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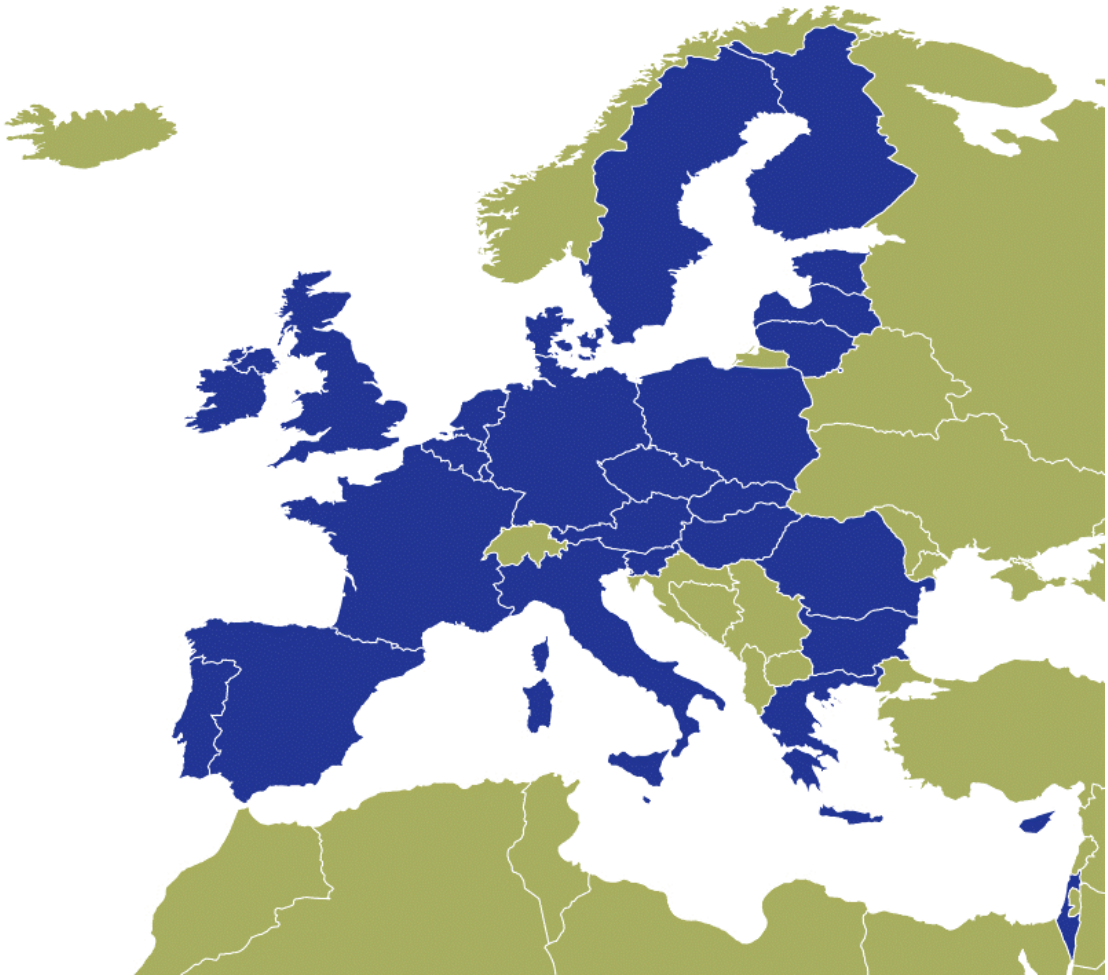
surveillance of vaccine preventable hepatitis

Recommendations for hepatitis A and B surveillance and prevention strategies: Proposal from the EUROHEP.NET project to the European Commission.



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Recommendations for hepatitis A and B surveillance and prevention strategies: Proposal to the European Commission from the EUROHEP.NET project

1. Pre-amble

Surveillance of vaccine-preventable viral hepatitis is necessary to alert health officials to hepatitis A and B outbreaks, to document the epidemiology of hepatitis A and B and the burden of disease, to measure the impact of vaccination programmes and other preventative interventions, and to ensure that targets for disease reduction and prevention are met.

