



Summary of an investigation of a gastroenteritis outbreak at a volleyball tournament in Orange County

Introduction

On January 21, 2003, The Orange County Health Department began receiving reports of gastrointestinal illness among players, coaches and spectators who had attended a volleyball tournament during the period of January 18 - January 20, 2003. Over 100 reports of illness were received by the Health Department, with peak onset falling on Tuesday, January 21, 2003.

A site visit to the sports complex hosting the event was conducted on Wednesday, January 29, 2003. Inspections of the restrooms and concession stands revealed no violations of public health concern. Sports site personnel related several incidents of players vomiting during the tournament, although no one vomited in the immediate vicinity of the volleyball courts. Coolers were permitted in the sports site. During the tournament, concession stands were open for the players and spectators. Water was provided courtside in 9 individual 5-gallon bottled water containers. Several sets of drinking fountains, located in the corners of the facility, provided water also.

Methods

An epidemiologic study, limited to the athletes participating in the tournament, was conducted to determine the extent of illness among the athletes and to search for any exposures associated with illness. Sample size was calculated by setting a confidence level and power and by making estimates of relative risks, the ratio of exposed to unexposed athletes and the percentage of disease among the unexposed. This computed sample size was adjusted upward to allow for non-responders. A random sample of players was taken, and the sampled players were administered telephone surveys. The survey questions asked about illness experienced and exposures during the tournament.

Results

- 129 completed questionnaires were obtained from a sample of 170 players (response rate = **75.9%**)
- Excluding the 17 players in the sample who did not go to the tournament (accurate team rosters were not available) the response rate increases to $129/153 = 84.3\%$.
- Cases were defined as players experiencing diarrhea and/or vomiting (both self-defined) between Wednesday, January 15, 2003 and Friday, January 24, 2003.
- Of these 129 players, 56 were cases, 67 were not, and it was unclear for 6 players.
- As 43% (56/129) of the sample were cases, the estimate for the number of sick volleyball players is 419 (there were 966 players total at the tournament) with a 95% confidence interval of (336-506)



- The clinical symptoms among the 56 cases were as follows:
 - Vomiting 89.3%
 - Nausea 87.5%
 - Fatigue 71.4%
 - Fever 69.9% (median temp. = 101.2)
 - Diarrhea 66.1%
 - Headache 62.5%
 - Dizziness 51.8%
- The mean duration of illness was 40 hours; the median duration was 36 hours.
- After returning from the tournament, some family members of the players developed similar symptoms, most often within two days of the player's return.
- The clinical presentation, duration of illness and incubation period all indicate Norovirus as the causal agent.
- Norovirus is spread through the fecal-oral route (thus, inadequate hand washing is often to blame). Water, ice and food can also be contaminated with the virus. Moreover, the virus can survive on environmental surfaces for days. Aerosolized virus particles from vomiting are thought to be another mode of transmission whereby people can become infected.
- The Epi Curve (see attached), with the large spike on Tuesday, January 21, indicates a point source outbreak. There were, however, players who were sick just before and during the tournament (some of these sick players were not part of random sample).
- Relative risks were calculated for many of the exposures queried on the questionnaire. Those players drinking from the bottled water containers beside the volleyball courts had 2.24 (95% C.I. 1.14-4.41) times the risk of illness compared to those who did not drink from these dispensers. This was the only relative risk that was statistically significant. No additional risk was seen for those who used bottles compared to those who used paper cups. Among those who did use a bottle, no association was found between touching the bottle to the dispenser spout and illness.
- No associations were found between illness and the following exposures: eating or drinking concession stand items, drinking from the water fountains, cooler use during the tournament or knowingly being around vomit during the tournament.
- Among cases, only 23.2% of the cases reported being around someone with vomiting or diarrhea in the 3 days preceding their illness. 76.8% said they were not around a sick person.

Discussion

The data indicate that this was a mixed-mode outbreak, meaning both person-to-person and point source transmission occurred. Reports of illness from the athletes who were part of the random sample and reports from other athletes indicate that there were a small number of players who were ill while the tournament was in progress. It is likely that these ill players could have infected some of the other athletes. However, the epi curve, with the large spike in illness on Tuesday, January 21, supports the idea of an exposure that infected many people in a short period of time (probably sometime Monday, January 20).



During the tournament, numerous opportunities existed for contact between players. Players were touching the same ball as well as slapping hands with teammates and opponents (during the handshake after the game). Aerosolized virus from vomit could have been responsible for transmission of the illness as well. Players used communal bathrooms, water fountains and bottled water dispensers. Some players reported touching their refillable water bottles to the spout of the bottled water dispensers. Based on the elevated relative risk found in this study between drinking from the bottled water dispensers and illness, this contact between the water bottles and the spouts of the dispensers could have contributed to the spread of the illness. Alternatively, the lever on the dispensers, which the players depress, could have been contaminated. The data do not, however, indicate that the bottled water itself was contaminated.

Recommendations

The affected sports site does a good job of environmental cleaning of its facility. Because of the potential for spread of illness via the bottled water dispensers, efforts should be made to eliminate contact between the players' bottles and the spouts of the communal dispensers. A study of Calgary elementary school children found bacterial contamination above drinking water guidelines in 64.4% of the students' reused plastic bottles and even detected fecal coliforms above drinking water guidelines in 8.9% of the bottles (Oliphant et al., 2002). At the volleyball tournament, paper cups were provided for use with the bottled water containers, but 52% of the players reported filling their own bottles at least some of the time. More frequent sterilization of the water dispensers and signs requesting that only unused paper cups be used for dispensing water from these bottled water containers may well serve to limit transmission of illness via this route.

Reference

Oliphant, J.A., M.C. Ryan, and A. Chu, 2002. Bacterial Water Quality in the Personal Water Bottles of Elementary Students. *Canadian Journal of Public Health*. 93(5):366-367.

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