Outbreak of HIV infection in a Scottish prison

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Abstract

***Objectives*—To investigate the possible spread of HIV infection and its route of transmission among prison inmates.**

***Design*—In response to an outbreak of acute clinical hepatitis B and two seroconversions to HIV infection, counselling and testing for HIV were offered to all inmates over a two week period in July 1993. Information was sought about drug injecting, sexual behaviour, and previous HIV testing.**

***Setting*—HM Prison Glenochil in Scotland.**

***Subjects*—Adult male prisoners.**

***Main outcome measures*—Uptake of HIV counselling and testing; occurrence and mode of HIV transmission within the prison.**

***Results*—Of a total 378 inmates, 227 (60%) were counselled and 162 (43%) tested for HIV. Twelve (7%) of those tested were positive for antibody to HIV. One third (76) of those counselled had injected drugs at some time, of whom 33 (43%) had injected in Glenochil; all 12 seropositive men belonged to this latter group. Thirty two of these 33 had shared needles and syringes in the prison. A further two inmates who injected in the prison were diagnosed as positive for HIV two months previously. Evidence based on sequential results and time of entry into prison indicated that eight transmissions definitely occurred within prison in the first half of 1993.**

***Conclusion*—This is the first report of an outbreak of HIV infection occurring within a prison. Restricted access to injecting equipment resulted in random sharing and placed injectors at high risk of becoming infected with HIV. Measures to prevent further spread of infection among prison injectors are urgently required.**

Introduction

Several studies have reported that HIV infection is prevalent among prisoners[1-5] and that drug injecting occurs within prisons.[6-12] While it has been conjectured that sharing needles and syringes has resulted in epidemic spread of HIV within prisons, however, to date no evidence exists to support this. When transmission has been detected rates of seroconversion have been under 1% per prison year,[13] and relevant behavioural data are often lacking.

Between April and June 1993 eight symptomatic cases of acute hepatitis B infection together with two seroconversions to HIV infection were detected among inmates of HM Prison Glenochil in Scotland. Reports of drug injecting and needle and syringe sharing were also received by the prison doctor. This precipitated a public health response which entailed HIV counselling and testing over a two week period beginning at the end of June 1993; the findings are reported here.

Methods

The principal aim was to offer prisoners counselling and testing for HIV infection if appropriate and to inform them firstly, of the risks of transmitting blood-borne infections through sharing needles and syringes and, secondly, of measures which could be taken to prevent spread of infection. Although the opportunity for HIV testing already existed through the prison medical service it was considered that more intensive counselling and testing were necessary.

The initiative was coordinated by a multidisciplinary working group in association with governors and officers from Glenochil Prison, and authorisation and guidance were provided by senior staff from the Scottish Prison Service. The day before the initiative began inmates in the four prison halls were spoken to by counsellors and told that some prisoners had became ill with hepatitis B infection, possibly as a result of sharing needles and syringes. Accordingly, voluntary confidential counselling and testing for both hepatitis B and HIV infections were to be offered to every prisoner. During this period an embargo was placed on the movement of prisoners to and from other prisons; only a few inmates whose release date coincided with the initiative were allowed to leave.

Information sought during counselling was restricted to what is normally collected as part of routine clinical practice. Analysis of demographic and behavioural data and test results was performed at the Scottish Centre for Infection and Environmental Health by using SPSS software.

