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CHOLERA IN EASTERN ZAIRE, 1978

by

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Summary — The Eastern Zaire cholera epidemic in 1978 originated in Tanzania. It was limited to the Lake areas and water played a major role in transmission of infection. Prophylactic and therapeutic measures are discussed. *Vibrio cholerae* el Tor was isolated from patients and healthy carriers. Antimicrobial susceptibility was determined.

KEYWORDS : Cholera; Zaire.

Introduction

In 1978 the Republic of Zaire officially reported a cholera outbreak (Wkly Epid. Rec., W. H. O., 1978, *53*, 189) for the first time since the current cholera pandemic reached Africa in 1970 (Barua and Cvjetanovic, 1970). Since 1971 cholera outbreaks were reported from neighbouring Sudan, Uganda, Tanzania and Angola (Stock, 1976).

Although never reported, a minor cholera epidemic is known to have occurred in 1973 in Mayumbe, the coastal region of Zaire. This outbreak was thought to be an extension of a simultaneous epidemic in Angola (Wkly Epid. Rec., W. H. O., 1973, *48*, 7). Five years later cholera reappeared in Zaire. A first outbreak was limited to the Mayumbe area and a second one occurred in the Eastern province of Kivu. This paper discusses the epidemiology and containment of the latter.

Description of the epidemic area

Kivu is the most eastern province of Zaire and is bounded by Tanzania, Burundi, Rwanda and Uganda (Fig. 1). It is situated south of the Equator between 25° and 30° eastern longitude.

The epidemic occurred mainly along the major borderlakes (Tanganyika-, Kivu- and Ex-Edward Lake). The area is mountainous except for the Ruzizi valley. The mean day temperature varies between 18° and 25 °C, with a long rainy season (October-May) and a short dry season (June-September). The nutritional situation in general is rather poor and protein intake is insufficient.

Bukavu, Goma and Uvira are three major cities in the epidemic area. These towns have their own medical facilities whereas the rural areas are

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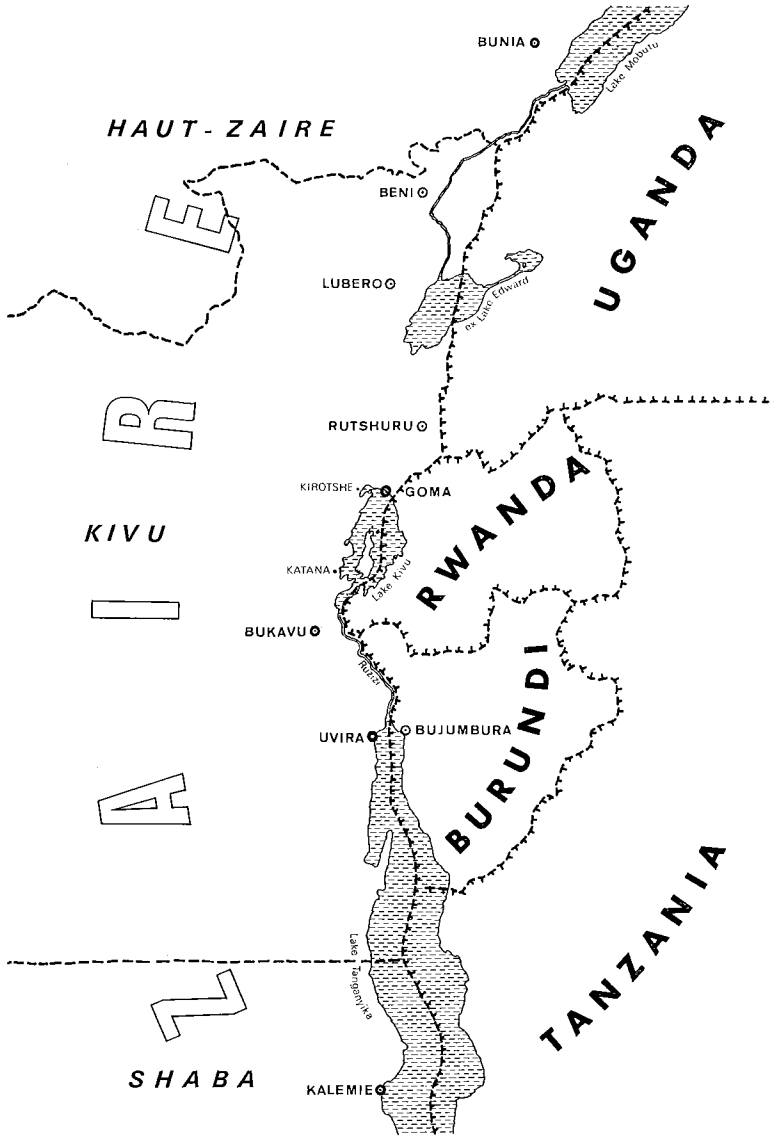

