Surveillance and epidemiology of hepatitis B and C in Europe – a review

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Hepatitis B virus (HBV) and hepatitis C virus (HCV) infections are frequent causes of acute and chronic hepatitis worldwide and leading causes for hepatic cirrhosis and cancer. There is a distinct geographical variation in HBV and HCV incidence and prevalence in the European Union (EU) and European Economic Area/European Free Trade Association (EEA/EFTA) member states and neighbouring countries. The HBV carrier prevalence ranges from 0.1 to 8.0% and that of HCV from 0.1 to 6.0%. Within the last few years, the HBV incidence has decreased while the HCV incidence has increased. Both diseases are concentrated in certain subpopulations, such as injecting drug users, with tens of times higher prevalence than in the general population. Most EU and EEA/EFTA countries have a surveillance system for HBV and HCV infections, but due to differences in system structures, reporting practices, data collection methods and case definitions used, the surveillance data are difficult to compare across countries. The harmonisation and strengthening of HBV and HCV surveillance at the European level is of utmost importance to obtain more robust data on these diseases.

Introduction

Hepatitis B virus (HBV) and hepatitis C virus (HCV) infections are frequent causes of acute and chronic hepatitis worldwide and they create a significant burden to healthcare systems due to the high morbidity and mortality, and costs of treatment. According to the World Health Organization (WHO) estimates, one third of the world's population have been infected with the HBV virus and more than 350 million have chronic infection. Regarding HCV, it has been estimated that 170 million persons have chronic infection and that 3 to 4 million new infections occur each year [1,2]. In the European Union, the occurrence of both HBV and HCV is known to differ across countries but the interpretation of this heterogeneity is difficult [3]. Within the last two years, a number of initiatives aimed at raising awareness of viral hepatitis have been undertaken in the European Union. In 2006, the harmonisation process of surveillance of viral hepatitis in the EU was identified by the European Parliament as one of the priorities for the European Centre for Disease Prevention and Control (ECDC). With the aim of strengthening the surveillance of HBV and HCV the ECDC has started on: 1) reviewing available information on surveillance systems and epidemiology of HBV and HCV in the EU and 2) drafting a proposal for EU-wide surveillance for hepatitis B and C. The objective of this paper is to summarise the main results and conclusions of the first of these projects.

Materials and methods

Data about existing surveillance systems were collected from the former Eurohep.net project funded by the European Commission Directorate-General for Research (DG Research) (available at: www.eurohep.net), the first annual epidemiological report of the ECDC (available at: www.ecdc.europa.eu) [3], and the 2006 annual report on the state of the drugs problem in Europe of the European Centre for Drugs and Drug Addiction (EMCDDA, available at: www.emcdda.europa.eu)

Information on current vaccination schedules were obtained from EUVAC.NET (available at: http://www.euvac.net/graphics/euvac/vaccination/vaccination.html). Country-specific data on the number of reported HBV and HCV cases are based on the background data sent by countries and used by ECDC for the first epidemiological report.

To summarise the epidemiology of the HBV and HCV infections in Europe a literature review was performed in September 2007 – February 2008. Articles indexed in the PubMed database were searched by using the following key words: hepatitis B and/or hepatitis C, incidence, prevalence, surveillance, Europe. Country-specific information was searched by adding a country name to the search. The search was restricted to EU and EEA/EFTA countries, Switzerland, countries of the former Yugoslavia and Albania. To obtain information on risk groups or other epidemiological features of these diseases, the following auxiliary terms were added to the search: injecting drug users (IDUs), men having sex with men (MSM), sex workers, prisoners, tattooing, immigrants, HIV, haemodialysis, blood transfusion, blood donors, health care workers. The search was restricted to publications written in English. Both review articles and original research reports were included. Papers published during recent years (2000-2007) were preferred.

Results

Hepatitis B surveillance

Eurohep.net was a feasibility project funded by DG Research in 2002-2005. The aim of the project was to take stock of, co-ordinate, strengthen and standardise the country-specific surveillance systems and prevention activities of the vaccine-preventable viral hepatitis A and B [4]. A survey was carried out on existing hepatitis A and B surveillance systems; here, only information concerning hepatitis B is summarised. A surveillance system for HBV infections was in place in all 19 European countries that responded to the survey. The objectives for surveillance were revealed to be very similar. Eighteen countries indicated that underreporting of cases was possible. Source of data, the variables, data availability at central level, and frequency of reporting and analysing the data varied between the countries (Table 1). Sixteen countries reported the use of ten different types of age categories [5].

In 2006, the ECDC conducted a survey on surveillance systems in 27 EU and EEA/EFTA countries. All 27 countries responded to the survey and all of them declared having a mandatory reporting system for HBV (Table 2). Altogether 39 different HBV surveillance systems were described in the survey: 21 countries had only one

Table 1

Summary of hepatitis B surveillance in 19 European countries* in 2002-2004, according to EUROHEP.NET survey (http://www.eurohep.net)

Characteristics of surveillance	Number of countries
Hepatitis B included in national surveillance	19
Type of surveillance	
active	6
passive	16
Surveillance data based on	
acute clinical cases only	12
acute clinical cases and chronic cases	6
data missing	1
Data source	
hospital data and laboratory reports	5
hospital data only	4
laboratory data only	4
none of these or data missing	6
Objectives for hepatitis B surveillance system	
to detect outbreaks	19
to monitor trends	19
to monitor changes in disease distribution and spread	18
to facilitate planning and control measures evaluation	18
to improve knowledge on the disease epidemiology	18
Type of information collected	
age and sex	18
place of residence	18
country of birth	7
risk factors	16
symptoms	10
date of onset	18
hospitalisation	16
outcome	14
Availability of data on central level	18
individual	13
aggregated	13
Frequency the clinical data is reported to central level	
continuously	10
weekly	6
monthly	6
Frequency of the data analysis at the surveillance centre	
continuously	8
weekly	7
monthly	7
Possibility for underreporting of cases	18

