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Hepatitis B outbreak at Glenochil prison during January to June 1993

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SUMMARY

This data linkage study examined the extent of hepatitis B transmission and co-infection with HIV among 636 former inmates of Glenochil prison, Scotland, during an outbreak of bloodborne diseases in 1993 which was related to needle sharing. Eleven inmates imprisoned during the first half of 1993 presented with hepatitis B infection, of whom co-infection with HIV was detected in six. Based on dates of test results in relation to time of imprisonment, seven definitely acquired their hepatitis B infection within the prison. Only two infections were reported to Scotland's hepatitis B register and neither could be prison-linked. This outbreak of hepatitis B is the first of its kind to be reported but not the first to have occurred. It not only highlights the urgency for measures to prevent further spread of infection among prisoners but also illustrates the need for comprehensive surveillance of hepatitis B infection, and the need for a protocol on how to manage such outbreaks and on how to establish the extent of transmissions when acute hepatitis B occurs in prison.

INTRODUCTION

Concerns about the prevalence and transmission of hepatitis, and in particular hepatitis B infection, among drug injectors have been overshadowed by the concerns about the risks of HIV infection [1]. Hepatitis B is several-fold more infectious than HIV but because 95% of cases clear the virus spontaneously, relatively few injectors are infected at any one time [2]. The first report to provide definitive evidence of an outbreak of HIV occurring within a prison documented an HIV counselling and testing initiative for inmates from HM Prison Glenochil in Scotland [3]. This was prompted by the reporting between April and June 1993 of two diagnosed cases of primary infection with HIV as well as eight symptomatic cases of acute hepatitis B. Widespread drug injecting and needle and syringe sharing were also reported by the prison doctor. In all, 14 cases of HIV infection were diagnosed and which molecular epidemiological techniques have subsequently shown 13 of the 14 had been infected from a common source within this prison during the first half of 1993 [4]. Hitherto, no investigation had been conducted to determine the extent of hepatitis B transmission and co-infection with HIV at that time. Accordingly, the authors report the findings of a study of hepatitis B infection which involved matching the patient identifiers of case records from relevant data sources.

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METHODS

Sources of data

Five different sources were involved in the data linkage:

(1) A soundexed list of inmates who were incarcerated in Glenochil prison during January to June 1993 (Dataset A).

(2) Acute hepatitis B infection diagnoses made by the Department of Microbiology, Stirling Royal Infirmary (Dataset B).

(3) Scotland's hepatitis B Infection Register held at the Scottish Centre for Infection and Environmental Health (SCIEH) (Dataset C).

(4) A list of records based on previous studies of Glenochil inmates known to be HIV positive (Dataset D).

(5) Scotland's HIV denominator (test request) study database held at SCIEH (Dataset E).

Matching datasets A and B

Laboratory records of acute hepatitis B infections held at the Department of Microbiology, Stirling Royal Infirmary (SRI), the testing laboratory for Glenochil requests, were accessed to verify data on the known eight symptomatic cases of hepatitis B and to determine if any further cases at Glenochil had been confirmed by the laboratory during 1993. Hepatitis B infections detected on inmates' samples submitted in July–December 1993 were matched with a list of 636 male prisoners present in HMP Glenochil at some time during 1 January–30 June 1993, using the following identifiers: surname soundex, forename initial, gender, and date of birth. The soundexed January–June list of 636 inmates was compiled at HMP Glenochil. Clinical details of acute hepatitis B infection cases were obtained from casenotes held in the medical centre of Glenochil Prison.

Matching datasets A and C

Hepatitis B testing laboratories throughout Scotland report positive cases to the Scottish Centre for Infection and Environmental Health (SCIEH) on a weekly basis. The resulting register holds information on surname, forename, age, gender, testing laboratory, and health board of testing laboratory. All cases reported to the register during 1993 were matched with the list of 636 male prisoners using the same identifiers as described above to match datasets A and B.

Matching hepatitis B cases with datasets D and E

To establish if co-infection with HIV had occurred amongst individuals found to be infected with hepatitis B during the first half of 1993, records from these cases were matched with those of inmates known to be positive for HIV from previous studies [3, 4] using first initial, surname soundex, and date of birth identifiers. Additionally, Scotland's HIV denominator study database [5] was searched to establish the HIV test seeking behaviour of those hepatitis B infected Glenochil men. This database features soundex, date of birth, gender, exposure category, date of HIV test, test result, source of test, date of previous HIV test, and previous test result for individuals who have sought HIV testing in Scotland from 1989 onwards.