Figure 1.
Map of the area involved by cholera during 1978.

covered by health centers depending on a few hospitals. The different medical districts are :

— the city of Uvira with the rural areas of Ubembe and Ruzizi (± 300.000 inhabitants);

— the city of Bukavu (± 200.000 inhabitants);

— the rural area between Bukavu and Katana, covered by the hospital of Katana (Fomulac : Fondation Médicale de l'Université de Louvain en Afrique Centrale) (± 200.000 inhabitants);
— the rural area between Katana and Goma, covered by the hospital of Kirotshe (Cemubac : Centre médical de l'Université de Bruxelles en Afrique Centrale) (± 120.000 inhabitants);
— the city of Goma (± 70.000 inhabitants);
— the region north of Goma depending on the cities of Rutshuru, Lubero and Beni (± 800.000 inhabitants).

Definitions and methods

A cholera case was defined as a person presenting with acute diarrhea in an area where bacteriologically proven cholera occurred. A cholera death was a person who died from dehydration in an area where bacteriologically proven cholera occurred.

A healthy carrier was a person out of whom *Vibrio cholerae* was isolated without any symptoms of diarrhea. For this purpose 105 healthy persons were examined in a village of about 500 inhabitants where 4 clinical cases of cholera had occurred two days earlier.

At the beginning of the epidemic, morbidity and mortality were not regularly recorded. Later on, an investigation about mortality and morbidity in health centers and mortality in villages was carried out by questioning medical assistents and village chiefs. From July on morbidity and mortality were recorded as far as possible in all health centers and villages every week or two-week period.

Current methods (W. H. O., 1974) were used for the isolation and identification of *V. cholerae* el Tor from patients and healthy carriers. Stool specimens were collected with a rectal swab and transported in alcaline peptone water to the laboratory where they were streaked on TCBS plate. Sucrose fermenting colonies were put on Kligler Iron Agar and Sulfite Indole Motility media. Suspected cultures were tested for oxidase and indole production and agglutinated with specific antisera.

For the isolation of *V. cholerae* from the environment, water was sampled in recipients containing tenfold concentrated alcaline peptone water (Barua, 1974). Further procedures were as described above.

Minimal inhibitory concentrations (MIC) of 6 commonly used antibiotics (Ampicilline, Tetracycline, Chloramphenicol, Cotrimoxazole, Sulfafurazole and Sulfadoxine) were determined for 71 strains isolated in Zaire and Rwanda. Susceptibility testing was done as described by Washington and Barry (1974). The test medium was Mueller-Hinton Agar (Oxoid). *Escherichia coli* ATCC 25922 was simultaneously tested. The final inoculum was approximately 10^3 colony forming units. The MIC was the lowest concentration of antimicrobial (mg/ml) which gave complete macroscopic inhibition of growth.

Prophylactic measures and treatment of patients

As the stock of vaccine was limited, the number of exposed people enormous and the time lacking, classical intramuscular or subcutaneous vaccination was abandoned in favor of intradermal mass-vaccination, mostly with Ped-O-Jet (doses of 0.1 ml in children and 0.2 ml in adults were used).