* Data presented only from 19 European countries participating in the first phase of the Eurohep.net study: Austria, Belgium, Bulgaria, Czech Republic, Estonia, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Romania, Slovakia, Slovenia, and United Kingdom

Table 2

Characteristics of different hepatitis B surveillance systems (n=39) in 27 European countries* participating in the ECDC survey in 2006

Characteristics	Number of surveillance systems	Percentage of total
Number of surveillance systems having national coverage	32	82%
Mandatory surveillance	28	72%
Passive surveillance	31	31%
Active surveillance	8	21%
Case based data	34	87%
Aggregated data	5	13%
EU case definition used	20	51%
Other case definition used	14	36%
No case definition used	5	13%
Category of case definition	33**	
clinical+laboratory+epidemiological	17	52%
clinical+laboratory	3	9%
laboratory+epidemiological	3	9%
clinical only	2	6%
laboratory only	8	24%
Source of reporting	37***	
laboratory+physician+hospital+other source	4	11%
laboratory+physician+hospital	9	24%
laboratory+physician	6	16%
laboratory+hospital	2	5%
laboratory only	2	5%
physician only	5	14%
other source, with or without combination of above sources	9	24%

* Data from: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, United Kingdom;
** Data available from 33 surveillance systems;
*** Data available from 37 surveillance systems.

Table 3

The incidence of reported hepatitis B cases in 27 European countries in 1995-2005 (ECDC, 2007)

Country	Incidence (cases / 100,000 inhabitants) Year										
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Austria	2.6	2.8	2.6	3.1	4.0	3.3	2.6	4.2	6.4	7.1	7.0
Belgium	0.7	3.2	3	1.3	1.2	2.5	5.2	6.9	7.0	*	5.3
Cyprus	0.2	0.3	0.2	0.7	1.0	0.6	0.4	0	0.7	1.5	0.8
Czech republic	5.8	6.6	5.4	5.6	6.2	5.9	4.5	4.0	3.6	3.8	3.5
Denmark	2.1	1.9	1.9	1.8	1.1	1.2	0.9	1.2	0.7	0.8	0.5
Estonia	10.6	18.6	40.2	35.5	20.3	31.8	32.8	17.9	12.8	9.4	5.8
Finland	2.2	5.6	6.1	4.8	5.0	4.6	2.5	3.4	2.0	1.1	
France											0.2
Germany	7.5	7.4	7.4	6.3	5.6	5.5	2.9**	1.7	1.6	1.5	1.4
Greece	1.7	1.3	1.5	5.7	2.6	2.1	2.0	1.6	1.3	1.6	0.8
Hungary				1.8	1.6		1.6	1.6	1.4	1.3	1.2
Iceland	4.1	6.7	7.8	5.5	16.3	17.6	21.5	13.6	8.0	13.4	11.2
Ireland	0.3	0.3	0.8	4.2	4.3	4.9	8.9	11.7	13.8	18.0	1.8**
Italy	4.6	4.0	3.5	3.2	3.0	2.7	2.6	2.4	2.2	2.0	1.8
Latvia	19.8	17.5	15.3	16.4	18.9	30.1	35.5	21	14.5	9.2	7.4
Lithuania	14.5	14.3	12.0	13.2	10.6	9.9	11.0	7.9	5.1	5.4	4.1
Luxembourg	20.0	12.1	19.4	13.0	14.5	7.4	18.7		0.2	0.4	1.1
Malta	1.9	0.8	2.4	0.8	1.1	1.1	1.3	0.8	0.5	1.5	3.0
Netherlands	1.5	1.5	1.6	1.8	4.3	9.7	10.2	11.5	11.7	11.6	1.7
Norway	2.3	2.2	4.2	10.6	10.6	5.9	4.5	4.0	4.5	4.0	3.2
Poland	23.4	16.7	12.7	10.5	9.1	7.3	6.3	5.3	4.7	4.1	1.2
Portugal	9.9	8.3	6.8	5.7	4.0	2.8	2.0	1.5	1.1	0.9	0.8
Slovakia	6.3	5.6	4.8	3.7	3.9	3.1	2.8	2.6	2.6	2.1	2.3
Slovenia	2.2	1.8	1.2	1.8	1.5	1.3	0.9	0.8	1.2	1.2	0.9
Spain			2.9	2.9	2.3	2.2	1.9	2.0	1.9	1.8	1.5
Sweden	3.3	2.1	1.7	1.5	2.4	2.5	2.4	3.2	4.2	2.8	2.4
United Kingdom	1.4	1.4	1.5	1.6	2.0	1.8	1.6	1.5	1.1	0.7	0.7

* Blank cells indicate that data are not available. Comparing figures between the countries should be done cautiously because some notification systems do not distinguish between acute and chronic cases.

** Abrupt changes in the HBV incidence are most probably due to changes in reporting and/or surveillance system (e.g. from 2001 onwards Germany and from 2005 Ireland focused on notification of acute cases). However, country specific information on changes performed in surveillance systems is scarce at the moment.

surveillance system, whereas six countries had 2-6 different systems. At the national level, the EU case definition for HBV was used in 16 countries. Nine countries used other case definitions, and data were missing from two countries. At the surveillance system level, the EU case definition was used in 20 out of 39 surveillance systems [3]. The category of case definition used and the source of reporting varied greatly between the surveillance systems. The characteristics of HBV surveillance systems are presented in Table 2.

