

## Original Research Article

DOI: <http://dx.doi.org/10.18203/2394-6040.ijcmph20201032>

# An outbreak of diarrhoeal disease of *El Tor Vibrio cholerae O1 Ogawa* in and around Yavatmal district, Maharashtra, India in 2018

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**Received:** 12 December 2019

**Revised:** 17 February 2020

**Accepted:** 29 February 2020

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## ABSTRACT

**Background:** Epidemics of cholera have been reported from various parts of India. We investigated the epidemic of cholera that occurred in and around Yavatmal district in Maharashtra, India 2018, reported during March to July.

**Methods:** 711 stool samples collected from diarrhea patients were bacteriologically analyzed for their identification and antibiogram of *Vibrio cholera*.

**Results:** The cholera outbreak was caused by *V. cholerae* O1 Ogawa biotype El Tor. All the *V. cholerae* isolates from the stool samples were sensitive to tetracycline, doxycycline, ofloxacin, ciprofloxacin gentamycin, cotrimoxazole and resistant to ampicillin and ceftazidime.

**Conclusions:** The present outbreak was due to *V. cholerae* O1 Ogawa El Tor which seems to have completely replaced O139 serogroup of the previous outbreaks during the last decade.

**Keywords:** *V. cholerae*, Outbreak, Yavatmal

## INTRODUCTION

Cholera is an acute diarrhoeal disease caused by *Vibrio cholera*. During the monsoon, outbreaks of cholera are encountered almost every year. Epidemics of cholera have been reported from various parts of India.<sup>1-3</sup> *Vibrio cholerae* O139 emerged as a pathogen and has been reported from various parts of India.<sup>4-8</sup>

Outbreaks of cholera have also been regularly reported from Nagpur which is near Yavatmal district.<sup>9-11</sup> The pattern of outbreaks shifted from *V. cholerae* O1 to *V. cholerae* O139 in 1993, resurgence of *V. cholerae* during subsequent years followed by re-emergence of O139 strains in 1998 in Yavatmal.<sup>9,10</sup>

We report an outbreak of El Tor *Vibrio cholerae* O1 Ogawa in and around Yavatmal district, Maharashtra, India in 2018 during March to July.

## METHODS

A total of 711 stool specimens from patients admitted to Shri Vasantrao Naik Government Medical College, Yavatmal, Maharashtra were received in the clinical Microbiology laboratory during the study period of March to July in 2018. The study was approved by the Institutional Ethical committee. Of these, 211 had rice water consistency. Statistical analysis was done using standard guidelines, as per the public service of creative research systems survey software.

Direct plating of samples was done on sheep blood agar, Mac Conkey and thiosulphate citrate bile salt sucrose (TCBS) agar plates (Hi-Media, Mumbai). The stool samples were also inoculated in alkaline peptone water and incubated overnight at 37°C. Darting motility suggestive of *V. cholerae* seen in alkaline peptone water were again sub cultured on thiosulfate-citrate-bile salts-sucrose (TCBS) agar. Routine subcultures were made from alkaline peptone water on TCBS agar. The isolates of *V. cholerae* were identified morphologically and biochemically using standard recommended procedure.

The confirmation of isolates was done by sero-agglutination using vibrio polyvalent O1, monospecific Ogawa, Inaba and O139 antisera (Central Research Institute, Kasauli).<sup>12</sup> All the *V. cholera* strains were sent to the National Institute of Cholera and Enteric diseases, Kolkata, India for phage typing.

Antibiotic sensitivity testing of *V. cholerae* isolates was done on Muller Hinton agar by disc diffusion method of Kirby and Bauer.<sup>13</sup>

The antibiotics tested were tetracycline (30 µg), doxycycline, (30 µg), ofloxacin (5 µg), ciprofloxacin (5 µg), gentamycin (30 µg), ampicillin (A) (10 µg) ceftazidime (10µg) and cotrimoxazole (25 µg) (Hi-Media, Mumbai).

The *Escherichia coli* ATCC 25922 was used as the quality control strain.

