

THE 1978 CHOLERA OUTBREAK IN KRIAN DISTRICT

H. YADAV

SUMMARY

The findings of a cholera epidemic in Krian district is reported. There were 77 cases and 92 carriers in the epidemic. Although the three main ethnic groups of Malays, Chinese and Indians were involved in the epidemic, the Malays constituted majority of the cases and carriers. The overall infection rate and case attack rate was higher among the younger population. The case: carrier ratio was also higher among the younger population especially among Indians. Various reasons and probable causes of the epidemic have been described briefly.

INTRODUCTION

Krian district is situated north west of Perak. It is bounded by Province Wellesley and Kedah to the north, the Larut Matang and Selama district of Perak to the east and south, and the Straits of Malacca to the west (Fig. 1). The district has an area of 331 square miles and a population of 187,517 (PES Survey 1978, Department of Statistics Malaysia). The density of population is 566 which is one of the highest in Perak. Most of the district (80 percent) is low lying and water logged. Almost 40 percent of the district is padi land, thus it is known as the 'Rice Bowl of Perak'. The population consists of mainly Malays (65 percent), Chinese (22.4 percent) and Indians (12.3 percent). The main occupations are farming, fishing and rubber tapping.

H. Yadav MB., B.S. (Kerala) M.P.H. (Malaya)
Medical Officer of Health,
Krian.

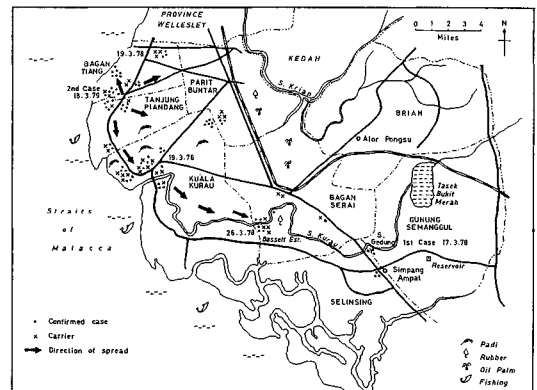


Fig. 1 Map of Krian District showing location and spread of cholera cases and carriers.

THE 1978 CHOLERA EPIDEMIC

The cholera epidemic in the district started on 17th March, 1978 and the last case was on 15th April, 1978. In all there were 77 cases and 92 carriers, bringing the total to 169 positive cases and carriers. The district experienced a similar outbreak in 1972 with 105 cases and 155 carriers. The epidemic lasted from May to October, 1972.

The epidemic started with the first case of cholera being confirmed on 17.3.1978 by Taiping Hospital. The case was an eight year old Chinese school boy from Sungai Gedong (7 miles South of Bagan Serai). He was admitted as a case of gastroenteritis. No other carriers were detected from his family and in the school which he studied.

The second case was reported on 18.3.1978 by Parit

Buntar hospital. This case was an eight month old female Chinese baby coming from Tanjong Piandang (10 miles from Parit Buntar). The baby was admitted for gastroenteritis and both the parents stools were negative for cholera.

The third case was notified on 19.3.1978. The case was an 80 year old Chinese female from Tanjong Piandang who was also admitted for gastroenteritis. This patient subsequently died. From the rectal swabs taken in the family three healthy carriers were found from this patient's home. Subsequent to this date more cases and carriers were detected. By the first week there were already 31 cases and 14 carriers in all (Fig. 2). By the second week there were already 52 confirmed cases and 50 carriers with 2 deaths. The epidemic spread to the north and south of Tanjong Piandang especially to Bagan Tiang and Kuala Kurau. The third week saw further rise in the cases and carriers. By now there were 68 cases and 85 carriers. The coastal area being mainly involved. The epidemic ended by the 5th week with a total of 77 cases and 92 carriers.

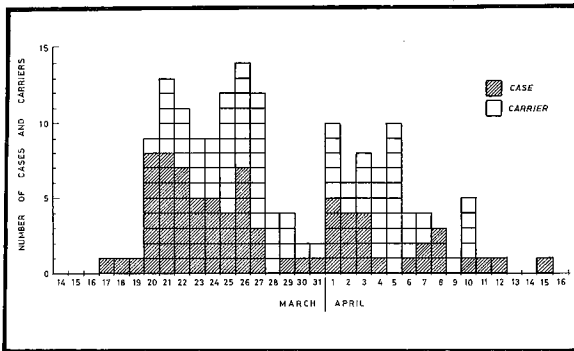


Fig. 2 Number of cases and carriers reported in Krian District, in 1978, according to date of confirmation.

