

Cholera outbreak in Tumpat, Kelantan - 1990

Ab.Rahman Isa MBBS, MPH&TM
Assoc.Prof./Head
Dept.Community Medicine
School of Medical Sciences
Universiti Sains Malaysia
16150 Kubang Kerian, Kelantan.

Wan Mahmud Othman MBBS,DPH
Director of Medical & Health Services
Kelantan.

Azaki Ishak MD
Medical Officer of Health
Tumpat Kelantan.

Summary

Two episodes of El Tor cholera outbreak occurred in Tumpat, Kelantan between the 13th of January and the 16th of May 1990. Every case and carrier reported were investigated to determine the source and mode of transmission and to identify specific preventive measures to break the chain of transmission. There were 109 cases and 85 carriers involved in this study. The first episode of one case only was of Inaba serotype while the second episode was caused by the imported Ogawa serotype. Two foci of spread were identified from cluster occurrence but the majority of infection had no discernible link between them. The outbreak became both explosive and protracted indicating poor basic sanitation and personal hygiene. Person-to-person transmission via food and water was the main mode of spread. The Kelantan river water and river clams were confirmed sources of reservoir during the outbreak. Recommendations for prevention are intensified surveillance throughout the year,urgent upgrading of potable water supply and concerted effort in public health education especially against the use of river water and the consumption of raw food.

Keywords: Cholera epidemic, Kelantan, river water, environmental sanitation, prevention and control.

Introduction

In the first half of 1990, Kelantan was revisited by another major cholera outbreak. All the districts in the state were affected. The districts with high population density and mobility like Kota Bharu, Tumpat and Pasir Mas experienced the brunt of the outbreak.

Tumpat district is nestled in the northeastern corner of the State of Kelantan, bordering with South Thailand to the north west. It covers an area of 168.3 sq.km. and has a population of 110,127, making it the more densely populated districts of Kelantan¹. More than 90% of the population are Malays, with a smaller proportions of Thais, Chinese and Indians. The main occupations are small holding farming of tobacco, rice, vegetables and coastal fishing. Thus Tumpat is recognized as one of the economically depressed districts of Peninsular Malaysia.

Being a small district and in close proximity to Kota Bharu, the capital town of Kelantan, Tumpat is well served with road infrastructure. The government health services cover the district well with a network of health centres and rural clinics.

For a decade there has been an intense campaign for the construction of pour flush latrines. Yet, in this outbreak, Tumpat was the worst hit with the case incidence rate of 1.0/1000 population compared to 0.4/1000 population of Kota Bharu. In fact, Tumpat is considered as a particularly cholera-prone area with epidemics occurring at 1 to 3 years interval since 1983².

This study details the investigative findings of every cholera case and carrier reported in Tumpat with the aims of a) determining the source and mode of transmission of this persistent public health problem; and b) identifying specific preventive measures that could break the chain of transmission and thus, make Tumpat less susceptible to future cholera epidemics.

Materials and methods

All cases of suspected cholera infection, either symptomatic or asymptomatic were required to be notified to the district health office by phone. The patients were interviewed by investigative teams to:- i) determine one week recall of movements ii) identify persons of close contacts iii) determine one week recall of certain food intakes and iv) ascertain possible modes of transmission.

The investigative teams then followed up immediately with home visits to observe and record environmental sanitation in terms of water supply, excreta disposal, sullage and refuse disposal. They were also required to do screening procedures of contacts by inquiring for incriminating symptoms and by taking rectal swabs. Samples of water supply and food whenever indicated, were taken for bacteriological analysis. All bacteriological samples were transported to the laboratory in alkaline peptone water. The receiving laboratory would reculture the specimens after 24 hours incubation on thiosulphate citrate bile sucrose agar (TCBS) followed by Vibrio cholerae serotyping if positive.

During the same visit, the investigative teams instituted preventive measures. Wells were chlorinated in the vicinity of the case. Disinfection of houses were carried out by spraying lysol solution 1:20 dilution of critical areas such as kitchens, toi lets, drains and well surroundings. All case contacts were given chemoprophylaxis of oral doxycycline 200 mg. stat to be taken in the presence of the investigators. Informal health education was given on an individual basis, focussing on personal and food hygiene, the importance of water supply and waste disposal. If there was any positive case after the screening, the investigative team would return to persuade the case for isolation by hospital admission.

