European survey of hepatitis B vaccination policies for healthcare workers

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Background: The risk of transmission of hepatitis B virus (HBV) to healthcare workers (HCWs) is well known. Under current European Union (EU) legislation, all employers should perform a risk assessment to identify those exposed to HBV and offer vaccination. Immunization should happen early after the start of their career to avoid infection and development of carrier status. Methods: Cross-sectional survey of country representatives, to find out how policies are put into practice in European countries. Results: Answers were received from 17 countries, representing 89% of the population of the 25 EU MS. HBV vaccination was mandatory for medical and nursing staff in five countries, and recommended in all other countries. It was mandatory for medical students and student nurses in five countries and recommended in nine other. Pre-vaccination sero- testing was done in six countries. The vaccination schedule most often used was 0, 1, 6 months. Combined vaccine (hepatitis A virus / HBV) was used in 10 countries. Post-vaccination sero-testing was done in 14 countries. Data on HBV vaccination coverage were available in 11 countries and published in five of them. Coverage was 85–93%. Conclusion: These results show the variation as to how EU legislation is translated into practice in European countries. More consultation between key actors at EU level could help to optimize the way this matter is dealt with. A battery of measures and interventions—including introduction of immunization programmes against HBV infection and increasing immunization coverage in HCWs—can contribute to further reducing HBV transmission to HCWs.

Keywords: cross-sectional survey, European countries, health-care workers, hepatitis B virus, vaccination policy

Introduction

The occupational risk of transmission of blood-borne pathogens, such as hepatitis B virus (HBV), hepatitis C virus (HCV) and human immunodeficiency virus (HIV) to healthcare workers (HCWs) is well recognized. Among them, HBV is far more infectious than HCV, which is in turn considerably more infectious than HIV. Especially HBeAg-positive individuals are highly infectious. The most common routes of transmission from patient to HCW are needlestick and other sharps injuries, followed by mucocutaneous exposure.

A range of measures and interventions can contribute to reduce HBV transmission to HCWs to low levels and such measures include adoption of standard precautions and the use of safety devices. The introduction of HBV vaccines in the 1980s, however, is to be considered the major achievement to reduce HBV transmission to HCWs to low levels and such measures. The introduction of HBV vaccines in the 1980s, however, is to be considered the major achievement to reduce HBV transmission to HCWs to low levels and such measures. The introduction of HBV vaccines in the 1980s, however, is to be considered the major achievement to reduce HBV transmission to HCWs to low levels and such measures. The introduction of HBV vaccines in the 1980s, however, is to be considered the major achievement to reduce HBV transmission to HCWs to low levels and such measures.

Under current European Union (EU) legislation, all employers have to perform a risk assessment of their workers to identify those exposed to HBV, explain them the risk, and offer vaccination. Moreover, vaccination should be given as early as possible after the start of their career in order to avoid HBV infection and its long-term consequences, particularly development of a carrier status.

At this moment and to our knowledge, no overview of the information on hepatitis B vaccination policies for HCWs in the different EU Member States (EU MS) has been made up. The purpose of the current study was to provide such an overview. Indeed, while the general principles of legislation on HBV vaccination are common in all EU MS, a certain degree of variation in the way MS integrate these regulations into their national legislation is probable. This study is meant to identify analogies, differences and gaps in policies in place between different MS. The results could stimulate further European collaboration in this area.

The European Union of Medical Specialists/Union Européenne des Médecins Spécialistes (UEMS), founded in 1958, is the representative organization for specialist doctors from the national associations of all EU MS and of an additional number of Western European non-EU countries adhering the Basel declaration of 2001. In 1997, the Board of the Occupational Medicine Specialist section of the UEMS was established.

Methods

This is a descriptive quantitative study using a structured self-administered 29-question questionnaire to survey HBV vaccination policies in HCWs in European countries.
2006–07 (25 EU MS plus Norway and Switzerland). The questionnaire included open and closed questions regarding general issues, pre-vaccination testing, vaccination policy, HBV post-vaccination testing, booster policy and non-responders policy.

