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Contents

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Cryptosporidiosis Outbreak in the South East, 2005

Introduction

An outbreak of cryptosporidiosis occurred in Carlow Town and environs during spring 2005. Cryptosporidiosis has been a notifiable disease since January 2004. An increase in the number of cases became apparent to staff in the Department of Public Health, HSE South East in March 2005. Carlow County Council were informed of this increase and arrangements were made to sample the town's water supply for *Cryptosporidium*.

Carlow Town public water supply provides water to approximately 25,000 people from two river sources, the Burren and Slaney. There is a separate treatment plant for each source and treatment at both plants is standard and includes coagulation, flocculation, filtration, and chlorination.

Epidemiological Investigation

Thirty one cases of cryptosporidiosis were notified between February and May 2005, mainly in young children. There were 18 females and 13 males. Eight people were hospitalised. All cases recovered. All cases had contact with Carlow Town public water supply. Other risk factors identified were untreated private well water, contact with animals, water sports, and contact with other cases. *C. hominis* was identified in seven faecal specimens. *C. hominis* is usually associated with humans but has been found in cattle.[1]

A case control study was carried out with 22 cases and 63 controls. Results showed that cases of cryptosporidiosis were significantly associated with a private water supply (OR 4.8, 95% CI 1.5-14.7, p = 0.004) and contact with animals (OR 2.6, 95% CI 0.95-6.9, p = 0.03) compared with controls. There was no association between illness and consumption of any food items. All cases and controls were exposed to the public water supply but some people said that they did not drink tap water. Analysis did not identify drinking tap water from the public water supply as significantly associated with illness (OR 0.42, 95% CI 0.14-1.26). The interpretation and limitations of the findings from the case control study in relation to water consumption are discussed in the full report.

Environmental Investigation

Water results showed low levels of *Cryptosporidium* (0.009-0.28 oocysts/10L) in the public water supply. *C. parvum, C. andersoni* and *C. muris* were identified. The usual hosts of these organisms are humans and cattle, cattle, and mice respectively. Levels of *Clostridium perfringens* were detected in the range 0-18/100ml during the incident. Turbidity results did not exceed 1 NTU but there was variability during March and April.

Outbreak Management

Outbreak management was multidisciplinary involving HSE SE (public health doctors, environmental health officers, consultant microbiologist and laboratory staff, surveillance scientists) and Carlow County Council (engineers, managers, and veterinary officers).

An initial result showed low levels of *Cryptosporidium* (0.04 oocysts/10L) in the treated public water supply. There was no evidence of a breach in the water treatment process. The system was scoured and follow-up results of water testing were clear. It was queried whether output from one treatment plant exceeded its design capacity and output was decreased (figure 1). This decrease could not be sustained and external risk assessment indicated that the design capacity was adequate. Notification of cryptosporidiosis cases continued and the pattern suggested an ongoing source of infection. The Director of Public Health/Medical Officer of Health recommended 'Boil water' advice as a precautionary measure. Carlow County Council issued a 'Boil water' notice on 14 April 2005. Subsequent water results again showed low levels of *Cryptosporidium*.

Public and environmental health measures which were put in place included:

- Enhanced surveillance.
- GPs and hospital consultants were asked to notify and send stool samples on cases of acute gastroenteritis and advise vulnerable immunocompromised patients to boil drinking water as a precautionary measure.
- Crèches were visited to emphasise hygiene measures and minimise person-to-person spread.
- The swimming pool was tested and advice given.
- A case control study was undertaken.

Measures taken by Carlow County Council included:

- Risk assessment of the water supply.
- A programme of improvement works at the treatment plants to reduce and manage the risk of *Cryptosporidium* entering the treated water supply.
- Water conservation.
- Inspection of the river catchment area.

Continued page 4

Epidemiology of Hepatitis B in Ireland

Introduction

Hepatitis B virus (HBV) is a common cause of morbidity and mortality, with approximately 350 million people chronically infected worldwide and a half to one million people dying as a result of HBV infection every year.

Only 10% of children and 30-50% of adults develop clinical symptoms during the acute phase of infection. However, there is a high probability of developing chronic HBV if the infection is acquired in infancy or early childhood. Ninety percent of infants infected at birth and 20-50% of children infected between one and five years of age develop chronic infection, compared to 1-10% of those infected as older children or adults. Chronic infection causes premature death from cirrhosis and/or hepatocellular carcinoma in 15-25% of cases.

