

A Cholera Epidemic in North Sumatra, Indonesia

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ABSTRACT

Epidemiological aspects on an outbreak of cholera at North Sumatra Province, Indonesia, in 1978 and 1979 were analyzed. The epidemic started at Nias island on March 1978, spread to the main area of the province until the beginning of 1979 and returned to Nias along the highways. A total of 23,900 cases of clinical cholera was reported in which 1,110 died by the 30th week of 1980. *Vibrio cholerae* eltor Ogawa strains were isolated from the cases reported in 1978 while eltor Ogawa and Inaba strains were isolated in 1979.

North Sumatra Province is located at the northern part of Sumatra island in Indonesia with an area of 72.7 km² and a population of about 7.5 million. Nias and small islands lie in Indian Ocean. The area is included in the climate area of tropical rain forest which is not clear in distinction of the dry and rainy seasons. Drinking water is provided mainly from shallow wells and rivers. Two highways pass through the province.

An epidemic of cholera started at Nias island on March 1978 and spread to the main area of the province. Records on the cases were collected at Provincial Health Service of North Sumatra, Regional Health Service of Medan and Regional Health Laboratory in Medan to elucidate the epidemiological characteristics of the outbreak.

Fig. 1 shows trends of clinical and fatal cases of acute diarrhoea with vomiting suspected of cholera in the province by 2-week of onset. The clinical cases increased from the beginning of 1978 to reach a peak of 1,333 in the 5-6th week of 1979, declined to 61 cases at the last 2-week of the year and shifted to a small peak in 1980. The clinical cases reached to 23,900 in which

1,110 died by the 30th week of 1980.

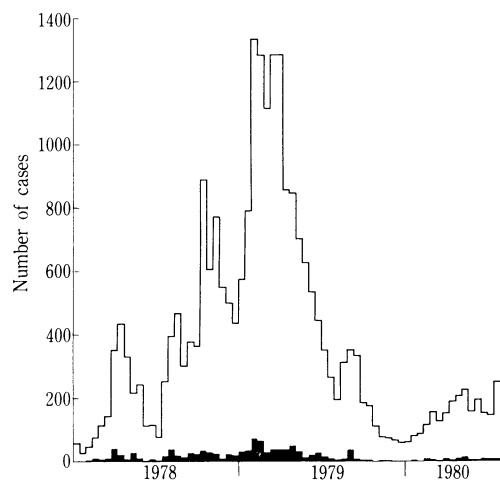


Fig. 1. Trends of clinical and fatal cases of cholera in North Sumatra Province, Indonesia, by 2-week of onset.

Fig. 2 shows trends of the clinical cases in each regency by 2-week of onset. The epidemic started on the 19th of March 1978 in Nias is-

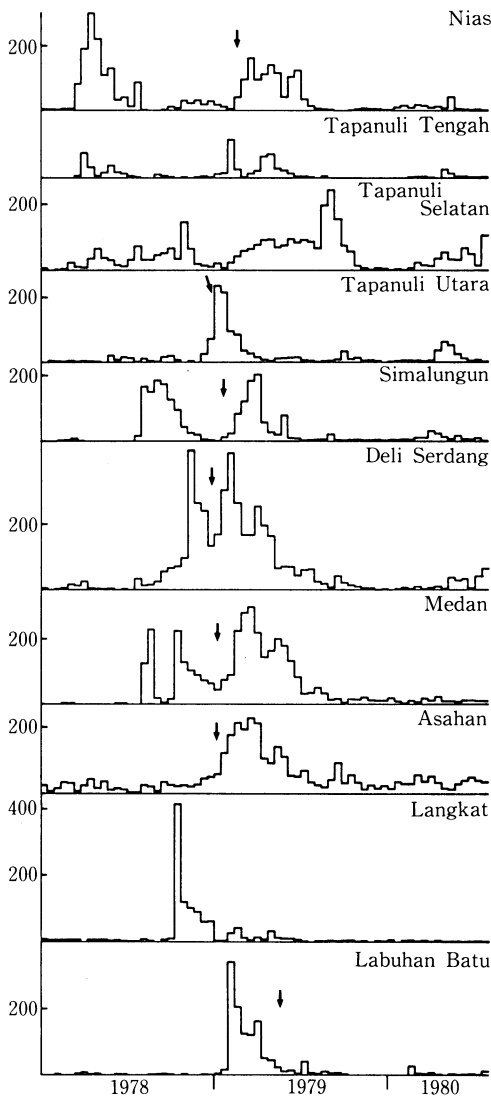


Fig. 2. Trends of clinical cholera cases at regencies in North Sumatra Province, Indonesia, by 2-week of onset.
 —▶ :The date which eltor Inaba strain was detected.

land and spread to Tapanuli Tengah at the next week followed by Tapanuli Utara, Simalungun, Deli Serdang, Medan and Langkat in order (Fig. 3). A branch of the epidemic spread from Deli Serdang to Asahan and Labuhan Batu. Another branch spread from Tapanuli Tengah to Tapanuli Selatan. The epidemic seems to have spread along the 2 highways, presumably reflected the social and economical activities of inhabitants.

