

Full Length Research Paper

Detection and management of a norovirus gastroenteritis outbreak, Special Olympics World Summer Games, Greece, June 2011

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Received 18 October, 2012; Accepted 06 November, 2012

The 2011 Special Olympics Summer Games were hosted in Greece, from 25 June to 4 July. A syndromic surveillance system was implemented for the needs of the Games. On 26 June a cluster of viral gastroenteritis cases among the members of the British delegation was detected. The delegation had arrived in Athens on 24 June from the island where they had been on holidays since 20 June. Control measures were implemented. Descriptive epidemiological data were gathered and a 1:1 case-control study was conducted. Controls were selected via simple random sampling, using a list of the British delegation members and a random number table. Data showed that this was a common point source outbreak. Cases were exposed on 24 June during their return to Athens. The only recognised statistically significant risk factor was a prior contact with a symptomatic case (OR=14.6, 95% CI 1.81-118.1). One specific case that reported vomiting during the trip was identified as the probable source of the outbreak. Two stool samples were positive for norovirus. Control measures resulted to the restriction of the outbreak and no cases were notified among the members of the other delegations. The syndromic surveillance system detected the outbreak on the first day of the Games. The investigation revealed the lack of laboratory capacity for virological testing of stool samples and the effectiveness of syndromic surveillance to identify the outbreak.

Key words: Norovirus, outbreak, olympic games, syndromic, control, mass-gathering.

INTRODUCTION

Special Olympics World Summer Games have been offering the opportunity to athletes with intellectual disabilities from all over the world, to reinforce their self-esteem through sports since the late 60's (Ghosh, 2012).

This global movement aims at raising awareness on human rights and equity and promote ideas, such as solidarity and respect of human lives. The 2011 Special

Olympics Games were hosted in Athens, Greece, from 25 June to 4 July, with the participation of 6,261 athletes.

Mass gatherings always present a challenge to public health authorities, as they have the potential to rapidly disseminate infectious diseases to many countries (Williams, 2009; Thackway, 2009).

Additionally, in case of Special Olympics, the participants have -by definition- underlying conditions that make them more susceptible to infectious diseases (Ghosh, 2012) even though published data on health events during Special Olympics Games are limited

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(Ehresmann et al., 1995).

As gastroenteritis outbreaks are frequent during mass gathering events (Wharton, 1990; Lee, 1991; Duizer, 2004; CDC, 2006; Schenkel, 2006) early identification of such outbreaks was one of the priorities of the surveillance during the Games.

A syndromic surveillance system was implemented by the Hellenic Centre for Disease Control and Prevention (HCDCP) and the Medical Operations Center for the needs of the Games based on international standards (CDC, 2006).

Data regarding the number of cases by syndrome and the total number of visits at the medical centres of the games were sent to HCDCP on a daily basis. Acute gastroenteritis was defined as at least one of the following: diarrhoea, vomiting, abdominal pain. On the first day of the games, a cluster of gastroenteritis cases was detected by the system. Eight members of the British delegation had visited the medical services of the games with gastroenteritis symptoms during the official opening ceremony of the games on 25 June. Initial communications resulted to the confirmation of the outbreak, as other athletes had also complained for symptoms earlier the same day and on 24 June as well. The 155 athletes and the 58 escorts of the delegation had been on holidays on Skiathos, an island in the north-western Aegean, from 20 to 24 June. Reported symptoms were mild, mainly vomiting and diarrhoea and clinicians suggested that this was an outbreak of viral gastroenteritis.

Even though several athletes had visited health care services the previous days on Skiathos and in Athens, the cluster was not reported through the Mandatory Notification System (MNS) and no stool samples had been tested for viruses.

The further investigation of the outbreak was decided in order to gather more information on the extent and mode of transmission. The fact that many cases occurred in a relatively short period of time combined with the various transmission routes of viral gastroenteritis (Estes, 2006; Greig, 2012), led researchers to investigate the possibility of a common point source outbreak and to identify possible risk factors. The prompt implementation of control measures was the main priority for the restriction of the outbreak in the complex context of this mass-gathering athletic event (Thackway 2009; Schenkel, 2006).

METHODS

Epidemiological investigation

An outbreak investigation team visited the members of the British delegation on the day of notification.

Descriptive epidemiological data and information on the

activities of the delegation in the previous days were gathered.

A 1:1 case-control study was conducted in order to identify the source of the outbreak and possible risk factors. Cases were defined as members of the British delegation (athletes or escorts) who developed gastroenteritis symptoms (vomiting or/and diarrhoea) from 24 to 26 June. Controls were selected via simple random sampling, using a list of the British delegation members and a random number table.