RESULTS

Matching datasets A and B

Eight previously known symptomatic cases of acute hepatitis B diagnosed in April–June 1993 [3] were confirmed by the Department of Microbiology at SRI (Table 1, cases 2–9). Laboratory records from SRI also showed that two additional men who were incarcerated in Glenochil during the first half of 1993 had presented with acute hepatitis B infection in August and September 1993 (Table 1, cases 10, 11).

Matching datasets A and C

Scotland's hepatitis B register revealed 119 hepatitis B infections amongst men, and a further 6 infections with unknown gender, aged 15 and above in Scotland with specimen dates corresponding to the year 1993. Both surname and forename were missing for 11 of the 119 male infections, and 1 surname, 3 forenames, and 5 ages were missing for the remaining 108 male infections. SRI laboratory reported 9 hepatitis B infections amongst men aged 15 years and above in 1993 – 6 in week 44, 2 in week 45, and 1 in week 50 – all of which had complete identifying information.

Matching a list of soundexed surnames, forename initials, and dates of birth of the 636 prisoners with the hepatitis B register for 1993 identified only two cases of hepatitis B infection: the first was recorded in April 1993, tested at the Regional Virus Laboratory, Edinburgh, and was the first diagnosed case of hepatitis B (Table 1, case 1) but was not one of the

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Table 1. *Characteristics of the outbreak of hepatitis B infection in Glenochil prison, 1993*

Case number*	Sentence began (month/year)	Arrived Glenochil (month/year)	Months during first half of 1993 in Glenochil	Date of positive test result for hep B	Markers of hepatitis B		Acute infection
					sAg	cIgM	
1	NA†	NA	Jan–May	13/04/93	+	NA	NK‡
2*	06/92	07/92	Jan–Jun	15/04/93	+	+	Yes
3*	02/91	10/91	Jan–Jun	23/04/93	+	+	Yes
4*	05/90	06/91	Jan–Jun	04/05/93	+	+	Yes
5*	05/90	04/91	Jan–Jun	06/05/93	+	+	Yes
6	02/93	02/93	Feb–Jun	12/05/93	+	+	Yes
7	01/93	03/93	Mar–Jun	07/06/93	+	+	Yes
8*	05/90	06/90	Jan–Jun	16/06/93	+	+	Yes
9	06/92	10/92	Jan–Jun	17/06/93	+	NA	NK
10*	10/86	10/86	Jan–Jun	05/08/93	−	+	Yes
11*	02/92	03/92	Jan–Jun	22/09/93	+	+	Yes

* Infection acquired within Glenochil prison.
† Data not available.
‡ Not known whether an acute infection.

eight symptomatic cases of acute hepatitis B which precipitated the public health response; the second was recorded in July 1993 and although he is one of the known eight symptomatic cases of hepatitis B (Table 1, case 9) the register does not recognize the test at SRI but rather reveals another test performed at the Regional Virus Laboratory, Glasgow (the hepatitis B confirmation laboratory for SRI) shortly after the initial test at SRI.

Extent and evidence for acute hepatitis B transmission inside HMP Glenochil

For the 11 infections Table 1 lists data which provide evidence that an outbreak of hepatitis B occurred within the prison during 1993. Nine cases (Table 1, cases 2–9, 11) were known to have nausea, vomiting, jaundice, and abnormal liver function tests, and case 2 also experienced abdominal pain. The presence of hepatitis B marker core IgM antibody for 9 (Table 1, cases 2–8, 10, 11) of the 11 cases indicates acute infection and case 9, with missing data for core IgM, presented with symptoms and a positive test for surface antigen and thus is possibly also an acute infection. Case 1 carried e antigen and lacked e antibodies at the time of his test but could not be confirmed as acute without a definitive test of core IgM (data not available). The incubation period of hepatitis B averages 3 months and can last up to 6 months. Based on the dates of test results in relation to time of entry into the prison, 7 transmissions (Table 1, cases 2–5, 8, 10, 11) definitely occurred within Glenochil and 3 likely occurred there (Table 1, cases 6, 7, 9).