## RESULTS

Of the 711 stool specimens, *V. cholerae* was isolated in 109 samples. Of these, 211 had rice water consistency (Table 2). Out of these, 80 samples were from adult patients and 29 from paediatric patients (Table 1). All 109 samples were El Tor *Vibrio cholerae* O1 Ogawa. None of the isolates was identified as *V. cholerae* O139.

**Table 1: Age wise distribution of *V. cholerae* isolates (n=109).**

| Adults      | Paediatric patients | Total |
|-------------|---------------------|-------|
| 80 (73.39%) | 29 (26.60%)         | 109   |

**Table 2: Consistency of stool samples received in Microbiology laboratory (n=711).**

| Consistency | N (%)       |
|-------------|-------------|
| Solid       | 278 (39.09) |
| Rice water  | 211 (29.67) |
| Semi-solid  | 222 (31.22) |
| Total       | 711 (100)   |

All these patients were from rural areas in and around Yavatmal district. Males and females were equally

affected. *V. cholera* O1 Ogawa was the predominant isolate during this outbreak (Table 3).

**Table 3: Distribution of type of bio-types of *V. cholerae* (n=109).**

| S. no. | Biotype                               | N (%)     |
|--------|---------------------------------------|-----------|
| 1.     | El Tor <i>V. cholerae</i> O1 Ogawa    | 109 (100) |
| 2.     | Classical <i>V. cholerae</i> O1 Ogawa | Nil       |

The antibiotics tested were tetracycline (30 µg), doxycycline (30 µg), ofloxacin (5 µg), ciprofloxacin (5 µg), gentamycin (30 µg), ampicillin (A) (10 µg) ceftazidime (10 µg) and cotrimoxazole (25 µg) (Hi-Media, Mumbai). The *E. coli* ATCC 25922 was used as the quality control strain.

Surprisingly all of these strains had same sensitivity.

They were all sensitive to tetracycline, doxycycline, ofloxacin, ciprofloxacin and gentamycin, cotrimoxazole, resistant to ampicillin and ceftazidime (Table 4).

**Table 4: Antibiotic sensitivity pattern of *V. cholerae* isolates (n=109).**

| S. no. | Antibiotics            | N (%)<br>sensitivity |
|--------|------------------------|----------------------|
| 1.     | Tetracycline (30 µg)   | 109 (100)            |
| 2.     | Doxycycline (30 µg)    | 109 (100)            |
| 3.     | Ofloxacin (5 µg)       | 109 (100)            |
| 4.     | Ciprofloxacin (5 µg)   | 109 (100)            |
| 5.     | Gentamycin (30 µg)     | 109 (100)            |
| 6.     | Gentamycin (30 µg)     | 0 (0)                |
| 7.     | Ampicillin (A) (10 µg) | 0 (0)                |
| 8.     | Ceftazidime (10 µg)    | 0 (0)                |
| 9.     | Cotrimoxazole (25 µg)  | 109 (100)            |

**Table 5: Clinical symptoms associated with patients with *V. cholerae* infection (n=109).**

| S. no. | Clinical symptoms  | N (%)      |
|--------|--|------------|
| 1.     | Sudden onset of belching abdominal pain within 5–6 hours | 98 (89.90) |
| 2.     | Rice watery stool  | 90 (82.56) |
| 3.     | Vomiting   | 78 (71.55) |
| 4.     | Muscular cramping  | 69 (63.30) |
| 5.     | Rapid progress of severe dehydration                     | 79 (72.47) |

The clinical signs and symptoms in the diarrhea patients were sudden onset of belching abdominal pain within 5–6 hours, with rice watery stool, vomiting, muscular cramping, and rapid progress of severe dehydration (Table 5). For management, rehydration was mainstay of treatment. Tetracycline was used as the first line drug;

however, the antibiotic was changed according to culture and sensitivity report, if required.

## DISCUSSION

Contamination of water sources is the main cause of transmission of cholera, a water-borne disease. Yavatmal

is set in the rural background with limited access to medical facility. According to the below table, there has not been any major outbreak of cholera gastroenteritis in Yavatmal in the last decade. Though sporadic cases have occurred here and there. But in 2018, not a single case of O139 was detected here. All were due to *V. cholerae* O1 Ogawa El Tor.