Reporting of surveillance data is an integral part of any surveillance system, with in particular feedback to the medical community. In addition, the role and purpose of surveillance should be stressed from the start of medical training. After all, the success of any surveillance system is dependent on the willingness of doctors to report cases of infectious diseases.

As surveillance data from acute disease reporting systems underestimate the true incidence of vaccine preventable viral hepatitis, surveillance data should be verified and validated by a second system in the country, e.g. through sero-survey or sentinel systems.

In most European countries notification of acute hepatitis A and B cases is mandatory, but case definitions, and the completeness and methods of reporting vary widely, making it difficult to compare countries or to combine the data from different countries. This was confirmed in the EUROHEP.NET feasibility survey.

The purpose of a EU wide surveillance system is to obtain comparable data, to monitor trends, to monitor emerging problems in order to formulate prevention strategies. This has to be clear to convince countries to adapt their systems.

A substantial amount of information on the surveillance and control of vaccine preventable hepatitis in Europe was gathered in 22 participating countries by a questionnaire. These data were used as basis for drafting proposals for recommendations. Analysis and reflection on the results were performed by the project's partners on several moments during the project, with attention for the common denominator in the answers and opinions and taking into account the reasons for diversity in surveillance and prevention measures according to the country's situation. Decision making was sometimes hard: e.g. case definitions used in the respective countries, as well as recommended by EU, WHO and CDC differ widely as do the used age categories etc. We aimed to reach consensus on all recommendations, but unfortunately this was not always feasible.

Drafted guidelines were proposed for feedback to all participants by a second online survey and these answers and remarks were discussed at the EUROHEP.NET resuming meeting in Malta, April 20-21, 2005. Country experts from 26 countries were actively involved in the preparation and discussion of these draft recommendations. For some countries, the representatives in Malta were not the same as those who filled the surveys. The draft recommendations and comments were discussed with the attending experts. However they are not officially endorsed by their Institutes.

The recommendations are the outcome of the EUROHEP.NET concerted action. Possible implementation of these recommendations is outside the scope of the project. However we are convinced of the community added value of this collaboration and hope these recommendations can assist the European decision and policy makers in developing an EU wide surveillance network for vaccine preventable viral hepatitis, as requested in Commission Decisions 2000/96/EC and its amendments 2003/534/EC and 2003/542/EC.

2. Recommendations for acute hepatitis A surveillance

2.1 Hepatitis A surveillance system

- Countries should have a mandatory surveillance system for acute hepatitis A in place; in some countries hospitalisation of acute hepatitis cases is compulsory; this explains why the number of reported acute hepatitis A cases equals the number of hospitalised hepatitis A cases. This should be clearly mentioned in the reported aggregated data.
- The recommendation formulated by the project Basic Surveillance Network, to use a minimal dataset for case reports, should be implemented by all countries. This data set covers: case identification, reporting country, age of case, sex of case, disease of case (i.e. acute hepatitis A), level of case definition, and reporting date. Specific for hepatitis A, the Basic Surveillance Network also recommends to provide the country of infection and the immunisation status of each case. In addition for acute hepatitis A surveillance, it should be indicated whether the case is part of an outbreak.
- Pending the availability of electronic minimal data set reports, collection of age-specific surveillance data at country-level should be encouraged; ideally this should be available electronically at a centralized level; if not available as individual data, a standard age distribution should be used: from the EUROHEP.NET survey, the most feasible standard age distribution to propose is: <1y, 1-4y, 5-9y, 10-14y, 15-19y, 20-24y, 25-29y, 30-34y, 35-39y, 40-44y, 45-49y, 50-54y, 55-59y, 60-64y, ≥65y of age *(=common denominator in the EUROHEP.NET survey and in accordance with World Health Organisation*). Comment: a standard age distribution should be used in all EU surveillance networks. See also section 6.1.

2.2 Hepatitis A case definition

- A revision of the EU case-definition is recommended :

> Probable case: a case that meets the clinical description* and has a epidemiological link with a confirmed case.
>
> Confirmed case: a case that meets the clinical description* and is laboratory confirmed by IgM anti-HAV positivity or detection of antigen in stool or detection of nucleic acid in serum or **stool****.
>
> * Clinical description: a symptomatic case with a clinical picture compatible with hepatitis, e.g. discrete onset of symptoms and jaundice or elevated serum aminotransferase levels.
>
> **Added: stool.

