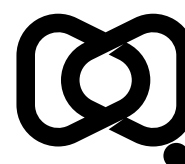


Multiple outbreaks of norovirus caused by persistent transmission in a hospitality setting in Victoria, Australia, 2023

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Abstract

This report describes unusually persistent transmission of norovirus in a hospitality setting in Victoria, Australia. In September 2023, the Victorian State Government Department of Health was notified of six gastroenteritis outbreaks associated with events held at a single function venue. Genomically identical norovirus genogroup II (GII) was detected from cases in five of the outbreaks. No statistically significant association with illness was found for any food item. Information collected through staff interviews provided evidence of food handlers and wait staff continuing to work while infectious, likely resulting in sustained transmission through person-to-person routes as well as through potential contamination of the environment.

Keywords: norovirus; outbreak; gastroenteritis; outbreak investigation

Background and methods

On 15 September 2023, the Victorian State Government Department of Health (Victoria Health) was notified of a gastroenteritis outbreak (Outbreak 2) affecting delegates attending a conference at a hotel. Three days later, a gastroenteritis outbreak involving 80 guests of a wedding reception was reported at a separate function venue (Outbreak 3). This function venue had earlier hosted a dinner for the affected conference delegates.

Subsequently, another four gastroenteritis outbreaks associated with separate wedding receptions held at the same venue were reported. All events served food prepared at the venue and took place over a fifteen-day period. These outbreaks are referred to as Outbreaks 1–6, indicating chronological order of exposure.

Where possible, attendees were interviewed using a menu-based questionnaire. A retrospective cohort study was performed for Outbreak 2 using food consumption data collected during interviews. Descriptive epidemiology for Outbreaks 2–6 was performed using data from case interviews and case laboratory testing reports. Outbreak 1 was not investigated due to the delayed notification. All staff who worked at the function venue during this period were interviewed regarding work schedules, duties, and gastrointestinal illness.

Faecal specimens were collected from cases from Outbreaks 2–6 for bacterial and viral panels. Food and environmental samples were collected from the premises by local government environmental health officers and tested for bacterial pathogens. As standard laboratory methods do not detect norovirus in food samples, viral pathogen testing was not undertaken. Testing was performed at the Microbiological Diagnostic Unit Public Health Laboratory and the Victorian Infectious Disease Reference Laboratory (VIDRL).

Description of outbreak

A confirmed case was defined as a person who attended an event at the venue during the fifteen-day period of interest, reported symptoms of gastroenteritis (vomiting, nausea, diarrhoea, fever, abdominal pain) during or within seven days of attendance, and had norovirus genogroup II (GII) detected from a faecal specimen. A probable case differed by either not having a faecal specimen tested or having a specimen with no pathogen detected. Individuals were excluded as a case if a pathogen other than norovirus GI was detected. A total of 273 cases (41 confirmed, 232 probable) were identified out of an estimated 1,098 people at risk (Table 1).

Table 1: Attendees at risk, cases, interviews performed, and faecal specimens collected, by outbreak,^{a,b} Victoria, Australia, 2023

Outbreak number	Day of event	At risk (Attendees) ^a	Total cases	Cases interviewed	Attendees interviewed (not ill)	Faecal specimens collected	Confirmed cases ^c
1	0	— ^b	30	0	0	0	0
2	3	346	88	37	21	9	9
3	6	276	80	27	0	23	21
4	12	109	28	10	0	6	6
5	13	237	42	9	0	6	4
6	14	130	5	0	0	2	1
Total	—	1,098	273	83	21	45	41

a Attendees were based on invite lists and may not be reflective of actual attendance.

