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Control of Occupational Hepatitis B Among Healthcare Workers in the Czech Republic, 1982 to 1995

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Abstract

Occupational hepatitis B remains a threat to healthcare workers (HCWs) worldwide, even with availability of an effective vaccine. Despite limited resources for public health, the Czech Republic instituted a mandatory vaccination program for HCWs in 1983. Annual incidence rates of acute hepatitis B were followed prospectively through 1995. Despite giving vaccine intradermally from 1983 to 1989 and intramuscularly as half dose from 1990 to 1995, rates of occupational hepatitis B decreased dramatically, from 177 cases per 100,000 workers in 1982 (before program initiated) to 17 cases per 100,000 in 1995. Among high-risk workers, the effect was even more dramatic (from 587 to 23 per 100,000). We conclude that strong public-health leadership led to control of occupational hepatitis B among HCWs in the Czech Republic, despite limited resources that precluded administering full-dose intramuscular vaccine for much of the program. Application of a similar program should be considered for other countries in regions that currently do not have a hepatitis B vaccination program.

Occupational transmission of hepatitis B poses a significant risk to healthcare workers (HCWs).¹⁻⁶ Because of this, in 1986, the US Department of Labor, in conjunction with Health and Human Services, issued recommendations for Universal Precautions to protect against exposure to body fluids. Subsequently, in 1991, the Occupational Safety and Health Administration published the Federal Bloodborne Pathogens Standard.⁷⁻⁸ This document mandated that all HCWs with potential exposure to blood or other infectious materials either be offered the hepatitis B vaccine series free of charge, demonstrate immunity to hepatitis B, or else formally decline vaccination.⁹⁻¹¹

In the Czech Republic, hepatitis has been a state-reportable disease for many decades, and rates of hepatitis B among HCWs and the general population have been closely tracked since the 1970s.¹²⁻¹⁵ Previously reported studies have demonstrated that morbidity among HCWs due to viral hepatitis was 3.6 times higher than among the general population.¹⁵ Many of these studies were performed on small samples or did not consider specific HCW occupations. Despite limited resources, control of nosocomial hepatitis was given high priority by state officials in the early 1980s. We report the effect of a hepatitis B vaccination program for HCWs in the Czech Republic.

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METHODS

The Czech Republic was formed in 1993, with the division of Czechoslovakia into two independent countries, the Czech Republic and Slovakia. Prior to this time, healthcare data were maintained in Czechoslovakia separately for the two federative states, the Czech and Slovak Republics. Identical geographic boundaries define the Czech Republic of the former Czechoslovakia and the current Czech Republic. Thus, data from 1982 to present are derived from the same population base.

The Czech Republic has 10 million persons, of whom approximately 200,000 (2%) are HCWs, similar to the proportion of HCWs in the United States (2.4%). Approximately 10,000 people enter the healthcare field annually. In addition, approximately 8,000 persons annually enter healthcare training, including medical, nursing, and other allied fields.

In 1983, vaccination of all “high-risk” HCWs became mandatory. High-risk HCWs included dialysis workers; internal medicine, surgery, and pathology specialists; biochemistry and hematology laboratory workers; medical and nursing students; and laboratory technicians. Vaccination schedules have varied according to availability of products and of national resources. From 1983 to 1989, the plasma vaccine H-B-VAX (Merck Sharp Dhome, Haarlem, The Netherlands) was used, with intradermal application of 0.1 mL at 0, 1, and 6 months. From 1990 to 1995, 0.5 mL of ENGERIX B (SmithKline Beecham, Rixensart, Belgium) was given intramuscularly at 0, 1, and 6 months. Beginning in 1996, the dose was doubled to the standard 1 mL/dose, given at the same interval and frequency. Vaccination was mandatory, and HCWs were not allowed to decline the series. A person is considered vaccinated only if a complete three-vaccine series has been administered. A booster dose at 5 years has been and will be given to all recipients of intradermal or half-dose vaccination.

Cases were identified as follows: all patients with diagnosed hepatitis of any etiology were hospitalized and isolated, and appropriate serologies were submitted (passive case finding) for reporting the result to the central hygiene station. Contact investigation was then undertaken (active case finding). The specific test varied according to the year of study. Currently, tests include hepatitis A antibody, hepatitis B surface and core antibody, hepatitis C antibody, and hepatitis B surface antigen.

Investigation of each case included serological testing of all family members and other contacts. All pregnant women were monitored for hepatitis B immune status, as were all HCWs, dialysis patients, and children of hepatitis B surface antigen-positive mothers. Among HCWs, hepatitis was considered an occupationally acquired compensable disease, increasing the likelihood of complete case-finding in this group. There is no perceived stigma and no restrictions for having hepatitis B. Hepatitis B patients are precluded from donating blood, but otherwise may resume their previous duties.

From 1982 to 1990, incident hepatitis B reporting was categorized as a “special compulsory” notification, meaning that highest priority was given to these reports. In 1991, hepatitis B reporting reverted to “routine notification.”

The countrywide annual rate of hepatitis B was derived from an established reporting system for numerous infectious diseases maintained at the National Center for the Analysis of Epidemiological Data of the National Institute of Public Health in Prague. The database included information for both the general population and for HCWs as a specific group within the general population. Information on the numbers of vaccinated HCWs was obtained from the staff of district and regional hygienic centers. Data were gathered from local treating physicians who performed the vaccinations.