Epidemiology of HBV in Europe

The incidence of reported HBV cases in the EU and EEA/EFTA countries has declined over the past ten years from 6.7 cases per 100,000 population in 1995 to 1.5 cases per 100,000 population in 2005. In 2005, a total of 6,977 new HBV cases were reported. The most affected age group was 25-44 year-olds followed by 15-24 year-olds. Men were 1.8 times (range 1-3) more frequently affected than women. Country-specific incidences for the period 1995-2005 are shown in Table 3 [3].

The prevalence of hepatitis B surface antigen (HBsAg) in the general population varies widely between European countries with intermediate to high HBsAg carrier rates in Turkey (8%) and Romania (6%), followed by Bulgaria (4%), Latvia (2%), and Greece (2%). In the Slovak Republic, Poland, Czech Republic, Belgium, Lithuania, Italy and Germany the HBsAg prevalence was 0.5%-1.5% and in the Netherlands, Estonia, Hungary, Slovenia and Norway below 0.5 %. The estimates are from different years and populations, which makes comparison difficult [5-7]. Estonia is, however, considered to be a highly endemic country because of the high incidence of cases (33/100,000) [8].

The most common HBV genotypes in Europe are A and D of which the former is more prevalent in Northern Europe, and the latter in the Mediterranean region and Eastern Europe [9]. For example, genotype A seems to be the prevailing one in Belgium [10], Iceland [11], the Netherlands [12], and Poland [13], whereas genotype D is dominant in northern Italy [14] and Spain [15]. Also, genotypes B and C which are common in Asian countries, genotype E which occurs in Western Africa, and genotypes F and G which are the main genotypes found in South and Central America, respectively, have been detected in Europe. The prevalence rates of the different genotypes vary both between and within individual countries, depending on the populations at risk and their ethnic and geographical origins [9,15,16]. For example, in 1999-2004 in south-western France, among HBsAg positive patients, genotype A was most frequent (51%) followed by genotype D (26%) [16] while in another study which included patients from Paris and south-east region of France, the proportion of genotypes D and A were 27% and 24%, respectively [17]. In general, in countries where the population is mixed and consists of groups of different geographical and ethnic origins, a more widespread distribution of different genotypes is observed [9]. Co-infection with two genotypes is also possible, but information on the prevalence of co-infections is scarce in Europe [9]. Several studies suggest that HBV response to treatment may differ between the genotypes. For example, patients infected with genotype B seem to have better response to interferon (INF) treatment than those infected with genotype C. A better response to INF treatment has also been detected for genotype A compared to genotype D. However, more studies on the relationship between patient outcome, treatment and HBV genotypes are needed [18].

Some groups are more frequently affected by HBV infection than the general population. The prevalence of HBsAg in IDUs ranges from 0 to 21% and the prevalence of antibodies to hepatitis B core antigen (anti-HBc), which indicates past infection, ranges from 20 to 85% [19]. Concurrent infections with HBV and/or HCV and HIV are common [20,21], especially among IDUs [22]. In Spain and in England, the HBsAg prevalence among sex workers varies between 6-7% [23,24]. In many European countries immigrants from highly endemic regions are 5-90 times more frequently affected by HBV than the general population [25-29]. Other populations at high risk of HBV infection are MSM, and those having multiple sex partners [30,31].

Transmission routes and prevention of HBV

In countries with intermediate to high HBV endemicity (HBsAg ≥ 2%) the most common transmission routes are mother-to-child transmission and horizontal transmission via close household contacts. In low endemic countries HBV is usually acquired via injecting drug use, sexual contacts, or body piercing activities [1]. There is evidence, at least from Denmark and the Netherlands, that the number of HBV infections transmitted by sexual contact has recently been increasing [32,33] but injecting drug use is a major mode of transmission in many countries [32,34]. In the past, HBV was frequently transmitted via blood transfusion, but due to improved testing of blood donors the estimated residual risk of acquiring HBV infection ranges from 1 to 10 per million transfusions in Europe [35-39]. The transmission of HBV infection may also occur through needle stick injuries, which is why health care workers can be at higher risk of getting the HBV infection. However, data from Denmark, Germany, Turkey and Albania showed that HBsAg prevalence among health care workers was at the same level as in the general population [20,40-42].

Table 4

Characteristics of hepatitis C surveillance systems (n=38) in 27 European countries* participating in the ECDC survey in 2006

Characteristics	Number of surveillance systems	Percentage of total
Number of surveillance systems having national coverage	30	79%
Mandatory surveillance	27	71%
Passive surveillance	29	76%
Active surveillance	9	24%
Case based data	33	87%
Aggregated data	5	13%
EU case definition	21	55%
Other case definition	12	32%
No case definition or information lacking	5	13%

* Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Malta, Luxembourg, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, United Kingdom

According to the most recent information from EUVAC.NET [43], 21 out of 30 EU and EEA/EFTA countries have implemented a universal vaccination programme for infants or adolescents or both. Eight countries (Denmark, Finland, Iceland, Norway, Sweden, the Netherlands, Ireland and United Kingdom) with low HBV prevalence have chosen a selective vaccination programme against hepatitis B targeted at risk groups. Information on one country was missing [43]. Most countries have implemented additional prevention programmes for different risk groups, most commonly targeted at those at increased risk of acquiring HBV infection via occupational exposure. For example, the Eurohep.net survey showed that 19 out of 19 countries had a vaccination programme for those at increased occupational risk of HBV infection. The next most common risk group targeted by vaccination programmes were the household contacts of HBV patients (17/19), neonates born to HBsAg-positive mothers (17/19), followed by dialysis patients (16/19) and IDUs (14/19). Vaccination of MSM or patients visiting STI clinics was offered in 10 and 9 countries, respectively. A screening programme for pregnant women was in place in 15 countries [5].

