URBAN CHOLERA EPIDEMIC, 1974

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Introduction

Before 1970 the Cholera Research Laboratory, Mohakhali experienced epidemics caused mainly by the classical Inaba Vibrio cholerae. In 1971 the urban epidemic was caused predominantly by classical Ogawa Vibrio cholerae, and by 1972 it was the only strain isolated at the CRL in Dacca. Since that time, however, the El Tor biotype of V. Cholerae has completely replaced its classical predecessor, and the Ogawa serotype has predominated although a significant number of Inaba El Tor organisms were isolated.

The cholera epidemic of 1974 was very special for the Cholera Research Laboratory in many respects: first, this was the first major El Tor epidemic in Dacca since the establishment of CRL; second the number of cases admitted surpassed all previous records; and third, the epidemic started six weeks earlier than the usual time of the post-monsoon-cholera epidemics of the past twelve years. The social and political setting has also undergone special changes following the war of liberation in 1971. The economy has been severely disrupted and it is generally admitted that the economic level of the average Bengali had deteriorated following the post-war inflation and serious dislocation of industry. Added to these longer-term difficulties was severe regional flooding in the monsoon season which damaged standing crops and seriously dislocated the rural population. The government maintained ration shops in urban centers, however, and destitute villagers flocked to the city for government assistance and jobs. The only accommodation available initially were bustee shanty-towns which probably stressed an already marginal environmental sanitation situation. In the overall setting of a depressed economy and an increased urban population swollen by homeless refugees from rural Bangladesh, large increases in the number of cases of shigellosis and cholera were observed. The cholera epidemic of 1974 afforded the opportunity to investigate urban cholera to identify the factors associated with the increased rate.

Materials and Methods

The population of Dacca Municipality was 556,712 in the 1961 census which increased to 1,310,975 during 1974. The population of Dacca corperation has increased to 1,699,219 having an average annual rate of growth of 8.76%. The number of diarrheal treatment centers remained the same, however, and the CRL was the principal center for treatment of diarrheal diseases for the entire period. Cholera case records from the Dacca CRL hospital inpatients were reviewed for the period 1970-74 and broken down by biotype and serotype. During the peak of the 1974 epidemic 613 cholera and 342 non-cholera diarrhea cases were interviewed on the CRL ward to identify sources of water for domestic use (drinking, bathing and washing), and sanitary facilities used by families. In addition, similar interviews were collected from 203 control families matched for similar socio-economic and neighborhood of residence of cholera cases. The data on cholera and non-cholera cases were collected within the shortest possible time from admission to the CRL ward by experienced field personnel. Control cases were interviewed in their residences. In the case of infants, minor and unconscious patients, questionnaires were administered to parents or attendants.

The map outlines the Thana of Dacca municipality and the surrounding suburban areas. The three municipal thanas, Kotwali, Lalbagh and Sutrapur comprise "old" Dacca and are characterized by high population density, few sources of surface water for domestic use, leaking sewarage line, service latrines, outdated piped water supplies and insignificant numbers of flush toilets. There is little industry, but thousands of small shops are there. In Sutrapur there is a large vegetable and fish market in addition to a few smaller ones. The Buriganga river water front is the small industry lifeline of Dacca. Mohammadpur, in new Dacca, is more spacious than old Dacca thanas and includes a large upperclass population and a large middle class population. Tejgaon is the industrial sector but contains large areas of lower class housing surrounding the industrial park. Ramna is a fascinating mix of upper class and lower class.

Results

Table 1 shows the gradual change from classical Inaba to the classical Ogawa and then to El Tor Ogawa as the predominant organism for CRL cholera admissions. It also shows the number of cholera admissions to the CRL from 1970 to 1974. During the recently concluded epidemic of 1974, 5,517 confirmed cases were treated by the CRL. This was higher than any other year in the CRL experience.

Figure 1 shows the post-monsoon cholera epidemic in Dacca city by weeks from 1970-74. Until 1974 the usual time of the major cholera epidemic was from October thru December. The usual pattern of complete absence of cholera cases for at least some weeks during the early monsoon was not observed in 1974. The influx of cholera cases began six weeks earlier than expected although it continued through December, the usual time of subsidence.

Figure 2 shows the monthly distribution of cases from July to December 1974. During this time there were 5,068 cholera cases admitted to the CRL ward. Out of these 1923 Ogawa El Tor and 338 Inaba El Tor were admitted from the Thanas comprising of Dacca Municipality. The remaining cases came from suburban Dacca and nearby rural fringes. The Dacca municipal area from which 51% of the cases came was estimated to have 1,329,207 persons in April 1974. This gave an overall attack rate of 1.70 per 1000 during the last half of calendar 1974.

