

# Prevalence of antibodies to hepatitis C virus, HIV and human T-cell leukaemia/lymphoma viruses in injecting drug users in Tayside, Scotland, 1993–7

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## SUMMARY

The prevalence of blood-borne viruses in injecting drug users (IDUs) in Tayside, Scotland was determined by testing serum samples from IDUs who underwent attributable HIV antibody testing during 1993–7. The prevalence of antibodies to HIV was 29/802, (3·6%); to hepatitis C virus (HCV) 451/691, (65·3%); and to human T-cell leukaemia/lymphoma viruses type 1 and 2 (HTLV) 0/679, (0·0%). The prevalence of HIV and HCV antibodies were higher in subjects over the age of 25 ( $P = 0·03$  and  $P = 0·001$ , respectively). During 1993–7 the prevalence of HCV fell only in younger female IDUs ( $P < 0·01$ ). HIV prevalence has declined dramatically since 1985, when a rate of 40% was recorded in similar populations. Harm reduction measures have failed to control HCV the spread of infection among IDUs in Tayside, as indicated by the high proportion of antibody positive IDUs, particularly males under the age of 25. Future studies should address the nature and effective reduction of continuing risk taking among IDUs in Tayside.

## INTRODUCTION

Determining the prevalence of blood-borne viruses (BBV) in injecting drug user populations is important because these infections are a considerable cause of morbidity and mortality in this group. Furthermore the success of interventions designed to minimize the risks of blood borne virus infection in IDUs can only be evaluated by gathering data. In Tayside, Scotland in 1986 the prevalence of HIV infection in IDUs who had undergone an attributable HIV test was 40·2% [1]. This remains the second highest recorded prevalence of HIV among a cohort of injectors in the United Kingdom, a rate that has only been exceeded by the 51% observed among a general practice cohort in Edinburgh during 1985 [2]. Other BBVs that IDUs are at increased risk of infection with include HCV and HTLV [3, 4]. Drug misuse was common in

Tayside in the 1990s [5]. This report determines the antibody prevalence of these three viruses and analyses trends during the period 1993–7. There are no other data on the prevalence of HTLV infection in Scottish IDUs.

## METHODS

Samples of serum for attributable HIV antibody testing from IDUs formed the basis for this study. The samples were received in the sole laboratory in Tayside providing such a service during 1993 and the period 1995–7. Since 1989, the Scottish Centre for Infection and Environmental Health (SCIEH) has held epidemiological data on all persons who have had a named HIV antibody test in Scotland [6]. These data are collected through the use of a national HIV test request form that accompanies the blood specimen for HIV testing to the appropriate laboratory [6]. The

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data, including the patient's HIV test result, are entered onto a database and sent to SCIEH for collation and analysis. Data items held at SCIEH, include the laboratory number of the test, soundex code of surname, date of birth, gender, area of residence, date of specimen and risk category (e.g. injecting drug user).

At SCIEH, we identified all records which belonged to individuals who, according to their HIV test request form, had indicated that they had injecting drugs and had undergone named HIV antibody testing in Tayside Health Board area during the period 1993 and 1995–7. These routinely collected records and their test results are the source of the HIV prevalence data. A list of laboratory numbers, each corresponding to an eligible record, was generated; each number was then aligned to an adhesive label that bore a code, indicating the patient's age band and gender. Lists of laboratory numbers and codes were sent from SCIEH to the Department of Medical Microbiology in Ninewells Hospital & Medical School, Dundee, Tayside. Using the laboratory numbers, a search was conducted to identify residual sera from injectors that had been stored following their HIV antibody tests. Sera were decanted into vials onto which corresponding coded labels were attached. Thus, sera that would now be tested for antibodies to HCV and antibodies to HTLV were held in containers that had no information attached to them other than the gender and the 5-year age band of the patient they belonged to. These samples formed the basis for an unlinked anonymous retrospective prevalence survey of HCV and HTLV antibodies. Thus, HIV data were collected routinely on all IDUs in Tayside undergoing HIV antibody testing whereas HCV and HTLV data were collected retrospectively by unlinked anonymous testing of residual samples collected for named, routine HIV tests.

HIV testing was recorded on 802 samples. Of these samples, sufficient serum remained for retrospective testing for HCV in 691 samples and then HTLV testing on 679 samples. Forty-six per cent of samples came from subjects with a home address in Dundee City.

HIV screening and confirmation was performed in accordance with established good laboratory practice [7]. Our laboratory is accredited for this purpose. Screening of samples was by a commercial enzyme immunoassay and confirmation of reactive samples by a second immunoassay, a gel particle agglutination assay and an immunoblot assay.

Samples were screened for HCV antibody using Ortho Diagnostics HCV 3.0 ELISA (Chiron Corporation, Emeryville, CA, USA) and the confirmation assay was the (new antigens) Monolisa anti HCV (Sanofi Pasteur Diagnostics, Marnes-la-Coquette, France). Assays were performed in accordance with manufacturer's instructions. Only samples reactive on both assays were regarded as positive [8, 9].

Specimens were tested for HTLV 1 and 2 antibodies according to an algorithm previously agreed by the HTLV European Research Network [4]. The algorithm dictates that the specimens are tested by assays that detect antibodies to both HTLV 1 and 2. If one screening assay proves positive then the specimen is tested by a second screening assay. Samples testing negative on the second screening assay are reported as negative. Samples reactive on both screening assays should be confirmed and subtyped as HTLV 1 or HTLV 2 antibody by immunoblot techniques.