HCV surveillance in Europe

All 27 European countries which responded to the ECDC survey in 2006 reported having a surveillance system for HCV infection (Table 5). In 25 countries the reporting was mandatory. Altogether there were 38 different HCV surveillance systems in 27 countries. Six countries had more than one system: Belgium (n=3), Cyprus (n=2), France (n=5), Italy (n=2), the Netherlands (n=3) and Portugal (n=2). The EU case definition was reported to be used in at least one of the surveillance systems in 17 of the 27 countries. Eight countries used other case definitions and two countries did not provide information on this topic. Surveillance data were collected from laboratories, physicians, hospitals, and other sources, or different combinations of these. Twenty countries collected data from laboratories as part of their surveillance system. Seven countries did not include laboratory reporting in the HCV surveillance [3]. The characteristics of HCV surveillance systems are shown in Table 4.

TABLE 5

The incidence of reported hepatitis C cases in 27 European countries in 1995-2005 (ECDC, 2007)

Country	cases / 100,000 Year										
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Austria	2.0	2.1	3.9	4.8	7.1	5.1	4.4	7.2	13.2	11.8	10.9
Belgium	*	1.7	0.8			4.2					8.9
Cyprus									1.3	1.0	0.5
Czech republic	2.1	2.7	2.6	4.3	6.2	6.2	7.8	8.4	8.3	8.5	8.3
Denmark	1.0	0.3	0.3	0.5	0.3	0.2	5.1	4.2	4.5	4.7	5.7
Estonia	4.5	6.5	19.3	26.3	17.7	26.6	22.4		11.4	9.2	6.0
Finland	26.6	34.7	37.1	35.0	34.0	33.6	28.8	26.4	24.3	23.7	23.8
France											
Germany				4.7	4.7	4.3	10.5	8.2	8.4	11.0	9.5
Greece	0.5	0.3	0.3	1.1	1.5	1.4	1.1	0.6	0.5	0.2	0.1
Hungary				0.8			0.4	0.4	0.3	0.4	0.2
Iceland	15.7	19.0	19.6	24.2	30.5	31.2	27.5	23.7	13.2	21.3	14
Ireland							1.7			28.2	35.0
Italy	2.6	2.0	1.6	1.5	1.4	0.4	0.9	0.7			
Latvia	2.4	3.3	4.2	6.9	10.3	12.5	8.7	6.4	5.2	4.9	4.8
Lithuania	2.5	2.8	3.1	3.1	3.4	3.0	5.7	3.7	2.8	2.4	2.0
Luxembourg	20.2	11.7	16.1	13.5	22.7	12.9					4.0
Malta			1.9	0.5	0.5		0	0.3	0	0.5	2.0
Netherlands					1.6	3.2	3.5	3.4	2.6	0.2	0.9
Norway		0.4	0.5	0.5	0.6	0.5	0.8	0.5	0.8	0.8	0.7
Poland			2.8	4.4	5.1	5.4	5.1	5.2	5.9	5.6	7.9
Portugal	4.6	4.0	4.8	6.9	4.0	2.0	2.4	2.0	0.7	1.5	0.9
Slovakia			0.7	0.8	0.6		1.3	0.9	0.7	0.4	0.5
Slovenia	1.7	1.7	2.4	2.6	2.3	2.6	0.5	0.4	0.6	0.7	0.5
Spain			2.0	2.8	2.5	2.1	1.6	1.8	1.6	0.7	0.6
Sweden	32.6	29.6	52.1	45.0	39.5	38.8	39.3	37.9	36.0	33.2	29.0
United Kingdom	4.9	6.6	7.9	11.2	13.2	12.3	11.4	13.2	14.5	12.5	17.5

* Blank cells indicate that data are not available. Comparison of figures between the countries should be done cautiously because some notification systems do not distinguish between acute and chronic cases. Abrupt changes in the HCV incidence may reflect changes implemented in surveillance systems.

HCV epidemiology in Europe

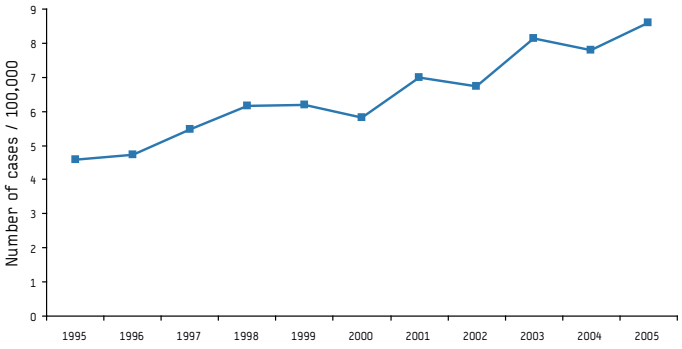
Almost 250,000 HCV cases were notified by 24 EU and EEA/EFTA countries in 1995-2005. During this period a steady increase in the incidence of reported HCV cases was observed (Figure).

As hepatitis C is often asymptomatic and could easily be missed for diagnosis, cases reported to national surveillance systems could be either newly diagnosed prevalent cases or new incident cases. In 2005, a total of 29,243 HCV cases were reported in EU. The rate was highest in the age group of 25-44 year-olds followed by 15-24 year-olds. In men, the rate was twice as high as in women [3]. The incidence of reported HCV cases by country in 1995-2005 is shown in Table 5. According to the WHO, the HCV prevalence in Europe is estimated to be approximately 1% [44]. Compared to other geographical areas in the world this figure is relatively low [2]. The available data from Europe indicate a wide variation in HCV prevalence between the countries, ranging from 0.1 to 6.0%. The lowest HCV prevalence (≤ 0.5%) estimates are from Scandinavian countries, Austria and the Netherlands, and the highest (≥ 3%) from Bulgaria, Greece, Italy and Romania [44].

