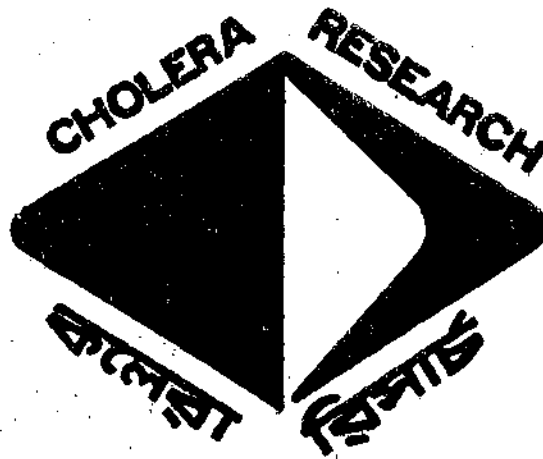


**HOURS OF ONSET OF CHOLERA CLASSICAL AND  
EL TOR AND DIARRHOEA**

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## PREFACE

The International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) is an autonomous, international, philanthropic and non-profit centre for research, education and training as well as clinical service. The Centre is derived from the Cholera Research Laboratory (CRL). The activities of the institution are to undertake and promote study, research and dissemination of knowledge in diarrhoeal diseases and directly related subjects of nutrition and fertility with a view to develop improved methods of health care and for the prevention and control of diarrhoeal diseases and improvement of public health programmes with special relevance to developing countries. ICDDR,B issues two types of papers: scientific reports and working papers which demonstrate the type of research activity currently in progress at ICDDR,B. The views expressed in these papers are those of authors and do not necessarily represent views of International Centre for Diarrhoeal Disease Research, Bangladesh. They should not be quoted without the permission of the authors.

### ABSTRACT

Nearly a century ago scientists observed that the hour of onset of cholera was mostly during night. But there has been no study about its hours of onset. In addition, there are little information about the hours of onset of acute diarrhoea as well.

We have analysed the hours of onset of 983 classical cholera and 1460 acute diarrhoea which had been admitted and treated in the ward of the International Centre for Diarrhoeal Disease Research, Bangladesh (formerly Cholera Research Laboratory) during 1964 and 1965. To compare the findings with the data obtained after about a decade we have analysed the hours of onset of 1413 El Tor cholera cases and 801 acute diarrhoea cases treated in the same ward during 1975 to 1977.

The analysis shows that nearly 25% of all cholera, classical and El Tor had their hours of onset in the early hours of a day between 3-6 A.M. At the same time, over 20% of all diarrhoea cases had their hour of onset in the early part of a day during the same hour as cholera. This pattern of hours of onset has considerable epidemiological significance. An individual can carry infection to a long distance during day before getting an attack during the early hours. This pattern of hours of onset may have some physiochemical property of gut or host parasite relationship which needs further exploration.

## INTRODUCTION

Griensinger (1) in 1857 and Labert (2) in 1874 observed that attack of cholera occurs generally at night. Patients sleep with discomfort, and then suddenly wake up with the urge to defecate. In the last century, during the epidemic in Hamburg, the residents of the city were afraid to go to bed at night for fear of onset of cholera. During cholera epidemic in rural Bangladesh during 1960s the practice of staying awake prevailed. Though investigators have observed the onset of cholera during night, none has examined this closely to identify the time of onset of cholera. On the other hand, the usual hour of onset of acute diarrhoeal illnesses have not been defined by any author. We therefore, wanted to examine these points in greater detail.

## METHODOLOGY

The International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) has been operating the largest facility for treating all diarrhoeal diseases in Dacca since 1962. All severe diarrhoea cases including cholera, Non-cholera vibrio diarrhoea, *E.coli* diarrhoea, define Rotavirus diarrhoea etc. are admitted for treatment. The date and time of onset are recorded by the physicians. The clinical history sheets were randomly selected and analysed for the time of onset of classical cholera which occurred during 1964 and 1965. Similar analysis was also done on acute non-cholera diarrhoea cases admitted during the same time.

Classical cholera cases were replaced by El Tor in 1973. To compare the pattern of classical cases with El Tor cholera, the clinical history sheets of El Tor cholera cases, which occurred during 1975 to 1977 have been randomly selected and analysed. The time of onset for diarrhoea for the period 1975 to 1977, have also been analysed to compare with cholera and former diarrhoea cases. The entire period of the day has been divided into eight fractions each having 3 hours of time. The age and sex of the cases for the classical period (1964-65) could not be obtained. But the age and sex have been analysed both for cholera and diarrhoea cases for the period from 1975 to 1977. The results of confirmed cases of cholera only have been incorporated. The diagnoses of the cholera cases have been done as previously reported (3,4,5).