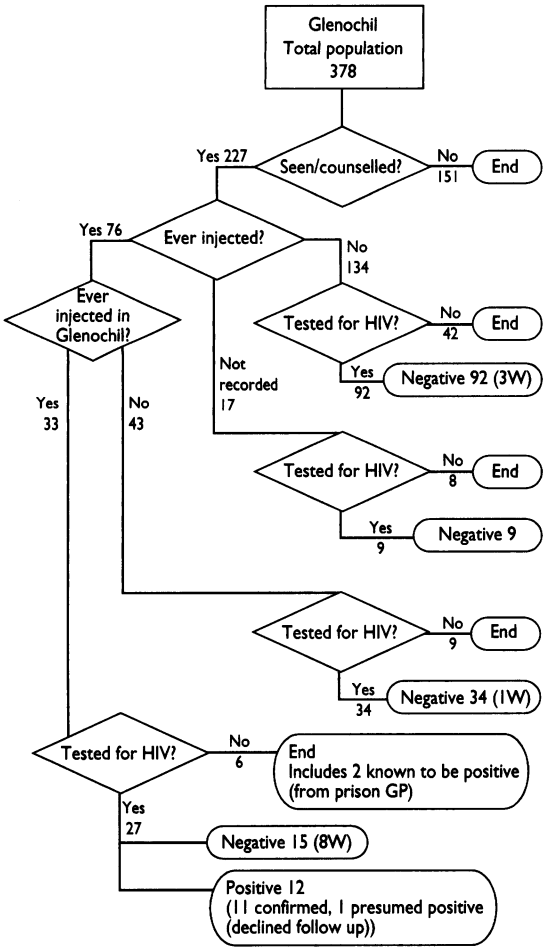
Blood for HIV testing was sent to the regional virus laboratory at Ruchill Hospital. Initial testing was performed by using an HIV 1 and 2 enzyme linked immunosorbent assay (ELISA; Abbott Laboratories, third generation) with reactives confirmed by western blotting (Cambridge Biotechnology, Ortho Diagnostics). HIV antigen was detected and reactives confirmed by neutralisation with the p24 antigen ELISA (Coulter Corporation).

Test results and counselling were given one week later. In a few cases arrangements were made with the prison doctor for second tests, either because the specimen had been taken during the "window period" (a period of less than three months having elapsed since the last high risk exposure) or because the western blot had shown an early banding pattern suggestive of seroconversion but was not definitive enough for diagnostic purposes.

Results

COMPLIANCE WITH COUNSELLING AND HIV TESTING (FIGURE)

There were 636 inmates in Glenochil at some time between 1 January and 30 June 1993. By the time of the exercise, however, 66 had been released and 192 transferred to other prisons. Of the remaining 378, 227 (60%) came forward for counselling. Of those who accepted counselling a greater proportion were aged between 21 and 29 years compared with age 30 and above (65% (159/244) *v* 51% (68/134)). The prison, however, was not a homogeneous unit; it comprised 11 subunits, and for each the uptake for counselling varied from as low as 43% in one to as high as 84% in another. In the absence of any contact with the 151 who declined counselling it is impossible to venture a considered opinion on full epidemiological differences,



Flow chart of testing for HIV and counselling in HM Prison Glenochil. W=window period—that is, less than three months having elapsed since last high risk exposure. GP=general practitioner

including category of risk, between the two groups. Anecdotal reports, however, suggested that many of those who had declined counselling were injectors from a subunit in which injecting was particularly prevalent.

HIV TRANSMISSION (FIGURE)

Of the 227 counselled, 162 (71%) opted to be tested for HIV infection. Twelve of the 162 (7%) were diagnosed seropositive, and 12 were in the window period at the time of sampling. One third (76) of those counselled had injected drugs at some time, of whom 33 (43%) reported injecting in Glenochil; all 12 seropositive men were among the 27 in this latter group who were tested for HIV. The prevalence of HIV infection among the 27 who had injected in Glenochil and who were tested was 44% (12/27). Two other inmates, diagnosed two months previously as infected with HIV and who did not participate in the counselling exercise, also reported injecting in Glenochil.

No infected men were identified among the 34 tested injectors who had not injected in Glenochil or among the tested non-injectors. Thus, even with only 43% (162/378) of inmates undergoing HIV testing, there was an extremely strong association between inmates becoming infected and the practice of injecting within the prison during the early months of 1993 ($P<0.01$ for HIV among those injecting in Glenochil compared with HIV among drug users not injecting in Glenochil).

