Community-based study of the incidence of gastrointestinal diseases in The Netherlands

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SUMMARY

The incidence of gastrointestinal diseases was studied in a community-based study in four regions of The Netherlands. Two grades of severity were distinguished – 1: diarrhoea or vomiting and at least 2 additional symptoms within the period of 1 week, and 2: diarrhoea or vomiting and at least 2 additional symptoms occurring on the same day lasting at least 2 days within the period of 1 week. The incidence of gastrointestinal episodes was calculated to be 630 for grade 1 and 180 for grade 2 disease per 1000 person-years, after correction for age and sex. The incidence was higher for women than for men (relative risk 1·25) and lower for those in the 19–64-year-old age group when compared to those younger or older (relative risk 0·75 and 0·40, respectively). Independent of the degree of severity of the symptoms, about 20% of the patients had consulted a general practitioner. about half in person and half by telephone. It is concluded that community studies are essential to assess the real incidence of gastrointestinal diseases in the population.

INTRODUCTION

Gastrointestinal infections are major causes of morbidity and economic losses in both developed and developing countries [1–5]. In the USA acute enteric illnesses are the second most common short-term diseases affecting the population [6]. In developed countries the reported increase in the incidence of gastrointestinal disease includes hospital-acquired diarrhoea, enteric illness in extended care facilities for the elderly, in child care centres and in severely immunocompromised patients [7, 8]. In 1992 the WHO Collaborating Centre for Research and Training in Food Hygiene and Zoonoses signalled a rise in the total number of reported foodborne diseases in several European countries [9]. This increase was observed in spite of improvement in food-handling techniques and codes of hygiene in food industries generally [10].

With any incident of gastroenteritis both infectious and non-infectious causes must be considered but when hitherto healthy persons are affected an infectious process is most likely [11, 12].

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The incidence of gastroenteritis is generally measured by reports of patients presenting themselves to physicians. However, more accurate assessments require study of the population at large. The present report is based on a community survey in four regions of The Netherlands in 1991 and provides information on the incidence and severity of these conditions in single households or families.

MATERIALS AND METHODS

Study size and design

The study was organized by the National Institute of Public Health and Environmental Protection (RIVM) in collaboration with four regional public health services. Ten municipalities were selected to represent different geographical regions (north, east, south and middle). Three of the communities were rural, 2 were urban and 5 had both rural and urban elements. The total population living in the 10 municipalities was about 400000 persons.

Each of the four public health services randomly selected a sample of about 1500 persons from the population register of the municipalities. Only one individual from each household was eligible for the study. A letter was sent to all selected subjects, outlining the purpose of the study and requesting their participation. Where necessary, reminders were sent 2 weeks later; finally after 4–5 weeks a random sample of non-responders were telephoned. Subjects who indicated unwillingness to participate, were not contacted further.

Each participant was asked to return each week a completed questionnaire. The questionnaire was previously tested for comprehensibility and ease of completion, and covered the presence and persistence of gastrointestinal symptoms, where relevant the reason for medical consultation, the provided medical care and the use of medicines. Participants who developed symptoms during the survey were asked to send a faecal sample for laboratory examination immediately. In each region the survey extended over 17 consecutive weeks over the period between March and July 1991.

Case definitions

Subjects were asked to report any of the following symptoms: diarrhoea ($\geqslant$ two stools daily), fever, vomiting, nausea, abdominal pain and/or cramps, and the presence of blood and/or mucus in stools. Episodes of gastroenteritis were defined in 2 grades: Grade 1, diarrhoea or vomiting and at least 2 additional symptoms of either nausea, abdominal pain, cramps, blood or mucus in stools within the period of 1 week, grade 2, diarrhoea or vomiting and at least 2 additional symptoms as in grade 1 but both on the same day and lasting at least 2 days within the period of 1 week. The latter definition indicates the more severe cases and defines a subset within the first definition. The intensity of inflammation caused by the microbial pathogen was assumed to have been the greater in the second group. An episode of gastroenteritis was considered to be over 2 weeks after the cessation of symptoms.

Analysis

If one individual had several episodes during the study period the cases were considered to be dependent on each other. Therefore our risk analysis is based on the numbers of individuals who had one or more episodes ('case individuals')

Table 1. *Rates of response before and compliance during the study*

Region	Selected group (no.)	Study group (no.)	Response rate (%)	Compliance rate (%) (after > 10 wks)	Compliance rate (%) (after > 14 wks)
North	1512	549	36	95	93
East	1517	527	35	96	95
South	1504	601	40	97	96
Middle	1710	578	34		
Urk				92	83
*Lelystad				83	60
Total	6243	2257	36	93	86

* In Lelystad the total study period was 14 weeks. The period included the school holidays.

rather than the numbers of cases. All case individuals were considered epidemiologically independent. The age- and sex-related relative risks were calculated using a log-linear model [13]. In this model the numbers of case individuals are assumed to have been Poisson-distributed with the expected relative risk to be multiplicatively dependent on the covariates, sex and age, and on the observation time. The regression coefficients were calculated using the Genstat statistical program [14]. Numbers of case individuals for a 1-year period were obtained by multiplying the numbers for the 4-months period by three.

