrhoea was defined as the passage of watery stools regardless to its frequency.

This study was done during the seasonal period of its maximum incidence. In a previous report on diarrhoeal diseases, Shazali⁷ reported the maximum occurrence to be between May and October.

Bacterial pathogens were isolated from 23 patients only (10.6%) out of 216. EPEC was the main bacteria isolated. EPEC serotypes 0114, 0127 and 0128 predominated (Table IV). The results of this study conform with those observed in Sudanese patients by Abdallah⁵, Ibrahim and Gupta⁶ and by Shazali⁷. Also the results agree with those reported from Indonesia by Biddulph⁹ and Bachtin et al¹⁰. The etiology in most cases of diarrhoea under five years of age in nine Southeast Asian countries was not known¹¹. It was stated that bacterial diarrhoea due to EPEC, salmonella and shigellae comprise 10-20% of episodes of children's diarrhoea in tropical America and India¹². The results obtained in this study are comparable to most of the above-mentioned studies.

In this study 55% of diarrhoea cases occurred between the age of 6 months to 2 years. 78.3% of the detected bacteria were isolated from this age group. *Giardia lamblia* was detected in 51 cases (20.6%) and was found to be highly prevalent in the third year of life. It is difficult to say whether *Giardia lamblia* was a real cause of diarrhoea or whether it was a by stand excreted due to diarrhoea caused by another pathogen e.g. viruses. However, none of our cases showed a mixed infection (Giardiasis and bacterial pathogen).

Another interesting finding in this study was the high resistance of EPEC to the currently used antibiotics except for chloramphenicol and co-trimoxazole (Septrin). This may be due to abuse of antibiotics in Khartoum. However, these two drugs should not be used routinely for treatment of diarrhoea, especially in developing countries. They have to be reserved for treatment of typhoid fever and serious infections e.g. meningitis. Abdallah⁵, Shazali⁷, Ibrahim and Gupta⁶ found similar results in Sudanese children. Similar results were also reported from Indonesia⁹.

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REFERENCES

1. Parker RL et al. Oral Rehydration Therapy (ORT) for Childhood Diarrhoea. Population Reports. Series 1 No 2 Vol VIII No 6. Population Programme, the John Hopkins University, Baltimore, 1980.
2. Rhode JE et al. Rehydration is everybody's business. *J Trop Pediatr Env Child Hlth* 1977;23:109-110.
3. Omer MIA, Karrar ZEA. The pattern of paediatric emergency admissions in one unit in Khartoum. *Sudan J Pediatr* 1977;1:19-30.
4. Yousif M. A study of mortality, morbidity and clinical features among children in Hag Yousif village (Sudan). *Sudan Med J* 1967;5:127-136.
5. Abdallah L. Some major problems in paediatric practice in the Sudan. *Sudan Med J* 1967;5:95-103.
6. Ibrahim M, Gupta JM. Diarrhoea and vomiting in children in outpatients. *Sudan Med J* 1967;5:142-145.
7. Shazalin H. Prevalence of gastro-enteritis in the paediatric. *Sudan J Pediatr* 1970;8:159-177.
8. Levine MM et al. A Manual for Treatment of Acute Diarrhoea (WHO Document, WHO/CDD/SER/80-2).
9. Biddulph J. Standardized management of diarrhoea in young children. *Paediatrica Indonesia* 1971;11:37-46.
10. Bachtin M, Nelwan, Suppto, Sebodo T, Ismangoen. The use of antibiotics in childhood diarrhoea. *J Trop Pediatr Env Child Hlth* 1979;25:101-103.
11. Suoto. Diarrhoeal diseases of children in South East Asia. *Paediatrica Indonesia* 1977;19:231-242.
12. Hirschhorn N, March. The treatment of acute diarrhoea in children: A historical and physiological perspective. *Am J Clin Nutr* 1980;33:637-663.
13. Egemen A, Bertan M. A study of oral rehydration therapy by midwives in a rural area near Ankra. *Bull WHO* 1980;58:333-338.