- Asymptomatic cases should not be included in the reporting of acute hepatitis A cases [1]. If asymptomatic cases or cases where there are no data on the clinical picture are identified by serology during an outbreak investigation or by incident, they should be labelled as such and be reported separately. See also section 6.2.

2.3 Hepatitis A outbreak

- Hepatitis A outbreaks should be registered.
- Definition of an outbreak (See also section 6.3):
    - Most widely accepted definition for an outbreak is defined: when at least 2 epidemiologically linked cases(of which at least one confirmed) are reported.
    - This definition might not be appropriate to countries with a higher level of endemicity. Therefore according to the country specific epidemiology of hepatitis A, two different categories of threshold number of cases (e.g. outbreaks with < or > 5 cases) can be used. Countries should be able to report

information about the threshold number of cases and the outbreak definition they are using.

- An unexpected increase of cases in a population of risk groups should trigger countries to perform outbreak investigation.

2.4 Hepatitis A burden of disease measurement [2]:

- In addition to reporting surveillance data, all countries should make an effort to systematically collect burden of disease data on hospital admissions (e.g. hospitalised cases, hospitalisation days) for hepatitis A, using the ICD-10 coding system and have these data communicated to the Ministry of Health or the Institute of Public Health. Ideally, these hospital data should be linked to the case identification in the surveillance report. However linking of hospital data with surveillance data may be hindered due to coding problems and privacy issues.
- In a number of countries, hospitalisation of acute viral hepatitis cases is compulsory. This policy should be reconsidered, as hospitalisation is not medically indicated for all acute viral hepatitis cases and has no epidemiological added value.

2.5 Hepatitis A mortality data

- All countries should make an effort to systematically collect data on mortality due to hepatitis A, by using the ICD-10 coding system. In addition, countries should make the effort to link these data (electronically) to surveillance data, so that calculation of the age-specific case fatality ratio is possible. However linking of mortality data with surveillance data may be hindered due to coding problems or privacy issues.

2.6 Liver transplantation

- If liver transplantations are performed, information on the annual number and respective indications should be made available. If feasible, these data should be linked to the case identification in the surveillance report.
- Since this is a rare complication of hepatitis A, it may not justify the effort. Maybe it is easier to be accomplished through specific studies. Information could be gained through Eurotransplant and maybe to be in parallel with hepatitis B.

2.7 Hepatitis A seroprevalence data

- To describe the changing epidemiology in an increasing number of European countries in an unambiguous way [3], countries are advised to collect age-specific seroprevalence data (e.g. ESEN2)[4]. (see also section 6.4).
- Countries with changing epidemiology, are advised to perform age-specific representative seroprevalence studies in regular intervals (at least every 10 years)

3. Recommendations for hepatitis A prevention strategies:

3.1 Hepatitis A pre-exposure prophylaxis

3.1.1 Universal vaccination programmes

The decision to adopt a universal hepatitis A vaccination should be based on the burden of disease of hepatitis A infection (including age-specific prevalence and incidence), frequency of outbreaks, health impact of hepatitis A infection compared to other health priorities, programmatic feasibility of a HAV vaccination programme and economic attractiveness. Regarding HAV pre-exposure vaccination WHO recommends:

- In highly endemic countries, almost all persons are asymptomatically infected with hepatitis A in (early) childhood. Large scale vaccination campaigns are not recommended.
- In countries of intermediate endemicity where a relatively large proportion of adults is susceptible to hepatitis A virus, large-scale childhood vaccination may be considered as a supplement to health education and improved sanitation.
- In regions of low endemicity, vaccination against hepatitis A is indicated for individuals with increased risk of contracting the infection.

If a country or region decides to implement a universal hepatitis A vaccination programme, young children should be the primary focus of the immunization strategy, because of their hepatitis A incidence and their role in the transmission. Countries implementing universal hepatitis A vaccination programmes should ensure that vaccination coverage is monitored. Nevertheless there currently is no agreed definition on hepatitis A endemicity levels. See also section 6.4.