Types 1a, 3/3a and 4 are commonly found in IDU-related infections whilst 1b and 2 genotypes are linked to blood transfusion or nosocomial transmission [44]. Genotype 4 has also been associated with having a tattoo [45]. As a result of improved blood transfusion safety serotypes associated with blood transfusions are being replaced by other serotypes especially those related to injecting drug use [44]. Prisoners often have prevalence rates of antibodies to HCV comparable to those of IDUs due to a high proportion of IDUs among this group [46-54]. In Germany, Spain and in UK the anti-HCV prevalence in sex workers ranged from 0.7 to 9.0 %; with the lowest estimate in Germany [20,23,24]. In Germany, Spain and in the UK the anti-HCV prevalence in sex workers ranged from 0.7 to 9.0 %; with the lowest estimate in Germany [24]. However, these figures are difficult to compare due to methodological and timeframe differences.

Figure

The incidence of reported hepatitis C cases in EU and EEA/EFTA countries in 1995-2005



HCV infections in sex workers have been shown to be associated with injecting drug use [55]. A north to south gradient in anti-HCV prevalence among hemodialysis patients in Europe was described based on samples from the 1990's [55]. According to samples from 1997-2001, the anti-HCV prevalence (adjusted for age, gender, race, time on end stage renal disease, and alcohol or drug abuse), was 22% in Italy and Spain, and lower in France (10.4%), Germany (3.8%) and UK (2.6%) [56], although these figures do not necessarily represent the country-specific incidences in general. Data from different studies indicate that there is a remarkable variation between and within individual countries in the anti-HCV prevalence in HD patients. However, it is likely that many of the populations in these studies have been chronic cases exposed to the virus in the past, before screening and testing was widely available, so most likely these results do not reflect the current situation. It should also be noted that the anti-HCV prevalence does not indicate what proportion of the population are HCV RNA carriers and thus infective. The presence of virus (being RNA-positive) can be confirmed in 40-90% of those who are anti-HCV-positive [19].

Transmission routes and prevention of HCV

HCV infection is mainly associated with injecting drug use (blood-blood contact, sharing syringes and needles), blood transfusion, nosocomial transmission, or other parenteral exposure such as needle stick injuries, body piercing or tattooing. In many countries, including France, Germany, Austria, Greece, Sweden and Italy, the most common risk factor is injecting drug use, which accounts for 30-59% of all HCV infections. The second most common risk factor is blood transfusion performed before 1991. In 10-54% of cases the risk factor is unknown [44]. Mother-to-child transmission and transmission of HCV by sexual contact seem to be rare [2] although it has been observed that high-risk sexual behaviour among MSM may predispose to HCV infection probably via permucosal route, especially in HIV-infected MSM [57-59]. The implementation of effective virus inactivation procedures and of anti-HCV testing methods in the late 1980s and early 1990s, as well as the recent introduction of HCV RNA tests significantly improved the safety of blood products [44]. The estimated residual risk for acquiring HCV via blood products ranges from 1 to 40 per 10 million transfusions in Europe [35-39].

There is no vaccine against HCV infection. The cornerstones of preventing and reducing the burden of HCV are early diagnosis, effective preventing programmes, and appropriate treatment [44,60]. It is known that a large number of individuals carrying the HCV virus are not aware of being infected due to the high proportion of asymptomatic infections [2,61]. Thus it is necessary to target the screening of HCV at the risk groups and to provide appropriate testing facilities, also for hard-to-reach populations. However, personal and institutional barriers may reduce the uptake of HCV testing, especially in prisons. Thus further research and development of testing strategies is needed [47]. Needle and syringe exchange programmes, may be useful in reducing the incidence of HCV infection among IDUs, although the impact may be limited, as indicated by the high prevalence of HCV in IDU [19]. In addition, it is vital to encourage education and increase awareness of HCV in the general population, health care providers and policy makers [44].

Discussion

Numerous scientific reports on HBV and HCV epidemiology have been published. The comparability of their results, however, is challenged by differences in objectives, methods, strategies, timeframes, and target populations. Regardless of these limitations, the available data suggest that the epidemiology of both HBV and HCV differ widely between countries and that HBV and HCV infections create a significant burden to health care systems. Viral hepatitis affects the general population disproportionately, with the highest burden on certain risk groups with different epidemiological characteristics across the EU. Prevention and control of HBV and HCV infections require continuous monitoring as well as evaluation of surveillance and prevention strategies. Surveillance and prevention of HCV infection is even more challenging than that of HBV because HCV infections are mostly asymptomatic and may remain undiagnosed for a long time. Also, prevention is challenging as there is no vaccine available against HCV. Despite significant improvements in blood transfusion safety, hygiene practices, screening, education messages, sterile needle and condom availability and blood product treatment, the HCV infection rates continue to rise in Europe. The increasing trend cannot be easily interpreted as it may also partly reflect the results of improved surveillance, intensified screening activities and the availability of accurate testing methods. Nevertheless, HCV can be considered to be an increasing public health concern in Europe in the coming decades, which calls for appropriate public health action.