## RESULTS

Table 1 shows the hours of onset of 983 cases of classical cholera occurring during 1964 - 1965 and compares with the hours of onset of 1413 El Tor cholera cases occurring during 1975 to 1977. It is noteworthy that the hours of onset of El Tor cases occurring a decade later were recorded by a different group of physicians. The peak hours of onset for both classical (23.6%) and El Tor cholera (23.1%) was between 3 A.M. to 6 A.M. Similarly, the lowest number of both types of cholera cases had their hours of onset between 9 A.M. and 12 noon.

Table 2 compares the hours of onset of acute non-cholera diarrhoea cases admitted during 1964 - 1965 and 1975 - 1977. It compares the hours of onset of 1460 diarrhoeas with that of 801 cases at the two different time periods. The peak period of onset was somewhat extended compared to cholera. Maximum number of cases had their onset of diarrhoea between 3 A.M. to 9 A.M. both in 1964 - 1965 and 1975 - 1977 period (38.4% and 35.5% respectively).

Figure 1 shows the differences in the hours of onset of classical and El Tor cholera cases and that of the diarrhoea cases occurring during the two periods. It shows remarkable similarities in the hours of onset between the two types of cholera occurring after an interval of over 11 years. In both the cases the peak hour was between 3-6 A.M. and lowest peak was during 9 A.M. to 3 P.M.

The diarrhoea cases also had hours of onset identical to classical cholera cases. But during the El Tor period it was very similar to El Tor cholera cases. As is seen between cholera, there was a rise in the percentage of the hours of onset of diarrhoea during 3 P.M. to 12 midnight, in the cases of 1975-77 diarrhoeas over the other.

Whether age has any effect on the hours of onset of cholera is shown in Table 3. During the period between 0-3 A.M. the children (0-9), young adults (30-39) and the older (60+) group had higher rate of onset. But the differences are not highly significant. Between 3-6 A.M. the rates are identical for all ages excepting the older group who has lower rate than the others. In the 6-9 A.M. period young adults (30-39) had lower rate of onset compared to the other age groups. But during 0 to 3 P.M., the same group of young adults (30-39) had the highest rate. The hours of onset do not therefore, show any relation with age to particular period of days.

TABLE 1

## HOURS OF ONSET OF CHOLERA - CLASSICAL AND EL TOR

Hours Onset	No. of Classical Cholera 1964 - 1965	No. of El Tor Cholera 1975 - 1977	Percent Classical	Percent El Tor
.01-3 AM	131	229	13.3	16.2
3.01-6 AM	232	320	23.6	23.1
6.01-9 AM	194	197	19.7	13.9
9.01-12 NOON	66	91	6.7	6.4
12.01-3 PM	95	135	9.7	9.6
3.01-6 PM	108	145	11.0	10.3
6.01-9 PM	87	146	8.9	10.3
9.01-12 MN	70	144	7.1	10.2
Total	983	1413	100.0	100.0

TABLE 2

## HOURS OF ONSET OF DIARRHOEA DURING CLASSICAL AND EL TOR PERIOD

Hours Onset	Diarrhoea 1964 - 1965 Classical	Diarrhoea 1975 - 1977 El Tor	Percent 1964 - 1965 Classical	Percent 1975 - 1977 El Tor
12.01-3 AM	168	102	11.5	12.7
3.01-6 AM	276	187	18.9	23.3
6.01-9 AM	285	98	19.5	12.2
9.01-12 Noon	171	62	11.7	7.7
12.01- 3 PM	153	63	10.5	7.9
3.01- 6 PM	142	90	9.7	11.2
6.01- 9 PM	162	93	11.1	11.6
9.01-12 MN	105	106	7.1	13.2
Total	1460	801	100.0	100.0

HOURS OF ONSET OF CLASSICAL AND EL TOR CHOLERA  
AND DIARRHEA 1964-65 AND 1975-77.

