Vaccine xxx (2018) xxx–xxx

Contents lists available at ScienceDirect

Vaccine

journal homepage: www.elsevier.com/locate/vaccine

Predictors of hepatitis B vaccination completion among people who use drugs participating in a national program of targeted vaccination

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ARTICLE INFO

Article history:
Received 12 April 2018
Received in revised form 13 July 2018
Accepted 17 July 2018
Available online xxxx

Keywords:
Hepatitis B
Vaccination
High-risk group
People who use drugs

ABSTRACT

Background: Targeted vaccination strategies are necessary to prevent people who use drugs (PWUD) becoming infected with hepatitis B virus (HBV). The aims of this study were to provide an overview of the activities for PWUD in a decentralised vaccination program in the Netherlands and to explore the determinants associated with completing a standard hepatitis B vaccination series.
Methods: We used data for behavioural risk groups from the register of the national vaccination program. The data concerned PWUD who were immunised against hepatitis B in the Netherlands between 2002 and 2011. A standard series of three vaccinations (at 0, 1, and 6 months) was offered at inclusion and was continued if serological markers for past or chronic HBV infection were absent. Completion of a vaccination series (at least three vaccinations, irrespective of timing) was a dependent variable in our logistic regression analysis.
Results: The program reached 18,054 PWUD. Of the 15,746 participants eligible for vaccination (i.e. they were neither carriers of hepatitis B nor immune to hepatitis B), 9089 (58%) completed a series of three hepatitis B vaccinations. Factors associated with a higher completion rate of a vaccination series ($p < 0.01$) were: starting vaccination in the earlier years of the program, older age of PWUD, intravenous drug use, vaccine administration by addiction care centres, and flexibility in location of vaccine delivery.
Conclusion: Despite using a standard HBV vaccination schedule and no financial incentives, vaccination completion among PWUD was relatively high. Our results suggest that flexibility of vaccination location and administration of vaccines by healthcare workers with sustainable contact with PWUD could improve vaccination programs for this risk group.

1. Introduction

Western industrialised countries have implemented several vaccination strategies against hepatitis B to reduce the incidence of acute and chronic infection with hepatitis B virus (HBV). Universal vaccination, vaccination targeting specific high-risk groups, and a combination of both were strategies mostly implemented during the 1990 s [1,2]. Only the four Scandinavian countries have not yet included universal hepatitis B vaccination in childhood vaccination programs. The immunological effects of childhood programs will take several decades to protect an adult population against HBV infection because not all countries have augmented childhood vaccination with a catch-up program for youth and adolescents [2–5]. Incomplete coverage can limit the impact of starting targeted and universal vaccination programs 'early'. HBV transmission is ongoing in high-risk groups in the United States and Germany despite the introduction of targeted and universal vaccination in the 1980 s and the period 1990–1995 [6,7]. Consequently, targeted vaccination of adults at risk of HBV infection remains essential in many western countries to reduce further transmission [8,9–10].

In low endemic countries, virus transmission of acute hepatitis B cases occurs mainly through sexual contact in groups with high-risk behaviour such as men who have sex with men (MSM) or through the re-use of needles or other objects contaminated with infected blood either in a healthcare setting or among people who inject drugs (PWID). The latter is the fourth leading cause of

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https://doi.org/10.1016/j.vaccine.2018.07.045
0264-410X/

transmission and accounts for 11.3% of the acute cases in the European Union and the European economic area [4,11]. Despite strong regional differences, increasing evidence suggests that the prevalence of hepatitis B surface antigen (HBsAg) is considerably higher among PWID than in the general population. A recent German study reports a prevalence five times as great among PWID as in the general population [12,6,13]. Among people who use drugs (PWUD), the risk of infection with HBV is not only limited to people who inject drugs. Non-injecting PWUD have an increased risk of HBV infection as well, primarily via high-risk sexual behaviour [14–18]. Frequent co-infection in PWUD of HBV and HIV or HCV often results in more severe liver related morbidity [17,19]. The increased seroprevalence and disease burden urges for better prevention strategies against hepatitis B in this high-risk group.

Due to the low prevalence of HBV in the Dutch general population, the Netherlands implemented after a two-year pilot period a vaccination strategy targeting hepatitis B in high-risk behavioural groups in 2002, prior to implementing a universal childhood vaccination program in 2011. Initially, four groups were targeted: MSM, PWUD, commercial sex workers and heterosexuals with multiple sexual contacts. In 2007, heterosexuals with multiple sexual contacts were excluded due to their low prevalence of HBV infection. By the end of 2011, the program also stopped targeting PWUD because of the low prevalence of past and chronic HBV infection, no ongoing transmission of HBV strains associated with PWID, and a declining number of PWID in the Netherlands [20,21].