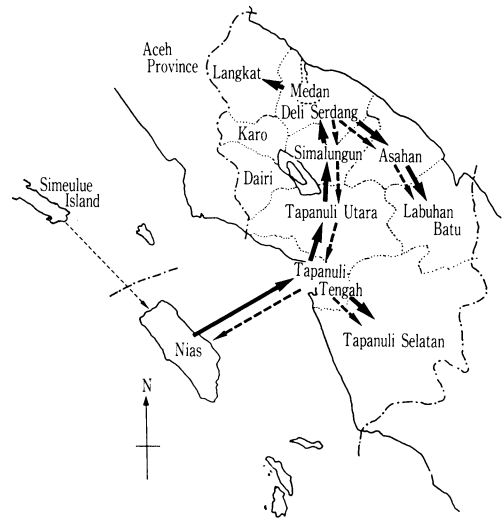


Fig. 3. Routes of transmission of cholera epidemic in North Sumatra Province, Indonesia.
 —▶ :Route of the epidemic in 1978 and 1979 associated with eltor Ogawa strains.
 - - -▶ :Route of the epidemic in 1979 associated with eltor Ogawa and Inaba strains.

Bacteriological analyses were carried out at Regional Health Laboratory in Medan using stools and rectal swabs sent from regencies (The Table). *Vibrio cholerae* biotype eltor serotype Ogawa was isolated from about 400 cases along the transfer from Nias to Deli Serdang until the first detection of *V. cholerae* eltor Inaba at Deli Serdang on the 26th of December 1978 (Fig. 2). Since the last week of 1978, eltor Inaba strains were detected consecutively with Ogawa strains at 7 regencies at approximately the same time with the onset of the second peak in each regency.

The onset of the second peak of the outbreak and the date of the first case of serotype Inaba in each regency (Fig. 2) showed the second epidemic by Ogawa and Inaba serotypes, which started at an area including Deli Serdang and Medan on the beginning of 1979 and spread to Simalungun, Tapanuli Utara, Tapanuli Tengah and Nias in order and to Asahan and Labuhan Batu in order and from Tapanuli Tengah to Tapanuli Selatan along the highways (Fig. 3). In Nias, only Inaba strains were detected consecutively at the second outbreak from February 1979. Inaba strain was not detected at Tapanu-

The Table Isolation of *V. cholerae* at the cholera epidemic in North Sumatra

	1978	1979	1980 (until 30th week)	Total
Clinical cases reported to Provincial Health Service of North Sumatra	7,616	13,995	2,328	23,939
Specimen submitted to Regional Health Laboratory in Medan	1,625	1,846	1,062	4,533
Specimen with sufficient records	1,088	1,137	1,036	3,261
Specimen positive in <i>V. cholerae</i>	417	566	129	1,112
Specimen positive in <i>V. cholerae</i> serotype Inaba	1	161	0	162

li Tengah and Tapanuli Selatan, presumably caused from insufficient specimens sent to the laboratory (The Table).

There are some endemic areas of cholera in Medan, Deli Serdang and Asahan established in 1961⁷, where sporadic cases were observed before the onsets of the new outbreaks (Fig. 2).

Source of the first outbreak in Nias was traced to an ice-producing factory in Gunung Sitori, a capital of Nias Regency, where the water was heavily contaminated with human excreta (Munthe, 1980; Master thesis). As a cholera epidemic was reported at Simeulue island in Aceh Province, about 150 km northwest from Nias island, from January till March 1978 with 480 cases and 82 deaths (Munthe, 1980; Master thesis), the organism caused the first outbreak in Nias was supposed to have been imported from Simeulue.

Sources of Ogawa and Inaba strains associated with the epidemic in 1979 were not elucidated. These strains might be imported at the end of 1978. Otherwise, Inaba strains changed from Ogawa strains at the area including Medan and Deli Serdang might cause the epidemic with the parent Ogawa strains in 1979. Antigenic changes of *V. cholerae* serotypes *in vitro*^{1,3,6} and *in vivo*^{4,5} have been observed by many workers. Phage typing of the organisms would confirm the relations between those isolated in 1978 and 1979.

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REFERENCES

1. **Bhaskaran, K. and Gorrill, R. H.** 1957. A study of antigenic variation in *Vibrio cholerae*. *J. Gen. Microbiol.* **16**: 721-729.
2. **Ogg, J. E., Ogg, B. J., Shrestha, M. B. and Poudayl, L.** 1979. Antigenic changes in *Vibrio cholerae* biotype *eltor* serotype Ogawa after bacteriophage infection. *Infect. Immun.* **24**: 974-978.
3. **Ogg, J. E., Shrestha, M. B. and Poudayl, L.** 1978. Phage-induced changes in *Vibrio cholerae*: serotype and biotype conversions. *Infect. Immun.* **19**: 231-238.
4. **Sack, R. B. and Miller, C. E.** 1969. Progressive changes of vibrio serotypes in germ-free mice infected with *Vibrio cholerae*. *J. Bacteriol.* **99**: 688-695.
5. **Sheehy, T. W., Sprinz, H., Augerson, W. S. and Formal, S. B.** 1966. Laboratory *Vibrio cholerae* infection in the United States. *J. Amer. Med. Assoc.* **197**: 321-325.
6. **Shrivastava, D. L. and White, P. B.** 1947. Note on the relationship of the so-called Ogawa and Inaba types of *V. cholerae*. *Ind. J. Med. Res.* **35**: 117-129.
7. **World Health Organization** 1971. The seventh cholera pandemic. *WHO Chronicle* **25**: 155-160.