Epidemiology of Cryptosporidiosis in Ireland, 2005

Key Points

- **In 2005, there was a 32% increase in the number of cryptosporidiosis cases notified in Ireland relative to 2004, with the crude incidence rate rising from 11.0 to 14.6 per 100,000 population**
- **Much of the excess in cases was concentrated in the months of April and May, a time when the incidence would be expected to be at its' highest**
- **Infection was reported most frequently in children under 5 years of age**
- **The lowest incidence was in the Eastern Region and the highest in the Western Area**

Introduction

Cryptosporidium is a protozoal parasite that causes a diarrhoeal illness in humans known as cryptosporidiosis. In immunocompetent patients it causes watery non-bloody diarrhoea, sometimes accompanied by abdominal pain, nausea, anorexia, fever and weight loss. In immuno-compromised individuals, especially those with AIDS, diarrhoea can be chronic and persistent, causing clinically significant fluid and electrolyte depletion. Weight loss, wasting and abdominal pain may be severe.

C. parvum (formerly known as *C. parvum* type II) and *C. hominis* (formerly known as *C. parvum* type I) are the main species associated with human infection, although a minority of human infections have been linked with other species such as *C. felis* and *C. meleagridis*. The primary reservoir for *C. hominis* is humans while both livestock (calves and lambs in particular) and humans serve as reservoirs for *C. parvum*. Thus, speciation can be used to indicate a likely source of infection for individual cases.

With both humans and animals serving as potential reservoirs, multiple routes of transmission are possible. The consumption of contaminated water is regarded as being an important transmission route, but infection has also been associated with swimming pools, farm animal contact, food and person-to-person spread.[1-6] A primary public health concern regarding *Cryptosporidium* is its relative resistance to chlorination.

Methods

Cases of cryptosporidiosis are notified, by both clinicians and laboratory directors, to the Medical Officer of Health in each

Table 1. Number of notified cases, crude incidence rate and age-standardised incidence rate of cryptosporidiosis by HSE area, 2005.

HSE area	No. notifications	CIR (95% CI)	ASIR (95% CI)
ER	38	2.7 (1.8-3.6)	2.6 (1.8-3.4)
M	36	16.0 (10.8-21.2)	14.7 (9.9-19.4)
MW	56	16.5 (12.2-20.8)	16.6 (12.3-21.0)
NE	62	18.0 (13.5-22.5)	16.8 (12.6-21.0)
NW	43	19.4 (13.6-25.2)	18.4 (12.8-23.9)
SE	99	23.4 (18.8-28.0)	23.1 (18.6-27.7)
S	105	18.1 (14.6-21.6)	18.6 (15.1-22.2)
W	131	34.4 (28.5-40.3)	35.7 (29.6-41.9)
Total	**570**	**14.6 (13.4-15.8)**	-

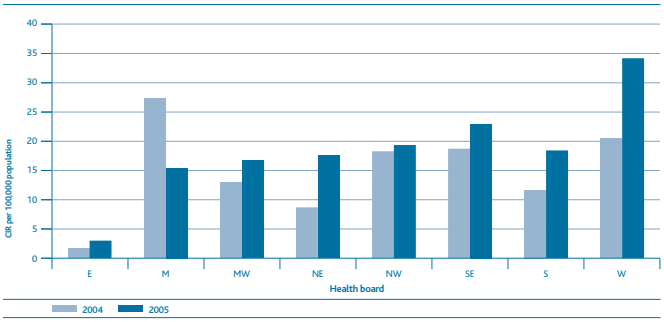

Figure 1. Crude incidence rates cryptosporidiosis by HSE area and year, 2004-2005

Table 2. Age-specific incidence rate of cryptosporidiosis by HSE area 2005.

Age group	HSE-ER	HSE-M	HSE-MW	HSE-NE	HSE-NW	HSE-SE	HSE-S	HSE-W
<1	0.0	87.49	175.28	91.59	66.14	99.73	91.31	267.88
1-4	7.76	192.46	160.26	136.49	162.45	212.62	159.38	427.60
5-9	2.25	24.17	34.44	32.04	56.19	30.15	51.33	54.38
10-14	0.0	5.60	16.11	7.41	22.47	18.20	14.31	20.69
>=15	2.67	0.58	1.87	6.40	3.49	7.57	4.56	3.59
Total	**2.71**	**15.97**	**16.49**	**17.97**	**19.41**	**23.37**	**18.09**	**34.45**

HSE area. These weekly notifications form the basis of the analyses presented here. The case definition used is that outlined in the HPSC booklet 'Case definitions for notifiable diseases' (http://www.ndsc.ie/hpsc/NotifiableDiseases/CaseDefinitions/). Census data from 2002 (CSO) were used to calculate incidence rates.

