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Problems in the diagnosis of foodborne infection in general practice

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SUMMARY

The incidence of acute gastroenteritis and self suspected food poisoning in general practice populations was compared with consultation rates in four group practices during a 3-month winter period and a 2-month autumn period. The average monthly consultation rate for acute gastroenteritis and self suspected food poisoning was 0·3% and 0·06% respectively. However, over the same period, on average, an estimated 7% of the practice population per month reported an acute gastroenteritis illness, and 0·7% suspected a food poisoning illness. Only about one in 26 people who suffer an acute episode of gastroenteritis consult their general practitioner (GP). In two practices, faecal samples were sought from all patient cases; the isolation rate for salmonellas was 2% (3/191) and for campylobacters it was 12% (23/191). In the other two practices following routine management, the isolation rate for salmonellas was 9% (6/64) and for campylobacters it was 2% (1/64). Isolation of faecal pathogens was not associated with patients' suspicion of food poisoning. A history of eating out in the week before onset was associated with a significantly increased yield of salmonellas and campylobacters.

INTRODUCTION

Foodborne disease, principally due to salmonella and campylobacter, has become one of the most important public health issues in recent years. In England and Wales in 1995 over 30000 cases of salmonella infection [1] and 43000 cases of campylobacter infection [2] were reported by laboratories to the Public Health Laboratory Service (PHLS) Communicable Disease Surveillance Centre. Suspected food poisoning is statutorily notifiable and in theory, prompt notification by GPs to the local public health authority should enable outbreaks and sources of infection to be detected early and controlled [3]. However following a large salmonella outbreak in North Wales, a House of Commons Select Committee expressed concern that the earliest cases were not identified until late into the outbreak, and they recommended that 'the Welsh Office commission studies to determine the most effective ways of encouraging GPs to make prompt notifications and take faecal samples from cases and suspected cases of food poisoning for laboratory analysis' [4]. The problem for GPs is that the symptoms associated with foodborne infection are very common. A survey carried out by the Office of Population Censuses and Surveys in 1992/3 estimated

that on average, adults experience just under one episode of diarrhoea per person per year [5]. When should foodborne infection be suspected so that cases can be notified to the public health authorities, and which patients should be asked to submit faecal samples for microbiological investigations? We have studied this problem in four general practices with the aims of (i) comparing self reported rates of gastroenteritis and suspected food poisoning with patient consultation rates in the same practice populations; (ii) assessing whether increasing faecal sampling increases the yield of pathogens of public health importance; (iii) identifying factors associated with a higher yield of pathogens; and (iv) providing data to estimate the public health resource implications of increased sampling and notification.

METHODS

Practice consultations

We chose two study periods, 1 January to 31 March (Winter) and 17 August to 18 October 1992 (Autumn), to cover the seasonal peaks of viral and bacterial infection. Each of four large urban general practices selected from the Welsh spotter practice network [5], in Cardiff, Newport, Merthyr and Swansea, kept a register of, and completed a questionnaire for, patients consulting for acute infective gastroenteritis. The definition of a case for inclusion in the study was a person contacting the practice complaining of acute onset of diarrhoea and/or vomiting. In analysis we have in addition also applied a commonly used definition of diarrhoea in epidemiological studies, 'three or more loose stools or watery stools in a 24 hour period'. Two practices (Group A) were asked to complete a questionnaire but manage cases as usual. In the other two practices (Group B) a faecal sample was to be requested from each case and sent to the local public health laboratory. Faeces samples were investigated for salmonella, shigella, campylobacter, cryptosporidium, *E. coli* 0157 and giardia by routine methods. Where possible, samples were also investigated for rotavirus by electron microscopy (EM) and ELISA methods; small round structured viruses and adenoviruses were sought by EM.

Practice population surveys

At the end of March and at the end of October postal questionnaires were sent with pre-paid envelopes to random samples of 250 patients in each practice. In the first survey people were asked, 'Since 1 January this year have you (or your child) had an illness with a tummy upset, diarrhoea or vomiting?', and in the second, 'Since the Summer Bank Holiday on 31 August this year, have you (or your child) had an illness with a tummy upset, diarrhoea or vomiting?'. In the second survey the Bank Holiday was chosen as the reference point, rather than the starting date of the practice consultations study because we considered that recall to this date would be more accurate. The sample was taken by applying a set of random numbers generated by EPI INFO 5 [6] to the computerised practice lists. Some small inaccuracies in the lists mean that the sample of patients identified was not exactly 2000.