Ireland is considered a low endemicity country for HBV. In low endemicity countries, HBV infections occur mainly among well defined risk groups such as babies born to mothers with acute or chronic HBV infections, household or sexual contacts of infected persons, injecting drug users (IDUs), healthcare workers, heterosexuals with multiple partners, and men who have sex with men (MSM).

HBV is a vaccine-preventable disease and in 1992 the World Health Organization (WHO) recommended that a HBV vaccine be included in routine immunisation programmes in all countries by 1997. The current immunisation policy in Ireland is based on targeting risk groups for vaccination.

Methods

Sources of HBV-related data used for this report include statutory notifications to the Health Protection Surveillance Centre (HPSC), immigration and work permit data, data from the Central Statistics Office (CSO), Hospital In-Patients Enquiry (HIPE) system, and the National Cancer Registry of Ireland (NCRI), in addition to data from prevalence studies and screening programmes.

An amendment to the Infectious Diseases Regulations 1981 (*Infectious Diseases (Amendment) (No. 3) Regulations 2003, S.I. No. 707 of 2003*) in January 2004, introduced case definitions and mandatory laboratory reporting. In addition, notifiers began distinguishing between acute and chronic cases of HBV. Enhanced surveillance for acute cases of HBV was introduced in January 2005. Some risk factor data are available for acute cases and, to a more limited extent, chronic cases, since January 2004.

Results

Hepatitis B statutory notifications

The number of HBV notifications to HPSC increased almost 30-fold between 1997 (n=31) and 2005 (n=905) (figure 1).

Hepatitis B notification data, 2004 and 2005

During 2004 and 2005, 1,626 cases of HBV were notified to HPSC. Seventy-four percent (n=1,201) were chronic infections, 8% (n=131) were acute, and the status of the remaining 18% (n=294) was not known. The epidemiology of the acute and chronic cases in Ireland is very different.

Acute cases

In 2004 and 2005, of the acute cases of HBV notified, 77% (n=101) were male and 22% (n=29) were female. Young adults were most affected, with 65% (n=85) of cases aged between 20 and 44 years (figure 2).

Where the reason for testing for HBV was known (n=74/131), 73% (n=54) of acute cases were tested after experiencing symptoms. Risk factor information was available for 65% (n=85/131) of the acute cases and the main exposures were sexual. Where information was provided, 29% (n=25) of cases were MSM, 6% (n=5) were associated with sexual contact with a known HBV carrier, and a further 15% (n=13) indicated that the infection could be related to sexual exposure. Where country of birth was known (n=70/131), 79% (n=55) of acute cases were born in Ireland.

Chronic cases

In contrast to the acute cases, the distribution of male (52%) and female (43%) chronic cases was more even. The majority of chronic cases were also young adults, with 82% (n=988) of cases aged between 20 and 44 years (figure 3).

Limited enhanced data were available for chronic cases. Where the reason for testing was known (n=210/1,201), 71% (n=150) of chronic cases were tested through voluntary health screening programmes for asylum seekers and a further 9% (n=19) were identified through antenatal screening programmes in maternity hospitals.

Data on source of infection were very limited for chronic cases. Where information on asylum seeker status or country of birth was available (n=258/1,201), 93% (n=240) of cases were either asylum seekers or were born in a country where HBV is endemic (hepatitis B surface antigen prevalence greater than or equal to 2%). Where country of birth was identified (n=193/1,201), 51% (n=99) of cases were born in Sub-Saharan Africa, 19% (n=36) were born in Central or Eastern Europe and 11% (n=22) were born in East Asia/The Pacific Region. Only 6% (n=12) of chronic cases were born in Ireland.

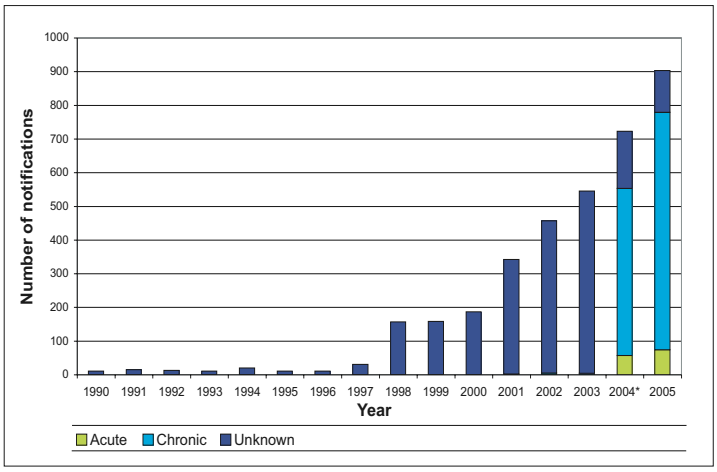

Figure 1. Number of cases of HBV notified, 1990 – 2005

*Laboratories required to notify HBV and acute/chronic status reported routinely from January 1st 2004