3.1.2 Risk group vaccination strategies

For risk group policies, countries are recommended to comply with internationally accepted recommendations (World Health Organisation, Viral Hepatitis Prevention Board): this includes in particular vaccination of international travellers to endemic destinations, men who have sex with men, chronic liver disease patients including carriers of hepatitis B and C virus, and contacts of infected persons. Other risk groups such as injecting drug users, sewage workers, and patients with clotting disorders, could be considered according to the country-specific epidemiological situation.

3.2 Anti-HAV testing

- Anti-HAV pre-immunization testing is not required. However it might be cost saving, based on the epidemiological situation, in certain age groups.
- Decision to perform anti-HAV pre-immunization testing above a certain threshold age, should be guided by age-specific seroprevalence data in each country and the relative cost of the vaccine compared to the cost of the screening test.
- There is no scientific evidence to recommend serological testing post-immunization.

3.3 Hepatitis A post-exposure prophylaxis

- Post-exposure prophylaxis can be offered by administration of passive (immunoglobulins) or active hepatitis A immunization, as soon as possible after exposure (and preferably within 7 days of exposure).

4. Recommendations for acute hepatitis B surveillance

4.1 Hepatitis B surveillance system

- Countries should have a mandatory surveillance system that is able to distinguish cases of acute hepatitis B from cases of chronic hepatitis B. See also section 4.6. In some countries hospitalisation of acute hepatitis cases is compulsory, this explains why the number of reported acute hepatitis B cases equals the number of hospitalised hepatitis B cases. This should be clearly mentioned in the reported aggregated data.
- The recommendation formulated by the Basic Surveillance Network project, to use minimal dataset for case report, should be implemented by all countries. This data set covers: case identification, reporting country, age of case, sex of case, disease of case (i.e. acute hepatitis B), level of case definition, and reporting date. Specific for hepatitis B, the Basic Surveillance Network also recommends providing information on the mode of transmission [5] and the immunisation status of each reported case.
- Pending the availability of electronic minimal data set reports, collection of age-specific surveillance data at country-level should be encouraged; ideally this should be available electronically at a centralized level. If not available as individual data, a standard age distribution should be used in all EU surveillance networks: from the EUROHEP.NET survey, the most feasible standard age distribution to propose is: <1y, 1-4y, 5-9y, 10-14y, 15-19y, 20-24y, 25-29y, 30-34y, 35-39y, 40-44y, 45-49y, 50-54y, 55-59y, 60-64y, >65y of age (=common denominator in the EUROHEP.NET survey). See also section 6.1.

4.2 Hepatitis B case definition

- All countries are recommended to use a standard acute hepatitis B case definition based on a revised EC acute hepatitis B case definition for surveillance purposes. To confirm an acute hepatitis B case, laboratory confirmation is required. In principle lab testing/case confirmation is required, but there might be obstacles to have this means available in all EU regions/countries.
- As the current EC hepatitis B case definition does not allow to discriminate acute from chronic hepatitis B, following amendments are proposed:

> Probable case: a case that has a clinical picture* compatible with an acute hepatitis and that is HBsAg positive or **with hepatitis B nucleic acid in the serum****.
>
> Confirmed case: a case that has a clinical picture* compatible with an acute hepatitis and is IgM anti-HBc positive**.
>
> *Clinical description: a picture compatible with hepatitis, e.g. discrete onset of symptoms and jaundice or elevated serum aminotransferase levels.
>
> **Detection of hepatitis B nucleic acid in the serum was added for a probable case and removed from the definition of a confirmed case.

- Asymptomatic cases should not be included in the reporting of acute hepatitis B cases. If asymptomatic cases or cases for whom there are no data on the clinical picture, are identified e.g. data from blood donors, carriers, they should be labelled as such and be reported separately. See also section 6.2.

4.3 Hepatitis B burden of disease measurement [2]

- Although surveillance of acute hepatitis B disease can be an essential parameter, it is insufficient to give a clear picture of the burden of disease. In addition to reporting surveillance data, all countries should make an effort to systematically collect burden of disease (e.g. hospitalised cases, hospitalisation days) data on hospital admissions for hepatitis B, using the ICD-10 coding system and have these data communicated to the

Ministry of Health or the Institute of Public Health, although linking of hospital data with surveillance data is hardly feasible (Coding, privacy issues). Effort should be made to harmonize reporting. Improvement of methodology should be attempted. A separate study could help in defining the most appropriate method.