Table 2 shows the attack rates within the municipal area by month and thana from July through December 1974. Using official Bangladesh 1974 census data as the denominator the thana attack rates were relatively similar for each thana although thanas vary widely in many social and geographic aspects. The rates varied from 1.35 to 2.08 per thousand and the average was 1.70.

Figure 3 shows the weekly incidence of cholera in the various thanas of the municipal area. It indicates that all the thanas had virtually simultaneous attacks of cholera except possibly Tejgaon, where it commenced and subsided comparatively later.

Table 3 shows the cholera and control indexes by age and sex. Out of 203 cases 102 were male and 101 were female.

Table 4 shows the interval between the onset and admission of cholera cases. 73% of the cases were brought to hospital by the 2nd day and by 6th day.

Table 5 gives the same information about non-cholera diarrhea cases. 62% of the cases were hospitalized by 2nd day and 91% by 6th day.

Table 6 gives the data on the duration of residence of cholera and non-cholera diarrhea patients and control families. Although there were minor differences in the proportion of each who resided in their homes for less than three months, the striking part of the data indicates that roughly three-fourths of all patients had resided in their homes for over one year.

Table 7 gives a breakdown of drinking, bathing and washing water sources by income for the cholera patients and controls independently. No significant association was observed between income and rates of using 'safe' water sources for either drinking or bathing and washing. In the urban setting, insignificant numbers of cholera patients and controls admitted to using other than tap water or tubewell water for drinking purposes. An analysis within each income group for cholera and control patients was not statistically significant.

Table 8 gives similar data for the use of sanitary latrines by income groups for the cholera and control families. As was noted previously with regards to water source no statistically significant association was noted between income and proportion of families using sanitary latrines.

Table 9 shows the porportion of cholera and non-cholera diarrhea patients and numbers of control families who stated that their homes were affected by flood. There were no statistically significant differences in the proportion of families in the three groups who had their homes so severely affected by flood that they had to move or were affected by flood and did not have to move their home.

Table 10 gives the rate of diarrhea observed in contacts

of cholera and non-cholera diarrheal patients and member of control families for the seven days preceeding the interview. It is noted that the diarrheal morbidity rates were similar for the three groups of families except with regard to the number of contacts who had severe diarrhea and had to be admitted to the hospital. It should be pointed out that 69 out of the 214 contacts of cholera patients who admitted to having diarrhea had to be admitted to CRL, whereas none of the contacts for non-cholera diarrheal and control families had to be admitted.

Table 11 gives the attack rates for cholera admission in three refugee camps. Camp A was the largest, but it was relatively well organized and an attack rate of 1.6 per 1000 was observed. Camp B and C were smaller and less well organized and remarkably similar attack rates of 3.9 and 4.3, per 1000 were noted. It is significant that in Camp A none of the patients had to resort to use of unsanitary water and unsanitary facilities for the disposal of waste and the two smaller camps in which higher attack rates were observed there were one third the facilities for safe water and 75% - 90% of the patients were forced to use unsatisfactory facilities for waste disposal.

Table 12 gives the history of eating out side by the indexes of the control families. It shows that the boys and adult males took meals outside more than the females. Out of 203 controls only 18 took meals outside within 5 days prior interview.

Table 13 shows the history of eating outside of the cholera cases within 5 days prior illness. Out of 203 cases 83 took meals outside. Adults took meals outside more frequently than children and females.

Discussion

Except for Mohammadpur thana, no thana in the Dacca municipal area was free from cholera in July. Although thousands of people stayed in the relief camps, and "Bastuhara" (homeless local people) colonies, the attack rate in Mohammadpur Thana was 1.35 per 1000, the lowest in the entire municipal area. The rate identified for Tejgaon thana was

higher than others thanas, but there is an artifact in this data. Because this thana had been subdivided into three urban thanas and people sometimes erroneously gave their address as Tejgaon thana when in fact it was a new thana not included in the municipal area. Interesting data was developed from Ramna thana where there were essentially only two classes of of residents. Ramna thana encompasses the elegant older section around the Hotel Intercontinental and Ramna Park and residents of this area are distinctly upper-class. However, also residing in Ramna Thana are thousands of refugees who live in bustees surrounding the Kamalapur Railway station and the Dacca University campus who are distinctly lower class. Perhaps because of these two widely different social classes residing in the same thana the data is remarkable in that the overall attack rates by thana were almost similar.