Fluids for oral and intravenous rehydration were locally prepared in Bukavu, Lwiro, Katana and Goma. Oral rehydration fluids were pasteurised and distributed in beerbottles; used bottles for intravenous rehydration were recycled and reintegrated in the production.

Health centers were reorganized and adapted to the epidemic situation. Special beds for cholera patients were locally constructed and were easy to dismount to facilitate disinfection and transport. Special attention was given to the training of nursing staff and standardised treatment schemes were distributed. Meetings were organized to divulgate information to the population, especially about the importance of hygienic measures.

The continuous supply of treatment centers, particularly in rural areas, was often difficult because of an important shortage of fuel and the sudden appearance of new epidemic foci.

Treatment of patients was classical : oral and intravenous rehydration, correction of acidosis and hypopotassemia, administration of an antibiotic (mostly tetracyclin). Nursing staff and contacts of patients received prophylactic sulfadoxine.

Results

The first patient in this epidemic was a fisherman who crossed Lake Tanganyika, coming from Tanzania. He died in Kalemie, a major port in northern Shaba. His death on May 12th and the funeral that followed, started an epidemic of 312 cases and 96 casualties within one month in the Kalemie area.

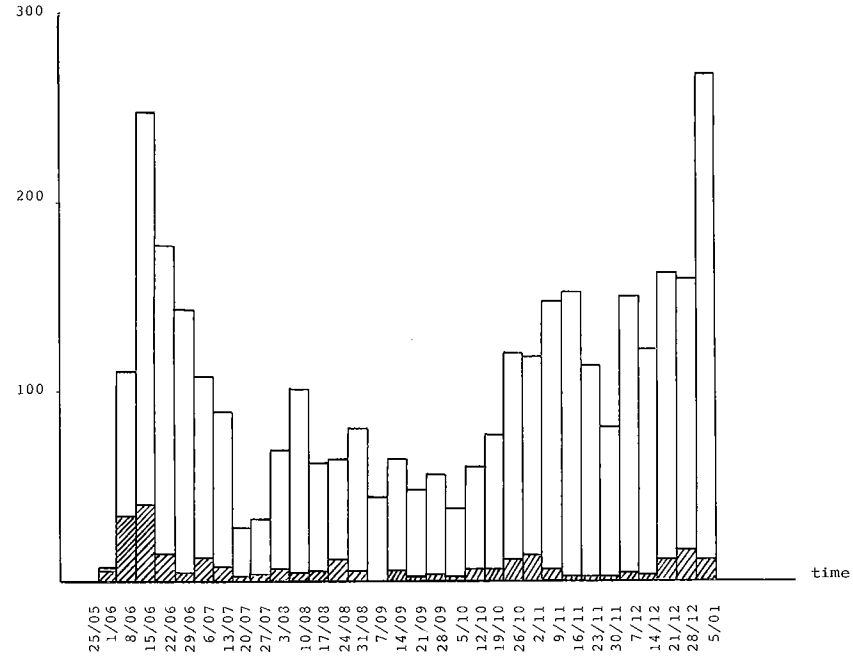

Figure 2.
Morbidity (3.295 cases) and mortality (258 cases) as recorded weekly in treatment-centers in the Uvira, Ruzizi and Ubembe area, between 25 May 1978 and 5 January 1979.

A second focus started on May 22nd in Uvira. As the local medical staff was not prepared to face the epidemic, it spread rapidly from Uvira to the neighbouring villages in the Ruzizi valley between Uvira and the Rwandan border. It also spread to the Ubembe area south of Uvira. Fig. 2 presents morbidity and mortality figures for these areas, as registered in health centers between May 25th 1978 and January 5th 1979. As many ill villagers never went to health centers, Fig. 2 does not present the real situation for the area.

The medical staff of the city of Bukavu was alerted by the Kalemie and Uvira outbreak and measures were taken to protect the city. The population south of the city was vaccinated first. Later on, when a sufficient supply of vaccine became available, the whole cholera-threatened zone was vaccinated.

