

Research Article**Epidemiology and Recent outbreak of Cholera in Sudan****Mubarak S. Karsany¹, Ayman A. Elshayeb² and Karimeldin M.A. Salih³**¹College of Medical Laboratory Sciences. Karary University. Sudan.²Department of Microbiology, College of Medical Laboratory Sciences. Karary University. Sudan.³Department of Paediatrics, Hail General Hospital. Kingdom of Saudi Arabia.E-mail: mubarak88@gmail.com**ABSTRACT**

*This work documents the epidemiological and bacteriological profile of cholera cases reported to the National Public Health Laboratory- Federal Ministry of Health during epidemics and reemergence of cholera as a post conflict public health challenge. Two separate epidemics of cholera in Sudan were confirmed in the years 2005-2006 from different states of the country. The number of positive stool culture were 109. The peak incidence of cases occurred in June 2005 with subsequent cases registered in 2006. All age groups were affected and the case fatality rate (CFR) was 5.1%. Strains isolated were *Vibrio cholerae* El-Tor 01, serotypes Inaba (89%) and Ogawa (6%), *V. parahaemolyticus* (2%) and non-agglutinable vibrios (1.8%). Antibiotic resistance was noted, specially to tetracycline.*

Keywords: Antibiotics/ Cholera/ El-Tor/ Epidemiology/ Inaba/ Ogawa/ Sudan**INTRODUCTION**

Cholera is an acute diarrheal disease caused by the bacillus *Vibrio cholera* serogroup 01 or 0139 members of the family Vibrionaceae. It is a facultative anaerobic Gram-negative, non-spore-forming curved rod, about 1.4-2.6 mm long capable of respiratory and fermentative metabolism. It is well defined on the basis of biochemical tests and DNA homology studies[1]. Currently the organism is classified into 206 "O" serogroups [2]. Until recently, epidemic cholera was exclusively associated with *V. cholerae* strains of the Oserogroup. All strains that were identified as *V. cholerae* on the basis of biochemical tests, but that did not agglutinate with "0" antiserum were collectively referred to as non-01 *V. cholerae*. The non-01 strains are occasionally isolated from cases of diarrhoea[1],[3] and from a variety of extraintestinal infections, from wounds, and from the ear, sputum, urine, and cerebrospinal fluid [4]. These strains lead to infection under low environmental hygiene [5]. The 01 serogroup exists as two biotypes, classical and El Tor; antigenic factors allow further differentiation into two major serotypes Ogawa and Inaba. Strains of the Ogawa serotype are said to express the A and B antigens and a small amount of C antigen, whereas Inaba strains express only the A and C antigens. A third serotype (Hikojima) expresses all three antigens but is rare and unstable. Although more than 100 serogroups exist, only two cause epidemics of cholera: *V. cholerae* 01, of which there are two biotypes (Classical and El Tor) and *V. cholerae* 0139, which emerged in the Bay of Bengal in 1992. Cholera is known to cause worldwide pandemics. *V. cholerae* 01, biotype El Tor accounts for most cases in the current, seventh pandemic.[6] *V. cholerae* is endemic in many low income countries, particularly in areas of inadequate sanitation and food hygiene practices. Humans are the only known natural hosts of *V. cholera* [6]. The causative agent of the seventh and current cholera pandemic which began in 1961 in Indonesia, is the El Tor biotype. The classical biotype has been completely displaced worldwide, except in Bangladesh where it reappeared in epidemic proportions in 1981,[7]. The simple distinction between *V. cholerae* 01 and *V. cholerae* non-01 became obsolete in early 1993 with the first report of a new epidemic of severe cholera-like disease, *V. cholerae* 0139, which emerged in the Bay of Bengal in 1992 in Bangladesh,[8]. Between April and October 2006, W.H.O 8200 cases were reported including more than 230 deaths from cholera in northern Sudan. The situation is further aggravated by significant population movements including the increasing number of returning IDPs, both from the North and the South. With limited or no capacity, a very fragile health system and a chronic lack of human resources, the transitional areas are also at risk of epidemics, especially cholera, [9]. Since the first cholera case in Sudan, on 21 April 2005, the total

number of confirmed cholera cases is 5369 with 180 deaths and a case fatality rate of 3.4%, as of 30 July 2006 [10].