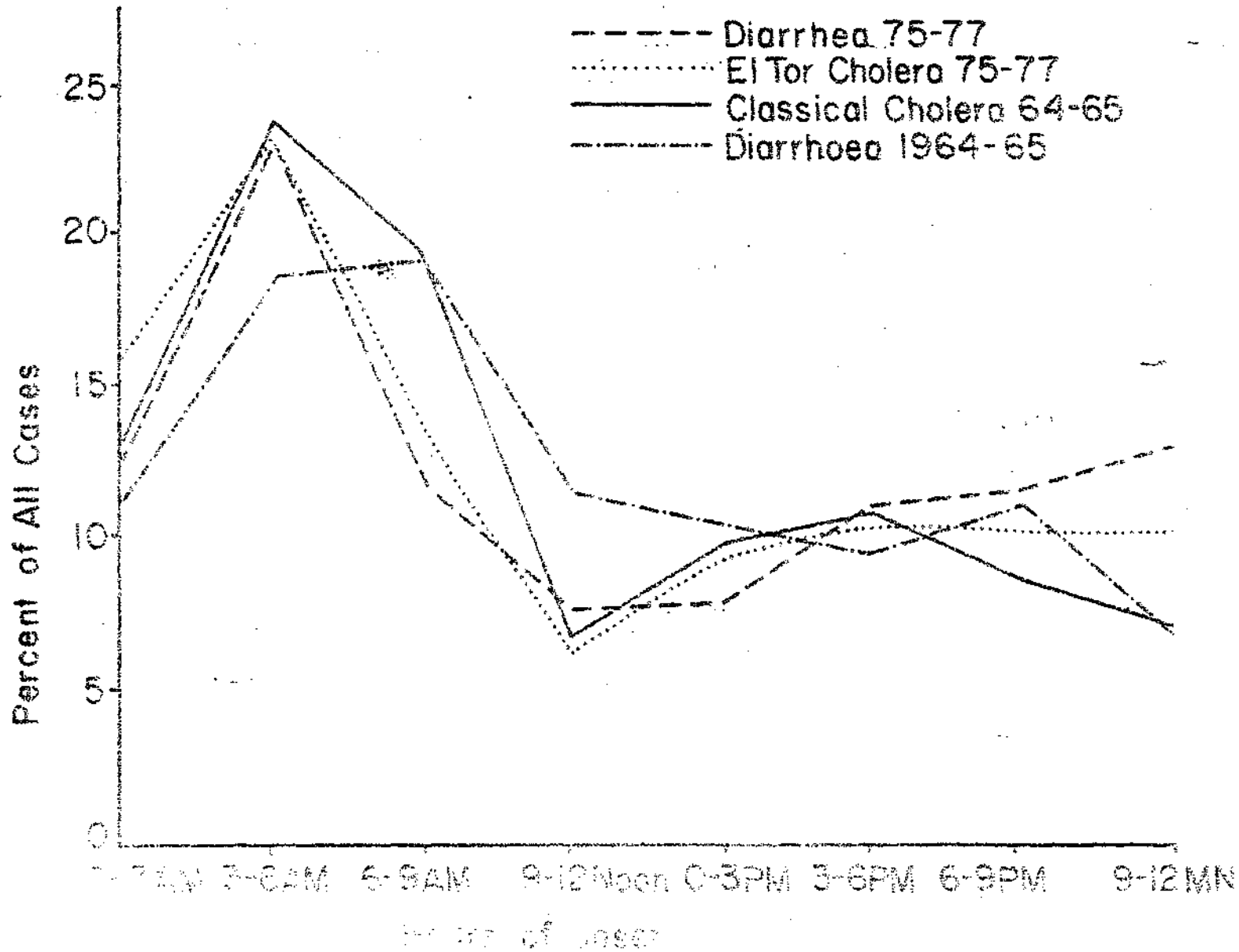




TABLE 3

HOURS OF ONSET OF CHOLERA BY AGE AND PERCENT OF AGE GROUPS  
1975 - 1977

Hours	AGE IN YEARS						
	0-9	10-19	20-29	30-39	40-49	50-59	60+
0-3 AM	118 18.8	34 12.0	32 14.3	24 16.9	9 13.2	5 11.6	7 17.1
3-6 AM	138 22.0	71 25.0	47 21.1	34 26.8	18 26.5	12 27.9	6 14.6
6-9 AM	82 13.1	44 15.5	36 16.1	12 9.4	10 14.7	7 16.3	6 14.6
9-12 Noon	33 5.3	31 10.9	14 6.3	4 3.1	4 5.9	4 9.3	1 2.4
0-3 PM	56 8.9	28 9.9	20 9.0	18 14.2	7 10.3	4 9.3	2 4.9
3-6 PM	66 10.5	23 8.1	25 11.2	12 9.4	8 11.7	3 7.0	8 19.5
6-9 PM	57 9.1	28 9.9	29 13.0	15 11.8	4 5.9	6 14.0	7 17.1
9-12 MN	77 12.3	25 8.8	20 9.0	8 6.3	8 11.7	2 4.7	4 9.8
Total	627	284	223	127	68	43	41

Whether the hour of onset of severe diarrhoea cases has any association with age has been shown on Table 4. During the hours 0-3 A.M. the young adults (30-39) had the lowest rate of onset of diarrhoea. The next lowest rates were in the age groups 10-19 years and over 60 years. But during the following hours, 3-6 A.M. the 10-19 years age group had the highest rate. During the period 9-12 noon 50-59 years age group had the highest rate of onset. It appears that, like cholera, age has no influence in the hours of onset of acute diarrhoea as well.