Results

Incidence

In 2005, 570 cases of cryptosporidiosis were notified in Ireland, a crude incidence rate of 14.6 per 100,000 population. This was a 32% increase on the number of cases notified in 2004.

Geographical distribution

The crude incidence (CIR) and age standardised incidence (ASIR) rates by HSE area for 2005 are reported in table 1. As per 2004, the HSE-ER reported the lowest crude incidence rate, while a 42% decrease in notifications occurred in the Midlands where a large outbreak in 2004 undoubtedly contributed to the higher incidence in that year. The main increases were reported in the HSE-NE, where the rate rose from 8.7 in 2004 to 18.0 per 100,000 in 2005 (a rate now similar to most other HSE areas), and in the HSE-W where the rate rose from 20.2 in 2004 to 34.4 per 100,000 in 2005, substantially higher that all other HSE areas (figure 1). In addition to a true difference in incidence, regional variation in incidence may also reflect regional variation in laboratory screening and case-finding policies.

Age distribution

The highest reported incidence was in children between the ages of 1 and 5 years (figure 2). This was found to be the case in almost all HSE areas although the age-specific incidence varied between 7.76 per 100,000 in this age group in the HSE -ER to 427.60 per 100,000 in the HSE-W (table 2). The incidence among males was slightly higher than for females in younger age groups (figure 2).

Seasonality

As in 2004, the disease displayed a pronounced seasonal distribution with 61% of cases notified during the 3 months April to June (figure 3). It was in this quarter in 2005 that the excess in cases were clustered.

Outbreaks of cryptosporidiosis

Six outbreaks of cryptosporidiosis were reported in 2005: four general outbreaks and two family outbreaks. Forty-nine people were reported ill as a result of these outbreaks, and 13 were hospitalised (an admission rate of 26%). The suspected mode of transmission for four outbreaks was unknown, however, for two general outbreaks, water was suspected to have played a role in transmission. The water supplies in both instances were public supplies and boil water notices were issued. Speciation of human isolates was undertaken for the SE outbreak, which was reported to be due to *C. hominis*.[7,8]

Discussion

Overall, there was a 32% increase in the number of cryptosporidiosis cases notified in Ireland in 2005 relative to 2004, with the crude incidence rate rising from 11.0 to 14.6 per 100,000. Much of the excess in cases was concentrated in the months of April and May, a time when the incidence would be expected to be at its' highest. At first, it was unclear

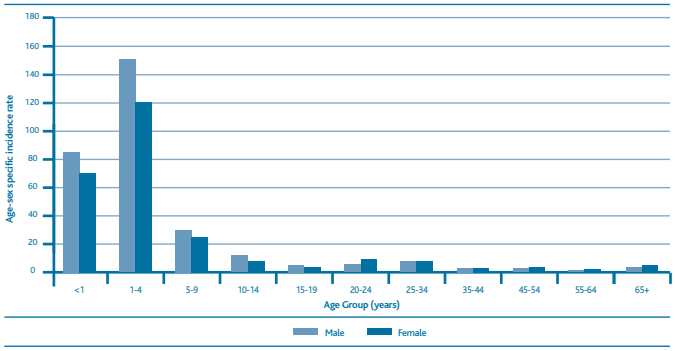

Figure 2. Age-sex specific incidence rates for cryptosporidiosis in Ireland, 2005