RESULTS

In 1982, the rate of new hepatitis B infection for healthcare workers was 177 per 100,000 population, including 587 per 100,000 workers in high-risk groups (Table 1). This is compared to a rate in the general population of 27 per 100,000. From 1980 to 1984, the healthcare occupations with the highest rates of hepatitis B included hemodialysis workers (2,083 per 100,000), laboratory workers (781 per 100,000), infectious disease-ward employees (710 per 100,000), and hematology-ward employees (644 per 100,000; Table 2).

Because of these findings, in 1983, the national policy was initiated for vaccination of selected high-risk groups, who constituted 20% of all HCWs but who contributed 60% of incident cases. The vaccination program was announced as mandatory by the Commissioner of Public Health, meaning that the cost was assumed by the State. Since then, approximately 100,000 persons have received a complete vaccine series.

The dramatic decrease in cases among healthcare workers, and particularly among high-risk workers, is demonstrated in the Figure and Table 1. By 1995, the rate of new hepatitis B cases had decreased to 17 per 100,000 among all healthcare workers and 23 per 100,000 among high-risk workers.

The number of vaccinations has increased each year. The relatively slow adoption of the program stemmed from insufficient funds for the purchase of the vaccine. The data shown in the graph reflect the effectiveness of intradermal application during the first years of vaccination, and the effectiveness of the low-dose (0.5 mL) intramuscular immunization from 1990 through 1995. In 1996, only 26 cases of hepatitis B were reported in Czech Republic HCWs, yielding a rate of 12.5 per 100,000 HCWs, including 25 per 100,000 high-risk workers. In the general population, 642 cases of acute hepatitis B were identified, for a calculated rate of 6.4 per 100,000.

DISCUSSION

This study demonstrates that a rigorous vaccination program can sharply reduce occupational transmission of hepatitis B and that such a program can be implemented in a country with modest resources, even during an era of profound national political change. Indeed, in the early years of the program, the high priority given to control of the disease resulted in the use of intradermal vaccination, and then half-dose vaccine, even with the knowledge that these approaches were suboptimal¹⁶ (all HCWs vaccinated during this time have received or will receive an additional single full intramuscular dose, to assure maximum durability of immunity). Studies from the United States have documented a similar decrease in hepatitis B rates among HCWs.^{10,17,18}

The current study has several limitations. The threshold for reporting cases of new hepatitis B changed in 1991, when reports went from “special compulsory” to “routine” notification status. This might be expected to lead to an underreporting of cases, beginning in 1991, and therefore an artifactually “effective” vaccine program. However, most of the improvement in hepatitis B rates had occurred prior to this time (from 177/100,000 to 32/100,000 in 1990). Furthermore, because hepatitis B infection remained a compensable condition for Czech HCWs throughout the study, we feel that most cases among HCWs continue to be reported.

Our estimations of the rate of hepatitis B in the general population are limited as well, since testing of persons is not mandatory and typically is limited to groups at risk (family or contacts of cases, children of antigen-positive mothers, dialysis patients, pregnant women) or those who present with clinical hepatitis (approximately half of whom are found to have

viral hepatitis). Thus, the rates probably underestimate the rate of hepatitis B in the general population. The dramatic fall in the rate of hepatitis B infection in the non-HCW population is due to using cleaner needles and a cleaner blood supply, public education, and other less evident factors.

Other improvements aimed at decreasing nosocomial transmission were initiated during the study period, including the introduction of disposable needles in hospitals. Such an intervention, however, would not be expected to influence hepatitis B rates among HCWs, but rather among hospitalized patients. In other countries in the region, this remains an important means of transmission of hepatitis B.^{19,20} In addition, we cannot be certain that a substantial proportion of HCW cases was not due to nonoccupational exposures, such as sexual contact. However, the very high rates among the highest-risk groups (hemodialysis workers, laboratory workers, etc) argue for a majority of risk being due to occupational exposure. We therefore feel that most of the decrease reported here is attributable to vaccination against this disease.

The foresight shown by the public health authorities in the 1980s has yielded enormous health benefits for the healthcare work force of the Czech Republic. Several countries in the region still do not routinely vaccinate HCWs against hepatitis B. We hope that the results of the program from the Czech Republic will provide assurance that occupational hepatitis B can be controlled, even in countries of limited resources during times of political turmoil.

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FIGURE.

Trends in acute hepatitis B among health care workers in the Czech Republic, 1982-1995, according to healthcare worker risk group. High-risk group, — — — ; lower-risk group,; total, _____.

TABLE 1

Change in the Incidence of Hepatitis B in the Czech Republic, 1982 to 1995^{*}, and in the United States, 1983 to 1995

	1982	1995
Czech Republic		
All HCWs	177	17
High-risk HCWs [†]	587	23
General population >15 y	27	7
United States		
HCWs	386 [‡]	9.1
General population	122 [‡]	50

Abbreviation: HCWs, healthcare workers.

^{*} Numbers reflect rates per 100,000 population.

[†] High-risk employees include dialysis workers; internal medicine, surgery, and pathology specialists; biochemistry and hematology laboratory workers; medical and nursing students; and laboratory technicians.

[‡] Initial numbers from US study¹⁰ are from 1983, not 1982.

TABLE 2

Rates of Hepatitis B Per 100,000 Healthcare Workers by Healthcare Occupation, Czech Federation, 1980 to 1984

Occupation	Rate Per 100,000 Workers
Hemodialysis workers	2,083
Laboratory workers	781
Infectious disease-ward employees	710
Hematology-ward employees	644
Surgery staff	463
Internal medicine employees	459
Urology employees	443
Tuberculosis and respiratory-disease-ward employees	267