There were no cases reported from 16.4.1978 onwards and the situation improved with time. The last case was on 15.4.1978. Unfortunately, the district was re-declared an infected area on 8.5.1978 with 4 more sporadic cases in isolated areas. On 27.5.1978 the district was again free with no other stray cases found.

PROBABLE CAUSES OF THE OUTBREAK

Water

The main problem was considered to be the shortage of drinking water in the district. Presently the water source (reservoir) in Gunong Semanggol is about 28 miles from Tanjong Piandang/Bagan Tiang and 22 miles from Parit Buntar. The daily drinking water available is 3 million gallons for a population of 187,517. Since the water has to be divided between factories and house-

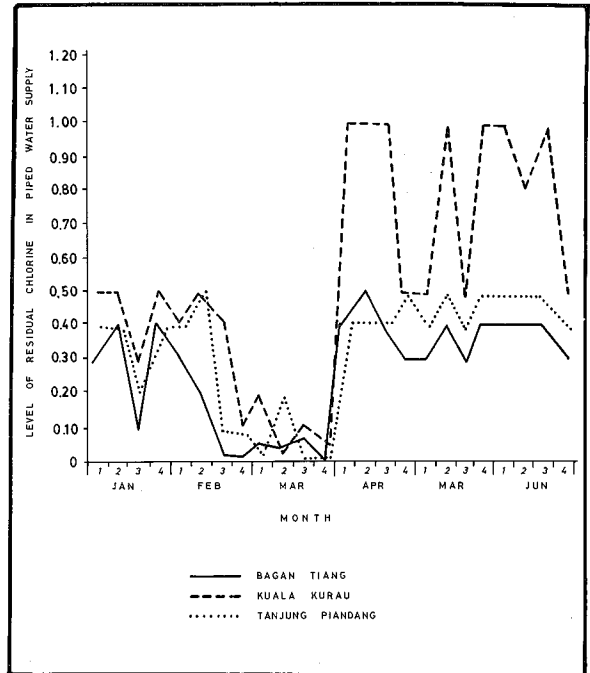


Fig. 3 Levels of residual chlorine recorded in Public Works Water Supplies in Krian District, 1978

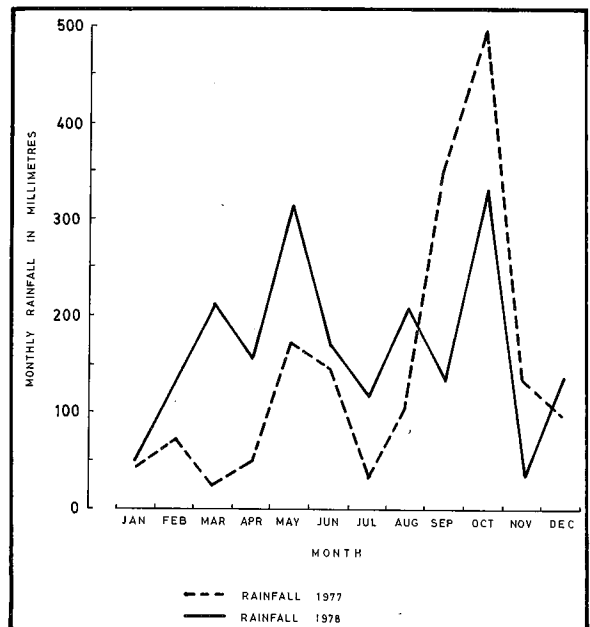


Fig. 4 Rainfall in Krian District in 1977 and 1978

holds, it is acutely insufficient, thus the public resorts to tampering of meters as well as other sources of water i.e. from the irrigation canals and other waterways.

The drinking water is chlorinated at source.

During the early period of February and March, 1978, the residual chlorine in water came down to low levels thus helping to propagate the epidemic (Fig. 3).

The people resorted to drinking the water available in the canals. They also depended on this available source for cleansing themselves and washing their utensils. This resulted as there was no other better source of water, like wells in most of the coastal areas. The overhanging latrines in these waterways made matters worse.

Climate

The months prior to the epidemic i.e. January to March were predominantly dry months. The average maximum temperature was between 90°F to 93°F and the average minimum temperature was 75°F to 80°F during January to March. During this period there was little rainfall (average January to March 4.65 m.m.). The Malacca epidemic in 1963 was also due to drought. During this period the brackish water during high tide went above the level of catchment point thus polluting the water supply tank. Similarly the Kedah outbreak (Chen, 1970) also occurred during periods of drought.

