Outbreak of cholera in & around Chandigarh during two successive years (2002, 2003)

Neelam Kaistha, Manjula Mehta, Vikas Gautam & Varsha Gupta

Department of Microbiology, Government Medical College & Hospital, Chandigarh, India

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Background & objectives: Outbreaks of cholera caused by *Vibrio cholerae* O1 Ogawa occurred in and around Chandigarh during two successive year 2002 and 2003. This study highlights the antibiotic sensitivity and phage typing pattern of *V. cholerae* isolates during 2002 and 2003.

Methods: Faecal specimens from acute gastroenteritis cases from July to September, 2002 and in the same month in 2003 were collected. Isolation and identification of pathogen was done according to standard methodology. Simultaneously water samples from the areas reporting the maximum number of cholera cases were also processed. Antibiotic susceptibility pattern of the isolates was studied and isolates were sent to National Institute of Cholera and Enteric Diseases (NICED), Kolkata for confirmation and phage typing.

Results: Of the 156 patients in 2002 and 125 in 2003, 59 and 40 isolates respectively were found to be positive for *V. cholerae* O1 serotype Ogawa biotype El tor. Of the 45 water samples tested in 2002, eight were found to be positive for *V. cholerae* O1 serotype Ogawa biotype El tor. None of the 52 water samples tested in 2003 was found to be positive for *V. cholerae*. Phage type 27 was found to be the predominant type for both the years. Majority of the clinical isolates were found to be resistant to more than two drugs.

Interpretation & conclusion: The drug resistance in *V. cholerae* was on the rise during the subsequent outbreak. Phage 27 remained the predominant type in both the years. The major reason for the outbreak was traced to be contaminated water of the hand pumps in the affected area. Continuous surveillance of the outbreak is necessary to contain the spread of transmission.

Key words: Outbreak - phage typing - *Vibrio cholerae* O1 Ogawa

Cholera, a major illness of public health importance, is one of the most important diarrhoeal diseases in India. Epidemics of cholera have been reported from various parts of India. Resurgence of *Vibrio cholerae* O139 in certain areas has also been reported. However, geographic distribution of cholera has changed considerably over the years. Continuous surveillance of cholera outbreak is necessary with particular reference to resistance pattern of the isolates and their phage typing.
Chandigarh, a well planned urban city of India, has been suffering from repeated outbreaks of cholera since last five years. A limited outbreak due to \textit{V. cholerae} O139 (36 cases, unpublished data) occurred in July 1994. In the subsequent years, only small outbreaks of \textit{V. cholerae} O1 Ogawa have been recorded. A small outbreak occurred in September 1999, followed by 56 and 31 confirmed cases in 2000 and 2001 respectively (unpublished data). The largest number of culture confirmed cases from Chandigarh in 2002 was reported by Taneja \textit{et al}~\textsuperscript{10}. During this outbreak and in subsequent outbreak in 2003, a large number of cases of cholera were admitted to Government Medical College & Hospital (GMCH), Chandigarh as well. We report here the antibiotic sensitivity pattern and phage types of \textit{V. cholerae} isolates during 2002 and 2003.

\textbf{Material & Methods}

A total of 156 patients in 2002 and 125 in 2003 suffering from acute gastroenteritis were admitted to Government Medical College & Hospital, Chandigarh. These patients included both children and adults (age ranging 1-60 yr) and belonged to the low socio-economic group.

Faecal specimen collected from each patient was studied bacteriologically and pathogen was identified using recommended procedures~\textsuperscript{11}. Isolates of \textit{V. cholerae} were biotyped by sheep RBC haemolysis, Voges Proskauer (VP) test and susceptibility to Polymixin B (50 units)~\textsuperscript{11}. Serotyping was performed using antiserum obtained from Central Research Institute, Kasauli. Antimicrobial susceptibility test was carried out by Stokes disc diffusion method~\textsuperscript{12} using the following antibiotics (\(\mu\)g/disc) (Hi-Media Laboratories, Mumbai, India) - co-trimoxazole (25), tetracycline (30), chloramphenicol (30), amoxycillin (100), ciprofloxacin (5), and furazolidone (50).

In 2002 and 2003 a total of 45 and 52 water samples respectively were received from the affected areas. Majorities of these samples were obtained from hand pumps and a few from tap water. 900 ml of the water sample was added to 100 ml of 10 times concentrated alkaline peptone water (APW) and incubated at 37°C for 24 h; 1 ml of this was added to 10 ml of sterile APW and subcultured after 4-6 h and after over night incubation on thiosulphate citrate bile salts (TCBS) sucrose agar~\textsuperscript{13}.

All the positive isolates for \textit{V. cholerae} were sent to National Institute of Cholera & Enteric Diseases (NICED), Kolkata for confirmation and phage typing.