- In addition, surveillance of the chronic consequences of hepatitis B (e.g. cirrhosis and hepatocellular carcinoma) is useful to further document the burden in the community.
- In a number of countries, hospitalisation of acute viral hepatitis cases is compulsory. From a good medical practice point of view this policy should be reconsidered as hospitalisation is not medically indicated for all acute viral hepatitis cases.

4.4 Hepatitis B mortality data

- All countries should make an effort to systematically collect data on mortality due to hepatitis B, by using the ICD-10 coding system and differentiating between acute and chronic cases. Ideally, countries should link (electronically) these data to the surveillance data, allowing calculation of the age-specific case fatality rate. However linking of mortality data with surveillance data may be hindered for coding problems and privacy issues. Data of acute cases should be linked to the case identification in the surveillance report.

4.5 Hepatitis B liver transplantation

- If liver transplantations are performed, information on the annual number and respective indications should be made available; if possible, distinguishing acute fulminant and chronic hepatitis. Countries should perform an assessment (at least once) to which extent viral hepatitis (A, B, C) contributes to liver transplantation.
- Regular monitoring is hardly feasible. But information can be gained through Eurotransplant and maybe in parallel with other viral hepatitis.

4.6 Hepatitis B seroprevalence data

- To describe the epidemiology in a unambiguous way, countries are advised to collect age–specific seroprevalence data (e.g. ESEN2) (HBsAg, anti-HBc, anti-HBs) (footnote 4). Sero-survey data from blood donors are not representative of the general population. Certain population groups – such as pregnant women and possibly military personnel – are relatively easily accessible for hepatitis B screening, and data collected from these groups might be relevant to document hepatitis B epidemiology in the respective country.
- Countries are advised to perform regularly representative seroprevalence studies
    - Age specific and at least every 10 years
    - In risk groups (MSM, IV Drug Users) in countries with changing epidemiology

5 Recommendations for hepatitis B prevention strategies

5.1 Prevention and control of hepatitis B in the community

- Since 1991, the World Health Organisation has called for all countries to add hepatitis B vaccine into their national immunization programmes. Universal immunization of all infants and/or adolescents should receive the highest priority.
- The majority of the countries give high priority to universal infant and/or adolescent immunization against hepatitis B. In some countries the decision to adopt universal infant and/or adolescent hepatitis B immunization is under review.
- All countries agree that universal infant and/or adolescent hepatitis B immunization should remain on the agenda as an important public health priority, whether a universal programme is implemented or not.
- For some countries universal infant and/or adolescent hepatitis B immunization is not foreseen because of a series of factors, among which low burden of disease, low economic attractiveness compared to other health interventions, competition with new vaccines, ….

5.2 Schedules of hepatitis B vaccination

5.2.1 Infant hepatitis B vaccination [6]

For those countries with a universal infant hepatitis B vaccination in place (not newborns at risk):

- As a general rule, hepatitis B vaccination schedule is composed of two parts, a priming and a completion part. The priming is composed of at least two doses. Countries should respect a minimum interval of 4 weeks between consecutive doses of the priming part. The completion part is the final dose of a 3 or 4 doses series. Countries are recommended to respect at least four months between the completing dose and the first dose of the priming [7].
- Universal infant immunisation should be completed before the age of 2 years.
- Other schedules used for universal infant HBV immunization should be evaluated.

5.2.2 Childhood or adolescent vaccination schedule

- For those countries with a universal childhood or adolescent HB vaccination programme:

  In countries with a catch-up programme (childhood or adolescent vaccination schedule), preference should be given to a 0,1,6 month vaccination schedule, particularly because of the practical reason to complete the full course within 1 school year.

  Addition: Other schedules can be considered, if a minimum interval of 4 weeks between consecutive doses of the priming part is respected, and at least four months between the completing dose and the first dose of the priming.

- Countries willing to introduce a new universal hepatitis B adolescent vaccination programme, could consider to choose for a two dose hepatitis B vaccination schedule instead of a three dose schedule: a two dose vaccination schedule (0-6 months) with an adult hepatitis B vaccine dosage could be an alternative worth considering, for budgetary (programmatic costs) as well as feasibility reasons.