Matching hepatitis B cases with datasets D and E: co-infection with HIV

At least 20 prisoners were estimated to be infected with HIV during the 1993 outbreak within Glenochil prison [6], of which the medical team at HMP Glenochil and the external healthcare team between them identified 14 HIV infections [3]. Molecular epidemiological analysis has subsequently shown that 13 of the 14 had been infected from a common source [4]. Two putative sources of infection, namely S1 and S2, who are known to have acquired their infection before the outbreak in Glenochil, possessed viral sequences sufficiently different from the cluster of 13 to discount linkage [4]. Matching first initial, surname soundex, and date of birth of the 11 hepatitis B infections with records of these aforesaid 16 Glenochil inmates (14 identified infections and 2 putative sources) known to be positive for HIV during the first half of 1993 identified hepatitis B case 1 as one of the putative sources (S1) of HIV infection and hepatitis B cases 3–5, 7, and 8 as members of the Glenochil HIV cohort infected from a common source. Eight other known HIV infected individuals were not tested for hepatitis B during 1993, and two remaining known HIV infected inmates tested negative for hepatitis B surface antigen prior to their HIV positive test in 1993. One of these latter two samples also exhibited core total antibodies, suggestive of a past hepatitis B

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infection. Searching Scotland's HIV denominator study database to establish the HIV test seeking behaviour of the remaining 5 hepatitis B infected men, 2 (Table 1, cases 9 and 10) tested negative for HIV subsequent to July 1993 and the other 3 (Table 1, cases 2, 6 and 11) have no record of an HIV test up to the end of July 1997. Insufficient samples from 1993 remain to test anonymously the latter 3 hepatitis B samples and the 9 HIV infected samples (omitting one HIV seropositive sample with known past hepatitis B infection) for HIV and cIgM antibody to hepatitis B core antigen, respectively.

DISCUSSION

Eleven Glenochil inmates who acquired hepatitis B infection in April–September 1993 were identified. Nine had acute infection and two had either an acute infection or were carriers. Based on dates of test results in relation to time of entry into Glenochil, seven transmissions definitely occurred within the prison. No further acute or chronic infections were detected through the infection control exercise in July 1993 [3], when 155 inmates, 24% of 636 men imprisoned during January–June 1993, were tested voluntarily for hepatitis B surface antigen.

Only 2 of the 11 infections were reported to Scotland's hepatitis B register and one was only recognized upon re-test at a different laboratory. The voluntary reporting of laboratory hepatitis B infections in Scotland generally functions well. However, there are deficiencies in the system and sometimes there is either under-reporting or duplicate reporting of infections. An electronic network, linking Microbiology Laboratories, SCIEH and Health Board Departments of Public Health is to be established in the near future; this new system will ensure that under-reporting of infections, as observed in this investigation, will be eradicated.

In addition to the under-reporting of hepatitis B infection which this investigation has demonstrated, other aspects of hepatitis B surveillance could be improved. Periods of incarceration in the 6 months prior to testing are neither routinely asked about nor centrally reported in cases of acute hepatitis B infection. On occasion, reports of an infection related to a prison reach SCIEH; only one was made in 1993 concerning a male imprisoned at Glenochil and tested at SRI in week 50 but he was not incarcerated in Glenochil during the critical first half of 1993. During this time, a cluster of symptomatic cases of acute hepatitis B was the critical sign that inmates, practising high risk behaviours, had transmitted infection and on which the prison doctor had acted. This led to the prison authorities sanctioning a counselling and testing exercise to prevent further spread of both HIV and hepatitis B infections. If Glenochil had not had a proactive medical officer, the surveillance system at that time could not have been relied upon to identify the Glenochil cluster, and the spread of hepatitis B and HIV may have been much greater.

Thus, comprehensive surveillance of hepatitis B infection is essential if its epidemiology is to be understood, if clusters of infection are to be recognized swiftly and if appropriate and well targeted public health interventions, including hepatitis B vaccination [7, 8], are to be conducted to prevent further spread of infection.

Co-infection with HIV was detected among 6 of the 11 hepatitis B infected inmates. One HIV infected individual was considered as the source of the HIV outbreak in Glenochil but later dismissed on molecular grounds [4]. The other five are members of the Glenochil HIV cohort infected from a common source [3, 4]. Based on dates of test results in relation to time of entry into prison, 4 of the latter 5 co-infected men definitely acquired both their hepatitis B and HIV infections within Glenochil. It remains unclear as to whether the other 10 known HIV infected individuals acquired a hepatitis B infection in Glenochil during the critical first half of 1993.