Although major social upheavals have occurred in and around Dacca in the recent past, including a severe flood immediately preceeding and co-existing with 1974 post-monsoon epidemics, an analysis of cases by location in the Dacca municipal area revealed no striking differentials with regard to time of occurrence. The three old city thanas which are characterized by very high population density and relatively poor sanitary facilities had similar attack rates. One Thana, Mohammadpur, much less densely populated and more covered by sanitary facilities, had a significantly lower overall attack rate. Despite these differences, with the possible exception of one thana the epidemic began, peaked and ended simultaneously in each section of the city. The degree of flooding was greater in Sutrapur, Lalbag and Ramna thanas, but this did not affect the rate and the time of onset of the epidemic. The slightly uneven distribution of cases with respect to location cannot be ascribed to specific cause, but the area with the lowest rate also contains a high proportion of upper and middle class residents and better sanitary facilities.

The undocumented impression of observers who were present in the city during the flood and peak of the epidemic was that there were tremendously increased numbers of homeless, 'floating' people in the city at that time. An analysis of the duration of residence of cholera cases, non-cholera cases and control families chosen from similar economic strata

indicated that similar proportions from each group could be called transient. It was somewhat surprising that fewer than 10% of the cases admitted to the Cholera Hospital in both cholera and non-cholera diarrhea categories had lived in their homes less than 3 months and 3 out of 4 had lived in their home for more than 1 year. These data tend to refute the argument that a large increase in numbers of patients came from the transient population. We do not have data, however, to rule out a significant impact of the influx of transients on the general level of sanitation that could have contributed indirectly to an increased attack rate in Dacca city. It should be mentioned by comparison that the observed attack rate in the municipal area in the latter half of 1974 was very similar to the attack rate observed in Matlab thana where the CRL operates the diarrheal treatment center.

Cholera and non-cholera diarrheal patients were interviewed in the hospital setting and probably deliberately under estimated the degree to which they use 'unsafe' water-sources and unsanitary facilities for waste disposal. Control families were interviewed in their home and the opportunity to deliberately mislead field workers with regard to these factors was minimized. Owing to this difference in methodology, we believe that the data with regard to water-use patterns and waste disposal patterns in case control study were not different.

The data with regard to diarrheal morbidity rates among cholera and non-cholera diarrheal patients and families and control families does not reveal any differences in overall rates of diarrhea. This may be due to the fact that control patients were matched carefully for income, status and neighborhood of residence. Given the constraints of the matching process it is clear that no significant differences were observed among families who had cholera, non-cholera and no admission to the CRL. However, there is a suggestion of epidemiologic specificity in that contacts among cholera families who developed diarrhea had a much more severe disease than the contacts among non-cholera diarrheal families or control families.

To obtain a closer look at the relationship between

sources of domestic water used for drinking, bathing, and washing and sanitary facilities and attack rates for cholera, the case control approach was limited to three refugee camp situations. This data provided a suggestion that the general sanitary level was associated with attack rate in that the camp in which none of the patients admitted to having to use unsanitary facilities for waste disposal had a much lower attack rate than did two camps which were less well organized and around one fourth of the patients admitted to using such facilities. In none of the camps however, did significant numbers of patients or controls admit to using 'unsafe' water sources for domestic use. Having to use unsanitary waste-disposal facilities, of course, does not imply direct causal relationship, but rather, it is suggestive that the overall sanitary level reflects other factors which more directly influence cholera rates within the locale.

The spectacular data reveals from the last two tables that the poorer classes of worker who usually contract cholera are in the habit of taking their meals from the road side vendors and cheap hotels. The way-side vendors do not have any room and as such there is no particular source of water. They bring water in open bucket from either a tap or tubewell for drinking and also may bring water from canal, pond and river if available for washing the dishes, utensils and hands. They use the same mug for pouring water which helps to mix the two types of water. Usually they prepare molasses and rice or flour gruel or puffed rice molasses mix or cakes at night and serve in the morning. In addition the unsold food of the previous night specially "Pantavat" are also served in the morning. During noon they serve rice and curry or bread and curry. The differences between cases and controls in taking meals out side were remarkable. These are statistically highly significant in all groups except for the infants (0-4). The rate of eating outside by adult males (15+) who usually go out for earning livelihood, is much higher than females. It appears that road side vendors and cheap hotels owners primarily help in the transmission of urban cholera through food and drink in addition to the exposure of unsafe water and unsanitary facilities.