  Addition: as long as the vaccines are licensed for this indication and schedule either within the country or within the EU. This schedule is licensed for some hepatitis B

vaccines in some countries (US, Canada, France, Switzerland, Hungary) for 11-15 year olds, who are not at immediate risk of hepatitis B infection during the course of the vaccination. Countries choosing for this schedule should guarantee a high coverage of the second/last dose; implementation of such programme through a school health system could meet this requirement.

5.2.3 Schedules for risk group hepatitis B vaccination (not including the at risk newborns):

- For risk group programmes hepatitis B vaccine can be offered according to a 0,1,6 month schedule.
- For risk groups who are hard to target (e.g. men who have sex with men, sex workers, intravenous drug users, prison inmates, …), or in order to guarantee a better coverage, or to offer a more rapid protection, alternative schedules could be considered: e.g. 0,1, 4 months, 0, 7d, 21d or 0,1,2 months. For the two latter schedules, in order to offer a long lasting protection, a fourth dose should be scheduled at least 4 months after the first dose.

5.3 Prevention of perinatal hepatitis B transmission [8]

- For those countries where no universal neonatal programme is implemented,
    - HBsAg testing should be offered to all pregnant women as part of good medical practice.
    - Vaccination is offered at birth to infants of HBV-infected mothers (acute as well as carriers), as soon as possible, and preferably within 12 hours after birth followed by a second dose at 1 month of age, a third dose at 2 months of age and a fourth dose at 12 months. In case hepatitis B immunoglobulins are available in the country, it should be offered simultaneously with the vaccine, at an injection site other than that of the vaccination.
    - If the hepatitis B status of the pregnant women is not known at the moment of delivery, she should be considered as HBV-infected unless otherwise proven.

- For those countries where universal neonatal hepatitis B vaccination is in place, hepatitis B vaccination should be offered preferably within 12 hours after birth.

5.4 Risk group vaccination strategies

- Risk group strategies have failed to control hepatitis B infection in the community in many countries. However, it is good medical practice to protect individuals in these groups. Strategies aimed at vaccinating and changing behaviour in high risk groups should therefore continue, and the implementation of a universal programme should not be regarded as a replacement of a high risk group strategy
- Countries should be encouraged to comply with internationally accepted recommendations for risk group vaccination:
    - In particular, injecting drug users, persons with multiple sexual partners, attendees of sexually transmitted infections (STI) clinics, chronic liver disease patients, dialysis patients, contacts of infected persons, health care workers and others occupationally exposed (including the trainees and students), travellers to intermediate and high endemic areas; newborns born to HBV-infected mothers (acute as well as carriers); should be targeted.

- Other risk groups can be considered according to the country specific epidemiological situation or based on experiences in other countries

5.5 Hepatitis B vaccination coverage

- Countries with universal hepatitis B vaccination programmes and/or high-risk group policies in place should ensure vaccination coverage monitoring at an age when coverage measuring is easily feasible.
- The standard is monitoring 3 doses of vaccine by 2 years of age, by geographical distribution, through routine data collection or representative surveys.
- Besides the use of age specific incidence and prevalence data, vaccine coverage measurement as well as sero-epidemiological data can be used to evaluate the impact of the countries' hepatitis B vaccination programme(s), in risk groups as well as universally implemented programmes. See also section 6.5.
- WHO- European region is monitoring the timeliness of the immunization e.g. number of neonates immunized with the first dose HBV vaccine at birth (number of immunized with first dose : total number of neonates). See also section 5.3.

5.6 Post-vaccination testing for anti-HBs

- Post-vaccination testing is not routinely recommended for universal hepatitis B vaccination programmes.
- Depending on the resources, post-vaccination testing can be advised for risk groups, to document whether the vaccination was successful or for medico-legal reasons (e.g. for health care workers).

5.7 Booster policies

- Current data do not support the need for booster vaccine doses in universal hepatitis B immunisation programmes.
- According to post-vaccination testing in risk groups a booster policy can be implemented for specific risk groups (immunocompromised patients, dialysis patients, …)

6. Observed possibilities for improvement:

6.1 Age categories

- A same age distribution should be used for the reporting in other infectious disease surveillance systems at EU and WHO level. There is clearly a need for standardisation of these age groups for EU projects, EU networks, as well as for WHO See also section 2.1 and 4.1.

