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Prevention of hepatitis B in Italy: lessons from surveillance of type-specific acute viral hepatitis

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SUMMARY

The relative contribution of various risk factors to the incidence of acute hepatitis B in Italy was estimated using a special surveillance system (SEIEVA) for type-specific acute viral hepatitis. At present 146 health departments (USLs) which contain 21% of the Italian population participate in SEIEVA out of the total of 650. Data on 2460 hepatitis B cases and 708 hepatitis A cases were compared.

Hospitalization, surgical intervention, dental therapy, other percutaneous exposures, barber shop shaving, i.v. drug abuse and household contact with HBsAg carriers were associated with acute hepatitis B and a large number of cases were attributable to these risk factors.

Because the control programme based on vaccination will not be effective in the short term at reducing hepatitis B incidence, other additional interventions are recommended.

INTRODUCTION

Each year about 8000 cases of acute hepatitis B are notified in Italy but as many as 300000 new infections, clinical and subclinical, are estimated to occur [1–4]. In 1984 a national programme of vaccination of infants born to HBsAg positive mothers, household contacts of HBsAg carriers and health care workers was begun [5]. In the same period an information system for type-specific acute viral hepatitis (SEIEVA) was established [2].

This paper analyses 3 years of SEIEVA surveillance data and estimates the impact of different hepatitis B risk factors in Italy so as to identify ways to improve the current prevention programme.

Study population and methods

Over the period of 3 years, since SEIEVA begun in May 1984, 146 out of 650 health departments (USLs) in Italy, scattered all over the country, have gradually begun to participate in the surveillance system. The population of USL reporting to SEIEVA is close to 12000000, 21% of the whole Italian population.

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Following ascertainment of laboratory results, each notified case of viral hepatitis, hospitalized or not, was interviewed by either a public health inspector or a physician. A standard two-page questionnaire which collected information on the principal hepatitis risk factors was used to interview patients and subsequently a copy was forwarded to the study centre at the National Institute of Health (Istituto Superiore di Sanitá).

Data on hepatitis B cases and hepatitis A cases were compared.

A hepatitis B case was defined as a subject reported with acute illness and with hepatitis B surface antigen (HBsAg), without anti hepatitis A virus IgM (anti-HAV) or whose anti-HAV was unknown. Each hepatitis A case had acute hepatitis and laboratory evidence of anti-HAV IgM.

Inclusion of cases was not limited by age or sex.

Multiple logistic regression was used for estimating the Odds Ratios (OR) associated with the suspected risk factors. Age, sex, area of residence, educational level, number of households and place of treatment were adjusted for in the analysis. Since the information on 'household or sexual contact with a HBsAg positive carrier' had many unknown or missing values (34% of all cases), two different models were considered. The first model did not include the risk factor 'household or sexual contact with HBsAg positive carrier'; the second model did, and was fitted to the subset of the data containing this information. If the two models gave similar coefficients for each of the other risk factors, the OR obtained from the model fitting the complete data set, being more precise, was quoted. Alternatively, when the variable 'household or sexual contact with HBsAg positive carrier' was a confounder and altered the OR of one of the other risk factors, the coefficient obtained from the second model was considered relevant.

Since 1987 data on IgM anti-hepatitis B core antigen (anti-HBc) was also collected. To evaluate the effect of misclassifying acute hepatitis B cases as cases of either hepatitis non-A non-B (NANB), delta or A hepatitis, a separate analysis which considered only cases with HBsAg and IgM anti-HBc was carried out on the 1987 data set (third regression model).

The proportion of all cases in the population attributable to a given risk factor (attributable risk) was calculated [6] using the Odds Ratio and estimates of the exposed proportion of the general population for each risk factor. To provide an estimate of the proportion of the population who experienced hospitalization and surgical intervention, we used the data of the Italian National Institute of Statistics (ISTAT) indicating in about 9 million the number of early hospitalized persons [7–9], and in about 2·5 out of 4·5 million the proportion of patients hospitalized in surgical departments who underwent a surgical intervention [7–9]. A survey conducted at the Italian National Institute of Health (Istituto Superiore di Sanità) estimated the number of i.v. drug abusers to be 150000 [10] and we assumed that every year at least one susceptible person had household or sexual contact with one of 1500000 HBsAg carriers [1]. Moreover, the proportion of hepatitis A cases with HBsAg in our study (3%) was similar to that reported earlier [1]. For dental therapy, other percutaneous exposure (ear piercing, tattooing, acupuncture, electrolysis, attendance at a chiropodist or manicurist) and barber shop shaving, the proportion of hepatitis A cases in our study which reported exposure was used. The proportion of immune subjects was estimated at