No attempt was made to look for predictors of HIV among the 27 tested injectors who had injected in Glenochil because small numbers were involved; there was a high probability that many who had injected in Glenochil did not come forward for counselling and testing; and of the 15 seronegative men, eight were tested during the window period.

For the 14 infected cases table I lists data which provide definitive evidence that an outbreak of HIV occurred within the prison during the first half of 1993. Based on the dates of results of HIV tests in relation to time of entry into the prison, six transmissions (cases 1, 3, 4, 9, 10, and 12) definitely occurred within Glenochil and another two (cases 6 and 7) probably in Glenochil but possibly in another prison before transfer. In six of the cases (1, 3, 6, 7, 9, and 12) western blot testing of sequential specimens taken within a three month period showed the transition from an early to a complete banding pattern of nine proteins specific for HIV, thus confirming seroconversion.[14] Although p24 antigenaemia is transient during seroconversion, its presence in five of these six cases further supports the case for recent HIV infection. Cases 6 and 12 also experienced acute symptoms of primary HIV infection. The transition from an early to a complete banding pattern on western blot was not observed in two cases (4 and 10), but each had a previous negative test result at least three months after admission to Glenochil.

All but one of the seropositive men came from Glasgow; all but one were under 29 years of age; and all had injected and shared needles and syringes during one or more of the first six months of 1993.

INJECTING AND SHARING NEEDLES AND SYRINGES

Of the 76 inmates who claimed to have injected at some time, seven began injecting while serving their current sentence (two of these were diagnosed seropositive), four of these seven injected less than once a month, information was missing for the three others. All seven always injected with used equipment. Of the 69 who had injected outside prison, 26 continued to do so in Glenochil. For these 26, frequency of injecting outside prison tended to be daily compared with

TABLE I—*Data to support case for outbreak of HIV infection in Glenochil prison in 1993*

Case No	Sentence began (month/year)	Arrived Glenochil (month/year)	Most recent negative results of test for HIV infection (month/year)	Early banding pattern on western blot testing* (month/year)	First positive result of test for HIV infection (month/year)	HIV antigen (at time of ELISA) reactive result) (pg/ml)	Symptomatic primary HIV infection	Definite evidence for HIV infection in prison	Months during first half of 1993 of injecting and sharing
1	9/88	7/91	NA	6/93	8/93	12	No	Yes	Jan-May
2	12/91	3/92	7/91	NA	6/93	0	No	No	May
3	5/90	4/91	NA	6/93	7/93	0	No	Yes	Jan/-Mar
4	5/90	6/90	9/91	NA	6/93	0	No	Yes	Jan-Apr
5	1/92	9/92	NA	NA	6/93	0	No	No	Jan-Mar
6	9/92	3/93	NA	5/93	6/93	191	Yes	Yes	Mar-May
7	9/92	2/93	NA	3/93	5/93	127	No	Yes	Feb-Apr
8	9/91	3/92	NA	6/93	†	NA	No	No	Jan-Feb
9	5/90	6/91	NA	5/93	5/93	14	No	Yes	Jan-Jun
10	2/91	10/91	2/93	NA	6/93	0	No	Yes	Jan-Jun
11	2/90	4/90	7/89	NA	5/93	0	No	No	Jan-Apr
12	3/91	5/92	NA	4/93	6/93	290	Yes	Yes	Jan-Apr
13	1/93	3/93	NA	NA	6/93	0	No	No	Jan-Apr
14	NA	0/91	NA	NA	6/93	0	No	No	Jan-May

*By definition HIV negative but ELISA reactive and early banding pattern on western blot highly suggestive of early seroconversion. †Patient declined a repeat test. NA=data not available.

weekly or monthly or even less than monthly while inside ($P<0.001$) (table II). Even more striking were the differences in sharing needles and syringes before and after their sentences; only two always injected with used equipment outside prison as opposed to at least 20 inside ($P<0.001$). Indeed all those who had injected in Glenochil and for whom information was available (32/33) had shared needles and syringes there. For the 12 injectors infected with HIV who had injected both inside Glenochil and outside prison, eight never did so with used equipment outside while 10 always shared inside. Some prisoners informed counsellors that between 20 and 30 inmates had often used the same needle and syringe in recent months.

