

Correspondence

How endemic is cholera in India?

Sir,

Cholera continues to remain an important public health concern in developing countries. Globally, the true number of cholera cases is known to be much higher than reported. The discrepancy results from underreporting and other surveillance system limitations, including inconsistencies in case definitions and lack of a standard vocabulary¹. The reporting system for cholera lacks standardization as only outbreaks are reported. As per the new definition of endemic cholera given during a meeting of the WHO Strategic Advisory Group of Experts (SAGE) on immunization held in October 2009 in Geneva, the occurrence of faecal culture-confirmed cholera diarrhoea in a population in at least 3 of the past 5 years confirms the area as endemic for cholera².

As a WHO Collaborating Center for Diarrhoeal Diseases Research and Training, the National Institute of Cholera and Enteric Diseases (NICED), Kolkata, West Bengal, India, receives about 1000 to 1500 strains of *Vibrio cholerae* every year from about 30 to 40 institutions from India and a few from outside the country for biotyping, serotyping and phage typing. During 1990-2007, a total of 16,624 strains of *Vibrio cholerae* were received from 24 States, of which 7,225 strains of *V. cholerae* were included for phage typing study. All these strains of *V. cholerae* were identified and confirmed by standard techniques³. Strains were serotyped using polyvalent O1 and monospecific Inaba and Ogawa antisera, and monoclonal antibody O139 (Difco, USA). Phage typing was performed by the standard methodology used at our laboratory^{4,5}. In the present study, we used the place from where strains of *V. cholerae* O1 were received from different parts of the country during different years as a proxy measure to determine whether a given area was endemic for cholera.

Our results indicated that 11 of the 28 States were endemic for cholera because the disease occurred in three consecutive years in that given area as reflected by culture positive strains sent from that State to our Phage typing Unit (Table). During the study period, 16,624 strains were received at NICED (both O1 and O139). The study period (18 yr) was divided in three time blocks (1990 to 1995-Block I, 1996 to 2001-Block II and 2002 to 2007-Block III). It was found that 24 of the 35 States and union territories sent strains at least once in this period. The States which sent strains in consecutive three years in any block were Andhra Pradesh, Delhi, Goa, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Punjab, Rajasthan, Tamil Nadu and West Bengal. Highest number of strains were received from Maharashtra, followed by West Bengal, and the pathogen was isolated every year during the study period. No strains were submitted from Puducherry in this period. From 2004 onwards, the new States entering in the cholera map were Kerala and Sikkim. Of the total strains received, 96.5 per cent strains were serotyped as Ogawa and the remaining 3.5 per cent were Inaba. Periodic shifts in the occurrence of Ogawa and Inaba serotypes in a given area are usual phenomenon and is thought to be a consequence of population-level immunity patterns⁶.

All these strains were clustered under type 2 and 4 when phage typed with Basu and Mukerjee scheme⁷. Almost 100 per cent typeability was observed with the new scheme⁸ with type 27 being the dominant phage type. On this basis, these strains can be divided in to three groups, T2-T27 (52.5%), T4-T27 (32.8%) and UT-T27 (14.7%), suggesting that three closely related clones were disseminated in India. Our study showed that type 27 was the dominant type in all parts of the country followed by type 26.

Table. Overview of *V. cholerae* strains received from different States of India from 1990-2007