Table 5 shows whether sex has a role in the hours of onset of cholera and acute diarrhoea. It shows that both sexes had identical rates in the hours of onset in 7 out of 8 sections of days. Males had higher (12.4%) rate of onset of cholera only during 6-9 P.M. as compared to females (8.3%).

In the cases of acute diarrhoea also there were no appreciable differences in the hours of onset of diarrhoea between the sexes.

#### DISCUSSION

The analysis shows that during the early hours of the day there is a definite prevalence of the onset of cholera. The time of onset of all cholera cases are during the early hour of the day. Diarrhoea, due to other causes, also have similar pattern. The age and sex have no influence on the hours of onset of cholera or acute diarrhoea. The century old observations of Griensberg and Lambert still hold true.

The pattern of the hours of onset has considerable epidemiological significance. An individual could be asymptomatic during the day and travel a long distance before developing the diarrhoeal symptoms the following night. In fact an infected man can fly to a country which is free from cholera. In addition, the practice of staying awake to ward off cholera, is still practiced, during cholera epidemic by the rural people of Bangladesh. There must be some valid reasons behind it. Therefore, the nocturnal onset of symptoms of cholera and acute diarrhoeal illness requires further study since it possibly reflects some factors in the physiology of gastro-intestinal tract or in the host parasite relationship that has so far been un-defined. Factors like gastric acidity during ambulatory and resting time of the subject and multiplication of vibrio might have relation. Further studies are needed to pinpoint the cause of the phenomenon.

TABLE 4

HOURS OF ONSET OF DIARRHOEA BY AGE  
1975 - 1977

Hours	A G E						
	0-9	10-19	20-29	30-39	40-49	50-59	60+
0-3 AM	30 13.2	11 10.2	22 13.9	12 9.0	13 16.5	9 21.4	5 10.2
3-6 AM	42 18.4	31 28.7	44 27.7	32 23.9	19 24.0	8 19.0	8 16.3
6-9 AM	30 13.2	13 12.0	21 13.2	15 11.2	10 12.7	4 9.5	5 10.2
9-12 NOON	14 6.1	8 7.4	5 3.1	16 11.9	6 10.1	5 11.9	6 12.2
0-3 PM	21 9.2	10 9.3	14 8.8	10 7.5	5 6.3	1 2.4	3 6.3
3-6 PM	39 17.1	11 10.2	14 8.8	11 8.2	7 8.9	4 9.5	5 10.1
6-9 PM	32 14.0	10 9.3	16 0.0	19 14.2	7 8.9	3 7.1	6 12.1
9-12 MN	20 8.8	14 13.0	13 14.5	19 14.2	10 12.7	8 19.0	11 22.1
Total	228	108	119	134	79	42	49

TABLE 5

## HOURS OF ONSET OF EL TOR CHOLERA AND DIARRHOEA BY SEX

Hours	El Tor				Diarrhoea	
	Male	Female	Male	Female	Male	Female
0-3 AM	109 15.7	120 16.7	49 12.0	53 13.5		
3-6 AM	160 23.1	166 23.0	93 24.4	104 26.4		
6-9 AM	96 13.9	101 14.0	55 13.5	43 10.9		
9-12 NOON	47 6.8	44 6.1	35 8.6	27 6.9		
0-3 PM	64 9.2	71 9.9	38 9.3	25 6.3		
3-6 PM	62 8.9	83 11.5	42 10.3	48 12.2		
6-9 PM	86 12.4	60 8.3	50 12.5	43 10.9		
9-12 MN	69 10.0	75 10.4	55 13.5	51 12.9		
Total	607	720	407	394		

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REFERENCES

1. Griensinger W: Infektionskrankheiten, malaria Krankheiten, gelbes Fieber, Typhses, Pest, cholera. In: Virchow R, ed: Handbuch der speciellen Pathologic and Thesapic, Erlangen, 1857. V.2, pt. 2:242
2. Labert H: Cholera indica, asiatica (Translated by JT Whittacker). In: Von Ziemssen H, ed: Cyclopedia of the practice of medicine. New York, 1874:350
3. Smith HL, Jr, Goodner K: Detection of bacteriological gelatinages by gelatin agar plate method. *J Bacteriol* 76:662-663, 1958
4. Monsur KA: A highly selective gelatin taurocholate tellurite medium for isolation of *Vibrio cholerae*. *Trans Roy Soc Trop Med Hyg* 55:440-445, 1961
5. Monsur KA: Bacteriological diagnosis of cholera under field conditions. *Bull WHO* 28:387-389, 1963