Objectives:

- 1- To update epidemiology of cholera in Sudan.
- 2- To determine the causative, type of organisms.
- 3- To study the outcome of cholera during 2005 – 2006 outbreak in Sudan.

PATIENTS AND METHODS

This work based on case definition of WHO recommendation and surveillance, second edition 1999 as follow:

- In an area where the disease is not known to be present; severe dehydration or death from acute watery diarrhea in patients aged 5 years or more.
- In an area where cholera is endemic; acute dehydration with or without vomiting in patients aged 5 years or more or in an area where is cholera epidemic [11].

The stool samples were transported in Carry Blair transport media containers to the Reference Laboratory at the Central Public Health Laboratory, where further processing of the stool was done in peptone water and TCBS (thiosulfate-citrate-bile-salts-sucrose agar) medium. Stool cultures were isolated and confirmed using specific sub-strains Ogawa and Inaba antisera. Antimicrobial resistance testing was carried out routinely as part of the general stool examination although for time reasons the choice of antibiotics for treatment was not only dependent on the results of sensitivity tests but rather on the availability of the selected agent. Only few samples, about 231 stool samples are collected for stool analysis for cholera from different states of the country (According to the policy of the National Health Lab only 10% samples should be taken during epidemic for analysis)[11].

RESULTS

The National Public Health Laboratory of the Federal Ministry of Health (FM o H) has confirmed the isolation of *Vibrio cholerae* 01 serotype inaba in 94 out of 231 stool samples (40.7%) collected. All age groups were affected and the case fatality rate (CFR) was 5.1%. Strains isolated were *Vibrio cholerae* El-Tor 01, serotypes Inaba (89%) and Ogawa (6%), *V. parahaemolyticus* (2%) and non-agglutinable vibrios (1.8%). *V. cholerae* 0139 was isolated from 2 cases (0.2%). Antibiotic resistance was noted, especially to tetracycline.

Table 1: Age and sex distribution of AWD reported cases, Sudan 2006

Age group (years)	Male	Female	Total	Died
	n (%)	n (%)	n (%)	n (%)
0 – 2	152 (53)	133 (47)	285 (3)	9 (3)
2 - 4	197 (54)	169(46)	366(4)	20(5)
5 - 14	849 (57)	643(43)	1492 (18)	42 (3)
15 - 29	1102(49)	1126(51)	2228(27)	61 (3)
30 - 44	717 (42)	975(58)	1692(20)	46(3)
45 & More	1054(46)	1248(54)	2302(28)	126(5)
Total	4071 (48)	4294(52)	8365(100)	304(4)

DISCUSSION

From temporal and geographical spread of cholera outbreak it was evident that it was brought through the unplanned and sudden influx of post war returnees from DRC (CONGO) mainly and Ugandan refugee camps who have quickly mixed with local population in the presence of meager untreated water sources. The poor health infrastructure of southern Sudan at that time have given great momentum to the spread of the outbreak to 80% of the country states in a very short time 2 months taking the vast area of Sudan. The river Nile water was the main source for these populations the direction of the outbreak was following the same route of the river south-north. The ferries, boats and ships of the river Nile were the main source that helped in the rapid spread of cholera. From the water samples taken from the different sites of the outbreak we have noted documented complete absence of any chlorination or any other water treatment procedures before and during this outbreak which have worsened the situation which did not improve except after the

involvement of NGOs, WHO and UNICEF. A similar reemergence of this outbreak have occurred in 1972-1973 following the Addis abbaba peace accord with the same story of rapid influx of returnees from neighboring countries with poor post war health infrastructure this lesson was not learned and totally missed in dealing with such events as the rapid movement of large population masses across borders .

CONCLUSION AND RECOMMENDATIONS

Cholera remains a potential threat to Sudan and is most likely to recur with such low indicators of social development and it remains a challenge to states where access to safe drinking water and adequate sanitation cannot be guaranteed. There is high need for constant testing of water, both official and unofficial water supplies, to detect where *Vibrio cholerae* (and other pathogens) may be harboring. Establishment of long term and permanent programme of prevention of waterborne diseases that includes cholera is high needed.

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