RESULTS

Practice population surveys

The response rates in the population surveys were 76% (757/1001) in the first study period and 82% (800/976) in the second (Table 1). In the first study, over 3 months, 19% (144/757, 95% confidence intervals (CI))16·2–21·8%) of people reported an acute gastrointestinal (GI) illness, giving a monthly average of 6·3% (4·7–8·3%) of the population. In the second survey, over 2 months, 18% (142/800, 95% CI 15·1–20·4%) reported GI illness, an average monthly rate of 8·9% (7·0–11·1%). Nine percent ($n = 26$) of people with acute GI symptoms answered that their illness was definitely ($n = 8$) or possibly ($n = 18$) due to 'food poisoning', giving an average monthly rate of 0·7% of the population.

Practice consultations

The total patient list size of the practices was 43138. The consultation rates were similar in both study periods with about 0·3% (601/43138) of patients consulting for GI illness on average per month (Table 2). Questionnaires were completed on 88% of these cases. Diarrhoea with three or more loose or watery stools in 24 h (D3) was reported by 73% (388/529) of patients giving an estimate of 0·2% of the practice population consulting for this symptom per month. In children 0–4 years old consultation rates were four to five times higher than in other age groups (Table 3). Of those consulting for any GI illness, 22% ($n = 114$) thought they definitely ($n = 21$) or probably ($n = 93$) were suffering from food poisoning, giving an estimated average monthly consultation rate for sus-

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Table 1. *Gastrointestinal illness in random samples of four general practice populations*

	Winter	Autumn	Total
Population sample	1001	976	1977
Replies	757 (76%)	800 (82%)	1557 (79%)
Gastrointestinal illness (GI)	144	142	286
Average monthly rate	6·3%	8·9%	7·4%
Diarrhoea (D3)*	73 (51%)	81 (57%)	154 (54%)
Diarrhoea (< D3)†	40 (28%)	40 (28%)	80 (28%)
Vomiting (V)	72 (50%)	53 (37%)	125 (44%)
D3 & V	27 (19%)	38 (27%)	65 (23%)
Mean duration of GI illness	4·9 days	3·7 days	4·3 days
Suspected food poisoning	13 (9%)	13 (9%)	26 (9%)
Average monthly rate	0·6%	0·8%	0·7%

* D3, three or more loose or watery stools in 24 h.
† < D3, less than three loose watery stools in 24 h.

Table 2. *Consultations for gastrointestinal illness in four general practice populations*

	Winter	Autumn	Total
Population	43138	43138	43138
Consultations for GI illness	386	215	601
Average monthly rate	0·30%	0·25%	0·28%
Questionnaires	338	191	529
Diarrhoea (D3)†	251 (74%)	137 (72%)	388 (73%)
Diarrhoea (< D3)‡	81 (24%)	53 (25%)	134 (25%)
Vomiting (V)	194 (57%)	84 (44%)	278 (53%)
D3 & V	139 (41%)	60 (31%)	199 (38%)
D3, Pain, Fever	91 (27%)	42 (22%)	133 (25%)
Suspected food poisoning	64 (19%)	50 (26%)	114 (22%)
Average monthly rate*	0·06	0·07%	0·06%

*, average monthly rates adjusted for 88% response rate.
† D3, three or more loose or watery stools in 24 h.
‡ < D3, less than three loose watery stools in 24 h.

pected food poisoning of 0·06% of the practice population (Table 2).

Faecal sampling rates

In Group A practices which managed cases as usual, 26% (64/243) of patients provided faeces samples, compared to 67% (191/286) in Group B practices which sought samples from all cases for this study (Table 4). In Group A, sampling was associated with severity of diarrhoea. The mean maximum number of stools a day in those who were sampled was eight, compared with six in those who were not sampled (Kruskal–Wallis χ^2 3·6, $P = 0{\cdot}06$). Symptoms of abdominal pain and fever in addition to diarrhoea were not associated with increased sampling; 24% (15/62) of these patients were sampled compared with 27% (49/181) of other cases. The duration of illness before contacting the surgery was also related to sampling rates. In the 195 cases where date of onset and date of sample were known, 16% (14/86) who were in contact within 48 h of onset were sampled, compared with 25% (7/28) in contact on day 3 of illness, 43% (9/21) on day 4 and 45% (27/60) in contact after day 4 (χ^2 for trend = 15·7, $P = 0{\cdot}00007$).