RESULTS

Response of selected subjects

Of the 6243 persons who were approached, 2257 (36%) ultimately participated in the study. As all incoming data were rapidly processed by computer, communication with participants who did not complete the questionnaire in time could be swift which may have contributed to the high compliance rates during the survey (Table 1). Table 2 presents the distribution by sex and age of the selected group (S) and the group of participants (P) by region. The main difference between these groups was a higher participation among people aged under 18 years and those between 36 and 64 years old, and a lower participation among the age group 19 to 35 and those above the age of 65, compared to the randomly selected population. The distribution does not differ between the regions.

Incidence of gastroenteritis

In the present study, 425 and 115 cases conformed to definition 1 and 2 respectively. In Table 3 the distribution of cases by region, sex and age is presented. Of the participants 11 and 5% within grade 1 and 2, respectively, suffered more than 1 episode over the study period of 4 months.

Based on these data, an incidence of 190 and 50 cases (episodes of gastrointestinal illness) per 1000 persons per 4 months was calculated for definitions 1 and 2. In 18 and 22% of the cases meeting these definitions a doctor was consulted, in half of the cases by visit and in half only by telephone.

The calculated numbers of case individual per 1000 person-years specified by age and sex are presented in Table 4. The differences between the regions were small and not significant.

Table 2. *Distribution by sex and age in % of the total number of individuals in each group of the randomly selected persons (S) and the actual participants in the study (P). respectively*

Region	Group	Sex		Age group in years			
		M	F	≤ 18	19–35	36–64	≥ 65
North	S	49	51	21	32	34	13
	P	45	55	26	28	37	9
East	S	50	50	21	28	40	11
	P	46	54	24	27	41	8
South	S	51	49	27	25	35	11
	P	41	49	35	18	39	8
Middle	S	51	49	35	28	35	2
	P	42	58	42	21	35	2
Total	S	50	50	27	28	35	10
	P	44	56	32	24	38	6

Table 3. *Absolute number of cases of gastrointestinal disease per region, age and sex*

Region	Case def.	Sex		Age groups in years			
		M	F	≤ 18	19–35	36–64	≥ 65
North	1	30	63	44	17	28	5
	2	6	11	7	3	6	1
East	1	44	46	24	25	35	6
	2	16	13	8	11	9	1
South	1	47	66	43	34	36	2
	2	23	17	12	14	14	0
Middle	1	40	86	55	30	40	1
	2	11	18	11	9	8	1
Total	1	167	261	166	106	139	14
	2	56	59	38	37	37	3

Table 4. *Numbers of case-individuals with gastrointestinal disease per 1000 person-years, by age and sex*

Case definition	Sex	Numbers of case-individuals per 1000 person-years by age (years)			
		≤ 18	19–35	36–64	≥ 65
1	M	490 (40*)	445 (45)	365 (35)	245 (60)
	F	570 (40)	525 (45)	435 (35)	300 (70)
	M + F	1060 (80)	970 (90)	800 (70)	545 (130)
2	M	175 (30)	210 (40)	155 (35)	80 (45)
	F	135 (25)	160 (30)	115 (20)	65 (35)
	M + F	310 (55)	370 (70)	270 (55)	145 (80)

* Standard errors are given in parentheses.

For every participant the risk of catching gastrointestinal illness was calculated as a function of sex and age. Using case definition 1 we found statistically significant ($\alpha = 0.05$) differences in risk for these parameters. The relative risk for women compared to men was 1·25. The relative risks for the third age group

(36–64 years of age) and the fourth (above 65 years of age) compared to the first age group (under 18 years old) were 0·75 and 0·40 respectively. We did not find a statistically significant difference between the incidence found in the second age group (19–35 years old) and that in any of the other age groups. The age effects did not differ significantly between men and women. Using case definition 2 we did not find statistically significantly differences either by age or by sex.

DISCUSSION

From the results of the study an incidence of 570 and 150 episodes of gastrointestinal illness per 1000 person-years could be calculated for the less and more severe case definitions. For the whole country, which has 15 million inhabitants, about 8 and 2 million episodes, respectively, are estimated to occur each year.