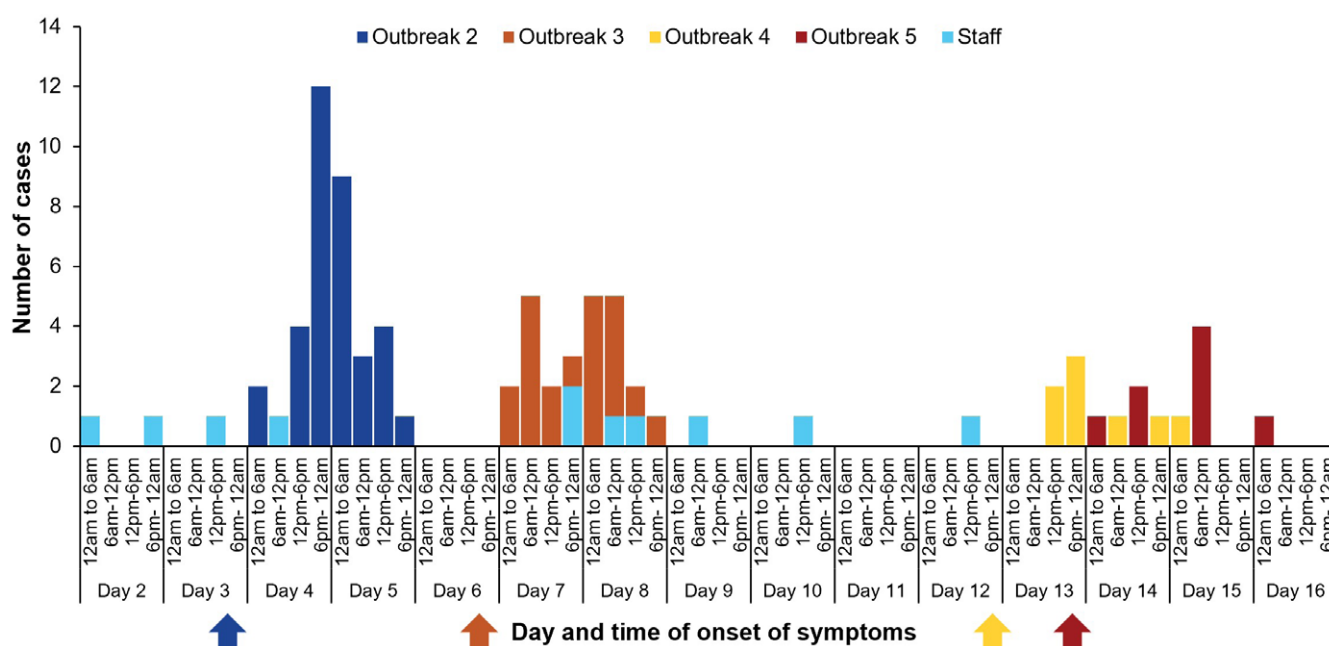
b Attendees at the function associated with Outbreak 1 were not reported.

c Those for whom detection of norovirus GII was reported.

The median age of cases was 37 years (range: 14–85 years) and 61% were female. Reported symptoms included nausea (90%); abdominal pain (83%); diarrhoea (78%); vomiting (77%); and fever (59%). Median estimated incubation period was 27.5 hours (range 4–92 hours), calculated from an arbitrary exposure time during each event (8 pm). Median duration of illness was three days (range: 1–7 days). Clinical presentation, incubation periods and duration of illness were similar between outbreaks.

Food exposure analysis was undertaken for Outbreak 2 only. Univariable analysis found no statistically significant association between illness and any individual food item. Venue menus indicated that several dishes were served across multiple events; however, information was unavailable regarding whether common ingredients or batches of ready-to-eat foods were used at different functions.

Figure 1: Epidemic curve for norovirus outbreaks 2–5, among attendees and staff, by onset date and time,^{a,b} Victoria, Australia, 2023



a Symptom onset data was provided at interview for outbreaks 2–5, and for 11 of 12 staff with illness.

b Arrows, colour coded by outbreak number, indicate the day and times of the event.