Results

Case incidence: There were 2 distinct epidemic episodes of cholera in Tumpat in 1990. The first episode of one case only occurred on the 13th of January, was caused by El Tor cholera of Inaba serotype. After a lull period of about 2 months, a second episode of major proportion began on the 16th of March and ended by the 9th of May. The first and the last carriers were detected on the 23rd of March and 16th of May respectively. The organism isolated in all the specimens submitted to the laboratory were of the Ogawa serotype. The Moslem fasting month of Ramadhan commenced on the 23rd of March, almost 2 weeks after the epidemic was declared and lasted until the 26th of April, after which the epidemic tailed off. The total cases reported were 108 and

85 carriers were identified by case detection, giving a case-carrier ratio of 1:0.8 (Fig.1). There was only 1 death - an elderly lady who was admitted late with severe dehydration.

Foci of spread: Although the distribution of cholera cases were widespread throughout the district, the worst hit areas were riverine villages especially around Kampung Sungai Pinang and Kebakat and the Tumpat municipality. Fig.2 indicates the links of 15 cases with 2 carriers identified from the Tumpat main market. All these cases gave a history of eating foods sold by the 2 carriers who were vendors in the market selling rice dishes, vermicelli dishes (laksa) and sweet cakes (kuih). None of the food samples taken gave a positive vibrio growth, although they were positive when cultured for coliform organisms. The possible spread from 2 carriers who were food vendors selling from makeshift outlets in Kampung Sungai Pinang is shown in Fig.3. These vendors received their supplies for sale from a food preparer who was also a confirmed carrier. Eighteen cases gave a history of having eaten rice dishes (nasi lemak, nasi berlauk, nasi kerabu) from these 3 foodhandlers. Again, none of the food samples gave a positive culture for vibrio. The rest of the cases investigated did not show a common source of transmission.

Fig. 1: The incidence of reported cholera cases in Tumpat - 1990

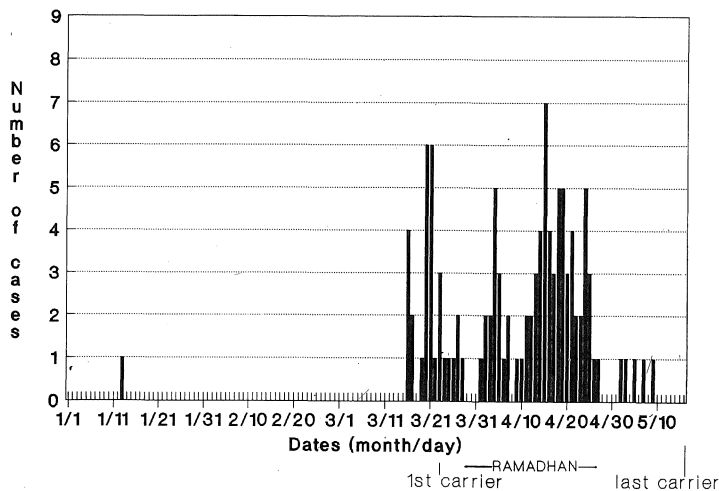


Fig.2 : Focus of spread of cholera in Tumpat Municipality

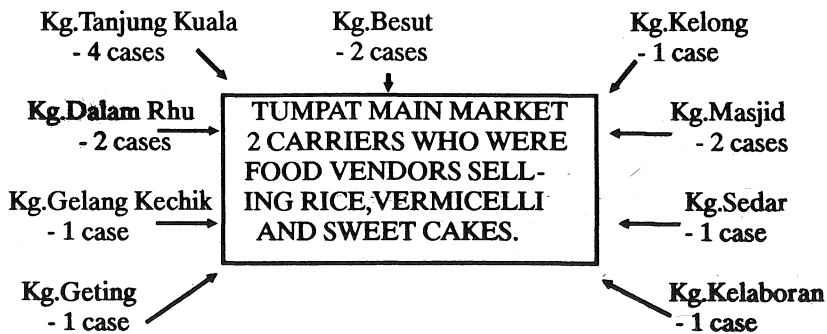
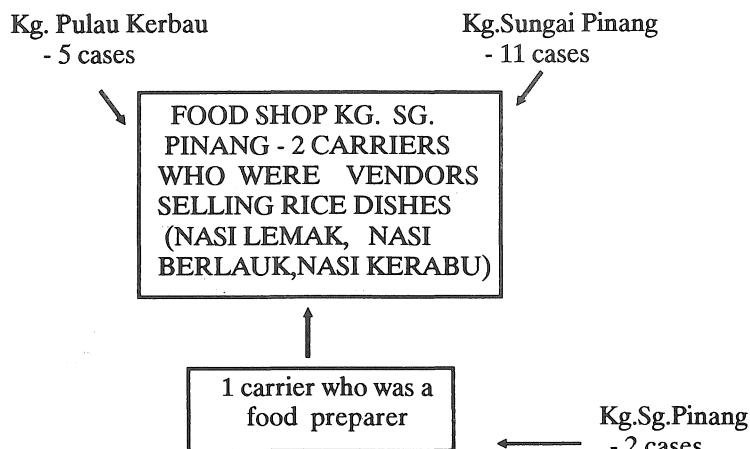