The concept and the practical modalities of the survey were discussed and agreed at a meeting of UEMS representatives. The questionnaires were sent through e-mail to the UEMS national representatives. If a particular UEMS representative felt that he or she for whatever reason was unable to fill in the questionnaire, we explicitly requested to send us the contact details of a colleague who could instead. If no answer was received within a month after the first mailing, a reminder was sent, equally by e-mail.

**Results**

Answers were received from 17 countries: 15 EU MS (Austria/AT, Belgium/BE, Czech Republic/CZ, Denmark/DK, France/FR, Germany/DE, Ireland/IE, Italy/IT, Luxembourg/LU, the Netherlands/NL, Poland/PL, Slovenia/SI, Spain/ES, Sweden/SE and the United Kingdom/UK) plus Norway/NO and Switzerland/CH. These 15 EU MS represented 89% of the total EU population and 90% of the total number of HCWs in the EU at the time of the survey. The questionnaire was filled in by an occupational physician in nine out of 17 countries.

As a working definition, a HCW was considered as a person who has professional contacts with patients and/or is potentially exposed to contamination sources inside or outside the hospital. According to this definition, a HCW belongs to one of the following professional categories: medical staff, nursing staff, other paramedical staff, medical students, student nurses, other paramedical students, technical staff and cleaning staff.

**General issues**

The first aspect to know was whether the occupational health laws and regulations in a specific country were valid for the whole country. This turned out to be the case in all participating countries.

**Vaccination policies**

National HBV vaccination policies for employees and students are shown in table 1. Vaccination against HBV infection is mandatory for medical staff, nursing staff, and other paramedical staff in five of the participating countries (BE, CZ, FR, PL, SI). It is recommended for medical, nursing and other paramedical staff in all other countries, with the exception of Denmark, where there is no recommendation for 'other paramedical staff'.

For technical and cleaning staff, HBV vaccination is mandatory in only four countries (BE, CZ, PL, SI). It is recommended in 11 other countries. In France, where HBV vaccination is mandatory for the other categories of HCWs, vaccination of technical/cleaning staff is not mandatory, but recommended. Vaccination is neither recommended nor mandatory for technical/cleaning staff in Denmark and Norway.

The different HBV vaccination policies for students are also summarized in table 1. Vaccination is mandatory for medical students, student nurses, and other paramedical students in the same five countries as above (BE, CZ, FR, PL, SI). It is recommended for these categories in nine other countries. There is no recommendation for students (medical, nursing and other paramedical) in Denmark. Luxembourg has no medical students of its own and therefore the question ‘vaccination recommended for medical students or not’ is not applicable. It is, however, recommended for Luxembourg student nurses and paramedical students. And finally, HBV vaccination is recommended for medical students, but not for student nurses or paramedical students in Norway.

**Pre-vaccination testing**

Serotesting before HBV vaccination (table 2) is done for medical and nursing staff in six countries (FR, DE, IE, ES, SE, UK). In five of these countries it is done for ‘other paramedical staff’ (FR, DE, IE, ES, SE), medical students (FR, DE, CH, IE, UK), and student nurses (FR, DE, IE, SE, UK). In four countries out of six it is done for ‘other paramedical students’ (FR, DE, IE, SE), and in three countries out of six for technical and cleaning staff (DE, IE, SE). Among the countries performing HCW testing before HBV vaccination, HBsAg and anti-HBc are tested in four of them (IE, ES, SE, UK, and DE, IE, ES, UK, respectively), anti-HBs in three of them (FR, DE, SE). In several countries (DE, IE, ES, SE, UK), several tests are used together (table 3).
Vaccination timing and schedule

HBV vaccination is reported to be done at the start of the involved HCW’s career in 16 of the participating countries; only in Denmark this is not explicitly stated (results not shown). Each of the categories ‘medical students’, ‘student nurses’ and ‘other paramedical students’ are vaccinated in 15 countries (table 1). The vaccination schedule most often applied (in 16 out of 17 countries) is 0, 1, 6 months. The schedule 0, 1, 2, 12 months is used in three countries (BE, CZ, IE) and other schedules [e.g. 0, 1, 12 or 0, 1, 2, 6 months in two countries (FR, LU)]. In some countries (BE, CZ, FR, IE, UK), different schedules (0, 1, 6 and 0, 1, 2, 12 months) are possible.

