

Sudden rise in uptake of hepatitis B vaccination among injecting drug users associated with a universal vaccine programme in prisons

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Abstract

Hitherto, services have failed to deliver the UK Government's 1988 recommendation to vaccinate injecting drug users (IDUs) against hepatitis B virus (HBV). In April 1999, the Scottish Prison Service implemented an initiative to offer HBV vaccination to all inmates; we sought to determine the impact of this initiative on the IDU population. Among community-recruited IDUs (who had injected for ≤ 5 years) in Glasgow, vaccine uptake was significantly higher among those surveyed in 2001–2002 (52% of 387) than in 1993 (16% of 166), 1994 (19% of 138) or January–March 1999 (15% of 128); of the 2001–2002 vaccinees, 56% had been vaccinated in prison. Our results indicate that the universal offer of vaccination to all prisoners, within two years of the initiative's implementation, has had a dramatic impact on uptake among IDUs. © 2004 Elsevier Ltd. All rights reserved.

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1. Introduction

The UK's selective vaccination policy against hepatitis B virus (HBV) is currently being reviewed by the Joint Committee on Vaccination and Immunisation, in the context of both the World Health Organisation's recommendation that all countries should introduce universal vaccination and the increased incidence of acute infection in the UK during the late 1990s [1]. Injecting drug use remains the most commonly reported risk exposure associated with acute HBV infection in the UK [1]. Vaccination of injecting drug users (IDUs) has been advocated since 1988, yet uptake has remained below 30% during the 1990s [2–4].

Spurred by regional injection-related outbreaks of acute HBV infection which, during 1998 and early 1999, gave rise to cases in three Scottish prisons, in April 1999 the Scottish Prison Service implemented an initiative to offer HBV vaccination—at zero, one and two months (and recently at zero, seven and twenty-one days), followed by a booster at 12 months—to all inmates of prisons and young offender institutions in Scotland irrespective of their injecting history. A subsequent survey of inmates in one of Scotland's long-term prisons during October 1999–April 2000 [5] demonstrated that HBV vaccine uptake (of at least one dose) was considerable: 69% (114/166) among all and 63% (33/52) among IDU inmates. During 1999–2000, the Scottish Prison Service ordered 27,813 doses of HBV vaccine which equates to approximately 1.4 doses per released prisoner (based on 20,000 released individuals [6]). The universality of implementation was evident across prisons; for local (excluding one), long-term and other prisons, 1.4, 1.7 and 1.0 doses

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had been ordered per released prisoner, respectively (personal communication: Sheila Bird).

With the high rate of imprisonment (for short stays) among IDUs [7], the authors concluded that any appreciable impact of this initiative should be evident in community-based IDU populations soon after its implementation. The hypothesis was explored on Glasgow's IDU population, estimated to be 6100–8600 [8], by examining self-report behavioural and vaccine uptake data generated through a series of community-wide surveys, undertaken before and after the introduction of this measure.

2. Methods

Four voluntary, anonymous cross-sectional surveys of Glasgow's IDUs were conducted in 1993, 1994, 1999 and 2001–2002 to determine, primarily, their prevalence of bloodborne viruses and associated risk behaviours; equivalent surveys performed in 1990, 1991, 1992 and 1996 were excluded from this analysis as questions on HBV vaccine uptake were not asked in these years. A multi-site sampling strategy—with respondents drawn from street, needle exchange and drug treatment settings (described in detail elsewhere [9])—was adopted in each survey to minimise the selection bias which would have occurred if IDUs had been recruited from single sites or particular geographical or social networks. Sites were located throughout Glasgow to cover the city's entire IDU population. Participants were interviewed face to face by trained interviewers using a questionnaire which was standardised across survey years. Individuals were eligible for participation in the 1993 and 1994 surveys if they had injected drugs in the two months prior to interview and, in the 1999 and 2001–2002 surveys, if they had commenced injecting since 1990 and 1996, respectively. To address this difference in selection criteria between surveys, only individuals who had both injected in the previous two months and had commenced injecting within the previous five years were included in the subsequent analyses; as a result, those included in the analyses had all made their injecting debuts following the recommendation, in 1988, that IDUs should be immunised.

For all surveys, a question about having received at least one dose of HBV vaccination was asked. Additionally, in the 1999 and 2001–2002 surveys, the setting of vaccine receipt and, for the latter survey, the number of doses received, were recorded; information on the date of vaccination was not requested. Changes in HBV vaccine uptake were examined between surveys using Pearson's chi-square test. An assessment of the difference in HBV vaccine uptake between IDUs interviewed (i) before (i.e. 1993, 1994 and January–March 1999), (ii) in the early stages following (April–July 1999), and (iii) after (2001–2002) the introduction of the prison universal vaccination programme was made, adjusting for other (potentially confounding) demographic and injecting drug use characteristics, using multi-factorial logistic regression anal-

ysis. Seven factors (i.e. period since introduction of prison vaccine programme, recruitment setting, gender, age, time since onset of injecting, received treatment and imprisonment; Table 1 details the categories for each variable) and interaction terms, which were significant at the 5% level, were included in the multi-factorial model. Data were analysed using S-PLUS software.