Comparison of surveillance data is hampered by differences in the surveillance systems, the population under surveillance, the data sources, and the unknown proportion of infections being undiagnosed or missed because asymptomatic or – if diagnosed – unreported. Also, there is no clear distinction in the overall reporting between acute and chronic cases. Abrupt changes in country-specific incidences of reported HBV and HCV cases most probably reflect changes in surveillance systems made by these countries rather than true trends. However, at present, information on these changes is mostly lacking at the EU level and deserves more attention in the future. The differentiation between acute and chronic cases of HBV or HCV infections is a demanding task but will need to be tackled in order to accurately estimate the disease burden. Reporting asymptomatic infections is controversial, but should be discussed as part of a new framework for enhanced surveillance of hepatitis B and C in the EU. Asymptomatic infections may have long term consequences since HBV and HCV infections acquired early in childhood are commonly asymptomatic but may lead to liver cirrhosis, liver failure or even carcinoma at the older age. They can also serve as a reservoir for infection to spread. In the light of these facts non-reporting of asymptomatic infections

would underestimate the real incidence and burden of HBV and HCV. To enhance the specificity and comparability of surveillance data between the countries only laboratory-confirmed cases should be reported, but laboratory data need to be supplemented by good quality clinical and epidemiological data. Underreporting of cases also seems to be a common phenomenon. All except one country in the Eurohep.net survey replied that underreporting of HBV was possible. This applies also to HCV. For example, in England, only half of the HCV cases diagnosed in sentinel laboratories were reported via national surveillance system between October 2002 and September 2003 [62]. In Austria, the reporting activity was even lower since only one fifth of the 10,000 HCV cases in the hospital discharge register were reported to the national surveillance in the period of 1993-2000 [63].

Toward harmonisation of EU-wide surveillance

Although there were some differences in methodology and the number of participating countries between the Eurohep.net and the ECDC surveys, both clearly showed that surveillance systems differ in many ways. The objectives of the surveillance systems are very similar and basic data sets (e.g. age, sex, place of residence, date of onset, data on hospitalisation, and risk factors) are collected in most countries, but there is great heterogeneity between surveillance systems regarding the use of EU case definitions, reporting of acute and chronic cases, inclusion of asymptomatic cases in the reporting, data sources, and the legal aspects of reporting. While the availability of electronic data has markedly improved within the last years, many different types and formats of the data are being used. All these issues are likely to pose a major challenge for EU-wide harmonised data collection.

Nevertheless, harmonisation of EU-wide surveillance of viral hepatitis is of utmost importance in order to be able to make true comparisons between trends and epidemiological characteristics of these diseases across countries, to contribute to targeted prevention and control strategies, and to assess the disease burden. The ECDC is currently preparing to strengthen the surveillance of HBV and HCV in the EU.

Conclusion

To conclude, comparable and validated reliable data on HBV and HCV infections are needed in the EU in order to estimate the disease burden of these diseases. However, harmonisation of the EU-wide surveillance of HBV and HCV infections faces many challenges due to differences in surveillance systems between the countries.

