

# National guidelines for outbreak investigation: an evaluation study

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## الدلائل الإرشادية الوطنية لاستقصاء الفاشيات: دراسة تقييمية

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الخلاصة: تعرض هذه الورقة دراسة وبائية مستقلة لتقييم صحة نتائج استقصاء رسمي حول فاشية من التهاب المعدة والأمعاء في حرم جامعي في ياسوجي، في جنوب وسط جمهورية إيران الإسلامية. فقد تضمن التقرير الرسمي الذي أصدره قسم مكافحة الأمراض في المركز الصحي حول الفاشية على صعيد الولاية أن 65 حالة فقط قد حدثت خلال خمسة أيام، جميعها من الإناث اللاتي يقمن في أجنحة إقامة الطالبات. وفي ذلك ما يتعارض مع ما توصلت إليه المسوحات الاستبائية التي شملت 963 من الطلاب في نفس الجامعة، من أن 395 من الطلبة (192 طالباً و203 طالبة) يعيشون في أجنحة الإقامة أو في المنازل، قد أبلغوا عن واحد أو أكثر من أعراض التهاب المعدة والأمعاء على مدى 12 أسبوعاً. ففي خلال تلك الفترة حدثت فاشيتان على الأقل. إن مثل هذا التعارض الصارخ بين التقرير الرسمي وبين نتائج الدراسة الحالية يوحي بأن الخدمات الصحية وعمامة الناس ربما يكونون قد ضلُّوا حول الاستجابة الملائمة للفاشية.

**ABSTRACT** This paper reports an independent epidemiological study to evaluate the validity of the results of an official investigation into an outbreak of gastroenteritis at a university campus in Yasuj, central-south Islamic Republic of Iran. The official report of the outbreak by the Department for Disease Control at the provincial health centre found only 65 cases over a 5-day period, all females, living in the student halls of residence. This contrasts with a questionnaire survey of 963 students at the same university, which found 395 students (192 males and 203 females), living in residences and at home, who reported at least 1 gastrointestinal symptom over a 12-week period. Within this period at least 2 outbreaks occurred. Such a large discrepancy between the official report and the current study suggests that the health services and the public may have been misled about the proper response to the outbreak.

## Lignes directrices nationales en matière d'investigation des flambées : une étude d'évaluation

**RÉSUMÉ** Les présents travaux rendent compte d'une étude épidémiologique indépendante qui visait à évaluer la validité des résultats d'une investigation officielle d'une flambée de gastroentérite sur un campus universitaire de Yasuj (République islamique d'Iran). Dans le rapport officiel sur la flambée, le Service chargé de la lutte contre les maladies au centre de santé provincial avait répertorié uniquement 65 cas sur une période de 5 jours, tous de sexe féminin, vivant dans des résidences universitaires. Ces résultats sont contradictoires avec ceux d'une enquête par questionnaire auprès de 963 étudiants de la même université, au cours de laquelle 395 étudiants (192 de sexe masculin et 203 de sexe féminin), vivant dans des résidences universitaires ou à domicile, ont affirmé avoir présenté au moins un symptôme gastro-intestinal au cours d'une période définie de 12 semaines. Au cours de ladite période, au moins deux flambées ont été observées. Une telle différence entre le rapport officiel et la présente étude suggère que les services sanitaires et les personnes interrogées ont été induits en erreur au sujet de la réponse appropriée à la flambée.

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## Introduction

The strategies for epidemic investigations and control measures are determined, evaluated and revised at the national level predominantly by the same organization. Independent studies are rarely carried on the same epidemics to evaluate the validity of the reports published by the responsible health sectors. Gastroenteritis, an infectious disease transmitted predominantly via food and water, is one of the most common communicable diseases [1,2]. However, many investigations into gastrointestinal disease outbreaks and epidemics fail to reach conclusive and unbiased results due to a number of issues including improper investigation guidelines, delayed response and shortage of laboratory and logistic facilities [3–6].

In October 2009 several cases of gastroenteritis requiring hospitalization were reported at the women's halls of residence at a university campus in Yasuj, central-south Islamic Republic of Iran. This triggered an official investigation at the local health centre, with follow-up to identify further cases and finally publication of an outbreak report from the Department for Disease Control. This paper reports an independent epidemiological study to evaluate the validity of the results of the official investigation. A questionnaire survey was made of students at the university to estimate the total incidence of gastroenteritis and dates of illness for comparison with the frequencies and dates of the official report of the outbreak.