3. Results

A total of 1025 IDUs had both injected in the previous two months and commenced injecting within the previous five years, of whom 963 (94%) responded to the question on ever having been vaccinated against HBV. Vaccine uptake was no different between IDUs surveyed, prior to the introduction of the prison vaccine programme, in 1993 (16% of 166), 1994 (19% of 138) or January–March 1999 (15% of 128) (Table 1). These data were used together in subsequent analysis as uptake was not significantly different between surveys stratified by recruitment setting, gender, age, time since onset of injecting, having received treatment and imprisonment. Compared to those surveyed prior to the introduction of the prison vaccine programme, vaccine uptake was significantly higher among those interviewed in the early stages of the programme in April–July 1999 (25% of 144) and later in 2001–2002 (52% of 387) ($P = 0.03$ and <0.0001 , respectively; Table 1). Whilst the characteristics of IDUs interviewed in 2001–2002 were marginally different from those recruited in 1993, 1994 and January–March 1999 (in the former, more were male and older), vaccine uptake increased significantly in all groups according to recruitment setting, gender, age, time since onset of injecting, having received treatment and imprisonment. The most appreciable rise was observed among IDUs who had been imprisoned since onset of injecting (16% during 1993, 1994 and January–March 1999 to 34% in April–July 1999 and 64% in 2001–2002); a significant but much smaller rise in uptake was also observed among IDUs who had not been imprisoned since onset of injecting (17% during 1993, 1994 and January–March 1999 to 37% in 2001–2002).

Of those interviewed during the early stage of the prison programme in April–July 1999, 17% (25/144) reported having been in prison during the same period and 56% (14/25) of these had been vaccinated compared to 18% (22/119) of those who had not been incarcerated during these four months ($\chi^2 = 13.6$; $P = 0.0002$). In addition, 69% (9/13, 1 not known) of vaccinated cases who had been in prison during April–July 1999 reported having received their course from prison (the date of which was not recorded) compared to 14% (3/22) of those interviewed, but who had not been in prison, during this period ($\chi^2 = 8.9$; $P = 0.003$). Of all 55 cases reporting vaccination in the 1999 survey, Base 75—a city centre medical and social work facility for female sex workers—was the source of vaccination in 32% (15/47, 8 not known; 43% (15/35) of

Table 1

Temporal trends and determinants of self-reported uptake of (at least one dose of) hepatitis B vaccination among 963 injecting drug users, who had both injected in the previous two months and began injecting within the previous five years, recruited in four cross-sectional surveys in Glasgow during 1993, 1994, 1999 and 2001–2002