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References

1. Shepard CW, Simard EP, Finelli L, Fiore AE, Bell BP. Hepatitis B virus infection: epidemiology and vaccination. Epidemiol Rev. 2006;28:112-125.
2. Sy T, Jamal MM. Epidemiology of hepatitis C virus (HCV) infection. Int J Med. Sci 2006;3:41-46.
3. European Centre for Disease Control and Prevention (ECDC). Annual Epidemiological Report on Communicable Diseases in Europe. ECDC, 2007:301. Available from: http://www.ecdc.europa.eu/pdf/ECDC_epi_report_2007.pdf
4. Leuridan E VA, Van Herck K, Van Damme P, the Eurohep.net team. Hepatitis A and B surveillance and immunization programmes in Europe: EUROHEP.NET project. Arch Public Health. 2005;63:199-217.
5. Eurohep.net project website. Available from: http://www.eurohep.net/
6. Bielawski K, Wlasiuk M, Truskolawska M, Falkiewicz B. HCV infection in Poland. Arch Med Res. 2000;31:532-535.
7. Nothdurft HD, Dahlgren AL, Gallagher EA, Kollaritsch H, Overbosch D, Rummukainen ML, et al. The risk of acquiring hepatitis A and B among travelers in selected Eastern and Southern Europe and non-European Mediterranean countries: review and consensus statement on hepatitis A and B vaccination. J Travel Med. 2007;14:181-187.
8. Tefanova V, Tallo T, Kutsar K, Priimgi L. Urgent action needed to stop spread of hepatitis B and C in Estonian drug users. Euro Surveill. 2006;11(4):pii=2883. Available from: http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=2883
9. Schaefer S. Hepatitis B virus genotypes in Europe. Hepatol Res. 2007;37:S20-26.
10. Micalessi MI, De Cock L, Vranckx R. Hepatitis B virus (HBV) genotyping in Belgian patients with chronic HBV infection. Clin Microbiol Infect 2005;11:499-501.
11. Bjornsdottir TB, Stanzeit B, Sallberg M, Love A, Hultgren C. Changing prevalence of hepatitis B virus genotypes in Iceland. J Med Virol. 2005;77:481-485.
12. van Houdt R, Bruisten SM, Koedijk FD, Dukers NH, Op de Coul EL, Mostert MC, et al. Molecular epidemiology of acute hepatitis B in the Netherlands in 2004: nationwide survey. J Med Virol. 2007;79:895-901.
13. Bielawski KP, Stalke P. Molecular epidemiology of chronic hepatitis B virus infection in northern Poland. J Clin Virol. 2005;34 Suppl 1:S63-69.
14. Medici MC, Aloisi A, Martinelli M, Abelli LA, Casula F, Valcavi P, et al. HBV genotypes and antiviral-resistant variants in HBV infected subjects in Northern Italy. New Microbiol 2006;29:63-67.
15. Echevarria JM, Avellon A, Magnius LO. Molecular epidemiology of hepatitis B virus in Spain: identification of viral genotypes and prediction of antigenic subtypes by limited sequencing. J Med Virol. 2005;76:176-184.
16. Trimoulet P, Boutonnet M, Winnock M, Faure M, Loko MA, De Ledinghen V, et al. Hepatitis B virus genotypes: a retrospective survey in Southwestern France, 1999-2004. Gastroenterol Clin Biol. 2007;31:1088-1094.
17. Halfon P, Bourliere M, Pol S, Benhamou Y, Ouzan D, Rotily M, et al. Multicentre study of hepatitis B virus genotypes in France: correlation with liver fibrosis and hepatitis B e antigen status. J Viral Hep. 2006;13:329-335.
18. Schaefer S. Hepatitis B virus: significance of genotypes. J Viral Hep. 2005;12:111-124.
19. EMCCDA. Annual report 2006: on the state of the drugs problem in Europe 2006. Available from: http://www.emcdda.europa.eu
20. Weber B, Rabenau H, Berger A, Scheuermann EH, Staszewski S, Kreuz W, et al. Seroprevalence of HCV, HAV, HBV, HDV, HCMV and HIV in high risk groups/Frankfurt a.M., Germany. Zentralbl Bakteriol 1995;282:102-112.
21. Sulkowski MS. Viral hepatitis and HIV coinfection. J Hepatol. 2008;48:353-367.
22. Uuskula A, Heimer R, Dehovitz J, Fischer K, McNutt LA. Surveillance of HIV, hepatitis B virus, and hepatitis C virus in an estonian injection drug-using population: sensitivity and specificity of testing syringes for public health surveillance. J Infect Dis. 2006;193:455-457.
23. Orduna A, Bratos MA, Gutierrez P, Almaraz A, Eiros JM, Martin JF, et al. Infection by hepatitis B and C virus in non-intravenous drug using female prostitutes in Spain. Eur J Epidemiol. 1992;8:656-659.
24. Ward H, Day S, Weber J. Risky business: health and safety in the sex industry over a 9 year period. Sex Transm Inf. 1999;75:340-343.
25. Bonura F, Sorgi M, Perna AM, Puccio G, Tramuto F, Cajozzo C, et al. Pregnant women as a sentinel population to target and implement hepatitis B virus (HBV) vaccine coverage: a three-year survey in Palermo, Sicily. Vaccine 2005;23:3243-3246.
26. Cowan SA. Denmark scales up hepatitis B screening and vaccination for risk groups. Euro Surveill. 2005;10(44):pii=2828. Available from: http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=2828.
27. Elefsiniotis IS, Glynou I, Pantazis KD, Fotos NV, Magaziotou I, Kada H. Prevalence of chronic HBV infection among 13,581 women at reproductive age in Greece. A prospective single center study. J Clin Virol. 2005;32:179-180.
28. Hahne S, Ramsay M, Balogun K, Edmunds WJ, Mortimer P. Incidence and routes of transmission of hepatitis B virus in England and Wales, 1995-2000: implications for immunisation policy. J Clin Virol 2004;29:211-220.
29. Hahne S, Ramsay M, Soldan K, Balogun K, Mortimer P. Hepatitis B incidence among South Asian children in England and Wales: implications for immunisation policy. Arch Dis Child. 2003;88:1082-1083.
30. Gunn RA, Murray PJ, Ackers ML, Hardison WG, Margolis HS. Screening for chronic hepatitis B and C virus infections in an urban sexually transmitted disease clinic: rationale for integrating services. Sex Transm Dis. 2001;28:166-170.