Conclusion

The post monsoon cholera epidemic in 1974 in Dacca city

was exclusively El Tor and predominently (84.5%) Ogawa. An overall attack rate of 1.70 per 1000 was noted in the municipal area. The epidemic occurred virtually simultaneously in all municipal thanas and cases were not randomly distributed among thanas. Significantly lower attack rates were observed in one thana characterized by higher standards of living. No pattern of association between duration of residence or degree to which families were effected by the flood could be discerned using the methods employed in the study. An analysis of diarrhea morbidity rates among hospitalized diarrhea patients and control families revealed similar diarrheal morbidity rates. Contact of cholera patients, however, had more serious diarrhea in that a higher proportion of such contact diarrhea patients were admitted to the hospital than observed in contact diarrhea patients of non-cholera diarrhea cases or control families. An analysis of cholera attack rates in three refugee camps revealed attack rates which were unlike thana attack rates as a whole. Among the three refugee camps however, the refugee camps in which greater numbers of patients admitted to use of unsanitary facilities of waste disposal and unsafe water for bathing and washing had significantly higher attack rates for cholera suggesting that the better overall sanitary environment was associated with lower attack rates.

The stricking observation was that the people who took meals from the road side vendor and cheap hotels had statistically highly significant differences in rates with controls. This was more marked among the adults males who took meals outside than children and females. The road side vendors and hotel keepers seem to play major roles in the transmission of urban cholera.

TABLE 1

URBAN CHOLERA STUDY, 1974

Number of Cholera Admissions to CRL, Dacca
by Calendar Year, Serotype, and Biotype

Year	Classical Inaba	Classical Ogawa	El Tor Inaba	El Tor Ogawa	Total
1970	2,792	38		138	2,968
1971	1,042	1,426		185	2,653
1972	40	598	1	63	702
1973	1		10	1,265	1,276
1974		2	853	4,662	5,517

TABLE 2

URBAN CHOLERA STUDY, 1974

Months / Thana	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	1974 Census Population	Rate/1,000
Kotwali	6	21	64	110	51	3	255	159,275	1.60
Sutrapur	4	42	92	182	73	7	400	218,938	1.83
Lalbag	5	17	93	217	50	13	395	247,494	1.60
Mohammadpur	-	8	81	147	54	4	294	217,134	1.35
Ramna	4	26	129	216	78	11	464	268,363	1.73
Tejgaon	2	16	93	214	111	17	453*	218,103	2.08*
Total	21	130	552	1,086	417	55	2,261	1,329,207	1.70

* Cases and rates probably inflated due to inaccuracy of location of residence.

Age and Sex Distribution of Control Matched Cholera Cases

Ages	Male	Percent	Female	Percent
0-4	28	27.6	19	18.8
5-9	21	20.6	16	15.8
10-14	19	18.6	7	6.9
15+	34	33.3	59	58.4
Total	102	100.0	101	99.9
Percent	50.2		49.8	

Ages and Sex Distribution of Matched Control Cases

Ages	Male	Percent	Female	Percent
0-4	22	21.6	19	18.7
5-9	23	22.5	22	21.8
10-14	20	19.6	1	1.0
15+	37	36.2	59	58.4
Total	102	99.9	101	99.9
Percent	50.2		49.8	

Table 4

URBAN CHOLERA EPIDEMIC, 1974

Interval of Hospitalization of Cholera Cases From Onset

Age	Same Day	2nd day	3rd day	4th day	5th day	6th day	7th day & Over	Total	Percent
0-4	54	46	13	11	6	4	8	142	23.16
5-9	59	44	12	7	2	-	3	127	20.71
10-14	21	27	11	4	1	-	2	66	10.76
15-19	9	19	7	2	-	2	-	39	6.36
20-29	36	43	16	11	6	2	1	115	18.76
30+	28	62	21	7	3	2	1	124	20.22
Total	207	241	80	42	18	10	15	613	99.97
Percent	33.76	39.31	13.05	6.85	2.93	1.63	2.44	99.95	
Cumulative percent	33.76	73.07	86.14	92.99	95.92	97.55	99.99		

Table 5

URBAN CHOLERA STUDY, 1974

Interval of Hospitalization of Non-cholera Diarrhea Cases From Onset

Age	Same day	2nd day	3rd day	4th day	5th day	6th day	7th day	Total	Percent
0-4	23	45	20	14	5	3	22	132	38.59
5-9	16	11	6	1	1	2	7	44	12.86
10-14	9	12	1	1			1	24	7.01
15-19	3	3	1		1	2		10	2.92
20-29	15	19	3	7				44	12.86
30+	20	37	18	7	2	3	1	88	25.73
Total	86	127	49	30	9	10	31	342	99.97
Percent	25.14	37.13	14.32	8.77	2.63	2.92	9.06	99.97	
Cumulative percent	25.14	62.27	76.59	85.36	87.99	90.91	99.97		