Type of HBV vaccine, post-vaccination testing and booster policy

A combined (HAV + HBV) vaccine is used in ten of the participating countries. A monovalent HBV vaccine is used in 14 out of 17 countries, while in some countries both types of vaccine are used.

Serological testing (anti-HBs) after HBV vaccination is performed in 14 countries. Medical, nursing and paramedical staff are tested in each of them. Serotesting is done for medical students, student nurses, paramedical and technical staff in 12, and for cleaning staff in 11 of the participating countries.

The time span between administration of the last vaccine dose and performance of the serological tests is between 1 and 3 months: 1 month in six countries, 2 months in six countries, and 3 months in two countries.

The anti-HBs level considered protective in serological post-vaccination testing is 10 IU/l in 13 out of 17 countries. Two countries, Germany and the UK, preferred a threshold level of 100 IU/l and one country did not answer this question.

Administration of a HBV vaccine booster dose (defined as any re-vaccination after a completed vaccination schedule) is recommended in 10 countries, but is not in the remaining seven countries. When asked whether the decision to give a booster dose is determined by the results of serological testing, an affirmative answer was given by 15 countries.

Policy on non-responders

A non-responder to HBV vaccination was defined as a person whose serum anti-HBs concentration is lower than 10 IU/l, as measured 1 month after completion of a primary vaccination course. Non-responders policies comprise giving one additional vaccine dose in nine participating countries, two or more additional doses in three countries, three additional doses in one country, and starting a complete re-vaccination scheme in four countries (table 4).

Data on HBV vaccination coverage among HCWs are available in 11 participating countries; in five of them, this type of information has been published. Estimated coverage ranges from 85 to 93%: BE (84.9%), IT (85.3%), PL (87.5%), ES (88.0%) and UK (93.0%) (references indicated by the survey respondents).8–13

Discussion

To the best of our knowledge, this survey is the first one presenting an overview of different aspects of HBV vaccination policies in HCWs in different European countries. We were able to obtain data from 17 countries, including 15 EU MS, representing 89% of the EU population and 90% of its total number of HCWs at the time of the survey. Therefore, the results can be considered to be representative for the EU.

We chose to send a survey to the national UEMS representatives, known to be experts in occupational medicine. If a particular representative was unable to participate, he or she was replaced by an equally competent colleague, as proposed by the former one. We therefore assumed that the respondents had a good knowledge of both the legislative and practical aspects of HBV vaccination of HCWs in their respective countries. This might be considered one of the strengths of our study. It represents, however, also a certain weakness, because the information on national policies was obtained from one person per country, while the implementation of the policy might differ among different actors in the country. This point could only be solved through organizing a series of country-wide surveys, which was beyond the scope of our study. Another potential weakness is the fact that we did not get useful answers from 10 EU MS; as already pointed out, however, these countries represent only 11% of the total EU population and 10% of the total number of HCWs.

