

TRANSMISSION OF INFECTION AMONG HOUSEHOLD CONTACTS OF CHOLERA PATIENTS IN THE 1978 OUTBREAK IN PERAK

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SUMMARY

In the outbreak of cholera in Perak in 1978, a study on 179 cholera patients (cases) from 8 health districts in the state indicated that those afflicted with the disease were from the rural areas, belonged to the lower socio-economic class and had little or no formal education. Under such conditions, it is expected that personal hygiene may not be satisfactory and person to person contact could play an important role in the transmission of the disease especially among those living in close contact. 34.2 percent of the 164 households of the cholera patients contained infected household contacts. From 1 to 6 infected household contacts per household were found for household size ranging from 2 to 18. Ninety-five (8.6 percent) of the total 1101 household contacts were infected. Only 8 of these 95 infected household contacts developed clinical symptoms giving a ratio of 1 : 12 symptomatic to inapparent infections. While most of the contacts probably acquired their infection from the patient who constitutes the index case, the role of the asymptomatic carrier in the transmission of infection cannot be underestimated.

INTRODUCTION

The outbreak of cholera in Malacca in May 1963

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marked the extension of the seventh cholera pandemic into Peninsular Malaysia and the beginning of a long period of endemicity of El Tor cholera in Peninsular Malaysia. From 1963 to 1978, cholera had been reported almost yearly in Peninsular Malaysia (Figure 1) with major

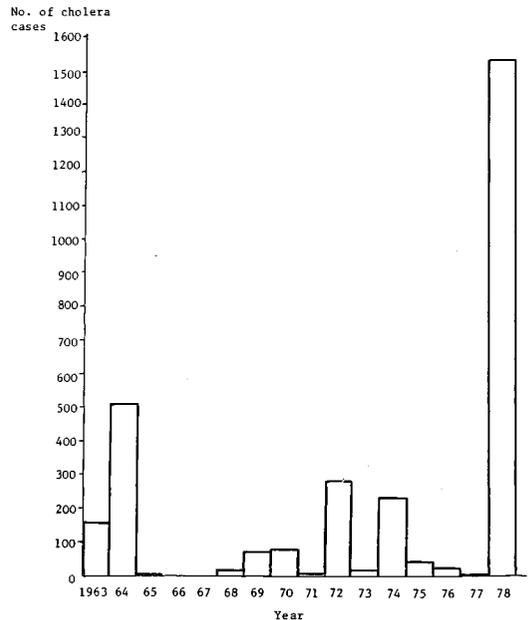


Fig. 1 Cases of Cholera Reported in Peninsular Malaysia (1963-1978)

outbreaks occurring in 1972, 1974 and 1978. In 1978, the largest number of cases was reported: there were 1,536 cases and 62 deaths, this being a sharp rise in the number of cases reported

compared with the previous year. Of all the states of Peninsular Malaysia, Perak ranked third in the number of cholera cases. A total of 228 cases was reported in this state in 1978.

Outbreaks of cholera in Peninsular Malaysia have been associated with river pollution from human excreta and the fact that river water is usually the source of water supply for all purposes in the rural home (Chen 1970, Chen 1971). Outbreaks have tended to occur in the dry season when many are forced to use river water. The disease is more prevalent amongst people living in the rural areas and is associated with cultural habits, lack of formal education, unsanitary water supply and poor environmental sanitation (Bhagwan Singh, 1972). This paper examines the environmental conditions from which cholera patients come and the transmission of infection among household contacts of people living under such environmental conditions.

STUDY AREA

This study covers 8 health districts in Perak: Kuala Kangsar, Krian, Selama, Larut and Matang, Kinta, Perak Tengah, Hilir Perak, Batang Padang and Dindings. It excludes Hulu Perak the most remote district in the north (Figure 2). The area under study covers about 5,576 square miles and the estimated population for the 8 health districts under study in 1978 was 1,825,258.