The first cholera case in Bukavu was reported on June 25th and was immediately treated in a well equiped center. Fig. 3 gives the morbidity and mortality figures in Bukavu between June 25th 1978 and January 1st

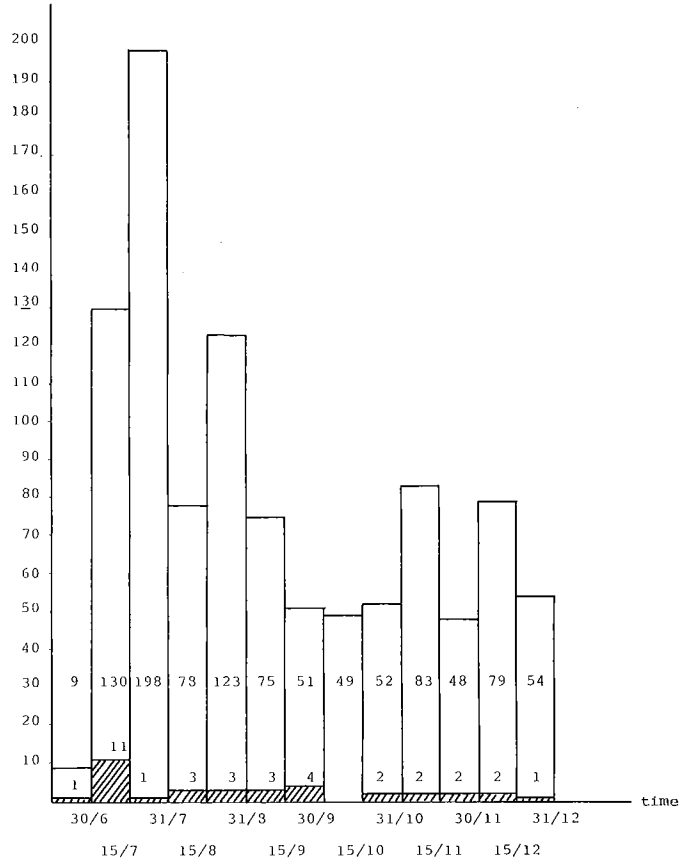

Figure 3.

Morbidity (1.029 cases) and mortality (35 cases) of cholera at Bukavu, between 25 Juny 1978 and 31 December 1978.

TABLE 1

Morbidity and mortality data for the Uvira-Ruzizi-Ubembe, the Bukavu and the Katana area

	Uvira-Ruzizi-Ubembe	Bukavu	Katana
Period	25.05.1978 - 5.01.1979	25.06.1978 - 31.12.1978	07.1978 - 11.1978
Estimation of exposed population	300,000	200,000	200,000
Number of cholera patients treated in health centers	3,295	1,029	4,500
Percentage of population treated in health centers	1.1 %	0.5 %	2.25 %
Mortality in health centers	258	35	145
Percentage of mortality of treated patients	7.8 %	3.5 %	3.2 %
Mortality in villages	252	15	29
Total mortality/1,000 inhabitants	1.7 ‰	0.25 ‰	0.87 ‰

1979, by two-weeks periods. Very few cholera patients were recorded in suburbs where piped water was available.

On July 2nd, the hospital of Katana reported its first cholera patient. The man had travelled to Uvira to collect his pension-money, and had probably been infected during his journey. His death started the epidemic-wave that hit Katana, spread to the islands of Lake Kivu, later on to Rwanda and also in northern direction. Between July and November 1978 4.500 patients were reported in this area of whom 145 died in health centers; 29 additional deaths were recorded in the villages. Morbidity was fairly high on the islands of Lake Kivu : 80 per 1.000 inhabitants on the islands Ibinja and 95 per 1.000 inhabitants on Iko.

Table 1 summarises morbidity and mortality in these three areas.