TABLE 6

URBAN CHOLERA, 1974

Duration of Stay & Incidence of Cholera

Interview Groups	Duration			Total
	0-3 m	3-12 m	12 m+	
Cholera	64	74	475	613
Percent	(10.4)	(12.1)	(77.4)	(99.9)
Non-cholera Diarrhea	44	54	254	352
Percent	(12.5)	(15.3)	(72.1)	(99.9)
Control	12	39	152	203
Percent	(5.9)	(19.2)	(74.8)	(99.9)

TABLE 7

URBAN CHOLERA STUDY, 1974

Usage of Water by Cholera and Control Families

	Cholera Affected Families				Control Families			
Income	Source	Drink	Wash & Bathe	Total	Source	Drink	Wash & Bathe	Total
0-200	Tap/TW	184	126	310	Tap/TW	38	22	60
	Open	2	60	62	Open		16	16
201-300	Tap/TW	199	120	319	Tap/TW	91	50	141
	Open	4	83	87	Open	2	43	45
301+	Tap/TW	221	155	361	Tap/TW	72	49	121
	Open	3	69	72	Open		23	23
Total	Tap/TW	604	401	1005	Tap/TW	201	121	322
	Open	9	212	221	Open	2	82	84

TABLE 8

URBAN CHOLERA STUDY, 1974

Usage of Latrine by Cholera and Control Families

	Cholera Affected Families			Control Families		
Income	Sanitary Latrine	Open Latrine	Total	Sanitary Latrine	Open Latrine	Total
0-200	48	138	186	6	32	38
201-300	35	168	203	8	85	93
300+	81	143	224	13	59	72
Total	164	449	613	27	176	203

TABLE 9

URBAN CHOLERA STUDY, 1974

Affect of Flood and Congestion

Interview Group	No. of Family	Flood Affected	Rate Affected/ 100	Residence Shifted	Rate Shifted/ 100	Person/ Room
Cholera Families	613	179	29.2	55	30.7	4.4
Non-Cholera Diarrhea	352	118	33.5	33	27.9	4.1
Control	203	65	32.0	14	21.5	4.5

TABLE 10

URBAN CHOLERA STUDY, 1974

Diarrhea of Contacts Within 7 Days From the Index/Interviewed

Groups	No. of Contact		No. of Diarr.		No. of Admission CRL	Percent of Diarr. in Contacts		Over all Percent Contact	Percent Including Index
	0-9	10-10+	0-9	10-10+		0-9	10-10+		
Cholera	1120	1723	164	50	69	14.64	2.90	7.52	23.99
Non-Cholera Diarrhea	558	985	85	37	-	15.23	3.75	7.90	24.65
Control	349	591	57	24	-	16.33	4.06	8.61	7.08

TABLE 11

URBAN CHOLERA STUDY, 1974

Cholera Rates, Water & Sanitary Facilities of Bustees and Camps

Bustees/Camp	Popu-lation	No. of Cases	Attack Rate/ 1000	No. of Tap/ Tubewell	No. of Pond/ Tank	Percent Use un-safe Water for W/B	No. of Sanitary Latrine	No. of Open Surface Latrine	Percent Use Un-sace Latrine
A Geneva Camp (New Relief)	49,675	80	1.61	75	-	-	382	-	-
B Kamalapur Rly. Station Bustees	11,375	45	3.95	6	2	100%	-	35	100%
C Kataban Babupara Bustees	12,112	52	4.29	6	4	100%	-	30	100%
Total	73,162	117	2.41	87	6		382	65	

Table 12

URBAN CHOLERA STUDY, 1974

History of Taking Meals by Control Index Outside Within 5 Days

	MALE					FEMALE				
Age	Ate in Family Having Known Diarrhea/ Cholera	Ate From a Road-side Vendor Rice/ Curry	Ate From Other Variety of Hotel, Restaurant Etc.	Total	Percent	Ate in Family Having Known Diarrhea/ Cholera	Ate From a Road-side Vendor Rice/ Curry	Ate From Other Variety of Hotel, Restaurant Etc.	Total	Perce
0-4		4		4	30.76	1	2	1	4	80.
5-9		4		4	30.76		1		1	20.
10-14		1		1	7.69					
15+	1	3		4	30.76					
Total	1	12		13	99.97	1	3	1	5	100
Percent	7.69	92.30		99.99		20.0	60.0	20.0	100.0	