**Table 6: Year-wise distribution of *V. cholerae* strains in Yavatmal district.**

| Year | Place    | Reference                    | <i>V. cholerae</i> strains | No of total positives | Total |
|------|----------|------------------------------|----------------------------|-----------------------|-------|
| 1992 | Yavatmal | Ingole et al <sup>16</sup>   | O139                       | 0                     | 9     |
|      |          |                              | O1 Ogawa El Tor            | 9                     |       |
| 1993 | Yavatmal | Jalgaokar et al <sup>5</sup> | O139                       | 26                    | 34    |
|      |          |                              | O1 Ogawa El Tor            | 8                     |       |
| 1994 | Yavatmal | Fule et al <sup>8</sup>      | O1 Ogawa El Tor            | 62                    | 65    |
|      |          |                              | O139                       | 3                     |       |
| 2018 | Yavatmal | Present study                | O1 Ogawa El Tor            | 109                   | 109   |
|      |          |                              | O139                       | Nil                   |       |

Ingole et al compared the changing pattern of *V. cholerae* in 1992, 1993 and 1994 (Table 6). In 1992 outbreak, there was predominantly *V. cholerae* O1 Ogawa El Tor prominence. In 1993, *V. cholerae* O139 was the predominant strain, though *V. cholerae* O1 Ogawa El Tor was present in only meager quantity. In 1994, *V. cholerae* O1 Ogawa El Tor became the predominant strain, but few cases of O139 were also reported.

According to Pal et al, the cholera outbreaks in Orissa in 2007 were caused by *V. cholerae* O1 Ogawa biotype El Tor in both Kashipur and Dasmantpur blocks. All the *V. cholerae* isolates from the clinical and environmental samples were sensitive to tetracycline, gentamicin, azithromycin, and chloramphenicol, but were resistant to ampicillin, ciprofloxacin, norfloxacin, co-trimoxazole, nalidixic acid, neomycin, and furazolidone.<sup>14</sup>

According to Roychoudhury et al in 2004, Out of 343 diarrhoea cases, 341 cases were caused by *V. cholerae* O1 and 2 by O139. Serotyping analysis showed that 104 cases were of Inaba and 237 to Ogawa serotypes.<sup>15</sup>

The year 2018 saw a major change in history, with only *V. cholerae* O1 Ogawa El Tor stains and no O139 strains.<sup>16</sup>

Kumar et al reported an outbreak of *V. cholerae* O1 Ogawa (Ten cases) in a village of Ambala district in Haryana, India in 2007. The water sample from handpump installed near the slum area was found to be positive for *V. cholerae* O1.<sup>17</sup>

The year 2018 was a year of acute water shortage for Yavatmal district and neighbouring areas, especially in summer season. Due to this, people were forced to drink water from contaminated wells and bore-wells.

Lack of chlorination of wells and other portable water resources, lack of health education, poverty could be the reasons for re-surgence of *V. cholerae* O1 Ogawa (El Tor) in this district.

## CONCLUSION

The present outbreak was due to *V. cholerae* O1 Ogawa El Tor seems to have completely replaced O139 serogroup of the previous outbreaks during the last decade. Continued monitoring and surveillance of all cholera outbreaks becomes a necessity. Proper Water sanitation plays an important role in situations like this where water scarcity is a routine problem. Early diagnosis and prompt management of cases is of utmost importance in such situations.

*Funding:* No funding sources

*Conflict of interest:* None declared

*Ethical approval:* The study was approved by the Institutional Ethics Committee

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**Cite this article as:** Kale SS, Bulle PA, Deshmukh DG, Tankhiwale SS, Gujar VM. An outbreak of diarrhoeal disease of El Tor *Vibrio cholerae* O1 Ogawa in and around Yavatmal district, Maharashtra, India in 2018. *Int J Community Med Public Health* 2020;7:1297-300.