Table 1. *Age and sex distribution of hepatitis B and hepatitis A cases*

	Hepatitis type								
	B				A				
	Sex				Sex				
Age (years)	M	F	Total	%	M	F	Total	%	
10–14	102	65	167	7	76	71	147	21	314
15–24	689	354	1043	42	151	82	233	33	1276
25–34	397	148	545	22	125	78	203	29	748
35–44	187	87	274	11	42	25	67	9	341
45 and over	256	175	431	18	32	26	58	8	489
Total	1631	829	2460	100	426	282	708	100	3168

Table 2. *Proportion of notified hepatitis B and A cases with recognized risk factors*

	Hepatitis B cases	Hepatitis A controls
Risk factor	*n* (%)	*n* (%)
Blood transfusion*	108 (4·5)	9 (1·3)
Surgical intervention*	246 (10·2)	26 (3·8)
Hospitalization*	366 (15·1)	40 (5·8)
Other percutaneous exposures*†	235 (9·9)	34 (5·0)
Barber shop shaving*‡	266 (21·8)	36 (13·2)
Dental therapy*	585 (24·3)	107 (15·6)
i.v. drug abuse	376 (15·6)	13 (1·9)
Household or sexual contact with HBsAg positive carrier	312 (19·3)	16 (3·2)
Total	2495	719

Cases may have more than one risk factor and some cases have no recognized risk factor.

* During the previous 6 months.

† Ear piercing, tattooing, acupuncture, electrolysis, attendance at a chiropodist or manicurist.

‡ Men aged 20–69; cases = 1284, controls = 283

15% among hospitalized subjects and dental clients [1], and 70% among i.v. drug abusers [1]. The total population of Italy in the 1981 census was around 56 million.

RESULTS

Between May 1984 and December 1987, 2495 out of 2523 (99%) questionnaires from hepatitis B cases and 719 questionnaires from 957 (73%) hepatitis A cases were available. The age, sex, and geographical distribution of hepatitis A-notified cases with and without questionnaire information was the same. The age and sex distribution of patients with completed questionnaire information is shown in Table 1. Forty-six cases were not included because there was no information on age or sex. Table 2 shows the proportions of hepatitis B and a cases exposed to each risk factor. The adjusted Odds Ratios obtained from the logistic regression

Table 3. *Odds ratios estimated from the three logistic regression models*

Risk factors		1st Model* OR (95% CI)	2nd Model† OR (95% CI)	3rd Model‡ OR (95% CI)
Hospitalization		1·86 (1·14–3·03)	2·11 (1·15–3·88)	1·61 (0·63–4·14)
Surgical intervention		2·27 (1·26–4·09)	2·12 (1·02–4·43)	2·09 (0·77–5·70)
Blood transfusion		2·16 (0·89–5·22)	2·71 (0·78–9·38)	3·82 (0·88–16·61)
Dental therapy		1·73 (1·34–2·24)	1·73 (1·25–2·40)	1·92 (1·22–3·01)
i.v. drug abuse		9·87 (5·38–18·13)	6·55 (3·37–12·76)	5·16 (2·35–11·29)
Household or sexual contact with HBsAg positive carrier		—	9·30 (5·07–11·07)	9·30 (4·50–19·21)
Other percutaneous exposures		2·09 (1·35–3·26)	1·70 (1·00–2·87)	2·70 (1·38–5·24)
Total number of responses used in the analysis	Cases Controls	1866 557	1244 395	212 395
Barber shop shaving (men aged 26–69)		1·65 (1·09–2·49)	1·63 (0·96–2·77)	1·21 (0·54–2·70)
Total number of responses used in the analysis	Cases Controls	998 236	673 178	111 178

* All cases.
† Only cases with information on household or sexual contact with HBsAg positive carrier.
‡ Only cases with HBsAg and IgM anti-HBc. Based on 1987 data set.