The structured questionnaire that was used contained possibly implicated risk factors, such as swimming and other recreational activities, food and water consumption and history of contacts with symptomatic cases in the 48 h before symptoms' onset. The athletes' questionnaires were completed by their escorts via personal interviews, given their intellectual disabilities, and the fact that the researchers did not want to impair the participation of the athletes to the games.

As this study was conducted in the context of outbreak investigation by HCDCP, which is the national agency responsible for outbreak response, no ethics committee approval was sought. However, the escorts and the athletes were informed on the purposes of the study and it was made clear that they could refuse to participate.

Stata 11.0 software (STATA, College Station, Texas, USA) was used for data analysis. Odds ratios (ORs) and their 95% confidence intervals (CIs) were calculated. Associations between categorical and quantitative variables were tested by the use of Student's t-test (for normally distributed variables), or the Mann-Whitney test for skewed variables. P-values of < 0.05 were considered statistically significant.

Laboratory investigation

The investigation team requested from the medical services of the games to collect stool samples and vomitus from the patients and to send them to the Laboratory of Microbiology at the University of Athens for virological testing.

Management of the outbreak

Guidance was promptly given regarding a) hygiene measures, b) proper disinfection of surfaces, and c) deferral from participating in athletic events or other group activities for as long as the symptoms lasted and for 48 h after recovery.

Gastroenteritis cases were placed in private rooms equipped with a hand washing sink and toilet. The aforementioned measures led to the restriction of the outbreak. Only three new cases were reported on 27 and 28 June. No outbreak-related cases were reported by the

Table 1. Reported clinical manifestations among gastroenteritis cases of the British delegation, Special Olympics June 2011, Greece (n=37).

Reported symptom	Percentage (%)
Vomiting	83.8 (31/37)
Diarrhoea	75.7 (28/37)
Abdominal pain	64.9 (24/37)
Fatigue	59.4 (22/37)
Nausea	56.8 (21/37)
Fever (defined as body temperature >38°C)	45.9 (17/37)
Bloody diarrhoea	5.4 (2/37)
Myalgia	5.4 (2/37)

Table 2. Attack rate (AR%) by sports team of the British delegation, Special Olympics June 2011, Athens, Greece (n=37).

Team	Cases /total number of participants	AR (%)
Kayaking	5 / 8	62.5
Powerlifting	6/10	60.0
Bowling	3/8	37.5
Management	3/9	33.3
Athletics	3/9	33.3
Gymnastics	6/18	33.3
Basketball	3/12	25.0
Aquatics	2/11	18.2
Badminton	1/7	14.3
Golf	1/7	14.3
Judo	1/9	11.1
Football	2/20	10.0
Football 5A	1/12	8.3

other delegations of the games.

RESULTS

Epidemiological investigation

Based on the information gathered, all members of the delegation had stayed at the same hotel at Skiathos. During their stay on the island, the delegation was divided into twenty different groups, according to the sport they were practicing, and had different daily activities. On 24 June they all travelled by ferry to the mainland (12 to 3 pm) and then by bus to Athens (3 to 8 pm). No cases were identified among the other residents and personnel of the hotel.

In total, 37 cases were identified; 25 (67.6%) athletes and 12 (32.4%) escorts. The median age of cases was 28 years (range: 16 to 66) and fifteen (40.5%) of the

cases were females. The reported symptoms are presented in Table 1.

Duration of symptoms ranged from 1 to 4 days (median: 1.5 days) and seven cases (18.9%) were hospitalized. Cases were identified at 13 of the 20 groups of the British delegation (Table 2).

According to the epidemic curve, which seems to be compatible with a common point source outbreak, there was a steady increase in the number of cases during 25 June, peaking between 18:00 and midnight, and declining over the next 24 h (Figure 1). The temporal occurrence of cases did not follow a specific pattern that could explain a possible transmission of cases from one team to another. Based on the incubation period for norovirus-associated gastroenteritis (Figure 1) (CDC, 2011), we can conclude that there was a common exposure on 24 June around midday during their travel, which is actually the time of symptoms' onset of the case on 24 June. The case on 23 June could not be linked to the outbreak and the cases