In Group B, where all patients should have been asked for a faecal sample, success of sampling was to some extent related to symptoms. The average frequency of stools in those sampled was six, not significantly greater than the average of five in those not sampled. However, 72% (145/201) of patients with D3 diarrhoea were sampled compared with 54%

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Table 3. *Population and consultation rates of diarrhoea (three or more loose or watery stools in 24 hours) by age group*

Age	Practice surveys				Practice consultations			
	Winter		Autumn		Winter		Autumn	
	Ill/total	Average monthly rate (%)	Ill/total	Average monthly rate (%)	Ill/total	Average monthly rate (%)†	Ill/total	Average monthly rate (%)†
0–4	11/40	9	8/24	17	92/2784	1·3	38/2784	0·8
5–14	14/101	5	10/102	5	24/5233	0·2	14/5233	0·1
15–24	6/81	2	13/88	7	19/5539	0·1	16/5539	0·1
25–34	7/92	3	12/87	7	35/6671	0·2	26/6671	0·2
35–44	13/110	4	12/113	5	12/5636	0·1	11/5636	0·1
45–64	15/189	3	19/229	4	41/8839	0·2	16/8839	0·1
65+	7/133	2	7/157	2	28/8436	0·1	16/8436	0·1
Total	73/757*	3	81/800	5	251/43138	0·2	137/43138	0·2

* Age unknown in 11 people.
† Corrected for 88% response rate.

(46/85) of those with less severe diarrhoea (χ^2 7·95, $P = 0{\cdot}005$).

Faecal pathogen isolation rates

In the Winter study, in Group A, only 1 campylobacter, 1 shigella and 3 rotaviruses were isolated from 34 samples (Table 4). In the autumn study, 20% (6/30) of samples yielded salmonellas, 7% (2/30) yielded shigellas and there were no campylobacters. (The six salmonella cases included two women who became ill on holiday in Spain, a mother diagnosed in the postnatal ward and her 2-day-old son, and a man who believed he acquired infection whilst water skiing on the River Wye.) In Group B, in the Winter study, 8% (10/131) of samples had campylobacters, 17% (22/131) yielded rotavirus, 4% (5/131) SRSV and 3% (4/131) adenoviruses. In the Autumn study, 5% (3/60) of samples yielded salmonellas and 22% (13/60) yielded campylobacters; there were no viruses identified. (The three patients with salmonellas included two men who were infected on holiday in Spain.) The campylobacter positivity rate increased significantly with age in Group B (χ^2 for trend 10·2, $P = 0{\cdot}001$).

We examined isolation rates by type of symptom in the 191 patients in Group B submitting faecal samples. Overall, 21% (16/77) of samples from patients reporting both abdominal pain and diarrhoea (D3) yielded campylobacters compared with 6% (7/114) of samples from patients with other symptoms (χ^2 8·0, $P = 0{\cdot}005$). In the autumn study the rate for campylobacter was 41% (9/22) for patients with diarrhoea (D3) and abdominal pain, compared with 11% (4/38) of patients with other symptoms (Fisher's exact $P = 0{\cdot}009$).

Isolation rates and suspected food poisoning

Twenty-two percent (114/529) of patients consulting for acute GI illness reported that they definitely ($n = 21$) or possibly ($n = 93$) were suffering from food poisoning (Table 2). About half of these patients submitted faeces samples. Isolation of faecal pathogens was no more likely from these patients than from others. Six percent (3/54) of them had salmonellas isolated, compared with 3% (6/201) of other cases (Fisher's exact $P = 0{\cdot}4$); 8% (4/54) had campylobacter isolated compared with 10% (20/201) amongst others.

In total, 255 of the 601 patients consulting practices submitted faecal samples, and 36% (93/255) reported

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Table 4. *Faecal samples/total cases and [isolations] by age group and practice group*

	Group A practices		Group B practices	
Age in years	Winter	Autumn	Winter	Autumn
0–4	12/55 (22%) [3R]	10/21 (48%) [S]	51/67 (76%) [C, 13R, 4SRSV, 4A]	21/27 (78%) [2C]
5–14	2/24 (8%)	1/16 (7%) [Sh]	13/20 (65%) [C, R]	6/11 (55%) [C, G]
15–24	3/16 (19%)	4/7 (56%) [2S]	11/16 (69%) [R]	7/13 (54%) [C]
25–34	5/24 (21%) [Sh]	4/16 (25%) [2S]	13/16 (81%) [C, 3R]	10/19 (53%) [2C]
35–44	0/5 (0%)	2/6 (33%)	5/10 (50%) [C]	5/8 (50%) [S, C]
45–64	6/20 (30%) [C]	5/8 (63%) [S]	19/24 (79%) [5C, 3R]	8/14 (57%) [2S, 4C]
65+	6/14 (43%)	4/11 (36%) [Sh]	19/27 (70%) [C, R, SRSV]	3/14 (21%) [2C]
Total	34/158 (22%)	30/85 (35%)	131/180 (73%)	60/106 (56%)

R, rotavirus; Sh, shigella; C, campylobacter; S, salmonella; G, giardia; SRSV, small round structured viruses; A, adenovirus.