Vaccination is mandatory for a number of professional subgroups of HCWs (including students) in some countries, while it is recommended for other groups (table 1). Comparison of published hepatitis B vaccination coverage figures in HCWs does not show much difference between countries where vaccination is mandatory (e.g. Belgium) and those where it is recommended, such as the UK and Spain.8,10,12,13 Further studies would be needed to determine exactly if (and to what extent) a variation in terms of ‘mandatory’, ‘recommended’, or ‘not recommended’ implies
Table 4 Type of HBV vaccine used, post-vaccination testing and booster policy for hepatitis B vaccination for different categories of healthcare workers (including students) in European countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Type of HBV vaccine</th>
<th>Post-vaccination testing (Y/N)</th>
<th>Post-vaccination testing (type of staff)</th>
<th>Non-responders Policy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria (AT)</td>
<td>C</td>
<td>Y</td>
<td>All staff</td>
<td>≥2 doses</td>
</tr>
<tr>
<td>Belgium (BE)</td>
<td>M+C</td>
<td>Y</td>
<td>All staff</td>
<td>1 dose</td>
</tr>
<tr>
<td>Czech Republic (CZ)</td>
<td>M</td>
<td>Y</td>
<td>All staff</td>
<td>1 dose</td>
</tr>
<tr>
<td>Denmark (DK)</td>
<td>C</td>
<td>Y</td>
<td>All staff, except technical/cleaning</td>
<td>≥2 doses</td>
</tr>
<tr>
<td>France (FR)</td>
<td>M+C</td>
<td>Y</td>
<td>All staff</td>
<td>1 dose</td>
</tr>
<tr>
<td>Germany (DE)</td>
<td>M+C</td>
<td>Y</td>
<td>All staff</td>
<td>Complete re-vaccination</td>
</tr>
<tr>
<td>Ireland (IE)</td>
<td>M+C</td>
<td>Y</td>
<td>All staff</td>
<td>1 dose</td>
</tr>
<tr>
<td>Italy (IT)</td>
<td>M</td>
<td>Y</td>
<td>All staff, except medical students</td>
<td>1 dose</td>
</tr>
<tr>
<td>Luxembourg (LU)</td>
<td>C</td>
<td>Y</td>
<td>All staff</td>
<td>Complete re-vaccination</td>
</tr>
<tr>
<td>Netherlands (NL)</td>
<td>M</td>
<td>Y</td>
<td>All staff</td>
<td>1 dose</td>
</tr>
<tr>
<td>Norway (NO)</td>
<td>M</td>
<td>Y</td>
<td>All staff, except technical/cleaning</td>
<td>1 dose</td>
</tr>
<tr>
<td>Poland (PL)</td>
<td>M</td>
<td>N</td>
<td>–</td>
<td>3 doses</td>
</tr>
<tr>
<td>Slovenia (SI)</td>
<td>M</td>
<td>Y</td>
<td>All staff</td>
<td>Complete re-vaccination</td>
</tr>
<tr>
<td>Spain (ES)</td>
<td>M+C</td>
<td>Y</td>
<td>All staff, except cleaning and students</td>
<td>Complete re-vaccination</td>
</tr>
<tr>
<td>Sweden (SE)</td>
<td>M</td>
<td>Y</td>
<td>All staff</td>
<td>1 dose</td>
</tr>
<tr>
<td>Switzerland (CH)</td>
<td>M+C</td>
<td>Y</td>
<td>All staff</td>
<td>≥2 doses</td>
</tr>
<tr>
<td>United Kingdom (UK)</td>
<td>M+C</td>
<td>Y</td>
<td>All staff</td>
<td>1 dose</td>
</tr>
</tbody>
</table>

C: combined (HAV + HBV) vaccine; M: monovalent HBV vaccine
All staff: medical, nursing, paramedical, technical and cleaning staff, and medical students, student nurses and paramedical students

Vaccination schedules in the participating countries showed a relatively wide variation, although 16 out of 17 countries used at least the 0, 1, 6 months or 0, 1, 2, 12 months schedules, which are most frequently recommended. Schedules not frequently used include a 0, 1, 2, 6 months scheme in France and a 0, 1, 12 months scheme in Luxembourg. Both the monovalent HBV vaccine and the combined (HAV + HBV) vaccines were used in the respondent countries. Recently, the epidemiology of HAV infection has changed in most EU countries as a result of improved hygienic and sanitary conditions, which have led to decreased natural immunity to HAV and a growing proportion of the adolescent and adult populations being susceptible to HAV infection. This has resulted into a somewhat paradoxal situation wherein some population groups are now susceptible to both HAV and HBV infections. The combined (HAV + HBV) vaccine could therefore be recommended for them.

The practice of serotesting after HBV vaccination is apparently widespread: it is applied in 14 out of 17 countries for medical, nursing, and paramedical staff (table 4). One of the possible reasons is the fact that, under EU legislation, employers are responsible for protecting their HCWs against HBV infection.