## Methods

### Background to the official report

On 18 October 2009 a report was received by the Department for Disease Control at the provincial health centre in Yasuj city about the referral of 12 students—all females residing

at University of Yasuj student halls of residence—to the emergency ward of Shahid Beheshti general hospital. The students were suffering from gastrointestinal symptoms, mostly vomiting, nausea, diarrhoea and abdominal pain. According to the national guidelines for control of foodborne diseases issued by the Iranian Ministry of Health, any 2 or more cases with similar gastrointestinal symptoms who consumed food or drink from common sources should be considered as an outbreak. Therefore, this was considered as a gastrointestinal disease outbreak and was investigated immediately. Accordingly, all patients were interviewed by trained staff from the Department for Disease Control and the foodborne outbreak questionnaire from the Ministry of Health was filled out. Stool specimens (from 6 patients) were collected and sent to the central library for diagnosis of the responsible agents. The results of testing for parasites eggs, blood, *Escherichia coli* and *Entamoeba histolytica* were negative for 2 patients, *E. coli* was found in 3 samples and, both *E. coli* and *Entamoeba histolytica* were reported in 1 sample.

During the next 2 days, assuming that the agent was spread from girls' dormitories, the health staff visited the residence halls at the university campus from which the patients were referred, searching for any other students with the same symptoms. As a result, 47 more women were found suffering from gastrointestinal symptoms. On 22 October, health staff from the Department for Disease Control revisited the residence halls for follow-up investigations. Due to the panic caused by the outbreak, only 27 students remained in residence. Again, 6 more students with related symptoms were found, from whom stool specimens were tested for the previously named agents with no pathogens reported. In total, as a result of the epidemic investigation based on the national guidelines, 65 cases with at least 1 digestive symptom were reported

over a 5-day period from 18 October 2009 to 22 October 2009

### Independent evaluation

In order to estimate the incidence of gastroenteritis among all students on the campus of the University of Yasuj a specially designed, self-administered questionnaire was developed by the research team. This asked about any gastrointestinal symptoms (nausea, diarrhoea, vomiting and abdominal pain) experienced within a 3-month period (2 September 2009 to 21 November 2009). The questions regarding the symptoms were designed to be similar to the ones used by the health centre in the official investigation questionnaire. In addition the questionnaire included, demographic data and 23 open, yes/no questions regarding sources of foods, drinks and other relevant factors.

On the 29 November 2009 the questionnaire was distributed to the university students by volunteer students of public health, at 4 major access points in the campus: restaurant, bus stations, library and dormitories. At the time of the study, 5500 students were studying at University of Yasuj. The questionnaire was distributed to 1370 students (25% of the total study population) from which 963 questionnaires were completed and returned (18% of total student population, 70% response rate).

### Analysis

Descriptive methods, as well as chi-squares, Fisher exact and Student *t*-tests were used to analyse the data.

## Results

### Independent evaluation

In total, 963 completed questionnaires were collected and used for the independent analysis. Out of these, a total of 395 students (41.0%) reported at least 1 gastrointestinal symptom over the 12-week period from 2 September 2009 to

**Table 1 Sex-specific incidence of gastrointestinal illness among students in the evaluation study and the official report from the health centre**

Sex	Evaluation study			Official report		
	No. of respondents	No. of cases	Rate (%)	No. of people exposed	No. of cases	Rate (%)
Male	414	192	46.4	n/a	0	n/a
Female	549	203	37.0	n/a	65	n/a
Total	963	395	41.0	n/a	65 <sup>a</sup>	n/a

<sup>a</sup> $P < 0.001$ , Fisher exact test, comparing the sex distribution of cases reported by evaluation study and official report. RR = 1.26,  $P = 0.003$ , males versus females. n/a = not applicable.

21 November 2009. Cases were somewhat equally distributed among males (48.6%) and females (51.4%) (Table 1). The sex-specific incidence of disease among male students (192/414, 46.4%) was significantly higher than among female students (203/549, 37.0%) (male to female RR = 1.26; 95% CI: 1.09–1.46,  $P = 0.003$ ). Half of the students (51.6%) reported diarrhoea and 77.7% had abdominal cramps (Table 2).

The incidence of symptoms reported suggests that from 2 September 2009 to 21 November 2009, 2 gastrointestinal outbreaks occurred. Accordingly, the first outbreak began on 6 October 2009 and ended on 26 October 2009 (21 days). The second outbreak began on 5 November 2009 and ended on 16 November 2009 (12 days) (Figure 1). Moreover, a significant difference was found in the duration of the symptoms between the 2 outbreaks ( $P = 0.02$ ) (Table 3).

A significant association was found between the incidence of the disease and consumption of food at the restaurant

located at the university campus (Table 4). Always consuming foods provided by the restaurant significantly increased the risk of acquiring the disease compared with never using or occasionally using self-service food (risk ratio = 1.80; 95% CI: 1.35–2.40,  $P < 0.001$ ).