	Total (N = 963)	Uptake of HBV vaccine (%); by survey (i.e. 1993, 1994, 1999, 2001–2002) and timing (i.e. pre, early, post) in relation to introduction of prison vaccine programme in April 1999					Statistical test (Pearson's chi-square test; <i>P</i> -value) (NS: not significant at the 5% level)		Odds ratios for HBV vaccine uptake (95% CI)	
		Pre			Early	Post	Pre vs. early	Pre vs. post	Uni-factorial	Multi-factorial
		(a) 1993 (N = 166)	(b) 1994 (N = 138)	(c) January–March 1999 (N = 128)	(d) April–July 1999 (N = 144)	(e) 2001–2002 (N = 387)	(a–c) vs. (d)	(a–c) vs. (e)		
Period since introduction of prison vaccine programme										
Pre	432 (45%)	16 (26/166)	19 (26/138)	15 (19/128)	–	–	$\chi^2 = 4.7; P = 0.03$	$\chi^2 = 112.9; P < 0.0001$	1.00 (baseline)	1.00 (baseline)
Early	144 (15%)	–	–	–	25 (36/144)	–			1.69 (1.08–2.67)	0.48 (0.14–1.69)
Post	387 (40%)	–	–	–	–	52 (200/387)			5.44 (3.94–7.50)	6.27 (3.02–13.03)
Recruitment setting										
Street	527 (54%)	17 (9/54)	24 (11/45)	14 (15/105)	28 (35/126)	53 (105/197)	$\chi^2 = 4.6; P = 0.03$	$\chi^2 = 56.0; P < 0.0001$	1.25 (0.91–1.72)	1.36 (0.93–1.99)
Needle exchange	267 (28%)	11 (7/64)	12 (7/57)	17 (2/12)	0 (0/15)	50 (60/119)	NS	$\chi^2 = 42.1; P < 0.0001$	1.00 (baseline)	1.00 (baseline)
Treatment	169 (18%)	21 (10/48)	22 (8/36)	18 (2/11)	33 (1/3)	49 (35/71)	NS	$\chi^2 = 13.4; P = 0.0003$	1.25 (0.82–1.89)	1.36 (0.84–2.21)
Gender										
Male	614 (64%)	9 (9/100)	10 (7/70)	6 (5/84)	13 (11/85)	51 (139/275)	NS	$\chi^2 = 109.9; P < 0.0001$	1.00 (baseline)	1.00 (baseline)
Female	349 (36%)	26 (17/66)	28 (19/68)	32 (14/44)	42 (25/59)	54 (61/112)	NS	$\chi^2 = 19.1; P < 0.0001$	1.65 (1.25–2.18)	4.52 (2.56–7.98)
Age at interview (years)										
16–20	153 (16%)	14 (6/43)	20 (5/25)	22 (4/18)	46 (12/26)	56 (23/41)	$\chi^2 = 7.5; P = 0.01$	$\chi^2 = 18.0; P < 0.0001$	1.00 (baseline)	1.00 (baseline)
21–25	398 (41%)	14 (12/85)	14 (9/63)	11 (6/56)	30 (18/61)	55 (73/133)	$\chi^2 = 7.7; P = 0.01$	$\chi^2 = 65.0; P < 0.0001$	0.87 (0.58–1.30)	0.81 (0.51–1.30)
>25	412 (43%)	21 (8/38)	24 (12/50)	17 (9/54)	11 (6/57)	49 (104/213)	NS	$\chi^2 = 28.1; P < 0.0001$	1.05 (0.71–1.56)	0.74 (0.46–1.19)
Time since onset of injecting (years)										
<2	334 (35%)	15 (7/48)	11 (4/37)	19 (10/53)	23 (17/73)	46 (56/123)	NS	$\chi^2 = 27.3; P < 0.0001$	1.00 (baseline)	1.00 (baseline)
2–5	629 (65%)	16 (19/118)	22 (22/101)	12 (9/75)	27 (19/71)	55 (144/264)	NS	$\chi^2 = 84.8; P < 0.0001$	1.31 (0.98–1.75)	1.14 (0.80–1.62)
Ever received treatment for drug use (one non-response)										
Yes	763 (79%)	18 (23/130)	19 (19/102)	17 (17/102)	22 (24/107)	52 (169/322)	NS	$\chi^2 = 86.1; P < 0.0001$	1.29 (0.91–1.82)	0.92 (0.61–1.39)
No	199 (21%)	8 (3/36)	19 (7/36)	8 (2/26)	32 (12/37)	48 (31/64)	$\chi^2 = 6.2; P = 0.01$	$\chi^2 = 24.2; P < 0.0001$	1.00 (baseline)	1.00 (baseline)
Imprisoned since onset of injecting (five non-responses)										
Yes	577 (60%)	17% (21/126)	19% (20/103)	8% (5/64)	34% (25/73)	64% (135/211)	$\chi^2 = 11.7; P = 0.0006$	$\chi^2 = 122.2; P < 0.0001$	1.60 (1.20–2.13)	1.03 (0.58–1.85)
No	381 (40%)	13% (5/39)	13% (4/32)	22% (14/64)	15% (11/71)	37% (64/175)	NS	$\chi^2 = 13.5; P = 0.0002$	1.00 (baseline)	1.00 (baseline)
Significant interaction terms ^a included in multi-factorial logistic regression model										
Period since introduction of prison vaccine programme and gender										
Early (April–July 1999) and female										1.89 (0.60–5.93)
Post (2001–2002) and female										0.33 (0.16–0.70)
Period since introduction of prison vaccine programme and imprisoned since onset of injecting										
Early (April–July 1999) and yes (imprisoned)										5.49 (1.74–17.35)
Post (2001–2002) and yes (imprisoned)										3.18 (1.55–6.54)

^a Regression χ^2 for inclusion of two interaction terms was 29.3 on four degrees of freedom ($P < 0.0001$).

female vaccinees), followed by prison (26%, 12/47), general practitioner (GP) or health care centre (21%, 10/47), hospital (13%, 6/47) and other drug services (9%). Of the 2001–2002 vaccinated respondents, 56% (111/199), 23% (46/199) and 21% had received their course from prison, drug services (including Base 75 (26)), and elsewhere (GP (26), hospital (13) and work (3)), respectively. A quarter (50/199), 44% (87/199) and 18% (36/199) of 2001–2002 vaccinees had received two only, three only, and four or more doses, respectively.