Thirty one of the 32 who had shared needles claimed that they always cleaned their equipment before use,

TABLE II—*Drug injecting behaviour among 26 intravenous drug users who had injected in Glenochil and before imprisonment*

Frequency of injecting	During six months before sentence	While in Glenochil
No of men	24*	22†
No (%) who injected:		
Daily	22 (92)	1 (4)
Weekly/monthly	1 (4)	9 (41)
Less than monthly	0 (0)	12 (55)
Never	1 (4)	0 (0)
No of men	23‡	25§
No (%) who injected with used equipment:		
Always	2 (9)	20 (80)
Sometimes	9 (39)	5 (20)
Never	12 (52)	0 (0)

*Information missing for two men.
†Informtion missing for four men.
‡Informtion missing for two men and for one man not applicable (never injected).
§Information missing for one man.

the other man doing so sometimes. The usual cleaning methods used were mostly ineffective: 17 usually rinsed the needle and syringe with hot or cold water, three used hairdressing liquid, three used bleach, one used boiling water, and seven used a combination of techniques (information missing for one case). Case 7, who definitely contracted HIV infection in Glenochil, claimed he always cleaned the needle and syringe with bleach before injecting.

SEXUAL PRACTICES

Of the 227 counselled, one non-injector admitted to having had sex with another man during his current sentence in Glenochil. In the 12 months before their sentences began the 33 inmates who had injected in Glenochil reported having had a median of three female sexual partners; all except one (no information) said they never used condoms.

Discussion

This is the first report which provides definitive evidence for an outbreak of HIV occurring within a prison. Sharing needles and syringes was undoubtedly the behaviour responsible. Eight transmissions definitely occurred in prison during the first half of 1993, and a further six possibly took place. An unknown number were not identified because some injectors declined counselling and testing while others were not approached because they had been released or transferred from Glenochil during the period of high exposure. The primary objective of the counselling exercise, however, was to prevent further spread of infections and not to determine prevalence of HIV infection in a way similar to that of other recent surveys in Scottish prisons.[2,15]

The absence of reliable prevalence data for inmates of Glenochil is offset by the unique findings of incident HIV infection there. Although some behavioural studies support the belief that prisons throughout the world might be fertile environments for the spread of HIV, hitherto such spread has been shown only rarely. In the United States Castro *et al* observed eight HIV seroconversions a year among 2390 susceptible inmates of correctional facilities during 1988 to 1990.[16] Horsburgh *et al* reported two seroconversions occurring among inmates during their period of incarceration, but in both cases infection could have occurred before entry.[17] Kall and Olin record an HIV incidence of about 1% among injectors recruited for study at the remand centre in Stockholm during 1987 to 1988,[18] but similarly definitive evidence for infection having occurred inside prison was lacking. Various studies of behaviour and prevalence of HIV in injecting drug users have shown that a period of imprisonment is an independent predictor of being positive for HIV, though they were unable to determine if transmission occurred there.[19-22]

This paucity of evidence for infection in prison is probably accounted for by the difficulties in determining the time of HIV seroconversion in relation to the period of incarceration rather than by the rarity of the event. Only if an HIV seropositive person has had western blot tests on sequential specimens, showing the transition from an early to a complete banding pattern, or a previous seronegative result with the interval between tests being relatively short can the time of infection be elucidated with any accuracy. At Glenochil a cluster of cases of acute hepatitis B infection was the critical sign that inmates were practising high risk behaviours. This, coupled with the evidence that HIV seroconversions were occurring, led to the prison authorities encouraging and sanctioning the counselling and testing exercise.