Poor Environmental Sanitation

The existing conditions of poor environmental sanitation, especially in Tanjong Piandang and Kuala Kurau and its Town Board areas and Bagan Tiang was another major factor contributing to the epidemic. Wilcocks and Manson (1972) also stated that overcrowding and poor sanitation play an important part in the spread of cholera.

There are no latrines in the Town Board areas of Tanjong Piandang (except 4 bucket latrines) and Kuala Kurau areas. Defaecation is generally indiscriminate, faeces is discarded on open ground and ultimately drained into canals and the rivers. This is the water people use, when shortage of potable water arises.

Bagan Serai and Parit Buntar areas are mostly served by bucket latrines. The practice of washing buckets and even direct dumping of night-soil into the drains, rivers and canals still continues. As long as this practice continues, health hazards (especially water-borne diseases) to the community will always be present.

Refuse collections and disposal methods are lacking. The disposal sites on the river banks in Parit Buntar and Kuala Kurau pose a constant source of contamination to the river.

Chronic Carriers

The district witnessed a similar epidemic in 1972 with 105 cases and 155 carriers. Some of the cases and carriers

in the present epidemic were traced to the 1972 epidemic. It is postulated that there could be chronic carriers in the district. It is intended that an interim study to trace carriers will be done in the near future. There is a possibility that these chronic carriers could initiate epidemics. Felsenfield (1966) remarked that chronic carriers are sources of further infection and may carry the disease from one area to another.

Movement Of Population

The movement of population especially from Kedah and other districts could have helped in the spread of cholera.

The population movement is mainly from Kedah because of the padi harvest. Temporary labourers, workers and relatives of the local padi planters come to help these families during the harvest season. Some of them may bring cholera along. (Note: Kedah was infected much earlier than Krian).

Liberal Policies Of Street Trading

There is no limitation in the licensing of hawkers and street trading in the Town Board areas. Hawking in the rural areas are beyond the control of the Health authorities as there are no legal bonds on hawkers under the Sales of Food & Drug Ordinance, 1952, except for the control under the Hawkers (Pedlars) Licences (Perak) Rules, 1959 enforced by the State and/or local authorities. The existence of such street trading creates different eating habits and movement of unhygienic food.

Host Factors Affecting The Epidemic

The various socio-cultural habits of the people helped to propagate cholera in the district. This is further aggravated by their die-hard attitudes and beliefs.

Occupation

Most of the people in the district are fishermen and farmers (padi planters) as such they come into contact with water and this helps to spread the epidemic.

Personal Hygiene And Household Hygiene

This greatly depends upon different cultures and varies between individuals within a culture. In Tanjong Piandang (coastal fishing village) the Chinese mainly use the canal water and store it in the houses. This is because of the shortage of piped water supply. This stored water is used to prepare pig food as well as for cleaning utensils and personal cleanliness. The use of the water from the canals could have been one factor which propagated the epidemic.

Dietary Habits And Food Pattern

The district has mainly a rural population. There are many hawkers, and food is freely sold to the public. The district also has many 'kenduri' or feasts and the cooks for these weddings are not immunised and they could have helped to propagate the epidemic. Many village fairs are held where people buy and sell their products. In these fairs cooked food is also sold. They are held nearly everyday of the week in various parts of the district.

Socio-Economic

The literacy rate is also low in the district and most people have large families. The level of education is also a factor in the transmission of the disease to a certain extent.

RESULTS

A total of 77 cases and 92 carriers were detected in the district from 17th March 1978 to 15th April 1978. Fig. 1 shows the geographical distribution of the cases. Most of the cases were distributed in the coastal region. The fishing villages of Tanjong Piandang, Kuala Kurau and Bagan Tiang were mainly affected. Another important area affected was Basset Estate.

Table I shows that majority of cases (43.2 percent) were from Tanjong Piandang and Kuala Kurau (15.4 percent) with Bagan Tiang (14.8 percent) and Basset Estate (19.5 percent).

The number of confirmed cases by day of onset is shown in Fig. 5. The epidemic spread over 6 incubation periods. It suggests a multiple foci and multiple exposure type of epidemic.

In Table II a total of 81 (47.9 percent) of cases and carriers were Malays. The Chinese constituted 50 (29.6 percent) of cases and Indians 38 (22.5 percent).

By sex distribution there were 75 male cases and carriers, 94 female cases and carriers. The male: female sex ratio is 1:1.25.