#### Comparison with the official report

The number of cases found and the outbreak patterns in the current evaluation (395 students over a 12-week period) contrasted with the official report from the Department for Disease Control of only 65 cases over a 5-day period.

The time trends of the cases were also different. Although during a short period of time both sources reported a similar frequency of cases (Figure 1), the overall trends were dramatically different, as the official report suggested a considerably shorter period for the outbreak (5 days) compared with the present evaluation (21 days, for the second outbreak identified). Furthermore, 2 gastrointestinal outbreaks were

identified in the current evaluation, not just one.

Although the official report suggested that all the cases recorded were among females, the results from the present study found cases in both males and females (Table 1). No comparison of the sex-specific incidence of disease could be made between the 2 reports because no population at risk was reported by the formal investigation.

The spatial distribution of the cases reported by the 2 studies was also markedly different, as all patients reported by the official investigation were residents of girls' residence halls located at the university campus whereas the current study reported cases among both girls and boys resident in university residence halls or private houses.

On the other hand, comparison of the prevalence of symptoms (diarrhoea, vomiting and abdominal cramps) among cases reported by the official report and the current evaluation showed similar distributions ( $P > 0.05$ ) (Table 2).

**Table 2 Incidence of gastrointestinal symptoms reported from cases in the evaluation study and the official report from the health centre**

Symptom	Evaluation study (n = 395)		Official report (n = 65)		Data sources compared
	No. with symptoms	%	No. with symptoms	%	P-value
Diarrhoea	204	51.6	34	52.3	1.00
Vomiting	137	34.7	20	30.8	0.58
Abdominal cramps	307	77.7	53	81.5	0.63

n = total number of cases.