Table 13

URBAN CHOLERA STUDY, 1974

History of Taking Meals By Cholera Cases Outside Within 5 Days

	MALE					FEMALE				
Age	Ate in Family Having Known Diarrhea/ Cholera	Ate From a Road-side Vendor Rice/ Curry	Ate From Other Variety of Hotel, Restaurant Etc.	Total	Percent	Ate in Family Having Known Diarrhea/ Cholera	Ate From a Road-side Vendor Rice/ Curry	Ate From Other Variety of Hotel, Restaurant Etc.	Total	Percent
0-4	3	5	1	9	18.36		1	2	3	8.82
5-9	2	6	2	10	20.40	1	7	2	10	29.41
0-14		1	5	6	12.24	2	3		5	14.70
5+	3	5	16	24	48.97	3	2	11	16	47.05
Total	8	17	24	49	99.97	6	13	15	34	99.98
Percent	16.32	34.69	48.97	99.98		17.64	38.23	44.11	99.98	

FIGURE 1

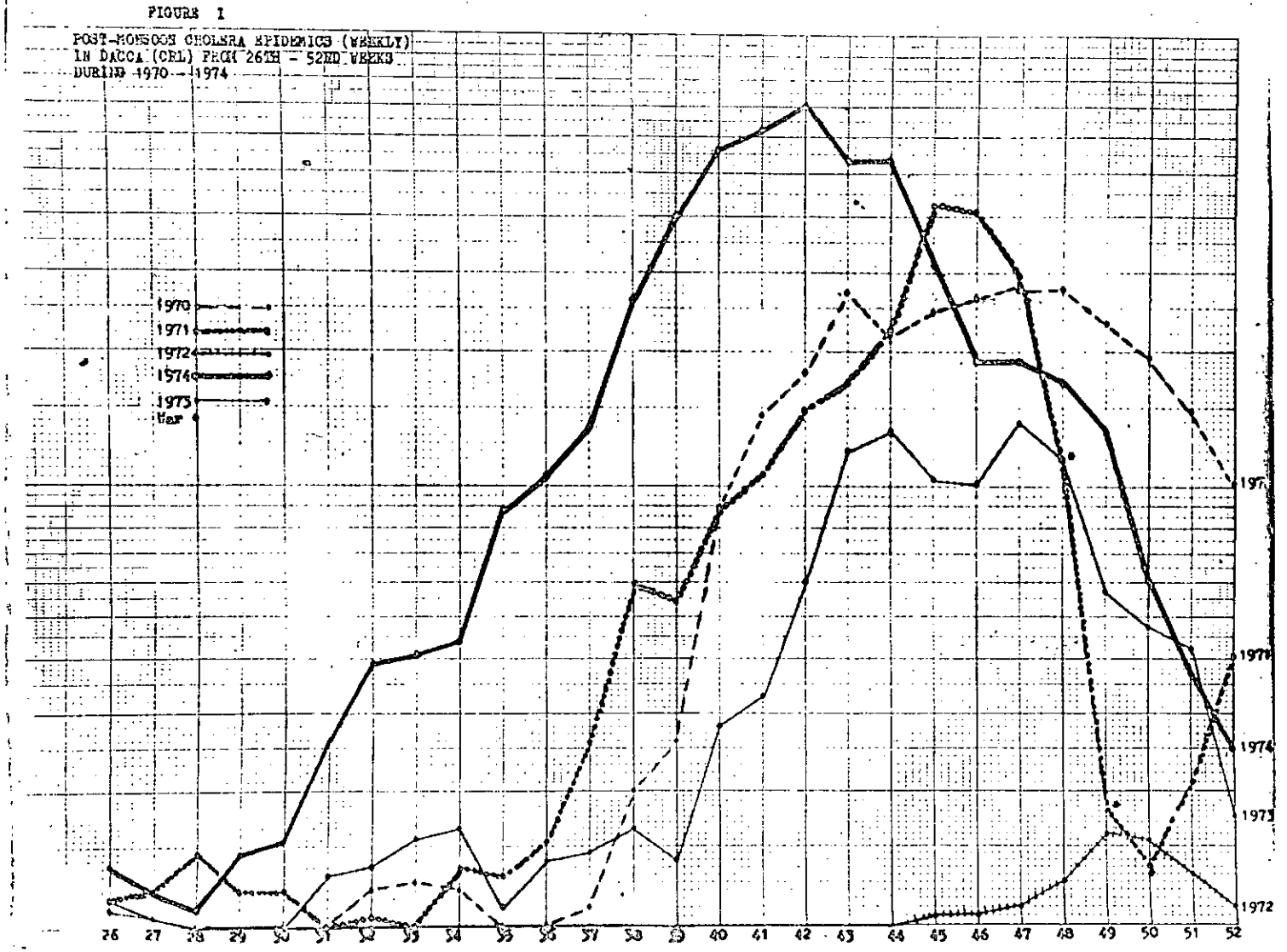


FIGURE 1
POST-MONSOON CHOLERA EPIDEMICS (WEEKLY)
IN DACCA (CRL) FROM 26TH - 52ND WEEKS
DURING 1970 - 1974
1970
1971
1972
1974
1973
War
1971
1970
1974
1973
1972
26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52

