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Norovirus Storm in Osaka, Japan, Last Winter (2006/2007)

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The last norovirus epidemic in Osaka, Japan, occurred on an incredibly large scale. The Department of Public Health and Welfare of the Osaka Prefectural Government reported 322 outbreaks due to norovirus infection and 11,583 cases between October 2006 and March 2007 in its administrative area (Fig. 1). These outbreaks were spread by person-to-person transmission, with neither outbreaks involving less than 10 patients nor food-borne outbreaks included in these reports. These numbers differed sharply from the 79 outbreaks of norovirus and 2,560 cases reported in the same period of 2005/06. In 2006/07, the majority of outbreaks occurred mainly in nursing homes and welfare facilities (53%), followed by hospitals (27%), kindergartens (15%), and elementary and junior high schools (5%). In contrast, the incidences at these same locations were 21, 5, 31, and 43% in 2005/06, respectively.

A total of 322 outbreaks were confirmed to be norovirus infection by private medical laboratories, hospital laboratories, and our institute. Our laboratory detected norovirus from 222 of the 322 outbreaks by RT-PCR using G1F1'/G1R1 (G1F1': 5´-ctgcccgaattygtaaatgat-3´, G1R1: 5´-ccaacccacrttacattt-3´) or G2F1/G2R (G2F1: 5´-gtgggagggcgatcgcaatct-3´, G2R1: 5´-tgcataaccattrtacattct-3´) primer sets (3). These primer sets amplified about 330 bp from the 3´-end of ORF1 to the beginning of the capsid region. The number of samples amounted to 998 (including 6 vomitus), collected from 222 outbreaks; 819 of them were positive for norovirus (82.1%). A total of 493 PCR products representing each outbreak were sequenced and typed into 35 genotypes, followed by homology analysis using reference strains shown by Kageyama et al. (2) and Okada et al. (5). Finally, 209 (94.1%) outbreaks were caused by the GII.4 (Bristol is reference strain) type, and 8 outbreaks were of other genotypes (GI.4, 2 outbreaks; GI.8, 2; GII.7, 1; GII.13, 3). The remaining 5 outbreaks were typed as GII.4 in which a combination of sapovirus, GI.7, GI.8, GI.14, or GII.2 was observed. However, types other than GII.4 in these mix-isolates were not dominant in the outbreak, except in the case of the GII.2 outbreak.

Furthermore, this norovirus epidemic influenced infantile sporadic diarrhea. Infectious gastroenteritis cases were reported in 197 hospitals, mainly in pediatrics departments designated as Osaka Infectious Disease Surveillance Centers. The number of infectious gastroenteritis cases reported weekly in Osaka reached an alarming level for 5 weeks from November 13 to December 24, 2006. It was the first time that a warning was issued for infectious gastroenteritis in the past 10 years. Such warnings are issued only when more than 20 cases are diagnosed as infectious gastroenteritis per week per hospital in Japan. We diagnosed 83 cases of norovirus infection from sporadic infantile gastroenteritis in the winter of 2006/07, and the genotypes were identified for 76 samples (91.6%). All 76 samples were classified GII.4.

GII.4 appeared to be a special type of norovirus because it led to pandemic outbreaks in 2002, 2004, and 2006 (8). During the winter of 2004/05, GII.4 caused many outbreaks in various nursing homes in Osaka (6). Histo-blood group

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antigens (HBGAs) are a candidate for one of the norovirus receptors. GII.4 bound strongly and widely to saliva samples and HBGAs (7). This may be one of the reasons that GII.4 easily spreads to human and has caused many outbreaks. However, the number of outbreaks in the season of 2006/07 was significantly higher than in past GII.4-dominant seasons. It is still unclear why many outbreaks have been caused by GII.4 and what the difference was in GII.4 between the most recent outbreak and past seasons. We will continue the sequence analysis of GII.4 strains, including the ORF1 region, to clarify the key point of genetic mutation for infectivity and propagation (1,4).

REFERENCES


Fig. 1. Number of norovirus outbreaks were collected by the Department of Public Health and Welfare, Osaka Prefectural Government from January 2005 to March 2007.