eating a meal outside the home in the week before onset of symptoms. Of these, 5% (5/93) had salmonellas isolated and 16% (15/93) had campylobacters isolated. Of the 162 sampled who had not eaten out, only 2% (4/162) had salmonellas isolated (Fisher's exact $P = 0{\cdot}3$) and 6% (9/162) had campylobacters isolated (χ^2 6·6, $P = 0{\cdot}01$). If isolations of salmonella and campylobacter are combined, the isolation rate in those eating out was 20/93 (22%) compared with 13/162 (8%) for those not eating out (odds ratio = 3·1; 95% CI 1·4–7·1, χ^2 8·4, $P = 0{\cdot}01$). The combination of diarrhoea (D3), abdominal pain and eating outside the home was associated with an isolation rate for salmonella or campylobacter of 29% (15/51).

DISCUSSION

This study was carried out in four teaching practices within the Wales GP spotter practice network [7]. Although the practices themselves cannot be considered as representative of all practices in Wales, there is no reason to doubt that the practice populations themselves are representative of urban populations in Wales, and this is supported by the following: the rate of consultations for acute gastroenteritis of 3·3% per year in our practices was identical to the RCGP estimate obtained in 1988 [8]; the campylobacter positivity rate in our study of 9%, is close to the rate of 6% found in earlier studies [9, 10]; the salmonella positivity rate of 3·5% is almost identical to the rate of 3·2% found by the PHLS [9], and 3·4% found in the study by Skirrow [10]; the estimated incidence of self suspected food poisoning in our study was 8% of the practice populations per year, and this is very close to the results of the UK MORI survey in 1993 which found that 9% of Welsh people said they had suffered food poisoning in the previous year [11]. These data confirm that our study population is representative of the community at large.

We found that an average of about 7% of the registered practice patients per month suffered from acute gastrointestinal illness. In over half of these illnesses people complained of diarrhoea with three or more loose or watery stools in 24 h. However, the average monthly consultation rate for GI illness was only about 0·3% of practice patients. We estimate that for every patient consulting for such an illness there would be 26 others who did not, confirming that most people cope with such symptoms without consulting their doctor.

As expected faecal sampling was related to both the severity of diarrhoea and to the number of days the patient had been ill before seeing the doctor. The policy which was introduced into two practices of seeking faecal samples from all patients consulting with GI symptoms was only 67% successful. This is not surprising since many patients find the idea of providing a sample distasteful. The yield of pathogens

in samples submitted was similar to findings in previous studies [9, 10, 12–14], with rotavirus the main pathogen in the winter and campylobacter and salmonella in the autumn. But even in a population of 40000 people, only nine salmonellas were identified in 5 months. Two of these cases were diagnosed in a maternity unit, four were infected on holiday in Spain and one was possibly not foodborne infection but acquired from recreational exposure to river water. Our results suggest that if the policy of sampling all patients presenting with acute gastroenteritis was introduced into general practice, the number submitting faeces would double but this would not necessarily increase the numbers of cases of salmonella infection identified. The current selective investigations carried out by GPs appear to be just as effective at identifying salmonellosis. Such a policy would result in an increase in campylobacter isolations throughout the year, and an increase in rotavirus infections in winter. Isolations of campylobacter and rotavirus seldom result in any public health action, except in outbreaks, and public health benefit from such a policy is questionable.

We found that suspected 'food poisoning' was very common; 9% of those in the community surveys who reported gastrointestinal illness, and 22% of those consulting their GPs for such illness thought they definitely or probably were suffering from food poisoning. If all patients consulting for acute gastroenteritis were asked routinely if they believed they were suffering from 'food poisoning' the practices could at best identify only 1 in 13 of the actual 'cases' in the practice population. If these patients who believed they had 'food poisoning' were notified to local authorities the increase in work load of environmental health departments would be colossal, about 53 cases per 100000 population per month. Follow up of these cases by environmental health officers might result in an increase in the faecal sampling rate, but our study suggests that these patients are no more likely to have food poisoning pathogens identified than others with similar symptoms. On the other hand, questioning patients about eating outside the home may have greater value.

In summary, our study does not suggest that routine faecal sampling of all patients with acute gastroenteritis would have public health benefit. Asking patients' opinions about whether they think they are suffering from food poisoning does not predict a greater chance of a pathogen being identified. However, a patient with a history of acute abdominal pain and diarrhoea and a history of eating outside the home is significantly more likely to have campylobacter or salmonella infection. In addition to these considerations, however, we recommend that patients who may be part of outbreaks, those who report suspicious food histories, and those with confirmed food poisoning pathogens should be notified immediately to the public health authorities.

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