Fig.3 : Focus of spread of cholera in Sungai Pinang



Source of contamination: Table 1 shows the type of water supplies and toilet facilities subscribed by both cases and carriers. Safe water supplies were considered only from 2 sources. They were either tap water supplied by the Public Works Department or water from covered wells, which were pumped into overhead tanks that redistributed the water to houses by gravity. All other supplies were therefore, considered unsafe for they were easily subjected to external contamination. Only 33 (17.0%) of the cases had access to safe water supply and 8 of them were obtaining river water for consumption.

Toilet facilities of at least the pour flush type (Jitra bowl or equivalent) were considered sanitary. Among the cases and carriers, 177(91.2%) were using sanitary toilets. These figures reveal the imbalance between the proportion of cholera infected persons who enjoy safe water and the availability of sanitary toilets.

Table 1
Water supplies and toilet facilities
among cholera infected persons

Cholera infect- ed persons	Water supplies					Sanitary toilets (%)
	PWD	OHT	open well w/out pump	open well with pump	river	
Cases	20	2	25	61	1	96(88.1%)
Carriers	11	0	30	37	7	81(95.3%)
Total	31	2	55	98	8	177(91.2%)

n = 194

key: PWD = Public Works Department

OHT = Overhead tank

Bacteriological analysis of all samples taken is presented in Table 2. Eight percent of the water sampled from wells and rivers grew *Vibrio cholerae*, implicating 31 wells and 12 sampling points

of the Kelantan river. Food handlers who conducted business in local authority areas were found to have a 0.6% carrier rate. Active case detection revealed a carrier rate of 0.3%.

None of the food samples taken gave a positive result for vibrio growth.

Table II
Vibrio cholera isolation in
water, food, and stool samples

Sources of sample	Samples examined	Samples positive	Percent positive
Water from wells&rivers	640	51	8.0%
Foods	380	0	0.0%
Food handlers' stools	1059	6	0.6%
Case detection(stools)	11575	33	0.3%

Comments

Since 1983, Tumpat has experienced 5 epidemics². All 4 previous epidemics, the *Vibrio cholerae* El Tor, Inaba serotype was implicated, but the recent epidemic was caused by the Ogawa serotype. The single case that occurred on the 13th of January was probably of indigenous strain and the epidemic that followed in the second episode was caused by imported strain, the origin of which remains uncertain.

The outbreak was both explosive and protracted, indicating that the overall basic sanitation and hygienic behaviour of the people was grossly favourable for cholera transmission. Otherwise, one would expect the epidemic to be localised and self-limiting. The intervening dry fasting month of Ramadhan, during which food sale activities were at an all time high aggravated the situation. Another peculiar food safety practice during Ramadhan in Kelantan are that storage periods for food between preparation and consumption are significantly longer and storage of food at ambient temperature is very common⁵.

The case to carrier ratio for El Tor cholera is expected to be 1:25 to 1:100⁶. In this outbreak the number of carriers detected was smaller than the number of cases. A more aggressive screening by rectal swabs or stool samples by active and passive detection was needed. Rectal swabs on the spot were met with many instances of resistance as experienced by the investigators. A compromised solution was to leave the alkaline peptone water media with the subjects to be collected at a more convenient time but this procedure was grossly unreliable.

The case fatality rate was low. The overall prognosis was excellent whenever those with symptoms were admitted early in the course of the disease. The treatment regime of fluid and electrolytes with chemotherapy of doxycycline proved effective.

The area distribution of cholera cases and carriers again confirmed the explosive and protracted nature of the epidemic. Figs. 3 and 4 illustrate the common sources and vehicles which connected clusters of cases and carriers identified within a period of 1 week at Kampung Sungai Pinang and Tumpat municipality. The protracted pattern occurred simultaneously with few cases

reported per day or week over several weeks and they were well dispersed throughout the district without any discernable link between them. When there are clusters of occurrence, every effort should be made to identify the common source for control measures are very effective as illustrated by the Broad Street Pump epidemic described by John Snow in London in 1854.