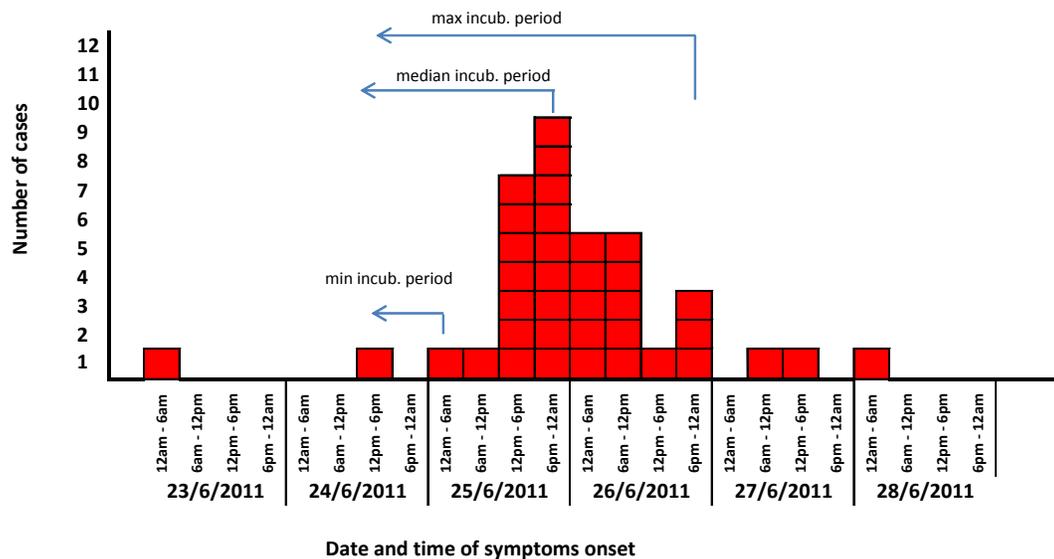


Figure 1. Distribution of cases by date and time of symptoms' onset, British delegation, Special Olympics June 2011, Greece (n=37).

on 27 and 28 were considered secondary person to person transmitted cases of the outbreak.

Thirty seven controls, 25 athletes and 12 escorts, were selected. Age and gender distribution did not significantly differ between cases and controls. In the univariate analysis, the only exposure associated with the disease occurrence was having a prior contact with a case during the journey back to Athens (OR=14.6, 95%CI 1.81-118.1). All cases reported contact with a specific symptomatic person during the journey. This first case seems to have been the source of the outbreak. It was reported that he had vomited during the trip to Athens inside the ferry and the bus. Based on the detailed history of this case, it was not clear how he became infected.

Laboratory investigation

Stool samples from two patients were tested positive for norovirus.

DISCUSSION

A norovirus gastroenteritis outbreak was detected on the first day of the 2011 Special Olympics World Summer Games among the members of the British delegation. The epidemiological investigation showed that the outbreak had started before the official opening of the Games and data were in favor of a common point source outbreak. The first case on 24 June that developed vomiting during the delegation's journey from Skiathos to

Athens was probably the source of the outbreak.

The main challenge for public health authorities, in the context of this mass-gathering event, was to prevent further transmission of the disease among the members of the British team and also among the members of the other delegations. The risk of a massive outbreak was high because of the easiness with which norovirus is transmitted via person-to-person contact, the low infectivity dose of the virus (10 to 100 microorganisms), and also because of the difficulty of athletes to comply with hygiene rules (Greig, 2012; Kanerva, 2009; Fankhauser, 2002; Cowden, 2002). However, strict implementation and close follow-up of control measures proved to be effective and the outbreak was soon restricted.

Another conclusion that the public health authorities of the country drew regarded the effectiveness of syndromic surveillance to detect viral gastroenteritis outbreaks during mass gathering events.

Community outbreaks of viral gastroenteritis are rarely reported to public health authorities through passive surveillance systems, such as MNS, either because they are not identified by clinicians or due to the general belief that no public health measures are needed in case of viral gastroenteritis and because of the limited availability of reliable diagnostic tests at a local level (Blanton, 2006; Kroneman, 2008). This is the main reason for which investigation of such outbreaks was neglected in the past (Blanton, 2006). However, literature has showed that epidemiology investigation can lead to useful conclusions regarding the source and the mode of transmission and therefore to effective interventions for the control of the

outbreaks and the prevention of future ones (Schmid, 2007; Medici, 2009; Karagiannis, 2010; Wall, 2011).

The management of this outbreak revealed the restrictions of laboratory investigation for norovirus (Blanton, 2006). Practical issues, such as the cost of materials or transportation of samples to the reference laboratory should not be considered as trivial as they can be major barriers during outbreak investigations. This report emphasises the need for supporting mechanisms of laboratory investigation of viral gastroenteritis outbreaks.

Authors suggest there should be a clear protocol: a) defining when notification is needed and clarifying the reporting process, b) defining when samples should be collected, and the number of samples needed, c) inform on where samples can be sent for virological testing, and how they can be transferred there. This protocol should be disseminated to primary health care medical doctors all over the country in order to sensitize them on the timely notification of clusters and of increased number of gastroenteritis cases in the community and the timely collection of clinical samples.

ACKNOWLEDGEMENTS

We would like to thank the Laboratory of Microbiology, National and Kapodistrian University of Athens and Prof. A. Tsakris, the General Hospitals "Sismanogleio" and "G. Gennimatas", the health professionals and volunteers of 2011 Special Olympics World Summer Games and the Organizational committee of the Games for their help during investigation.

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