FIGURE II

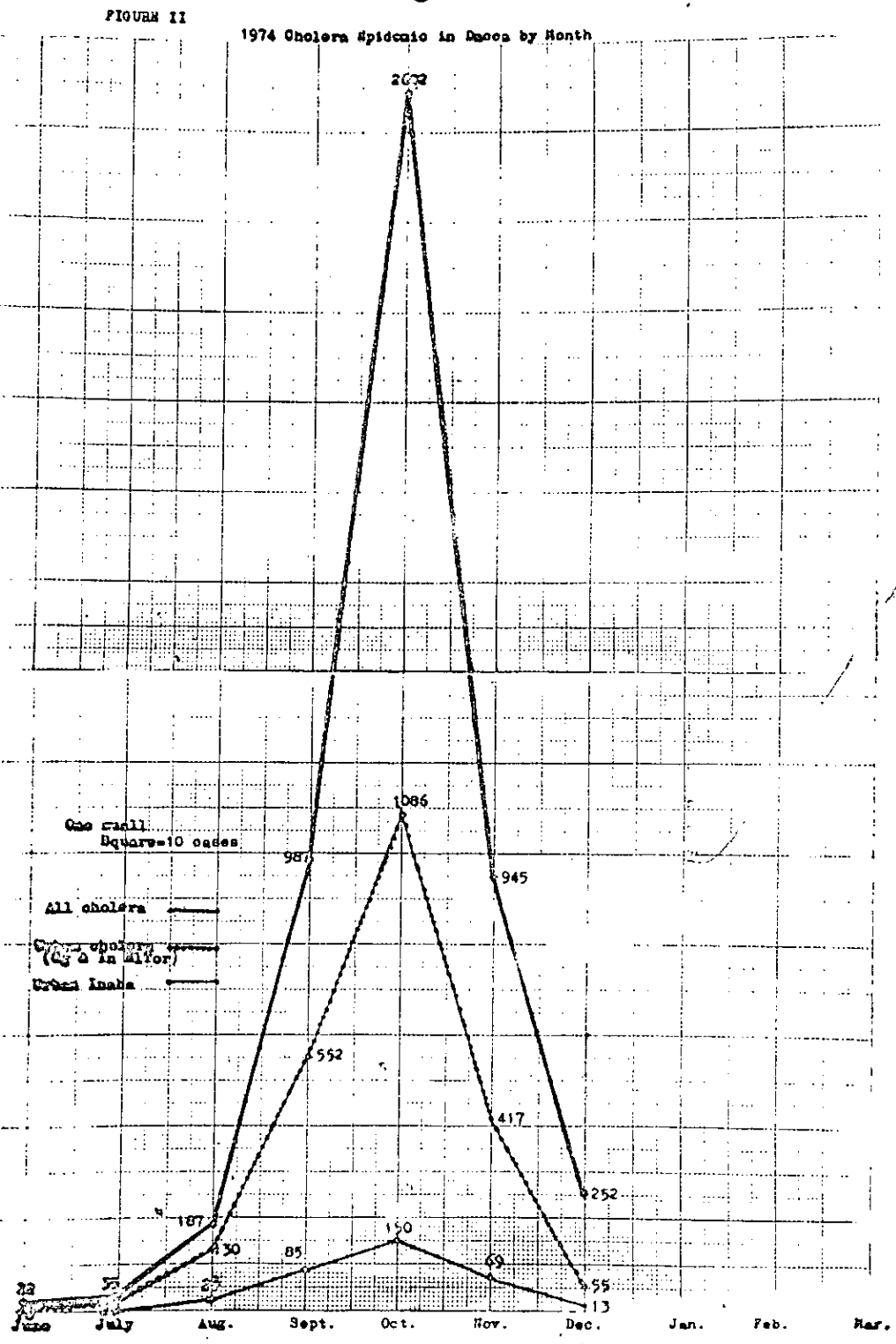
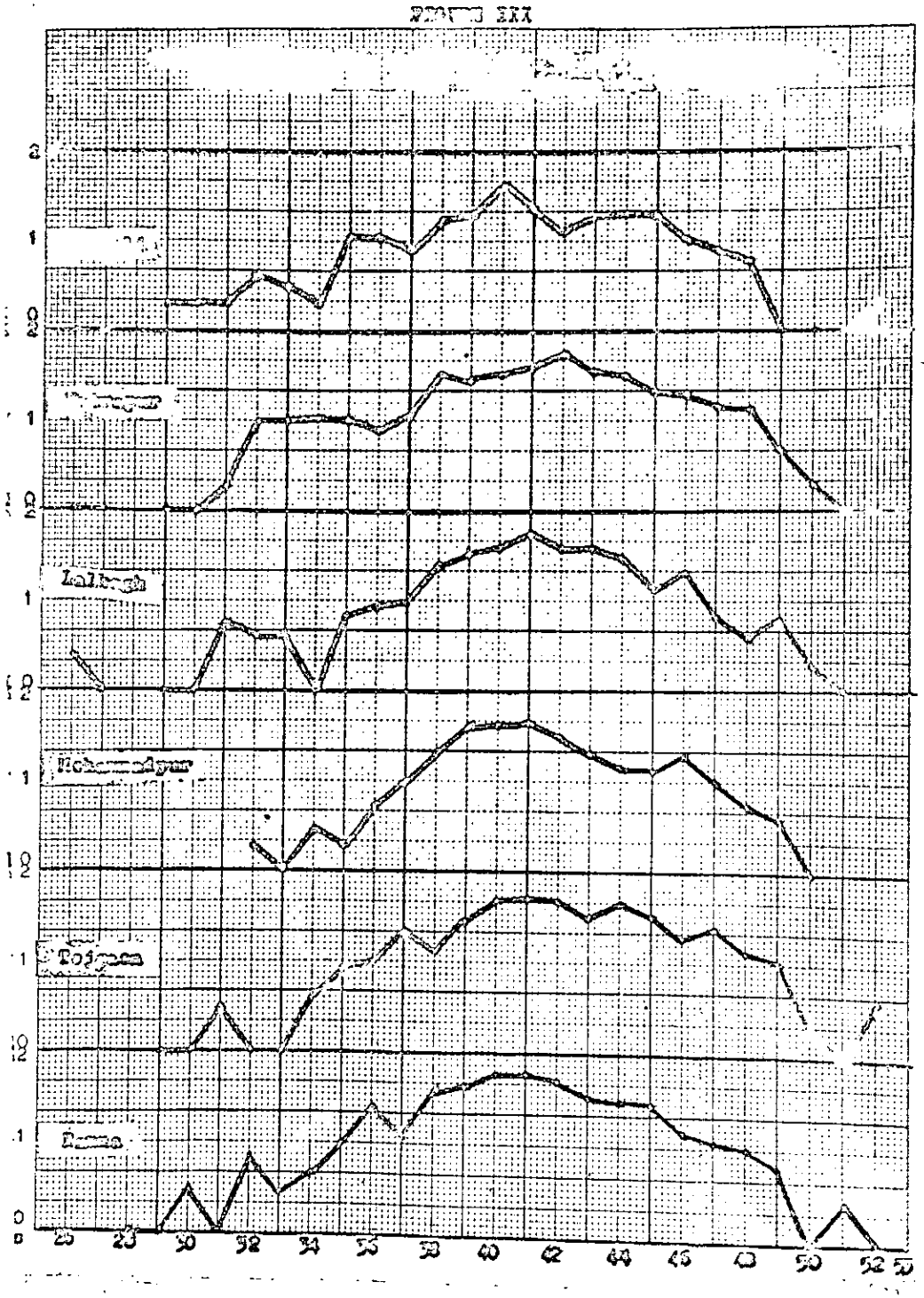


FIGURE II
1974 Cholera Epidemic in Dacca by Month
2092
1086
945
987
552
417
252
187
150
130
85
69
55
22
13
One small Square=10 cases
All cholera
Urban Dhaka
June
July
Aug.
Sept.
Oct.
Nov.
Dec.
Jan.
Feb.
Mar.



PROCEEDINGS OF THE 9TH MEETING OF THE SCIENTIFIC REVIEW AND TECHNICAL ADVISORY COMMITTEE OF THE CHOLERA RESEARCH LABORATORY

(a)

and

REPORTS OF THE COLLABORATIVE STUDIES BETWEEN CENTER FOR MEDICAL RESEARCH AND CHOLERA RESEARCH LABORATORY

For the

YEAR 1974

Dacca, Bangladesh