31. McMillan A. The changing prevalence of hepatitis B virus infection among men who have sex with men who attended a sexually transmitted infections clinic in Edinburgh, Scotland between 1989 and 2003. Int J STD AIDS. 2006;17(8):539-42. 32. Cowan SA. Denmark decides not to introduce hepatitis B into the childhood vaccination programme. Euro Surveill. 2005;10(44):pii=2827. Available from: http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=2827.
33. Veldhuijzen IK, Smits LJ, van de Laar MJ. The importance of imported infections in maintaining hepatitis B in The Netherlands. Epidemiol Infect. 2005;133:113-119.
34. Gay NJ, Hesketh LM, Osborne KP, Farrington CP, Morgan-Capner P, Miller E. The prevalence of hepatitis B infection in adults in England and Wales. Epidemiol Infect. 1999;122:133-138.
35. Alvarez do Barrio M, González Díez R, Hernández Sánchez JM, Oyonarte Gómez S. Residual risk of transfusion-transmitted viral infections in Spain, 1997-2002, and impact of nucleic acid testing. Euro Surveill. 2005;10(2):pii=521. Available from: http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=521.
36. Niederhauser C, Schneider P, Fopp M, Ruefer A, Lévy G. Incidence of viral markers and evaluation of the estimated risk in the Swiss blood donor population from 1996 to 2003. Euro Surveill. 2005;10(2):pii=518. Available from: http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=518.
37. Offergeld R, Faensen D, Ritter S, Hamouda O. Human immunodeficiency virus, hepatitis C and hepatitis B infections among blood donors in Germany 2000-2002: risk of virus transmission and the impact of nucleic acid amplification testing. Euro Surveill. 2005;10(2):pii=522. Available from: http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=522.
38. Pillonel J, Laperche S. Trends in risk of transfusion-transmitted viral infections (HIV, HCV, HBV) in France between 1992 and 2003 and impact of nucleic acid testing (NAT). Euro Surveill. 2005;10(2):pii=519. Available from: http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=519.
39. Soldan K, Davison K, Dow B. Estimates of the frequency of HBV, HCV, and HIV infectious donations entering the blood supply in the United Kingdom, 1996 to 2003. Euro Surveill. 2005;10(2):pii=520. Available from: http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=520.
40. Fisker N, Mygind LH, Krarup HB, Licht D, Georgsen J, Christensen PB. Blood borne viral infections among Danish health care workers--frequent blood exposure but low prevalence of infection. Eur J Epidemiol. 2004;19:61-67.
41. Kondili LA, Ulqinaku D, Hajdini M, Basho M, Chionne P, Madonna E, et al. Hepatitis B virus infection in health care workers in Albania: a country still highly endemic for HBV infection. Infection 2007;35:94-97.
42. Ozsoy MF, Oncul O, Cavuslu S, Erdemoglu A, Emekdas G, Pahsa A. Seroprevalences of hepatitis B and C among health care workers in Turkey. J Viral Hepat. 2003;10:150-156.
43. EUVAC.NET. A Surveillance Community Network for Vaccine Preventable Infectious Diseases. Available from: http://www.euvac.net
44. Esteban JI, Sauleda S, Quer J. The changing epidemiology of hepatitis C virus infection in Europe. J Hepatol. 2008;48:148-162.
45. Mathei C, Robaeys G, Van Ranst M, Van Damme P, Buntinx F. The epidemiology of hepatitis C among injecting drug users in Belgium. Acta Gastroenterol Belgica. 2005;68:50-54.
46. March JC, Oviedo-Joekes E, Romero M. Factors associated with reported hepatitis C and HIV among injecting drug users in ten European cities. Enfermedades infecciosas y microbiologia clinica 2007;25:91-97.
47. Khaw FM, Stobbart L, Murtagh MJ. 'I just keep thinking I haven't got it because I'm not yellow': a qualitative study of the factors that influence the uptake of Hepatitis C testing by prisoners. BMC public health 2007;7:98.
48. Zabransky T, Mravcik V, Korcisova B, Rehak V. Hepatitis C virus infection among injecting drug users in the Czech Republic - prevalence and associated factors. Eur Addict Res. 2006;12:151-160.
49. Hutchinson SJ, Roy KM, Wadd S, Bird SM, Taylor A, Anderson E, et al. Hepatitis C virus infection in Scotland: epidemiological review and public health challenges. Scottish Medical Journal 2006;51:8-15.
50. Montella M, Crispo A, Grimaldi M, Angeletti C, Amore A, Ronga D, et al. Prevalence of hepatitis C virus infection in different population groups in southern Italy. Infection 2005;33:9-12.
51. Judd A, Hutchinson S, Wadd S, Hickman M, Taylor A, Jones S, et al. Prevalence of, and risk factors for, hepatitis C virus infection among recent initiates to injecting in London and Glasgow: cross sectional analysis. J Viral Hep. 2005;12:655-662.
52. Long J, Allwright S, Barry J, Reynolds SR, Thornton L, Bradley F, et al. Prevalence of antibodies to hepatitis B, hepatitis C, and HIV and risk factors in entrants to Irish prisons: a national cross sectional survey. BMJ. 2001;323(7323):1209-13 53. Weild AR, Gill ON, Bennett D, Livingstone SJ, Parry JV, Curran L. Prevalence of HIV, hepatitis B, and hepatitis C antibodies in prisoners in England and Wales: a national survey. Commun Dis Public Health. 2000;3(2):121-6.
54. Ambrozaitis A, KS ZA, Balc Iunaite G, Widell A. Hepatitis C in Lithuania: incidence, prevalence, risk factors and viral genotypes. Clinical and diagnostic virology 1995;4:273-284.
55. Touzet S, Kraemer L, Colin C, Pradat P, Lanoir D, Bailly F, et al. Epidemiology of hepatitis C virus infection in seven European Union countries: a critical analysis of the literature. HENCORE Group. (Hepatitis C European Network for Co-operative Research). Eur J Gastroenterol Hepatol. 2000;12(6):667-78.
56. Fissell RB, Bragg-Gresham JL, Woods JD, Jadoul M, Gillespie B, Hedderwick SA, et al. Patterns of hepatitis C prevalence and seroconversion in hemodialysis units from three continents: the DOPPS. Kidney Int. 2004;65:2335-2342.
57. Danta M, Brown D, Bhagani S, Pybus OG, Sabin CA, Nelson M, et al. Recent epidemic of acute hepatitis C virus in HIV-positive men who have sex with men linked to high-risk sexual behaviours. AIDS. 2007;21:983-991.
58. van de Laar TJ, van der Bij AK, Prins M, Bruisten SM, Brinkman K, Ruys TA, et al. Increase in HCV incidence among men who have sex with men in Amsterdam most likely caused by sexual transmission. J Infec Dis. 2007;196:230-238.
59. Gambotti L, Acute hepatitis C collaborating group. Acute hepatitis C infection in HIV positive men who have sex with men in Paris, France, 2001-2004. Euro Surveill. 2005;10(5):pii=535. Available from: http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=535.
60. Desenclos JC. The challenge of hepatitis C surveillance in Europe. Euro Surveill. 2003;8(5):pii=409. Available from: http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=409.
61. Russmann S, Dowlatshahi EA, Printzen G, Habicht S, Reichen J, Zimmermann H. Prevalence and associated factors of viral hepatitis and transferrin elevations in 5036 patients admitted to the emergency room of a Swiss university hospital: cross-sectional study. BMC Gastroenterol. 2007;7:5.
62. Brant LJ, Hurrelle M, Balogun MA, Klapper P, Ahmad F, Boxall E, et al. Sentinel laboratory surveillance of hepatitis C antibody testing in England: understanding the epidemiology of HCV infection. Epidemiol Infect. 2007;135:417-426.
63. Strauss R, Fülöp G, Pfeifer C. Hepatitis C in Austria 1993–2000: reporting bias distort HCV epidemiology in Austria. Euro Surveill. 2003;8(5):pii=412. Available from: http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=412

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