Amongst the cases the Malays constituted the highest number 38 cases (49.4 percent) and Indians lowest 13 (16.8 percent). Amongst the carriers, the Malays constituted 43 (46.7 percent) and Chinese had the lowest carriers 24 (26.1 percent).

Age

The age distribution of the cases and carriers was analysed (Table III). The majority of the cases and

TABLE I
CHOLERA CASES AND CARRIERS BY MUKIM,
KRIAN DISTRICT,
1978

Mukim	Confirmed Cases	Deaths	Carrier	Total	%
Tanjong Piandang	37	2	36	73	43.2
Kuala Kurau	13		13	26	15.4
Bagan Serai	2		3	5	3.0
Basset Estate*	10		23	33	19.5
Parit Buntar	3		2	5	3.0
Bagan Tiang	11	2	14	25	14.8
Selinsing	1		—	1	0.6
Briah	—		1	1	0.6
Total	77	@	92	169	100.1

* Basset Estate was taken as a separate area although it falls within the Mukim of Kuala Kurau but is more easily approachable from Bagan Serai Area.

@ Deaths are included in the "Total" for cases and carrier.

carriers 45 (26.6 percent) were in the 5-14 years age group. The least number of cases and carriers 14 (8.28 percent) was in the 15-19 years age group.

Most of the cases 27 (35.0 percent) were in the 20-49 years age group and most of the carriers 31 (33.7 percent) were in the 5-14 years age group.

Occupation

Majority of the cases were amongst Malay farmers, others were mainly fishermen, housewives and children.

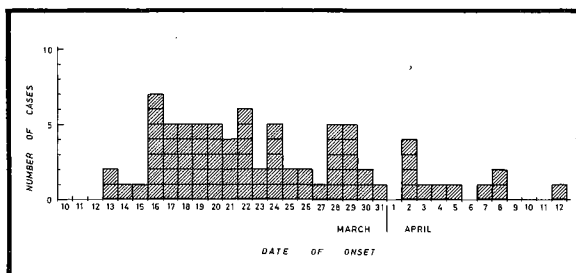


Fig. 5 Cholera cases by day of onset, Krian District, 1978

Infection Rate

The overall infection rate, cases and carriers was 9.01 per 10,000 population. Amongst the males the infection

TABLE II
DISTRIBUTION AND RATIO OF CASES AND CARRIERS BY ETHNIC GROUP
AND SEX, KRIAN 1978

Ethnic Group	Cases				Carriers				Total	%	Cases: Carriers Ratio		Total Cases: Carriers
	M	F	Total	%	M	F	Total	%			M	F	
Malays	22	16	38	49.4	20	23	43	46.7	81	47.9	1:0.9	1:1.43	1:1.13
Chinese	9	17	26	33.8	10	14	24	26.1	50	29.6	1:1.1	1:0.8	1:0.92
Indians	5	8	13	16.8	9	16	25	27.1	38	22.5	1:1.8	1:2	1:1.92
Total	36	41	77	100	39	53	92	99.9	169	100.0	1:1.08	1:1.3	1:1.19

TABLE III
DISTRIBUTION AND RATIO OF CHOLERA CASES AND CARRIERS BY AGE AND SEX KRIAN DISTRICT, 1978.

Age	Cases				%	Carriers				%	Cases: Carriers Ratio		Total Cases: Carriers
	M	F	Total	%		M	F	Total	%		M	F	
0—4 years	6	9	15	19.48	7	14	21	22.83	1:1.16	1:1.5	1:1.4		
5—14 years	10	4	14	18.18	13	18	31	33.70	1:1.3	1:4.5	1:2.2		
15—19 years	1	6	7	9.09	5	2	7	7.61	1:5	1:0.33	1:1		
20—49 years	11	16	27	35.06	10	17	27	29.35	1:0.9	1:1.06	1:1		
50 plus years	8	6	14	18.18	4	2	6	6.52	1:0.5	1:0.3	1:0.4		
Total	36	41	77	99.99	39	53	92	100.0	1:1.08	1:1.29	1:1.19		

TABLE IV
INFECTION RATE BY AGE GROUP AND SEX FOR CHOLERA PER 10,000 POPULATION KRIAN DISTRICT, 1978

Age	Male			Female			Total:		
	Case Carrier	Popul	Infect Rate	Case Carrier	Popul	Infect Rate	Case Carrier	Popul	Infect Rate
0—4 years	13	12165	10.69	22	13719	16.04	35	25884	13.52
5—14 years	23	28665	8.02	23	32325	7.12	46	60990	7.54
15—19 years	6	15241	3.94	8	17187	4.65	14	32428	4.32
20—49 years	21	22958	9.15	33	25889	12.75	54	48847	11.05
50 plus years	12	9103	13.18	8	10265	7.79	20	19368	10.33
Total	75	88132	8.51	94	99385	9.46	169	187517	9.01

* Pop. (P.E.S. Department of Statistics, K.L.)

rate was 8.51 per 10,000 and amongst the females it was 9.46 per 10,000.