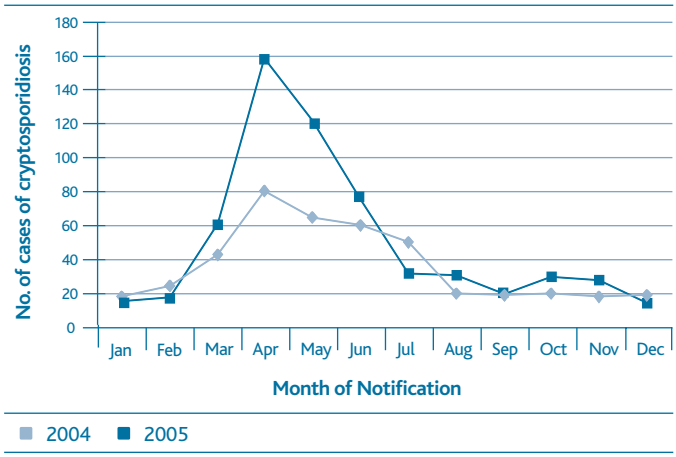

Figure 3. Seasonal distribution of cryptosporidiosis cases 2004-2005

if this just reflected improved reporting as notifiers became more familiar with the revised list of notifiable diseases and the new requirements of SI 707. However, provisional data show that the number of cryptosporidiosis cases notified in the second quarter 2006 mirrors more closely the number of cases reported in 2004 rather than in 2005, indicating that there was probably a real excess of cases in 2005.[9]

In 2005, the HSE-W reported the highest crude incidence rate -more than twice the national rate. There were 2 small general outbreaks reported from the region but the majority of cases appear to have been sporadic. Given the high rate of cryptosporidiosis reported in the HSE-W in 2005, a major new research project entitled 'Enhancing Human Health through Improved Water Quality' funded by the EPA at the Environmental Change Institute in National University of Ireland Galway (NUIG) is an interesting initiative. Led by Prof. Martin Cormican, researchers will examine the relationship between drinking water supply and the occurrence of cryptosporidium infection in the West of Ireland, and the effect of seasonal and environmental factors on ground water quality (http://www.nuigalway.ie/research/ehh/ehhtiwq _home.php). Another interesting study is being undertaken in Northern Ireland, where the CDSC (NI) has commenced a case control study to identify the risk factors for cryptosporidiosis infection.[10]

Drinking water is an important transmission route in outbreaks of cryptosporidiosis. Two outbreaks in Ireland in 2005 reported drinking water as being suspected of having played a role in transmission, and drinking water was also the suspected mode of transmission for four outbreaks in 2004.

The importance of water as a potential transmission route is reflected in a recommendation by the EPA that risk assessment should be carried out by each sanitary authority to determine the vulnerability of public water supplies to *Cryptosporidium*.[11] In 2005, the EPA reported that risk assessments had already been carried on 331 individual public water supplies in Ireland.[12]

Other potential transmission routes for cryptosporidiosis include direct animal contact, food, recreational water contact, and person-to-person spread. Significant outbreaks reported internationally in 2005 include a national outbreak in Scotland with 129 laboratory-confirmed cases. Infection was believed to be transmitted by infected lambs at a wildlife park where there were inadequate handwashing facilities.[5] A foodborne outbreak of *C. hominis* in Denmark was associated with whole carrots served in water at a salad bar in a company canteen.[6] And a recent review of waterborne outbreaks in England and Wales has reported that swimming pools were associated with 32 of 62 waterborne cryptosporidiosis outbreaks in England and Wales between 1992 and 2003.[4] These reports serve as reminders of the variety of transmission routes for *Cryptosporidium* infection.

A particularly interesting aspect of the HSE SE outbreak was the fact that it was due to *C. hominis*. In the absence of reference facilities for *Cryptosporidium* in Ireland, isolates from human cases are rarely typed except in the event of outbreaks. Given the very strong seasonal peak here in spring, it has seemed reasonable to suspect that *C. parvum* would be the predominant species in Ireland. Data from Northern Ireland and Scotland has shown *C. parvum* to predominate in

Table 2. Age-specific incidence rate of cryptosporidiosis by HSE area 2005.

Month	HSE area	Transmission route*	Location	Type	Number ill	Number hospitalised
Mar	SE	P-P and WB	Community	General	31	8
April	W	WB	Other	General	7	2
July	S	Unknown	Private house	Family	2	2
July	MW	Unknown	Private house	Family	2	-
Oct	W	Unknown	Travel related	General	4	-
Dec	S	Unknown	Community	General	3	1

** P-P denotes person-to-person transmission; WB denotes waterborne transmission*

these areas, however, in England, *C. hominis* is also important and accounts for over 40% of cases.[13-15] There is still much to learn about the epidemiology of *Cryptosporidium* in Ireland, and our understanding will remain limited in the absence of adequate typing information. A *Cryptosporidium* reference service would also be invaluable to sanitary authorities in assessing the risk to water supplies from *Cryptosporidium*.

Acknowledgements

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