Thirteen of the 14 men positive for HIV infection came from Glasgow, a city with an estimated 8400 current injectors where the prevalence of HIV infection was found to be 1·8% (8/457) in a community wide survey conducted in 1990[23]; as most of the seropositive cases in that study already knew they were infected the incidence of "new" HIV infections was estimated to be extremely low at between 0 and 0·2 per 100 person years. During 1991, 1992, and 1993 prevalence remained stable at 1·2%, 1·0%, and 0·6%, respectively. The city's extensive needle and syringe exchange scheme, instigated in 1988, seems to have prevented the circumstances which predispose to rapid spread observed, for example, in New York,[24] Edinburgh,[25] Bangkok,[24] Manipur State,[26] and Rangoon.[27] Rapid spread of HIV occurs in settings where injectors share equipment randomly,[24] usually because of restricted availability of needles and syringes, and lack of awareness about transmission of bloodborne infection.

In Glenochil during early 1993 HIV spread rapidly among prison injectors, almost all of whom shared needles and syringes at that time. Reports of between 20 and 30 inmates using the same needle and syringe indicate that random sharing occurred. The methods used by prison injectors to clean their injecting equipment were mostly unsatisfactory; even bleach, used by a few in Glenochil and still regarded as the virucidal agent of choice, may not always be used effectively.[28] Prison injectors seemed to be aware of the risks involved, however, as they all attempted to clean their needles and syringes inside prison, and only a few reported sharing equipment during their most recent six months' period outside.

Usually the consequences of rapid spread become apparent long after the event, but at Glenochil the investigation was virtually contemporaneous with the incident. This provided the rare opportunity of collecting information about recent risk behaviours which, for some inmates, coincided with HIV transmission events. Furthermore, serum samples showing distinct

Key messages

- Rapid spread of HIV infection among injecting drug users can occur within prisons
- In this outbreak, acute hepatitis B was the earliest indicator of the possible occurrence of HIV transmission
- All infected inmates had shared injecting equipment within the prison
- Random sharing of equipment may still occur in settings where access to sterile needles and syringes is restricted

viraemia (expressed as HIV antigen) were obtained from some prisoners who had just become infected. In the context of the rapid spread of HIV which occurred in Glenochil this observation supports the view that people can be particularly infectious shortly after exposure.[29] Thus it is likely that the presence of high levels of circulating virus among some inmates who practised random sharing with and ineffective cleaning of a limited number of needles and syringes constituted a potent cocktail of factors which permitted the rapid spread of HIV.

As with that for HIV prevalence, information concerning the prevalence of risk behaviours should be interpreted with caution because of the counselling exercise's comparatively high rate of non-participation. Twenty six (38%) of 69 inmates who had injected before imprisonment also injected in Glenochil—a proportion which lies within the range of previous findings from behavioural surveys conducted in prisons in the United Kingdom.[6 30]

As some injectors discontinue their injecting while in prison, incarceration may have a protective effect on their health. The restricted access to drugs and injecting equipment, which was probably responsible for the cessation of injecting by some inmates in Glenochil, however, did not prevent seven from injecting for the first time there and placed all of those who did inject in prison at high risk of contracting infections. This is manifested by the extraordinarily high incidence of sharing needles and syringes among the 33 prison injectors. Sexual intercourse between men did not feature as an important risk behaviour in Glenochil. Not one of the 33 prison injectors, however, reported using condoms with their female sexual partners in the 12 months before imprisonment. In addition to the dangers of further spread of HIV among injectors inside and later outside prison, there is clearly considerable potential for the dissemination of infection into the wider heterosexual population after release.

Issues relating to the prevention of spread of HIV infection among and from injecting inmates are beyond the scope of this paper and will be tackled elsewhere. Urgent consideration, however, must be given to this problem. Injecting drug users spend large parts of their lives in prison. The effort and imagination that has already been expended on preventing HIV transmission among injectors outside the prison setting should be afforded to the prevention of spread of infection inside.

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