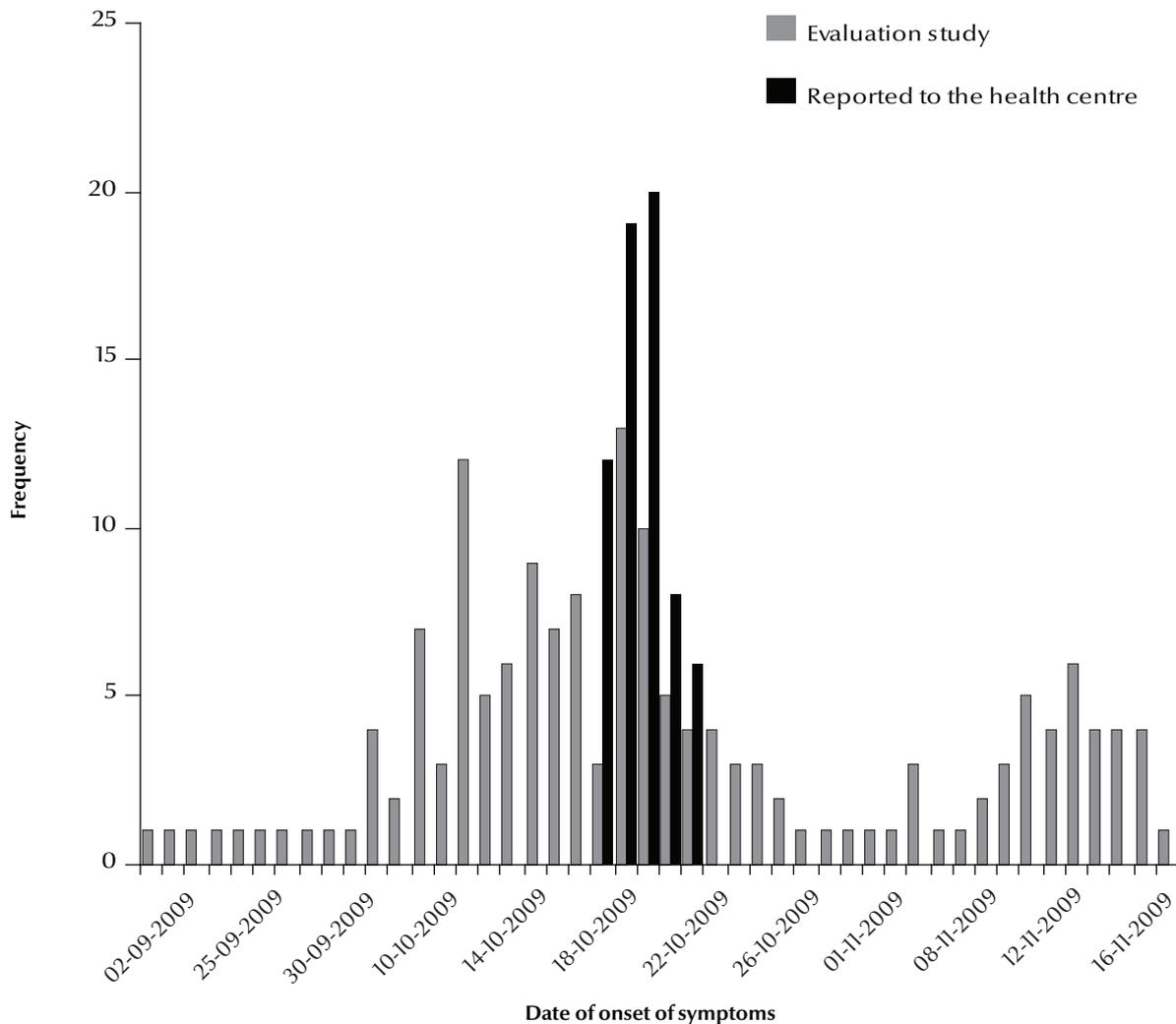


Figure 1 Time trends of the outbreak investigated by the evaluation study (n = 163), those reported the exact starting date of the symptoms) and the official epidemic investigation conducted by the health centre (n = 65)

Table 3 Duration of gastrointestinal illness among students in the evaluation study according to the date when symptoms started

Date symptoms started	No. of cases	Duration of illness (days)	
		Mean (SD)	95% CI
Before 6 Oct 2009	7	10.9 (9.4)	2.2-19.6
6-26 Oct 2009 <sup>a</sup>	97	4.4 (3.5) <sup>a</sup>	3.7-5.1
26 Oct-5 Nov 2009	5	3.4 (2.6)	0.2-6.6
5-16 Nov 2009 <sup>a</sup>	28	2.6 (2.0) <sup>a</sup>	1.9-3.4
16-23 Nov 2009	1	2.0 -	-
All specified	138	4.3 (4.0)	5.0-3.7
All unspecified	257	-	-
Total	395	-	-

<sup>a</sup>P < 0.02, comparing the 2 outbreaks.  
SD = standard deviation; CI = confidence interval.

## Discussion

Despite extensive experiences and development in the diagnosis and management of epidemics, numerous epidemic investigations are terminated without satisfying results [3,4,7]. The reasons, especially in developing countries, include insufficient guidelines for diseases surveillance and epidemic investigation, delayed and improper response due to lack of required facilities and insufficient training of health staff [4]. The results of present epidemiological study

**Table 4 Incidence of gastrointestinal illness among students in the evaluation study according to consumption of foods at the university campus restaurant**

Food consumption habits	No. of respondents	No. of cases	%
Always consumed the restaurant food	753	241	32.0
Sometimes consumed the restaurant food	330	95	28.8
Never consumed the restaurant food	190	38	20.0
Unspecified	85	21	24.7
Total	963	395	41.0

Risk ratio = 1.80,  $P < 0.001$ , always consumed versus never or occasionally consumed the restaurant food.

among students of University of Yasuj in autumn 2009 were used to evaluate the results of an official outbreak investigation conducted by the Department for Disease Control in the local health centre.

Comparison of the results of the 2 studies revealed significant differences in the reported number of cases and the temporal and spatial pattern of the outbreak during the study period, suggesting a serious biased presentation of the situation by the official report. In contrast to the official report from the Department for Disease Control indicating occurrence of a short gastrointestinal disease outbreak, the results of the present study suggested the occurrence of at least 2 outbreaks within the 3 months of the study period. The significant difference in the duration of the symptoms suggests the possible involvement of different pathogens in the outbreaks. The sex distribution of

the patients was also significantly different in the 2 reports, suggesting a biased presentation of the situation in the official report.

Regarding the risk factors, due to the time gap between the occurrence of the outbreak and the conduction of the present study no attempt was made to find the pathogens responsible for the outbreak. However, being male and eating food prepared by the university campus restaurant significantly raised the risk of disease among the students.

A number of limitations to the study should be noted. First, we were unable to take microbiological samples. Secondly, many students returned home in the panic caused by the outbreak and this prevented the researchers from carrying out the evaluation immediately after the outbreak. This delay may have introduced recall bias in reporting the

occurrence and exact timing of symptoms. However, this is likely to have reduced the number of cases reported and as a result should have decreased the differences between the 2 reports regarding the incidence of symptoms. There is no reason to assume that there were systematic errors in reporting the time of the occurrence of the symptoms that would affect the findings about the temporal pattern of the outbreak.

Irrespective of the shortage of facilities and appropriate laboratory services which were may have been the case at the local health centre, it seems that government action strategies are unable to respond timely and efficiently to outbreaks and that the results of epidemic investigations may be biased and misleading [2,6].

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