In the literature there are few community studies with which to compare our results. Our figures are relatively lower than those found in a community study performed in the USA in the sixties [5]. In this study an incidence for enteric illnesses of 1200 per 1000 person-years was calculated using the occurrence of diarrhoea or vomiting, or diarrhoea and vomiting, or nausea and/or upset stomach as a case-definition. This definition is somewhat broader than our case definition 1, which may partly explain the higher rate observed. Similarly to the present study a physician was consulted, either by visit or by telephone in 18·2 % of the cases.

An interesting aspect of gastrointestinal illness is the question of seasonal variability. Unfortunately, for several practical reasons the sampling period in the present study could not be extended to cover all four seasons. In a sentinel study carried out in 1987–91 in general practices [15] a peak in the number of reported gastrointestinal complaints was seen in the summer (August and September). Most of the illnesses in this period probably resulted from infections acquired abroad. In view of the relevance for public health policy, the purpose of the present study was to measure the incidence of gastrointestinal diseases arising in The Netherlands. Therefore it was decided not to include the summer period. Based upon data obtained in the general practice survey, it was assumed that a study performed during the months March to July would give a representative picture of the incidence of gastrointestinal illnesses in the Dutch situation (Fig. 1).

The degree to which the study group could be said to represent the whole population of The Netherlands was limited because of the response rate of 36 %. The calculations were corrected for differences in age, sex, region and urbanization classes between the study group and the population at large. However, socio-economic aspects were not investigated and bias due to these factors cannot be excluded. Additional studies should address this issue.

From the sentinel study in general practices, which was performed in Amsterdam and Helmond in 1987–91, an incidence rate of gastrointestinal illness (case definition 1) was calculated to be about 15 episodes per 1000 person-years [18]. Another study in general practices in The Netherlands showed 20–38 episodes per 1000 person-years [16]. Only patients who visited their doctor were counted in these surveys and, according to the data from the present study, their
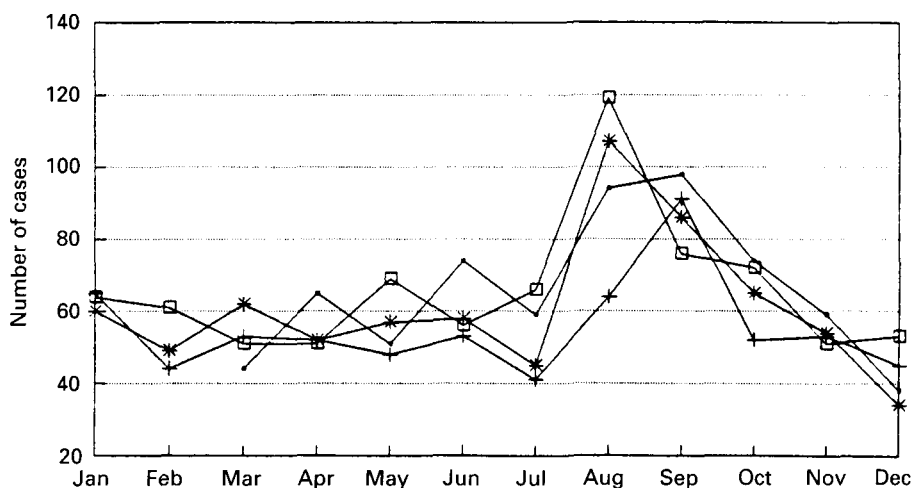
Fig. 1. Gastrointestinal illnesses in general practices. ●——●. 1987; +——+. 1988; ✱——✱, 1989; □----□, 1990.

numbers should be multiplied by about 10 to obtain the number of episodes in the community. The resulting figures would then seem similar to those found in the present study but differences in the case definitions used exclude a rigorous comparison.

Other Dutch studies in the community, undertaken in 1959 [17] and 1964 [18], showed incidences of gastrointestinal illness of 350 and 800 per 1000 person-years, respectively. Studies done in 1948 [19] and 1965 [5] in the USA showed incidences of 1600 and 1200 per 1000 person-years, respectively. Differences in the case definitions used as well as in the composition of the study groups again render the data not fully comparable with that presented here.

Although the symptoms were generally mild, the number of patients suffering from gastroenteric illnesses found in the present study indicate that the total medical and other costs caused by this disease are high [20]. Moreover, in very young and in the elderly the consequences of diarrhoea can be more serious or even fatal because of their weakened immunological and non-immunological defences [21, 22]. Among old persons, women and those residing in long-term case facilities are particularly at risk [14].

In conclusion, the total burden of gastrointestinal illness is substantial. Its potential preventability by hygienic measures justifies the operation of a system of general practice sentinel stations, continuously monitoring this disease. Periodically, community studies are needed to assess the impact of these diseases on the population more completely.

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