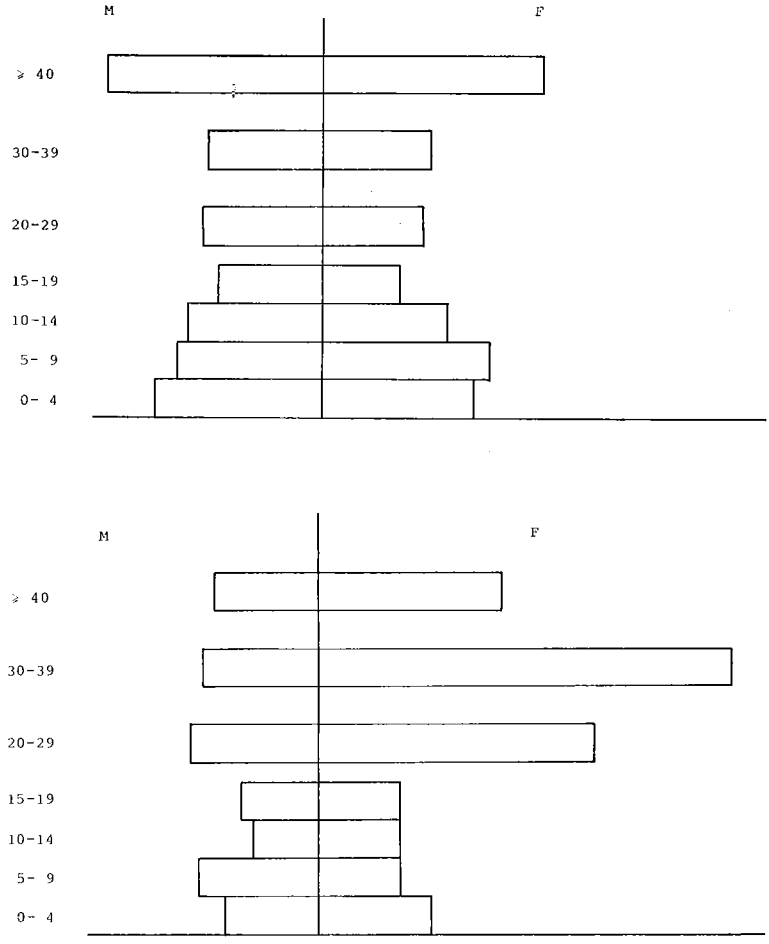

Figure 4.

Population structure at Bukavu (after Vis *et al.*, 1969).
Cholera cases at Bukavu, 1978.

North of Katana, in the area controlled by the Kirotshe hospital more than 2.000 cases were treated in health centers between July 31st and September 6th 1978. Fourty eight of these patients died and 190 additional cholera deaths were recorded in villages in the same period. On August 27th the epidemic reached Goma and spread north of this city.

From December 20th on, cases were reported from the area west of Lake Mobutu in the province of High Zaire. This epidemic was probably imported from Uganda. Cholera reached the city of Kisangani on the river Zaire in March 1979.

In the whole Eastern Zaire epidemic area adult women had more frequently cholera than the other population groups. Figure 4 gives morbidity by age and sex for Bukavu as compared to the population structure of this city (Vis *et al.*, 1969).

Despite poor laboratory equipment, the epidemic was confirmed bacteriologically very soon after its outbreak. *Vibrio cholerae* biotype el Tor serotype Ogawa was isolated from the stools of several patients. The laboratory always tried to confirm outbreaks in newly involved areas.

After October 15th not only serotype Ogawa but also serotype Inaba and Hikojima were isolated (Colaert, Goyens & Schyns, 1978). Although serotype Inaba occurred in Mayumbe, it is supposed that seroconversion occurred rather than importation of a new serotype.

MIC's of antibiotics tested are summarised in table 2. It appears clearly that no resistance was found to these antimicrobials contrary to observations in Tanzania (Mhalu, Mmari & Ijumba, 1979; Colaert *et al.*, 1979).

TABLE 2

Minimal inhibitory concentration (M. I. C.) for 71 strains of *V. el Tor* isolated during 1978 in Zaire and Rwanda

	M. I. C. (mg/ml)								
	0.25	0.5	1	2	4	8	16	32	64
Chloramphenicol		71							
Tetracycline		71							
Ampicilline				44	27				
Cotrimoxazole	71								
Sulfafurazole					50	21			
Sulfadoxine							37	34	

Fifteen healthy carriers were detected within the group of 105 examined persons. Thus for every patient there were 18 healthy carriers.