\textbf{Results}

Out of 156 faecal samples processed in 2002, 59 (37.8 \%) were found positive for \textit{V. cholerae}. Of the 125 samples processed in 2003, 40 (32\%) were found positive for \textit{V. cholerae}. All the isolates belonged to serotype Ogawa, biotype El tor of \textit{V. cholerae} O1. The same was also confirmed by the NICED, Kolkata. Of the 45 water samples collected in 2002, 8 were found positive for \textit{V. cholerae}. None of the water samples received in 2003 was found positive for \textit{V. cholerae}. All the 2002 water isolates were labelled serotype Ogawa biotype El tor of \textit{V. cholerae}, however, it was found that agglutination was obtained with some difficulty using O1 antisera and also the agglutination was weak. NICED, Kolkata reported these isolates as belonging to non O1 non O139 of \textit{V. cholerae}.

All the clinical isolates of the year 2002 belonged to phage group IV of Basu and Mukherjee conventional scheme~\textsuperscript{14}. Out of 59 isolates 54 belonged to phage group 27 of the new scheme~\textsuperscript{15}. Two belonged to group 13 and one each to groups 7 and 23. All the 2003 isolates belonged to phage group IV of Basu and Mukherjee conventional scheme. Majority (26 isolates) belonged to phage group 27, 5 to phage group 26, 3 to phage group 13, 2 to phage group 15, and one each to phage groups 10, 17, 18 and 20.

The resistance pattern of the 2002 isolates showed a uniform pattern. All were found to be resistant to co-trimoxazole, furazolidone and amoxycillin. Four isolates were resistant to chloramphenicol of which one was resistant to ciprofloxacin as well. Of the environmental isolates, all were resistant to amoxycillin and sensitive to the other drugs tested. However, one of the isolates was found to show multidrug resistance to tetracycline,
chloramphenicol, furazolidone and amoxycillin. The resistance pattern of the 2003 isolates showed a variable pattern. Of the 40 isolates, 32 were resistant to furazolidone and 37 to co-trimoxazole, 31 were found to be resistant to both furazolidone and co-trimoxazole. In comparison to the 2002 isolates, the 2003 isolates were all sensitive to amoxycillin. Also none of the isolates of 2003 were resistant to chloramphenicol and ciprofloxacin.

A high percentage of infection in children (50.6 and 55% in 2002 and 2003 respectively) was found. Majority of the patients were from a single urban slum colony at Chandigarh. The main contaminating source of the spread was traced to be hand pumps. Of the 8 water isolates in 2002, seven were from hand pumps and only one was from tap water.

Discussion

In the present study all the isolates were *V. cholerae* O1 serotype Ogawa, biotype El tor. The results of phage typing were consistent with the overall countrywide epidemiological data which reported Type 27 to be the predominant type.

Our study revealed a high percentage of children affected in the outbreak. The main contaminating source of the outbreak was traced to be the hand pumps. The incidence correlated well with the onset of monsoon in July. Causes of repeated outbreaks of cholera have been traced to leakage of water pumps, low pressure of water necessitating the use of booster pumps leading to suction of sewage into the water pipes, consumption of rain water/shallow hand pump water and practice of open air defaecation.

The report of water samples isolated in 2002 belonging to non O1 non O139 by NICED, Kolkata was at variance with our findings. The isolates obtained from the water samples when serotyped in our Department were reported as *V. cholerae* O1 Ogawa. However, we observed that the agglutination was obtained with difficulty and after a prolonged period of time. Isolation of *V. cholerae* from the environment has been known to be difficult even from the cholera endemic areas. A possibility is that these isolates were mixed cultures of O1 and non O1 or possibly repeated sub-culturing might have led to seroconversion to the more stable/enduring non O1 form.

The clinical isolates of 2002 showed uniform pattern of resistance to co-trimoxazole, furazolidone and amoxycillin. In contrast Taneja et al reported 100 per cent sensitivity for amoxycillin. The resistance pattern of the 2003 isolates showed a variable pattern. However, *V. cholerae* is known to show spatial and temporal fluctuations, with periods of resistance fluctuating with periods of sensitivity, usually reflective of the antibiotics that are abused in any given region. Only one isolate was resistant to ciprofloxacin. Ciprofloxacin resistance has earlier been reported from India.

Most of the isolates obtained from the water samples were sensitive to all the antibiotics tested except for one isolate, which showed multidrug resistance to tetracycline, chloramphenicol, furazolidone and amoxycillin, but the very presence of such resistance is an indicator of the potential to spread. The results of 2003 indicated the resistance to more than one antibiotic was common amongst the clinical isolates. There are reports of multidrug resistant *V. cholerae* appearing with increasing frequency and the emergence of resistance to multiple drugs is a serious problem in the treatment and containment of the disease as reflected by the increase in fatality rate from 1 to 5.3 per cent after the emergence of drug resistant strains in Guinea Bissau during the 1996-97 epidemic of cholera.

In conclusion, there is a need for continued vigilance and planning-effective strategies to provide safe drinking water and simultaneously strengthening the disease surveillance to contain the outbreaks of cholera especially in the vulnerable sections like urban slums.

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References


Reprint requests: Dr Neelam Kaistha, Department of Microbiology, Government Medical College & Hospital Sarai Building, Chandigarh 160047, India e-mail: varshagupta_99@yahoo.com