The campaign for better environmental sanitation has shown marked improvement in the coverage of sanitary toilets. For the whole district, the Health Inspectorate reported an 80.7% household coverage for toilet but only 31.6% coverage of safe water supply². Among the cases and carriers, the stark discrepancies between sanitary toilet coverage of 91.2% and safe water supply coverage of 17.0% was obvious. Indiscriminate waste disposal especially into rivers and waterways was evident in the course of the investigation amongst riverine dwellers without sanitary toilet. Among those without safe water supply, 5.2% used river water for all needs. Furthermore, 12 sampling points along the Kelantan river grew Vibrio cholera. In this outbreak Kelantan river played a major role as a reservoir for transmission as seen in a high density of infection in riverine villages. The importance of an abundant safe water supply could not be overemphasized in preventing or controlling cholera epidemic.

Although routine screening among high risk groups yielded small proportions of positivity in this instance, it has to be done persistently in view of the expected high ratio of healthy carriers to every case reported. Laboratory reinforcement must be called for so that case detection activities are not curtailed by backlog in laboratory processing during epidemic. Uncontrolled cholera epidemic due to unidentified reservoir in healthy carriers would cast an unfavourable impression on Public Health Authority. Cost effective consideration is clear in this case for there is no other cheaper alternative in interrupting 'silent' transmission.

Food microbiological analysis was disappointing but the high coliform contamination correlated with poor food hygiene practices. In the adjacent district of Pasir Mas, samples of fresh water clams known locally as 'etok' eaten salted and sun-dried, grew Vibrio cholera on culture. During the 1987 epidemic, 'etok' obtained from Tumpat and Kota Bharu districts was also implicated³. Vibrio cholera viability on most food items at room temperature is usually 1 to 5 hours. In certain food items like milk products, wet raw vegetables, the organism can survive up to 7 hours or more⁶. Therefore, food items such as ice creams and 'nasi kerabu' which includes a combination of raw leafy vegetables (ulam) should be given due importance during sampling.

In this epidemic, there is sufficient evidence to conclude that there was widespread person-to-person transmission via the vehicles of water and food.

We would like to put forward the following additional measures to strengthen the existing preventive strategies.

In cholera prone areas like Tumpat, all cases seen or admitted as acute gastro-enteritis in health facilities must be screened for vibrio infection by stool culture throughout the year as part of the intensified surveillance.

The upgrading of potable water supply to this district is of topmost priority.

The use of waterways, irrigation canals and rivers as a source of water supply, for bathing in which gargling is inevitable, and for washing of raw food such as the cleansing of slaughtered chicken or beef should be discouraged by intensified public health education.

The consumption of raw foods such as 'etok' and 'nasi kerabu' has become a deeply entrenched habit amongst the Kelantanese Malays. The campaign against eating these foods could be highlighted during epidemic by harnessing the cholera-phobia for greater effect.

Because of the high traffic in food trade across the border between Kelantan and South Thailand, there should be a communication channel for information sharing in the surveillance of cholera. If one country is facing an epidemic, the other should be alerted immediately for preventive action.

Acknowledgement

The authors are deeply indebted to Mr. Azuddin bin Ab. Rahman for assistance in computer graphics and typesetting.

References

1. Annual report Tumpat health services. Tumpat 1989.
2. Laporan lengkap kejadian wabak taun di jajahan Tumpat, Kelantan. Health Office Tumpat 1990.
3. Report of the cholera outbreak in the State of Kelantan, Feb. to July 1987. Department of Medical and Health Services, Kota Bharu Kelantan 1987.
4. Plan for action for cholera control during epidemic for use by Medical and Health Department. Kota Bharu, Kelantan.
5. WHO Principles and Practice of cholera control. WHO Public Health paper no.40. Geneva 1970.
6. Apiwathnasorn C., Vilainerun D., Watson C. Food safety practices in Kelantan. Master of Tropical Health dissertation. Univ. of Queensland. Univ. Sains Malaysia. Kelantan 1990.
7. Killewo JZ, Amsi DM, Mhalu FS. An investigation of a cholera epidemic in Butiama village of the Mara region, Tanzania. *Jour. of diarrhoeal diseases res. Bangladesh* 1989, 13-17.
8. Swaddiwudhipong. W, Akarasewi P, Chayanayodhin T, Kunasol P, Foi HM. Several sporadic outbreaks of EITor cholera in Sunpathong, Chiang Mai, 1987. *our. Med. Assoc. Thai* 1989, 72 (10), 583-8.
9. Lowry PW, Pavia AT, McFarland LM et al. Cholera in Louisiana. Widening spectrum of seafood vehicles. *Arch Intern Med.* 1989, 149 (9), 2079-84.
10. Baveja CP et al. Bacteriological study of drinking water during epidemic of cholera in Delhi. *Jour. Communicable Disease (India)* 1989 21 (1), 59-61.
11. Mill CJ, Feachem RG, Drasar BS. Cholera epidemiology in developed and developing countries; New thoughts on transmission, seasonality, and control. *The Lancet* 1985 (i); 261-263