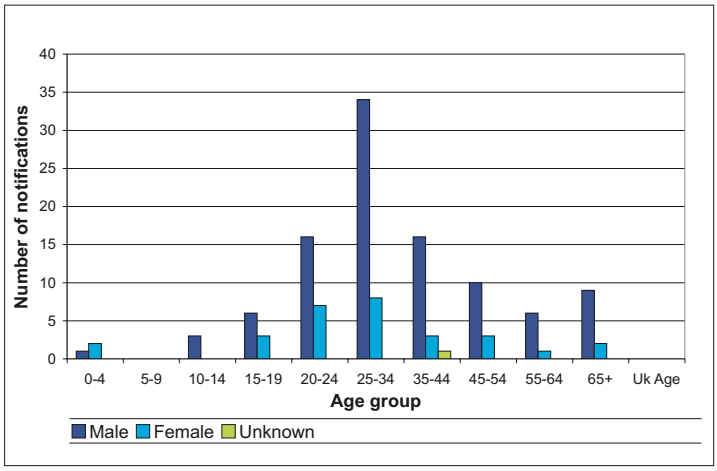

Figure 2. Age and sex breakdown of acute cases of HBV, 2004 and 2005

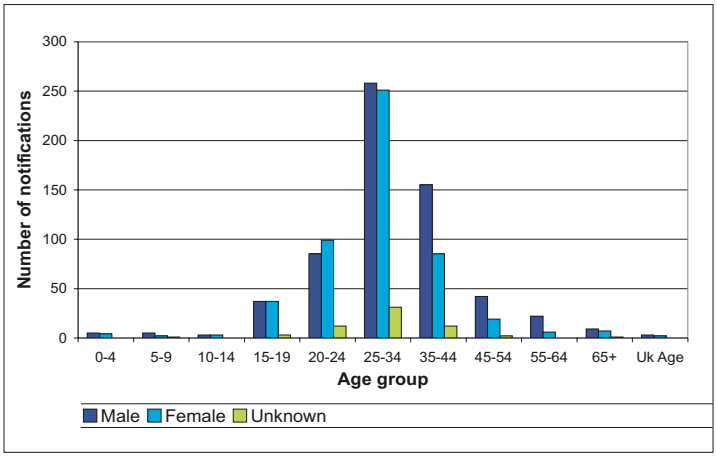

Figure 3. Age and sex breakdown of chronic cases of HBV, 2004 and 2005

Hepatitis B prevalence data

The prevalence of HBV infection in the general population in Ireland is low. However, HBV is more prevalent in certain high-risk sub-groups of the population such as IDUs, prisoners, homeless people, and immigrants from intermediate- or high-endemicity countries. Data on the prevalence of HBV in both risk groups and in the general population are available from cross-sectional studies and screening programmes (table 1).

Immigration data

The prevalence of HBV in Ireland is influenced, to a large extent, by the immunisation policies and the prevalence of HBV in the country of birth of immigrants to Ireland.

Asylum seekers

Almost 50,000 (49,886) applications were received by the Office of the Refugee Applications Commissioner between 2000 and 2005. Many of the source countries of asylum seeker applicants are areas of intermediate- or high-HBV endemicity. Between 2000 and 2005, 34% of all applicants were from Nigeria, 14% were from Romania, 4% were from Moldova, and 3% were from the Democratic Republic of the Congo. The prevalences of HBsAg in these countries are 12%, 7%, 8%, and 12% respectively.

Work permits

The number of work permits issued by the Department of Enterprise, Trade and Employment has also increased substantially in recent years, with 62,627 new work permits issued between 2002 and 2005. Although migrant workers come to Ireland from all over the world, 52% of all new work permits between 2002 and 2005 were issued to people from Eastern and Central Europe. The top five recipient countries of new permits during this time period were Poland (9.4%), Lithuania (8.2%), Philippines (7.7%), Latvia (7.1%), and South Africa (6.5%). The Philippines and South Africa have endemic levels of HBV carriage (10% and 8% respectively).