Previous investigations have demonstrated that HIV spread rapidly among a cohort of inmates from a single source or along a chain [3, 4]. Establishing that all HIV-infected cases had the same virus strain, lent considerable support to the hypothesis that transmissions occurred inside the prison at approximately the same time. We did not consider it necessary to conduct a similar molecular epidemiological analysis on each of the hepatitis B infections. Because, unlike HIV, acute hepatitis B has a well defined incubation period of, on average, 3 months, it was therefore possible to ascertain that hepatitis B transmission occurred inside Glenochil prison over a short interval without the aid of the molecular approach. The fact that co-infection with hepatitis B occurred in a sub-group of this cohort suggests strongly that the dynamics of transmission for hepatitis B and HIV were similar. It is thus necessary that the prevention of hepatitis B virus infection is seen to be of continuing public health importance alongside that of HIV [1].

Vaccination against hepatitis B has been available in the UK since 1982. In the decade that followed, strategies to immunize those at higher risk of infection such as injecting drug users and homosexual/bisexual males were unsuccessful partly due to difficulties in reaching these groups and, accordingly, infection continued to spread [7, 9–12]. In England and Wales, over the period 1990–4, 24% of reports of acute hepatitis B were associated with injecting drug use, 24% with heterosexual contact, and 30% with homosexual contact in cases where exposure risk was identified [13]. Five studies in England and Wales interviewed over 1000 injectors in 1988–90 about their prison experience revealed that 55–70% had been imprisoned at some time [14–18]. In Scotland, 30% of adult male prisoners have a history of injecting drug use [19], half of whom report having injected inside prison ever [20], and one in 60 first-time prisoners who never injected on the outside is initiated into injecting drug use during his first sentence [21]. In two city-wide voluntary anonymous surveys in Glasgow [22] and Edinburgh [23], in 1990–3, 390/503 (78%) and 168/233 (72%) of injecting drug users, respectively, reported that they had been imprisoned at least once since starting to inject. Indeed prisons represent a valuable opportunity to educate drug users to the range of harm reduction measures available [24], not least an ideal environment to deliver hepatitis B immunization programmes [25].

Even though around 1% of adults who become infected with hepatitis B proceed to chronic liver disease [26], including hepatocellular carcinoma, the cost implications for health and care services are considerable. As indicated in the recent Task Force to Review Services for Drug Misusers [27], appreciable savings could be made if a significant proportion of the current population of drug misusers completed a full course of vaccination [28].

Changes in behaviour that have occurred since the onset of the HIV epidemic may have been responsible for the reported reduction in the incidence of hepatitis B infection in the UK and the USA [9, 29, 30]. However, preventive measures, such as the introduction of needle exchange schemes and ready access to condoms, are only available outside penal institutions and so the potential for transmission of bloodborne diseases within prisons is relatively greater now. Adequate methadone substitution, with drug rehabilitation programmes, in all prisons is needed to encourage injector inmates 'off injecting' [31, 32]. The Glenochil HIV and hepatitis B outbreak [3] was the catalyst for the introduction of sterilizing tablets to all Scottish prisoners in December 1993 for purposes including cleaning needles and works, and Bird and colleagues [20] have shown that injector inmates use sterilizing tablets to clean injecting equipment as often as they inject.

Recent guidelines from the UK Departments of Health recommended that all prisoners should be offered immunization against hepatitis B [33]. Higher rates of hepatitis have been reported in association with injecting while incarcerated compared with that for injecting drug users who only injected outside prison [34]. A recent study in a French prison [25] showed that 292/391 (75%) of inmates who participated required immunization against hepatitis B. In 1996 Willing Anonymous Salivary HIV (WASH) surveillance studies in two Scottish prisons [20] reported that only 4% of inmates had ever been offered vaccination against hepatitis B either outwith or in prison. Scottish prisoners have contracted hepatitis B whilst in custody, and more will do so unless a coherent prevention policy is introduced throughout the UK, which incorporates hepatitis B vaccination schedules with provision of sterilising tablets, condoms, and adequate drug detoxification and reduction regimes. There should also be a strict protocol on what to do for prisoners and on how to establish the extent of transmissions when acute hepatitis B occurs in prison.

Acute symptomatic hepatitis B in prisons is well recognized. In England and Wales, 28 such cases were reported among prisoners in 1995 and 27 in 1996, representing 55/1215 (5%) of all reported acute hepatitis B infections, or rather at most 55/221 (25%) since data on referral source were missing on 994 of the 1215 reported hepatitis B cases for these years, whereas prisoners represent approximately 0·1% of the population (personal communication, Dr Mary Ramsay). While it is acknowledged that appreciable hepatitis B infection occurs inside the prison setting there is little reported evidence of prison transmission [35, 36]. Therefore the authors believe that the outbreak of hepatitis B in Glenochil prison is the first of its kind to be reported but not the first to have occurred.

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