Among both sexes the infection rate was highest i.e. 13.52 between 0-4 years age group. Males, 50 years and above, had highest infection rate (i.e. 13.18) whereas amongst the females the infection rate was highest (16.04) among the 0-4 years age group.

The overall case attack rate was 4.11 per 10,000 for the whole district. The overall case attack rate for males was 4.08 per 10,000 and for females it was 4.13 per 10,000. Amongst the males the case attack rate was highest in the 50 years and over age group i.e. 8.79 per 10,000 whereas among females the case attack rate was highest among the 0-4 years age group (6.56 per 10,000).

The overall carrier rate was 4.91 per 10,000. The carrier rate for males was 4.43 per 10,000 and the carrier rate for females was 5.33 per 10,000. Amongst the males the 0-4 years age group had the highest carrier rate i.e. 5.75 and among females the carrier rate was highest among the 0-4 years age group i.e. 10.20 per 10,000 population.

The overall case: carrier ratio was 1:19. Among the ethnic groups the Indians constituted the highest case: carrier ratio of 1:1.92 and the Chinese constituted the lowest case: carrier ratio of 1:0.92. Amongst the males the Indians had highest 1:1.8 case: carrier ratio and amongst females the Indians also constituted the highest case: carrier ratio of 1:2.

Amongst males the 15-19 years age group had highest case: carrier ratio 1:5 and amongst females the 5-14 years age group had the highest case: carrier ratio of 1:4.5.

The 5-14 years age group had highest case: carrier ratio of 1:2.2 and the lowest was in the 50 years and over age group i.e. 1:0.4. Amongst males the highest case: carrier ratio was in the 15-19 years age group 1:5 and the lowest case: carrier ratio was in the 50 years and over age group. Similarly amongst females the highest case: carrier ratio was in the 5-14 years age group and the lowest was also in the 50 years and over, age group, 1:0.3.

Table V shows that the household carrier rate was 12.04 percent and the neighbourhood carrier rate was 7.22 percent. Amongst the 548 number of household contacts examined, 66 were positive (carrier ratio of 12.04 percent). There were 4 deaths amongst the 169 cases and carriers. The death rate was 2.4 percent.

DISCUSSION

Most of the cases and carriers are mainly from the coastal region. There are two rivers which drain into the

TABLE V
CARRIER RATE AMONG HOUSEHOLD AND
NEIGHBOURHOOD WITH INDEX CASES INVESTIGATED
FOR CHOLERA OUTBREAK, KRIAN DISTRICT, 1978.

Contacts	Total No. Examined	Total No. Positive	Carrier Rate (%)
Household Contacts	548	66	12.04
Neighbourhood Contacts	83	6	7.22
Total	631	72	11.41

sea, because of the proximity to the sea the salinity of the river may have enhanced the cholera vibro culture.

The places affected were those which had poor environmental sanitation, poor water supply, poor refuse disposal. And most of the areas did not have latrines but indiscriminate disposal of faeces.

The outbreak had been an explosive onset (Fig. 5) and water borne. There were 2 positive water samples one from a pond and one from a house. Person to person spread especially contact from hawkers and other food vendors could have helped to build up the epidemic.

Though cholera has no specific preference for race (Pollitzer, 1959) in this study most of the cases were among Malays (47.9 percent) and the Indians had the least (22.5 percent). These may not be significant because the population breakdown of the district shows that Malays are the largest number and Indians, the smallest. Other studies (Singh, 1972. Palanicavadan 1975. Chen, 1972) all show similar results.

There were more females than males among the total number of cases. The male female ratio was 1:1.25. Amongst the cases 46.8 percent were males and 53.2 percent were females and amongst carriers there were 42.0 percent males and 57.6 percent females.

During the initial part of the epidemic more females and children were affected. In the later part of the epidemic more males were affected. This is quite different as seen in some other places where more males are affected earlier (Pollitzer, 1959) compared to females and children. In the Sarawak outbreak 1961 (Govt. Offset Printers) there were more males than females and in the Kelantan outbreak there were more females than males.