Morbidity and mortality data

HIPE discharge data

The HIPE system collects medical and administrative data regarding discharges and deaths from acute hospitals. Between 1999 and 2004, its coverage was 95%, excluding private hospitals. During this time period, there were 527 hospital discharges with a principal diagnosis of acute, chronic, or unspecified HBV. Seventy-four percent were male and the average patient age was 36.7 years.

NCRI Hepatocellular carcinoma data

Hepatocellular carcinoma is the most common form of primary liver cancer. Between 1994 and 2001, 226 cases were registered with the NCRI. The vast majority of these (77%) were male. The proportion of cases that were due to HBV is unknown but WHO estimates that HBV causes up to 80% of hepatocellular carcinoma worldwide.

CSO mortality data

Between 1994 and 2004, there were 243 deaths from primary liver cancer, of which 67.5% were male. HBV was recorded as the primary cause of death for 23 people over the same time period and 83% of these were male.

Discussion

Statutory notifications of HBV have increased substantially in recent years and the epidemiology of HBV in Ireland is changing. This is due, in part, to the changes in immigration patterns to Ireland associated with economic development. It is also likely that HBV case identification and notification have improved with mandatory laboratory reporting, and screening programmes such as voluntary health screening for asylum seekers and IDUs and antenatal screening in some maternity hospitals. Surveillance of HBV could be improved further using genotyping and other molecular testing to investigate potential links between cases.

Antenatal screening is currently carried out at some, but not all, maternity hospitals in Ireland. Universal antenatal screening for hepatitis B with a co-ordinated follow-up vaccination service has been shown to be a feasible and cost-effective method of preventing vertical transmission of HBV.

The existing HBV vaccination programme in Ireland is a selective programme targeting high-risk groups, but there are often difficulties in successfully identifying and vaccinating those at risk. In light of increases in hepatitis B in Ireland in recent years, the National Immunisation Advisory Committee (NIAC) is currently considering introducing universal HBV vaccination.

Niamh Murphy and Lelia Thornton, HPSC

Table 1. Prevalence of HBV in risk groups and in the general population in Ireland

Prevalence studies and screening programmes for HBV	Prevalence of HBV anti-core antibody (current or past infection) (%)	Prevalence of HBV surface antigen (current acute or chronic infection) (%)
National study in general population of Ireland, 1999	0.51	
European Sero-Epidemiology Network, Irish specimens – general population, 2003	1.7	0.1
IBTS blood donor screening, new blood donors, 1997-2004		0.01
Antenatal screening in the Rotunda, hospital Jan 1998-June 2000*		0.35
HSE E asylum seeker screening, 1998-2003	20.2	5
Cross-sectional study of opiate users attending EHB methadone clinics, 1997	28.1	5.1
Cross-sectional study in 21 addiction treatment centres in SWAHB, Dec 2001 -Jan 2002	17	2
Cross-sectional study in nine Irish prisons,1998	8.7 (18.5 in prisoners who had ever injected drugs)	
Homeless people, HSE E, 1999-2000	9	

*91% of those testing positive in the Rotunda antenatal screening programme were immigrants from areas of moderate to high HBV prevalence and 9% were Irish (HBsAg prevalences of >4% and 0.03%, respectively)

Acknowledgements

We wish to thank all of the following for their contribution to this report and for providing the data contained in it: Directors of Public Health and their staff; notifiers of hepatitis B, both clinicians and laboratory directors; the Central Statistics Office; the Office of the Refugee Applications Commissioner; the National Cancer Registry Ireland; the Economic and Social Research Institute; the Department of Justice, Equality and Law Reform; Dr Judy Mac Diarmada, HSE ER.

References available on request.

- Close monitoring and use of turbidities to control the treatment process.
- Veterinary investigation.

The 'Boil water' notice was rescinded on 24 May 2005 based on epidemiological evidence, environmental evidence including water monitoring results, continued risk assessment, and a programme of improvements at the treatment plants. It was decided that an acceptable level of oocysts was 0.05 oocysts/10L based on continuous 24-hour sampling for seven consecutive days.

Works have been carried out at the treatment plants which have reduced one plant from a 'very high' to a 'low' risk category and the other from a 'moderate' to 'low' risk.