Table 4. *Proportion of all hepatitis B cases attributable to particular risk factors*

Risk factor	Estimated exposure prevalence in population (%)	Attributable risk (%)
Surgical intervention	3	4
Hospitalization	14	11
Other percutaneous exposure	4	4
Barber shop shaving	2	2
Dental therapy	13	9
i.v. drug abuse	0·08	0·4
Household or sexual contact with HBsAg positive carrier	2·6	18

models are shown in Table 3. Hospitalization, surgical intervention, dental therapy and barber shop shaving in the previous 6 months, i.v. drug abuse and household contact with HBsAg positive carrier were associated with the risk of acquiring acute hepatitis B. The variable 'household or sexual contact with HBsAg carrier' was a confounder only for 'i.v. drug abusers'. Results were

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essentially unchanged when only hepatitis B cases with IgM anti-HBc were considered.

None of the two-factor interactions included in the models were significant.

Table 4 shows the proportion of all acute B hepatitis cases attributable to given risk factors. In estimating attributable risks, ORs calculated in the second model were used for 'i.v. drug abuse' and ORs from the first model for all other risk factors. Hospitalization, surgical intervention, dental therapy, other percutaneous exposures and barber shop shaving, explained as many as 30%, household or sexual contact with an HBsAg positive carrier 18%, but i.v. drug abuse only 0·4% of the total of acute hepatitis B cases in Italy.

DISCUSSION

To save time and expense hepatitis A cases were used as controls. Hepatitis B and A have different modes of transmission and post-transfusional or hospital-acquired hepatitis A are virtually non existant. In case-control study design comparability is more important than representativeness. In our study both hepatitis B and A patients were notified cases identified through the same surveillance system and therefore exposed to similar selective factors, if any. In addition, we took into account variables which could confound the association examined such as age, sex, geographical area, education, household size and place of treatment.

Results of SEIEVA underscore the role of hospitalization, surgical intervention, dental therapy, other percutaneous exposure, barber shop shaving, i.v. drug abuse and household or sexual contact with HBsAg carrier in the spread of acute hepatitis B in Italy. Because the proportion of drug abusers in the total Italian population is very small, the proportion of acute hepatitis B cases attributable to this risk factor is negligible (0·4%), and a large majority of cases are attributable to other risk factors.

Assuming that the distribution of risk factors amongst notified cases is similar to that of non-notified cases and subclinical infections, a large proportion of the estimated 300000 hepatitis B infections occurring annually in Italy may be related to hospitalization, surgical intervention, dental therapy, other percutaneous exposures, barber shop shaving and household or sexual contacts of HBsAg carriers.

In our data hospitalization is a risk factor independent of blood transfusion, surgical intervention and other risk factors. Therapeutic and diagnostic procedures such as venepuncture, biopsy, endoscopy and cardiac catheterization may explain the risk related to hospitalization and thus it is important to develop suitable recommendations for invasive procedures and for the sterilization and maintenance of instruments. Similarly, protocols and sterilization procedures for dental practice need to be implemented rigorously. Within the groups who were exposed through surgical intervention, it was unknown whether the surgery was major or minor and this difference needs to be studied further. Hepatitis B transmission through either ear piercing, tattooing, acupuncture, electrolysis, or attendance at a chiropodist or manicurist explained an appreciable number of

cases; thus effective sterilization measures coupled with increased use of disposable material should be extended to places where these practices occur.

While we recognized that our estimates of attributable risk (AR) may be inaccurate, these figures establish a rank order of public health importance for various risk factors and suggest prevention priorities.

The finding that almost two thirds of hepatitis A cases were in young adults aged 15–34 years could be explained by the high consumption of shellfish, a major risk factor in Italy [2–4] in this age group. Moreover a high proportion of older Italian adults are immune to hepatitis A [11, 12].

Type B viral hepatitis is a major public health problem in Italy and currently vaccination is the main prevention strategy. Because of vaccine cost and logistic considerations, the programme is targeted at members of high risk groups. This strategy is effective against household transmission of B hepatitis (both sexual and non sexual) in which the relative and attributable risk is the greatest. Such a strategy, however, of immunizing high risk groups is not likely to be effective in the short run to reduce hepatitis B infection due to other risk factors identified by the surveillance system [13]. It is a matter of primary importance for public health to combine the hepatitis B vaccination programme with other interventions. Additional measures to prevent B hepatitis due to hospitalization, surgical intervention, other percutaneous exposures, barber shop shaving and dental therapy should also help to control other diseases such as parenteral NANB hepatitis, which share the same risk factors with hepatitis B.

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