Twelve staff members reported gastroenteritis symptoms during the period of interest. Four were foodhandlers, and seven served food and drinks. Four staff members reported observing patrons vomiting at the venue one day prior to, and on the day of, the first outbreak-related event, and three of these staff helped to clean up the vomit. All four staff subsequently developed gastrointestinal illness. Following outbreaks 1 and 2, four staff members, including a chef, reported either working while symptomatic or returning to work within two days of symptom resolution.

Laboratory and environmental investigations

Norovirus GII was detected from 41 cases across Outbreaks 2–6. Genomic sequencing performed at VIDRL confirmed that the virus from the 41 cases associated with these outbreaks shared 100% identity across the 534 bp fragment sequenced.

No bacterial pathogens were detected in food or environmental samples.

Public health response

Environmental health officers assessed food preparation and handling practices at the venue and found them to be adequate at the time of initial inspection following notification of Outbreak 2. Following Outbreak 3, supervised environmental cleaning of the premises was arranged in accordance with the published Victoria Health guidelines for the investigation of gastroenteritis.¹ Despite these measures, additional outbreaks occurred. After Outbreak 6, venue operators voluntarily closed the premises for two weeks and undertook further intensive environmental cleaning. No additional outbreaks were reported after the venue reopened.

Discussion

Norovirus outbreaks in food and hospitality settings are relatively common in Victoria, with an average of 18 outbreaks recorded each year between 2018 and 2022. However, the occurrence of six gastroenteritis outbreaks linked to a single venue within a 15 day period has not previously been reported in Victoria and, to the authors' knowledge, has not been described in the literature.

This investigation provided genomic evidence to suggest that the outbreaks were connected. During the period between Outbreaks 1 and 3, staff were identified to have worked while symptomatic or infectious, contributing to the sustained transmission of illness via person-to-person contact or surface contamination.

A univariable analysis of food exposures of cases from Outbreak 2 suggested that there was no single significant food vehicle involved in transmission. Additionally, information on whether individual food batches were prepared and served across multiple events was unavailable. Despite this, reports of food handlers preparing food while symptomatic or potentially infectious, together with the service of common dishes across events, suggest that contamination of ready-to-eat foods, or of food-preparation surfaces, cannot be discounted as a potential source of transmission, particularly during the earlier outbreak events.

Environmental contamination may have also played a role. Comprehensive supervised cleaning of the premises was only undertaken following Outbreak 3, and again following Outbreak 6, raising the possibility that contaminated environmental surfaces were not fully decontaminated throughout the 15 day period and may have served as a persistent source of transmission.

Plausible chains of transmission were identified between Outbreaks 1 to 3 and between Outbreaks 4 to 6. However, the mechanism by which norovirus was reintroduced between Outbreaks 3 and 4 remains uncertain. Although supervised cleaning had been carried out and no staff reported working while symptomatic during this interval, genomic evidence indicates that transmission continued. It is therefore possible that ill staff were not identified during interviews, or that, despite cleaning efforts, there was residual persistence of the virus in the environment.² A low infective dose,³ or faecal shedding of norovirus in asymptomatic individuals,⁴ may also have contributed to continued transmission.

Standard public health measures applied in response to the outbreaks, including supervised environmental cleaning, food safety advice and the exclusion of ill staff, were insufficient to interrupt transmission.

In Victoria, standard advice for food handlers with gastroenteritis of viral or unknown aetiology is to exclude from work until two days after cessation of symptoms.⁵ As shedding may occur both pre-symptomatically and for more than two days after symptoms cease,⁶ this routine advice may not fully prevent workplace transmission. Workplace factors may also affect compliance with exclusion requirements. Staff experiencing relatively mild symptoms may continue working; may return to work too soon after illness; or may choose not to disclose symptoms. These issues may be particularly relevant in hospitality settings, where casual employment is common and access to paid sick leave may be limited.⁷ During gastroenteritis outbreaks, food premises should reinforce exclusion requirements through clear communication and, where possible, should provide workplace arrangements that enable staff to remain away from work while ill without financial disadvantage.

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