6.2 Hepatitis A and B case definitions

- Case definitions are based on the knowledge of clinical symptoms. This may be problematic for countries with lab based surveillance. The lack of clinical data on an individual case may make it difficult to separate out asymptomatic cases from symptomatic cases. See also section 2.2 and 4.2.

6.3 Outbreak definitions for hepatitis A

- As the definition of an outbreak differs across the participating countries, there is a clear need for a standardization. In view of sharing outbreak information at an international level, a threshold number of cases in an outbreak has to be defined and applied by the participating countries. See also section 2.3.
- Additionally, the methodology for in-depth investigation and the control strategies of hepatitis A outbreaks was identified as an important topic for future research.

6.4 Hepatitis A endemicity

- A proposal should be made to define hepatitis A endemicity based on age-specific prevalence data . See also section 3.1.1.

6.5 Hepatitis B vaccination coverage

There is need for standardisation of the methodology of hepatitis B vaccination coverage measurement. See also section 5.5.

7. Proposed priorities for implementation of the recommendations

1. ***Revision of the case definitions***
2. ***Uniform age categories for surveillance purposes***
3. ***Update of the minimal dataset for surveillance purposes***
4. ***Outbreak definition for hepatitis A***
5. ***Burden of disease measurement***

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Endnotes

1. EUROHEP.NET supports the idea of the Commission to identify all acute viral hepatitis cases before reporting them. Therefore the case classification, possible, which is often only based on the clinical description, is not applicable for viral hepatitis. This is in contrast with the WHO guidelines that have a suspected case of acute viral hepatitis where no differentiation is made between the different types of viral hepatitis.

2. Consideration should be given to the valuable information of hospital discharge register data. Unlike hospital admission data these contain confirmed diagnoses. They don´t have a role for acute case detection and surveillance but are evident for disease burden measurement.

3. The following criteria for hepatitis A (HAV) endemicity were proposed by Hadler et al (1997)
   -very high: 90% HAV+ by age 5y
   -high: 90% HAV+ by age 10y
   -intermediate: 80% HAV+ by age 20y
   -low: 10% HAV+ by age 15y (max of 70% HAV+ by age >50y)
   -very low: <10% HAV+ until age 35-40y

4 ESEN : European Sero-Epidemiology Network.

5. The Basic Surveillance Network indicates "heterosexual", "other" or "unknown" as possible modes of transmission for hepatitis B; in order to be informative this should be more detailed.

6. Evidently for infant vaccination programmes, countries should take the course of the traditional/existing infant vaccination schedule into consideration to decide on the hepatitis B vaccination schedule. Also the availability of combined vaccines will impact on the chosen vaccination course for hepatitis B in the respective countries.

7. Schedules of infant hepatitis B vaccination course differ largely across countries, often based on the existing infant primary immunization schedule in the country. Timing of the hepatitis B vaccination schedule allows a certain flexibility; based on the information collected through the survey, all hepatitis B vaccination schedules implemented in the participating countries appear to respect the requested minimum intervals between subsequent doses to guarantee a satisfying immunogenicity.

8. In countries of high endemicity (HBsAg prevalence $\geq$8%) HBV is mainly transmitted from mother to child at birth or from child to child during early childhood. In this epidemiological setting, schedules providing the first vaccine dose at birth are recommended. In countries of intermediate endemicity (HBsAg $\geq$2-<8%) routine neonatal hepatitis B vaccination should be given high priority, as even in this setting, an important proportion of chronic infections is acquired through HBV transmission at birth or early childhood. In areas of low hepatitis B endemicity (HBsAg <2%), HBsAg screening of all pregnant women and vaccination at birth of neonates from a HBsAg-positive mother (within 12-24 hours) is one of the options to prevent perinatal transmission. A maximal coverage of such programme should be encouraged, as in some countries this intervention is only partially effective, since women at the highest risk of infection often fail to attend prenatal clinics. Universal screening of pregnant women for HBsAg should be part of the routine antenatal care.