METHODOLOGY

A total of 195 cases of cholera was notified by telephone to the health offices of the 8 health districts from mid-March to the end of December in 1978. Upon notification, trained health personnel under the overall supervision of the medical officer of health of each of the districts were sent out to investigate the case. The investigation report of the public health inspector on each case of cholera was made on the form "MR and HS 8/64". These forms "MR and HS 8/64" are issued by the Medical Records and Health Services of the Ministry of Health for the investigation of cholera cases and carriers. Investigation included rectal swabbing of

all household contacts. (Household contacts refer to all persons eating and sleeping in the same dwelling unit as the patient).

Of the 195 notified cases, 179 of the investigation reports were located by the writer for case tracing and analysis. All 179 cases had been hospitalized and were bacteriologically confirmed by the Institute of Medical Research (IMR) at Ipoh. The rectal swabs of the household contacts were also sent for bacteriological examination at the IMR,

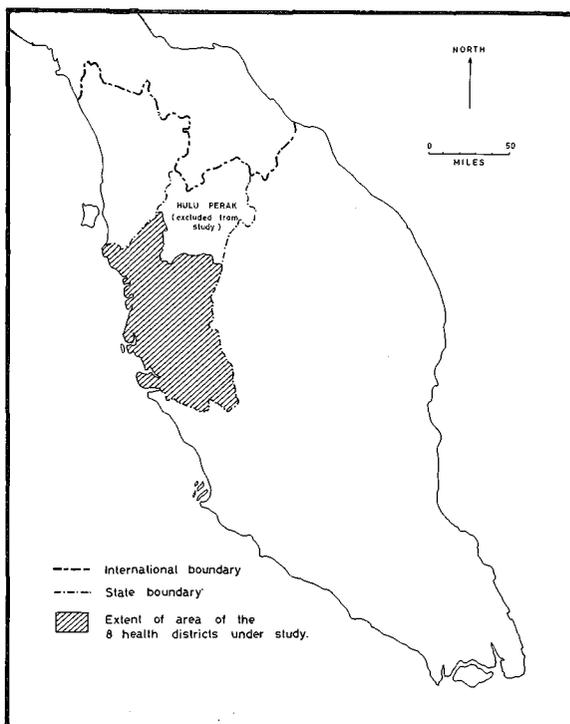


Fig. 2 Map of Peninsular Malaysia showing locations of study area

Ipoh. The transport media used was alkaline peptone water. The cholera vibrios of both cases and carriers were confirmed as E1 Tor. All were of the Ogawa serotype.

FINDINGS

The 179 cases came from 171 households. To provide some background information as to who the people afflicted with the disease are, the water supply, the excreta disposal systems and the occupations of the cases are analysed.

Table I shows the source of water used for consumption. An analysis of the type of water supply used for consumption by the households under investigation showed that 121(70.8 percent) of the households had treated pipe water. If protected well water is also considered as water of satisfactory sanitation, 125(73.1 percent) of households would be deemed to have satisfactory water supply. This leaves 44(25.7 percent) of households as using water of doubtful sanitation. In 2(1.2 percent) of households, the type of water supply used for consumption was not stated. It should be noted that among those who were provided with treated pipe water, some were unable to get a continuous supply of tap water. In times of drought, there was water rationing and this meant that some villages had to resort to using water from sources of dubious sanitation. It was also noted that 58(34.7 percent) of all households with cases did not boil their drinking water.

TABLE I
SOURCE OF WATER FOR CONSUMPTION AMONG HOUSEHOLDS WITH CASES

Source	Number of Households	% of Households
Treated piped water	121	(70.8)
River	24	(14.0)
Unprotected well	10	(5.9)
Irrigation drain	5	(2.9)
Protected well	4	(2.3)
Others (spring or waterfall)	4	(2.3)
Unknown	2	(1.2)
Untreated piped water	1	(0.6)
Total	171*	(100.0)

* The 179 cases came from 171 households

Table II shows the type of water supply used for bathing and washing. It will be seen that river water and water from irrigation canals were the second most common source of water for bathing and washing.