Most of the cases were below 15 years of age 56.53 percent, 22.83 percent of cases were below 5 years of age and the age group of 20 years and over comprised 35.87

percent. In the 1972 epidemic (Singh, 1972) in Malaysia majority were in the 20-29 years of age group and 72 percent of cases occurred in persons above 20 years of age. In a similar epidemic in the district (1972) majority of the cases were children and females (unpublished data).

The infection rate was highest in the 0-4 age group 13.52 per 10,000 population. In another study (Palanicavadan, 1975) in Penang the infection rate was highest in the 55 years and over age group. In this epidemic, the younger age groups had higher infection rates. This probably indicates a trend towards the disease becoming endemic in Krian.

The overall case attack rate was 4.11 per 10,000 and it was highest, 7.23 per 10,000 in the 50 years and over age group.

The carrier rate was seen to be highest in the 0-4 age group in both the sexes. Overall the carrier rate was 8.11 per 10,000 population in the 0-4 age group, whereas the overall carrier rate for the whole district was 4.91 per 10,000 population.

Overall case: carrier ratio in the epidemic was 1:1.19. Chen (1970) in the Kedah river outbreak reported a case: carrier ratio of 1:2 and Singh (1972) in the Kelantan outbreak reported a case: carrier ratio of 1:2. The Indians had the highest case: carrier ratio 1:1.92 and this could be due to several factors. In the retrospective study (Palanicavadan, 1975), similar findings were found where Indians had 1:1.2. This could be attributed to the using of fingers for eating by Indians and also washing the anal region with water after toilet.

The Malays also had more carriers amongst them as compared to the cases, whereas amongst the Chinese there were more cases than carriers 1:0.92.

The 5-14 years age group had the highest number of case: carriers ratio of 1:2.2, whereas the total case: carrier ratio was only 1:1.9. This could be due to endemicity of the disease or it could also be possible that the adults did not present themselves to the clinic but went to the general practitioner for fear of being hospitalised and isolated, especially when they were breadwinners in the family. The carrier rate amongst the household contacts was 12.04 which is much higher than some countries

reported in the region. Chuttani *et al.* (1967) reported a carrier rate of 6.7 percent. Renuka *et al.* (1967) reported 6.2 percent. Cohen *et al.* (1971) reported a carrier rate of 6 percent among 1500 household contacts of cholera patients during an outbreak of *El Tor* Cholera in Israel.

In the retrospective study in Penang the carrier rate among household contacts of the index case was only 3.8 which was lower than this study.

The neighbourhood carrier rate index case was 7.22 percent.

ACKNOWLEDGMENT

I wish to thank Dr. Gurmukh Singh, Pengarah Perkhidmatan Perubatan dan Kesihatan, Negeri Perak for allowing me to publish this data. My special thanks go to Mr. Lee Tay Heng Woh and his staff who worked earnestly and sincerely to bring this epidemic under control within a short period of time.

REFERENCES

- Chen, P.C.Y. (1970) Cholera in the Kedah River Area. *Medical J. Malaya* 24, 253—254.
- Cohen, J., Schwartz, T., Klasmer, T., Pridan, D., *et al.* (1971) Epidemiological Aspects of *El Tor* Cholera outbreak in a non-endemic area. *Lancet* ii 86—89.
- Committee of Enquiry Approved by the Cabinet, (1964). Report on the outbreak of Cholera in Malacca in 1963. Govt. Print. Dept. Kuala Lumpur.
- Felsenfield, O., (1966) Review of recent trends in Cholera Research and Control. *Bull. W.H.O.* 34. 177—178.
- Palanicavadan (1975) M.P.H. Dissertation. University of Malaya. Kuala Lumpur.
- Pollitzer, R., (1959) History of Cholera, W.H.O. Monograph Series No. 43.
- Renuka, S., Deb, B.C., De, S.P., Abou-Gareeb, A.N., and Shrivastava, D.L., (1967) Cholera carrier studies in Calcutta 1966—1967. *Bull. W.H.O.* 37. 89—100.
- Report on Cholera outbreak Sarawak 1961. Govt. Print. Off. Kuching 1963.
- Singh, B. (1972) Review of Cholera in Malaysia 1900—1970. *Med. J. Malaya* 26. 149—158.
- Wilcocks, C., and Manson-Bahr, P.E.C. (1972) Manson's Tropical Diseases. 504.