The European Consensus Group on Hepatitis B Immunity recommended testing for HBV immune responses among HCWs within a month after administering the final vaccine dose. The timing of serological testing differed slightly in the countries participating in our survey, although the time elapsed between giving a final dose and performing the tests was never <1 month and never exceeded 3 months. There was apparently some confusion regarding this aspect since some respondent countries reported not to perform any post-vaccination serological testing, but still indicated the time they tested after completion of the HBV vaccination course.

Against the background of the recommendations made by the European Consensus Group, it seems appropriate to consider the period of time after HBV vaccination as a window of opportunity wherein present and future HCWs should have both their HBV and HCV serostatus checked, if this was not already done before vaccination. Recommendations on protective serum anti-HBs concentrations differ somewhat in different groups of HCWs: 10 IU/l is most often

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cited as a threshold, but 100 IU/l has also been proposed, particularly in EPP-performing HCWs. Working with a 100 IU/l threshold has several advantages: levels >100 IU/l are less susceptible to non-specific reactivity in the tests, take inter-test variation into account, and are usually above the levels measured in HBV carriers with concurrent serum HBsAg and anti-HBs.4,20

The answers to the questions concerning HBV booster policies were confusing: on the one hand, in only 10 out of 17 countries a booster vaccine dose is recommended, but in 15 countries the decision to give a booster dose is allegedly determined by the results of serological testing. This apparent contradiction is probably due to some respondents’ misunderstanding of our question on boosters (‘Is an HBV vaccine booster dose recommended for HCsWs?’), which seems to have been interpreted as ‘Is a booster dose routinely (i.e. without sero-testing) given after a complete HBV vaccination course?’

The most plausible interpretation is that most of these 15 countries do not administer booster doses routinely, but only if the protective level of anti-HBs antibodies is not reached. This seems to be in line with the current recommendations, i.e. that no boosters are necessary in immunocompetent individuals that have adequately responded to a primary HBV vaccination course.20

Denmark is apparently the only respondent country that does not administer a booster dose and does not perform post-vaccination serological testing. In Poland, no serological testing is done and booster doses are given within 5 years after completion of the vaccination schedule. In the Czech Republic, serological testing after vaccination is not mandatory and no boosters are recommended, but if testing is done, the results would then determine the administration of a booster dose.

One of the more difficult issues is the policy on non-responders. It comes therefore as no surprise that booster policies vary widely between the participating countries. The European Consensus Group recommends administering up to three additional HBV vaccine doses to non-responders and then having their response re-checked.20 It has been shown that such a policy can result in cumulative response rates of about 70%.4 A new concept is to administer additional double doses of the combined (HAV + HBV) vaccine. In a small experimental study wherein this concept was applied, 95% seroprotection was reached in adult non-responders who had received three such doses.21

Our survey, wherein a large majority of European HCsWs is represented, reveals considerable variation in the way EU legislation regarding HBV vaccination is translated into MS policy, particularly concerning the practical implication details. More in-depth consultation between key actors from different countries (EU MS and other) could contribute to optimize the way this important matter is dealt with in Europe. The European Parliament resolution of 11 February 2010 on the proposal for a Council directive implementing the Framework Agreement between the EU social partners22 and its subsequent adoption by the EU Employment and Social Affairs Ministers on 8 March 201023 might represent significant steps in that direction.

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Conflicts of interest: None declared.

Key points

- Under current EU legislation, employers should perform a risk assessment to identify HCsWs exposed to HBV and offer vaccination, which should be given early after the start of their career to avoid infection and development of carrier status.
- A cross-sectional survey among representatives from EU MS plus Norway and Switzerland shows how and to which degree policies regarding HBV vaccination among HCsWs are put into practice.
- More consultation between key actors at EU level could help to optimize the way the matter is dealt with.
- A battery of measures and interventions, including introduction of immunization programmes against HBV infection and increasing immunization coverage in HCsWs, can contribute to further reducing HBV transmission to HCsWs.

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