Table III shows the types of latrines used in the 171 homes. If the pour flush, pit, water-closet, bucket and bore-hole latrines are taken to be satisfactory means of excreta disposal, it will be

TABLE II
SOURCE OF WATER FOR BATHING AND WASHING

Water supply for bathing and washing	Number of households	% of households
Treated piped water	75	43.9
River/Irrigation canal, Waterfall	64	37.4
Unprotected well water	20	11.7
Unknown	5	2.9
Protected well water	4	2.3
Rain	2	1.2
Untreated piped water	1	0.6
Total	171	100

TABLE III
TYPES OF LATRINES USED BY HOUSEHOLDS

Type of latrine	Total	% of household
Pour flush	31	(18.1)
Pit	16	(9.4)
Water-closet	7	(4.1)
Bucket	7	(4.1)
Bore-hole	5	(2.9)
Overhung latrine	40	(23.4)
No latrine present	34	(19.9)
River/Irrigation canal	20	(11.7)
Unknown	7	(4.1)
Seaside	4	(2.3)
Total	171	(100.0)

found that only about 66(38.6 percent) of all methods of excreta disposal are satisfactory and that 98(57.3 percent) of households have unacceptable ways of excreta disposal. In 7(4.1 percent) of households the system of excreta disposal was not recorded. Thus it can be seen that the means of excreta disposal is far from satisfactory.

Table IV shows the occupations of the 179 cholera patients. It will be seen that the occupation of those working indicate that they are from the lower socio-economic class and that they have little or no formal education.

Of the 179 cases, 7 cases lived alone so that there remained only 164 households in which the index case had household contacts. Table V shows the

TABLE IV
OCCUPATION OF THE 179 CASES OF CHOLERA

Occupation	Number of cases
Young children/old people (not employable)	44
Students	30
Housewives	26
Farmer/Tapper	25
Unknown/unemployed	20
Working in village (kerja kampong)	17
Labourers/unskilled workers	14
Army personnel	2
Fisherman	1
Total	179

that inapparent (asymptomatic) infections account for a large proportion of infections in the household. The 8 household contacts who developed clinical symptoms came from 8 households.

A total of 1101 household contacts were swabbed rectally within a period ranging from the day of onset of the index case to as long as 16 days later. Table VI shows the results of bacteriological examination of household contacts in relation to time of collection of the specimen (first rectal swab). The total number of infected household contacts was 95. This gives an overall infection rate of 8.6 percent. Repeated rectal swabs of household contacts were not carried out in this study.

TABLE V
NUMBER OF HOUSEHOLDS WITH INFECTED HOUSEHOLD CONTACTS AND NUMBER OF PERSONS INFECTED PER HOUSEHOLD

Number of households with household contacts	Number of infected persons per household	Total number of infected persons
108	0	0
35	1	35
11	2	22
6	3	18
2	4	8
2	6	12
164		95

number of households with infected household contacts and also the number of persons infected per household. Household size ranges from 2 to 18 members. In 108(65.8 percent) households there were no positive contacts while in 56(34.2 percent) households it was reported that there were persons infected with cholera, apart from the index case. The number of infected household contacts per household in these 56 households range from 1 to 6 infected persons.

The total number of infected household contacts was 95. Out of these 95 infected household contacts only 8 developed clinical symptoms, while the rest did not exhibit any clinical symptoms. The ratio of symptomatic to inapparent infections among household contracts was thus 1 : 11.9. This shows

Of the 95 infected household contacts, only 85 had information available regarding their age. Table VII shows the age and sex distribution of these 85 infected household contacts. Forty-two (49.4 percent) of these 85 infected household contacts were below 15 years of age. It may appear that the younger age groups are more susceptible to infection. However, a breakdown of the population of the 8 health districts show that in 1970 (census year), 45 percent of the population was below 15 years of age. The male to female ratio of these infected contacts is 0.77 : 1 while the male to female ratio of the population in these 8 districts in 1970 is 0.96 : 1.