For this study we looked at PWUD in the targeted HBV-vaccination program. Participation of this high-risk group in vaccination programs can be poor because of possible debts, unstable housing situations, stigma related to drug use and hepatitis B [1,22–24] and opportunities that various organisations have missed [6,25]. Besides participation, as a measure of a program's reach, factors associated with improving vaccination series completion are equally important to effectively protect a high-risk population against hepatitis B.

This study presents an overview of one decade of the activities for PWUD in the national HBV vaccination program for Dutch risk groups and reports on factors associated with completing a standard series of three vaccinations against HBV.

2. Methods

2.1. Study population and data collection

Recruiting organisations entered participant and vaccination data in a national web-based database using a structured questionnaire. We extracted data for this observational retrospective study from this web-based database where vaccination data were stored anonymously. The web-based design enabled all participating organisations to access these data, which facilitated completing vaccination series for participants at various organisations (such as prisons and addiction care facilities). A person was categorised in this database as PWUD depending on his/her reported behavioural risk (at least drug use) and the location of received vaccinations. People who used any of the following drugs were eligible for vaccination: heroin, base coke/crack, cocaine, amphetamine or methadone regardless of the administration route (by injection and/or not). People using recreational drugs (e.g. ecstasy) were not eligible for hepatitis B vaccination in the program. If a person's behavioural risk was restricted to drug use, he/she was categorised as PWUD irrespective the location of vaccination. Anyone with other behavioural risk factors besides drug use was categorised as a PWUD if he/she received vaccinations at a prison or addiction care facility. All PWUD who met these criteria were included for analysis if their first vaccination visit was registered between 1 January 2002 and 31 December 2011.

The common database provided information about the location and region of vaccination, number of hepatitis B vaccinations, hepatitis B serology (antibodies to hepatitis B core antigen (anti-HBc) and/or HBsAg), and baseline characteristics: age, gender, method of drug use and previous or current activities in commercial sex work.

2.2. Recruitment sites

Addiction care in the Netherlands is characterised by low threshold care ranging from detection of substance abuse to treatment and rehabilitation. All public health services (PHS) in the Netherlands cooperated regionally with addiction care facilities, homeless shelters and prisons to offer a standard series of hepatitis B vaccination (0,1, and 6 months), free of charge at the locations mentioned. Local policy of organisations determined the extent of training of professionals for this program and cooperation between organisations. A yearly exchange of the program's best practices was nationally organised for all participating organisations. Outreach activities (e.g. vaccination at methadone outlets or syringe exchange programs) were included in the program to inform and vaccinate participants, as well as to optimise the uptake. The participants who finished the vaccination series could receive an incentive (such as a pocket radio; no financial incentives were given) depending on organisation's policy. For the aims of the study, the organisation *responsible* for administering vaccination was registered as the organisation of vaccine delivery. The *location* of vaccination was not necessarily a location of that same organisation. For example, a health worker from a PHS could administer a vaccine series at an addiction care facility.

2.3. Procedures

During the first visit, each participant received his/her first vaccination and health workers took a venous blood sample that was sent to a regional laboratory to assess the HBsAg and anti-HBc as serological markers of a possible hepatitis B infection. Evaluation of a serological profile of hepatitis B can be complex due to declining antibodies, false-positive results or an occult HBV infection [26]. In short, no further vaccination was offered to a person who was positive to anti-HBc and HBsAg (classified as carrier of hepatitis B) or who was anti-HBc positive and HBsAg negative (classified as immune to hepatitis B). Carriers of hepatitis B were referred to standard health care for evaluation of the chronic hepatitis B infection. The main purpose of this public health program was to increase immunity to HBV in PWUD and to stop possible spill over to other risk groups. Therefore antibodies against HBsAg from individual participants were not routinely tested after vaccination to assess HBV immunity.

2.4. Ethical approval

The data were obtained from anonymous digital records in a fully de-identified manner and none of the researchers had access to patient identifying information. The study protocol was therefore exempt from formal medical-ethical approval under the prevailing Dutch laws because this is a retrospective observational study using anonymous data only.

2.5. Statistical analysis

The primary outcome was successful vaccination against hepatitis B, defined as completion of a series of at least three vaccinations, irrespective of the timing of the vaccine administration. Vaccination completion rates were computed only for participants

Please cite this article in press as: Raven S et al. Predictors of hepatitis B vaccination completion among people who use drugs participating in a national program of targeted vaccination. Vaccine (2018), https://doi.org/10.1016/j.vaccine.2018.07.045