On multi-factorial logistic regression analysis, IDUs who (i) were interviewed during 2001–2002 (two years after the introduction of universal vaccination to prisoners), (ii) were female (essentially those interviewed during 1993–1999, given the reduced odds associated with females interviewed in 2001–2002 from inclusion of the interaction term), and (iii) had both been incarcerated since their injecting debut and interviewed in either April–July 1999 or 2001–2002 were significantly more likely to have received HBV vaccination; neither recruitment setting, age, time since onset of injecting, nor drug treatment history differentially influenced uptake.

4. Discussion

This paper examines changes in uptake of HBV vaccination among almost 1000 IDUs interviewed in a series of cross-sectional, community-wide surveys during 1993–2002 to provide an understanding of the impact on this group of universal vaccination of prisoners. Vaccination status was self-reported and may therefore be subject to problems of recall and other sources of bias; until an accurate test to detect salivary antibody to HBV surface antigen is developed however, the monitoring of vaccine coverage among IDUs, recruited in the context of community-wide surveys as above, will likely continue to rely on self-report data [4]. The sampling approach used was the same in each survey and facilitated the recruitment of IDUs from every part of the city where injecting was prevalent. The proportions interviewed at the three main settings (street, needle exchange and drug treatment), however, differed between years as a result of the changing nature of the population. To address for the influence of this and other IDU characteristics, analyses were presented separately and adjusted in the regression analyses according to recruitment setting, gender, age, time since onset of injecting, treatment for drug use and imprisonment.

Our cross-sectional design is limited in that it identifies associations with, rather than causes of, vaccine uptake. Nevertheless, our results indicate that the Scottish Prison Service initiative to vaccinate all prisoners was largely responsible for the rise in vaccine uptake observed among the Glasgow IDU population. Prior to the prison programme, women were more likely than men to have been vaccinated, due in part to the efforts of the city's drop-in centre [10] for female sex workers which was the source of vaccination in 43% of female vaccinees participating in the 1999 survey. Delivery of vaccine to male IDUs was poor (8%) prior to the introduction

of the prison programme, comparable to that reported among 157 (vast majority male) IDUs interviewed in two Scottish prisons during 1996 (5%) [2], and increased to 51% thereafter. After adjustment for gender and other characteristics in the multi-factorial analysis, respondents who had both been incarcerated since first injecting and interviewed in either the early or later phases of the prison programme were significantly more likely to have been vaccinated. Whilst 56% of 2001–2002 survey vaccinees reported receipt of vaccination in prison, the absence of data on the timing of this limits our ability directly to attribute these cases to the universal prison vaccination programme. Given, however, that (i) none of the IDUs surveyed in January–March 1999 (prior to the prison programme) reported prison as the source of vaccination and (ii) the largest rise in vaccine uptake was found among those who had been in prison since first injecting suggests strongly that the 111 IDUs surveyed in 2001–2002 who reported vaccination in prison were indeed vaccinated as a result of the universal programme. The finding of a small significant rise in vaccine uptake in 2001–2002 compared to previous surveys in 1993–March 1999 among IDUs who had not been imprisoned (37% and 17%, respectively) indicates that other services had contributed to the rise in vaccine coverage; nevertheless, IDUs in Glasgow who avoid incarceration do not appear to have the same opportunity to protect themselves against HBV as those who enter prison.

In the absence of a childhood universal HBV vaccination programme, an efficient approach to reach high-risk groups is essential. Injecting drug use remains the major risk factor associated with HBV infection in the UK. Yet, services have failed to implement the Government's 1988 recommendation to vaccinate IDUs against HBV; rates well below 30% have been the norm [2–4]. The potential for prisons to vaccinate IDUs (and non-IDUs) has previously been emphasised [2]; 60% of IDUs in this study had been incarcerated within five years of commencing injecting. Recent modelling has demonstrated the economic savings to the healthcare system of vaccinating prisoners against HBV [11]. The observations in Glasgow show that the uptake of at least one dose of HBV vaccine had more than tripled (from 16% to 52%) among, most importantly, recent initiates to injecting drug use (i.e. those who had commenced injecting within the previous five years) in the two years since the introduction of universal HBV vaccination in prisons and young offender institutions. Completion of three doses by 2001–2002 vaccinees (62%) was higher than has previously been reported among IDUs vaccinated through specialist drug services in Glasgow with a rapid regimen of zero, one and two months (50% of 405) ($P = 0.01$) [12]; in addition, individuals who had received only one or two doses may benefit from vaccination as subsequent infection is less likely to result in carriage or disease [13]. It was not possible to evaluate vaccine effectiveness in this study and examine the response to the accelerated schedule, used in the prison setting with the potential difficulty of administering a booster dose at 12 months, given the issue of low antibody response among IDUs [14]. It is encouraging, however, that

no outbreaks of HBV among IDUs—witnessed before, and partly responsible for, the introduction of this policy—have occurred since. The sooner all prisons elsewhere in the UK adopt the same preventive approach as in Scotland, the better.

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