DISCUSSION

The analysis of the water supply and the excreta

TABLE VI
PREVALENCE OF INFECTION IN HOUSEHOLDS
OF CASES

Time of collection (day from onset of index case)	First rectal swab		Rate (%)
	Number swabbed	Number Positive	
0	58	4	6.9
1	148	23	15.5
2	136	19	14.0
3	285	14	4.9
4	226	21	9.3
5	137	6	4.4
6	57	4	7.0
7	28	3	10.7
8	10	0	0.0
9	8	0	0.0
16	8	1	12.5
Total	1101	95	8.6

TABLE VII
AGE DISTRIBUTION OF INFECTED HOUSEHOLD
CONTACTS

Age	Male	Female	Total
0-4	10	10	20
5-9	4	7	11
10-14	5	6	11
15-19	4	4	8
20-24	4	3	7
25-29	0	6	6
30-34	3	2	5
35-39	2	3	5
40-44	0	3	3
45-49	2	2	4
50-54	1	0	1
55-59	1	1	2
60-64	1	0	1
65-69	0	0	0
70-74	0	0	0
75-79	0	1	1
Total	37	48	85*

* Of the 95 infected household contacts, only 85 had information available regarding their age.

disposal systems of the cholera patients shows that those afflicted with the disease are from the rural or semi-rural areas where environmental sanitation is unsatisfactory. An examination of the occupations

of those working further supports the view that the cholera patients are from the rural lower socio-economic class that have little or no formal education. It is therefore not surprising that personal hygiene may not be satisfactory and person to person contact can play an important role in the transmission of cholera.

Studying the transmission of infection among household contacts, several features were noted. It will be noted that it is not uncommon to find infection among other members of the household of the hospitalised patient. This is shown by the fact that apart from the index case, 56(34.2 percent) of households contained infected persons, and that from one to 6 persons may be infected in each household. Further, it will be noted that among household contacts, out of 95 infected persons, only 8 developed clinical symptoms, giving a ratio of approximately 1 symptomatic to 12 inapparent infections. Finally, it will be noted that the overall infection rate for household contacts, giving an overall infection rate of 8.6 percent.

Studying El Tor cholera in the Philippines, Tamayo *et al.* (1965) found that of 42 households with bacteriologically proven cases, 60 percent of the households had one or more infected persons apart from the index case. The author estimated that among household contacts, asymptomatic infections was approximately ten times higher than the attack rate for clinically severe cholera. Dizon *et al.* (1967) in a further study of cholera carriers found that of 978 household contacts examined with a single rectal swab obtained within a period ranging from the day of onset of the index case to 17 days later, 109 were found to be positive. This gave an overall infection rate of 11.1 percent compared to 8.6 percent obtained in this study. A second rectal swab was repeated on Dizon's study and this yielded another 9 with positive results. Repeated rectal swabs were not done in this study but it is possible that the total infection rate of household contacts would have been higher if repeated rectal swabs had been carried out.

In El Tor cholera, the ratio of severe cases to mild and inapparent infection is in the range of 1 : 25 to 1 : 100. Gangrosa and Mosley (1974) depicted

that 75 percent of El Tor cholera were inapparent infections. The fact that inapparent infections greatly outnumber frank cases has also been demonstrated in this study. Out of 95 infected household contacts, only 8 developed clinical symptoms giving a ratio of about 1 : 12 for symptomatic to inapparent infections among household contacts.

The infrequency of multiple clinical cases within the same household had been illustrated by the studies of Siddichai and Grayston (1960), Morgan *et al.* (1960) in Thailand, where multiple hospitalized cases occurred in less than 5 percent of the households with cases. Tamayo *et al.* (1965) also showed that only 6.7 percent of 90 households with bacteriologically confirmed cases had multiple hospitalized cases. The present study also shows the relative rarity of multiple clinical cases in the same household. Of the 164 households of cholera patients with household contacts, 8 (4.8 percent) had more than one clinical (frank) case.

While most of the infected household contacts probably acquired their infections from the patient who constitutes the index case, the role of the asymptomatic carrier in the transmission of infection cannot be underestimated.

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