Out of the 70 samples of surface water taken around the city of Bukavu *V. cholerae* was isolated 12 times. Non agglutinating vibrio's were found in 9 instances, all from *V. cholerae* negative specimens.

Discussion

Although the first cholera outbreak in Zaire in 1978 appeared in Kalemie, there seems to be no relation between the Kalemie and Uvira epidemic. It is more likely that the Uvira outbreak originated in Bujumbura (Burundi) where cholera was reported at that time (Wkly Epid. Rec.,

W. H. O., 1978, *53*, 162). The intensive traffic between these two border towns certainly favored importation of cholera in Zaire.

The high mortality in the health centers in the Uvira, Ubembe and Ruzizi areas (7.8 percent) compared to Bukavu (3.5 percent) and Katana (3.2 percent) can be explained by the fact that the Uvira medical staff was not at all prepared to face an epidemic while in Bukavu and in Katana most health centers were sufficiently equiped when the first cases occurred, and were able to treat with little material restrictions. This lack of treatment facilities in health centers in the Uvira, Ubembe and Ruzizi area also explains the high mortality in the villages : as the population remarked that health centers could not provide sufficient treatment, many patients stayed home and died without any medical assistance. This also explains why such a small percentage of this population was admitted for treatment in health centers. Figure 2 clearly illustrates that the highest mortality occurred at the beginning of the epidemic and fell rapidly once urgency measures were taken. It is impossible to evaluate the effects of vaccination and prophylactic use of antibiotics.

That only 0.5 percent of the Bukavu population sought treatment can partially be explained by the fact that most part of the city is supplied with tapwater and that these parts stayed almost free of cholera. *V. cholerae* was only isolated from samples taken near areas where no central water distribution exists. This corresponds to the poorer neighbourhoods in the city.

The water-borne mode of transmission is also illustrated by the restriction of the major epidemic foci to the Lake areas. (*V. cholerae* was isolated from 12 out of 70 samples of surface water). The alcaline pH from the lake water certainly favors surviving of *V. cholerae* while this pH is more acid in inland-rivers. The higher morbidity in adult women could also be explained by the more frequent contact they have with surface water while performing domestic duties.

The absence of resistance to antibiotics in Zaire, as opposed to Tanzanian observations, can be explained by a decrease in selective pressure. Plasmids coding for drug resistance in *V. cholerae* are known to be labile (Rahal, Gerbaud and Bouanchaud, 1978). Prophylactic antibiotics were not widely used in Zaire and were limited to long-acting sulfonamides, whereas in Tanzania tetracyclines were intensively used. The introduction of cholera in major urban agglomerations in Zaire with widespread antibiotic abuse might favor the emergence of multiple drug resistant strains. However unlike in infections with other microorganisms, antibiotics are not essential in the treatment of cholera.

L'épidémie de choléra à l'Est du Zaire en 1978.

Résumé — L'épidémie de choléra à l'Est du Zaire en 1978 fut introduite à partir de la Tanzanie. Les foyers les plus importants étaient situés à proximité des grands lacs et il fut établi que l'eau contaminée jouait un rôle important dans la transmission de l'infection. Les mesures de prophylaxie et de traitements sont exposées. La sensibilité aux antibiotiques de *Vibrio cholerae* el Tor est déterminée.

De cholera epidemie in Oost-Zaire, 1978.

Samenvatting — De cholera epidemie is Oostelijk Zaire in 1978 vond zijn oorsprong in Tanzanië. De belangrijkste epidemische haarden bleven beperkt tot het gebied van de grote meren en besmet water lijkt een belangrijke rol gespeeld te hebben in de ziekte-overdracht.

Profylactische en curatieve maatregelen worden besproken. Aandacht wordt gegeven aan het opsporen van gezonde kiemdragers en antibiotica-gevoeligheid.

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