Discussion

In this outbreak descriptive epidemiological evidence and environmental results demonstrated a Grade A strong association between human illness and the public water supply.[2]

Most cases in this outbreak were young children which suggests that there may be a level of immunity to *Cryptosporidium* among adults in Carlow. Such immunity may result from previous exposure to low levels of *Cryptosporidium* and limit the usefulness and appropriateness of a case control study.[3]

Arguments have been forwarded against conducting an analytical study in the management of an outbreak of cryptosporidiosis. In 2002, a study in the UK described an outbreak of cryptosporidiosis where the descriptive epidemiology supported the hypothesis that the outbreak was associated with consumption of cold tap water in the area served by a particular water treatment works and it was considered neither necessary nor appropriate to carry out an analytical study.[4]

Following the experience of this outbreak joint recommendations were made by the HSE SE and Carlow County Council members of the Incident Response Team in relation to sampling/monitoring, treatment plant operation, public health, and general issues. The recommendations concerning public health refer to advice for vulnerable groups and the use of case control studies. It was recommended that:

1. Vulnerable immunocompromised patients should be advised to boil drinking water at all times where their supply has a surface water source or is influenced by surface water because of the delay in detecting an outbreak and the difficulty in ensuring patients receive appropriate advice.

2. In relation to infant feeds, when a boil water notice is issued
   - general advice should be reiterated that drinking water and water used to make up infant feeds should be boiled, and cooled, at all times and
   - given the widespread availability and use of bottled water, advice should be included that infant feeds should be made up with boiled and cooled tap water and not bottled water because of the high mineral content of some bottled waters.

3. Case control studies are resource intensive and may be of little value in particular outbreak situations where there may be long term exposure to low levels of *Cryptosporidium* and some degree of community immunity.

4. Advice should be provided to farmers regarding the potential for being infected with cryptosporidiosis.

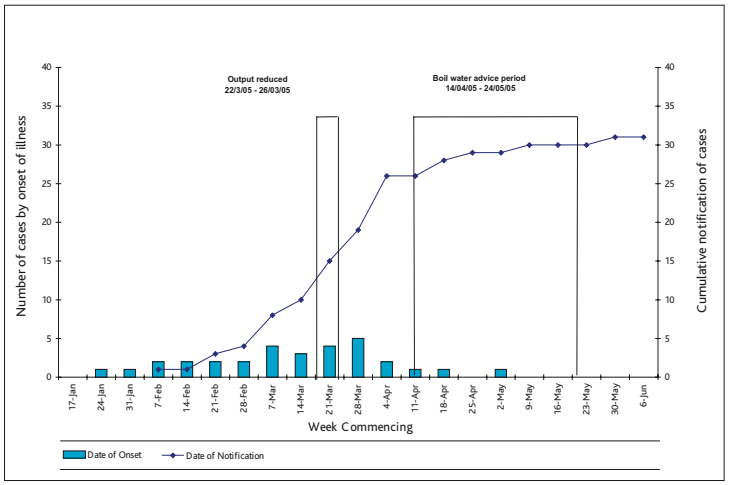

Figure 1: Notification of cases, onset of illness and actions taken in the cryptosporidiosis outbreak in HSE SE, 2005

Other general recommendations include the need for a national focus to advise on all aspects of the provision of safe drinking water and a national database on *Cryptosporidium* and *Clostridium* monitoring.

A full report was written on behalf of the HSE SE Outbreak Control Team and is available at www.hselibrary.ie, Irish Health Publications Archive – HSE Public Health Publications – infectious disease. A parallel report has been compiled by Carlow County Council and is available on the website www.carlow.ie.

The Water Liaison Committee of HSE SE and Carlow County Council continues to meet regularly and is updating the joint protocol for the management of microbiological incidents in the light of new Water Quality Regulations and to include chemical parameters.

BA Roch, AM O'Byrne, F Menton, C O'Hare, G Leane, HSE SE

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The Management of Invasive Group A Streptococcal Infections in Ireland

Invasive group A streptococcal infection (iGAS) became a notifiable disease in Ireland in 2004. In early 2005, possible temporal and geographic clustering of cases of iGAS were noted in HSE Western Area and there was some concern that there had been an increase in incidence of iGAS in Ireland. In May 2005, a multi-disciplinary sub-committee of the Scientific Advisory Committee of the Health Protection Surveillance Centre was set up to develop guidelines for the surveillance, diagnosis and management of invasive group A streptococcal infection in Ireland. The guidelines have recently been published and are available on the HPSC website at www.ndsc.ie/hpsc/A-Z/Other/GroupAStreptococcalDiseaseGAS/Publications.