State	Block I										Block II										Block III																												
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007													
Andhra Pradesh	16	15	2	67	18	28	1	-	-	-	-	-	-	4	-	69	-	45	16	15	2	67	18	28	1	-	-	-	-	-	-	-	-	-	-	-	-	-											
Andaman & Nicobar	3	-	1	-	-	-	-	-	-	5	-	-	-	-	-	-	-	-	-	3	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-										
Assam	-	7	-	-	-	-	-	18	-	-	-	-	-	-	-	-	-	-	-	-	7	-	-	-	-	-	18	-	-	-	-	-	-	-	-	-	-	-	-										
Bihar	-	-	-	-	4	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-										
Delhi	84	37	160	120	56	31	13	-	57	85	14	24	18	-	227	-	11	-	84	37	160	120	56	31	13	-	57	85	14	24	18	-	227	-	11	-	-	-	-										
Goa	4	3	3	14	-	1	-	-	-	4	3	-	-	3	22	-	-	-	4	3	3	14	-	1	-	-	-	4	3	-	3	22	-	-	-	-	-	-	-	-									
Gujarat	61	91	171	29	374	42	79	51	28	70	34	110	58	67	63	172	104	198	61	91	171	29	374	42	79	51	28	70	34	110	58	67	63	172	104	198	-	-	-										
Haryana	13	-	17	6	-	-	-	-	-	2	-	-	-	1	-	-	-	-	13	-	17	6	-	-	-	-	-	2	-	-	-	1	-	-	-	-	-	-	-	-									
Himachal Pradesh	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-									
Jammu & Kashmir	-	-	-	-	-	2	-	1	5	1	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	1	5	1	-	-	-	-	-	-	-	-	-	-	-	-	-								
Karnataka	-	-	1	-	6	54	87	44	71	20	12	2	14	-	3	32	12	30	-	-	1	-	6	54	87	44	71	20	12	2	14	-	3	32	12	30	-	-	-	-	-								
Kerala	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	3	-	-	-	-	-	-	-	-	-	-	-	-	1	3	-	-	-	-	-	-	-	-	-	-	-	-							
Madhya Pradesh	20	56	31	2	20	29	12	-	12	-	-	-	1	4	-	12	-	4	20	56	31	2	20	29	12	-	12	-	-	-	1	4	-	12	-	4	-	-	-	-	-	-							
Maharashtra	234	322	214	401	191	106	293	125	316	45	146	104	113	232	280	259	156	231	234	322	214	401	191	106	293	125	316	45	146	104	113	232	280	259	156	231	-	-	-	-	-								
Manipur	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
Mizoram	-	-	-	-	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
Orissa	4	23	-	18	-	2	-	-	-	-	2	3	-	-	15	-	-	-	4	23	-	18	-	2	-	-	-	-	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Punjab	43	34	43	5	94	47	1	24	63	81	21	148	127	-	199	37	-	23	43	34	43	5	94	47	1	24	63	81	21	148	127	-	199	37	-	23	-	-	-	-	-	-	-	-	-				
Rajasthan	24	12	22	9	82	50	33	58	27	10	27	20	8	-	12	8	2	-	24	12	22	9	82	50	33	58	27	10	27	20	8	-	12	8	2	-	-	-	-	-	-	-	-	-	-	-			
Sikkim	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Tamil Nadu	215	298	93	34	76	107	178	73	131	38	50	67	59	-	112	76	19	70	215	298	93	34	76	107	178	73	131	38	50	67	59	-	112	76	19	70	-	-	-	-	-	-	-	-	-	-	-	-	-
Tripura	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Uttar Pradesh	-	-	-	-	-	-	1	26	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	26	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
West Bengal	-	-	-	-	53	-	271	303	378	244	133	129	83	113	303	148	112	161	-	-	-	-	53	-	271	303	378	244	133	129	83	113	303	148	112	161	-	-	-	-	-	-	-	-	-	-	-	-	-

*Pondicherry (now Puducherry): No strains received; **Data from surveillance study were available since 1996

Our analysis shows that cholera occurs over a wider geographic area in India than was previously recognized. The annual number of cholera cases reported to WHO by the government was several times lower than the numbers we obtained through strains received at the Phage typing unit. This may be due to lack of surveillance as well as proper laboratory support and, therefore, the burden of cholera in India is clearly underestimated⁹. Data from population-based diarrhoea surveillance in an endemic area of Kolkata, India, revealed a cholera incidence of 2.2 cases per 1000 person-years¹⁰. If one extrapolates these phage data to all endemic areas in the country, the total number of cases would far exceed the numbers quoted above. Our findings also indicate that cholera is an under-recognized problem in India.

B.L. Sarkar¹, S. Kanungo² & G.B. Nair^{1*}

Divisions of ¹Bacteriology & ²Epidemiology
National Institute of Cholera & Enteric Diseases
(ICMR), Kolkata, India

**For correspondence:*

Dr G.B. Nair, Executive Director, Translational
Health Science & Technology Institute, 496 Phase III,
Udyog Vihar, Gurgaon 122 016, Haryana, India
gbnair_2000@yahoo.com

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