Samples were screened using the Serodia-HTLV 1 passive particle-agglutination test manufactured by Fujirebio Inc., Tokyo, Japan and reproducible positives by this assay were retested using the HTLV 1 + 2 qualitative enzyme immunoassay manufactured by Murex (supplied by Abbot Laboratories, Maidenhead, England).

Ethical approval was obtained from the Tayside Medical Research Ethics Committee. Statistical analysis used Fisher test and  $\chi^2$  test for linear trends as appropriate.

## RESULTS (summarized in Tables 1 and 2)

Twenty-nine of 802 samples tested for HIV antibodies were confirmed positive. HIV prevalence during 1993–7 was, therefore, 3.6% (95% CI 2.4–5.1%). HIV prevalence was higher among IDUs aged greater than or equal to 25 than in those aged less than 25 years (4.6% c.f. 1.3%;  $P = 0.03$ ). The prevalence in samples from male and female subjects was not significantly different (4.0% c.f. 2.6%;  $P = 0.36$ ). The HIV prevalence in 1993 was not significantly different from that in 1997 ( $P = 0.79$ ). The prevalence in 1993 was not significantly different from that in 1997 even when only samples from subjects aged less than 25 years were considered ( $P = 0.97$ ).

Of the 691 samples tested, 451 were confirmed positive for HCV antibody. HCV antibody prevalence was, therefore, 65.3% (95% CI 61.6–68.8%). HCV

Table 1. HCV antibody prevalence among injecting drug users in Tayside, Scotland (1993–7)

Age	1993			1995–6			1997		
	<i>n</i>	+ve	% of <i>n</i>	<i>n</i>	+ve	% of <i>n</i>	<i>n</i>	+ve	% of <i>n</i>
<b>Males</b>									
< 25	33	18	54.5	90	39	43.3	24	14	58.3
≥ 25	65	50	76.9	209	155	74.2	91	67	73.6
Total*	99	69	69.7	306	198	64.7	116	82	70.7
<b>Females</b>									
< 25	14	9	64.3	23	8	34.8	9	1	11.1
≥ 25	20	15	75.0	64	44	68.8	36	22	61.1
Total*	35	25	71.4	89	53	59.6	46	24	52.2
<b>Total</b>									
< 25	47	27	57.4	13	47	41.6	33	15	45.5
≥ 25	85	65	76.5	273	199	72.9	127	89	70.1
Total*	134	94	70.1	395	251	63.5	162	106	65.4

\* Total consists of subjects aged '< 25' years, '≥ 25' years and subjects where age was unknown.

$\chi^2$  test for linear trend (1993–7):

Males < 25 years:  $\chi^2$  trend = 0.04,  $P = 0.8$ ; ≥ 25 years:  $\chi^2$  trend = 0.2,  $P = 0.6$ ; total:  $\chi^2$  trend < 0.001,  $P = 1.0$ .

Females < 25 years:  $\chi^2$  trend = 6.7,  $P = 0.01$ ; ≥ 25 years:  $\chi^2$  trend = 1.1,  $P = 0.3$ ; total:  $\chi^2$  trend = 3.1,  $P = 0.08$ .

Total < 25 years:  $\chi^2$  trend = 2.2,  $P = 0.1$ ; ≥ 25 years:  $\chi^2$  trend = 1.0,  $P = 0.3$ ; total:  $\chi^2$  trend = 0.9,  $P = 0.3$ .

Table 2. HIV antibody prevalence among injecting drug users in Tayside, Scotland (1993–7)

Age	1993			1995–6			1997		
	<i>n</i>	+ve	% of <i>n</i>	<i>n</i>	+ve	% of <i>n</i>	<i>n</i>	+ve	% of <i>n</i>
<b>Males</b>									
< 25	54	1	1.9	91	0	0.0	24	1	4.2
≥ 25	109	7	6.4	220	9	4.1	100	6	6.0
Total*	164	8	4.9	318	9	2.8	125	7	5.6
<b>Females</b>									
< 25	20	1	5.0	26	0	0.0	10	0	0.0
≥ 25	32	1	3.1	65	1	1.5	38	2	5.3
Total*	53	2	3.8	93	1	1.1	49	2	4.1
<b>Total</b>									
< 25	74	2	2.7	117	0	0.0	34	1	2.9
≥ 25	141	8	5.7	285	10	3.5	138	8	5.8
Total*	217	10	4.6	411	10	2.4	174	9	5.2

\* Total consists of subjects aged '< 25' years, '≥ 25' years and subjects where age was unknown.

antibody prevalence was higher among IDUs aged greater than or equal to 25 than in those aged less than 25 years (72.8% c.f. 46.1%;  $P < 0.0001$ ). The prevalence in 1993 was not significantly different from that in 1997 even when only samples from subjects aged less than 25 years were considered ( $P = 0.45$ ); however the prevalence in samples from female subjects aged less than 25 fell significantly during the study period ( $P = 0.01$ ). The prevalence in 1997 was lower in females than among males when subjects of all ages ( $P$

= 0.04) and those aged less than 25 ( $P = 0.02$ ) were considered.

HTLV antibody screening of 679 serum samples found 5 samples that tested repeatedly reactive by the Serodia-HTLV1 assay. Two of the specimens had a titre of 32, one each of 64, 128 and 512. All five tested as negative by the Murex enzyme immunoassay. All samples were therefore regarded as HTLV 1 and 2 antibody negative. The prevalence of HTLV antibodies was 0.0% (95% CIs 0.0–0.5%).

## DISCUSSION

The injecting population studied was a selected one but the criteria for individuals being eligible for entry into the study – having undergone a named HIV test and reported injecting drug use – remained consistent over the period of investigation. Also, because of the anonymous nature of the study, participation bias was not an issue. Testing was performed in the order HIV (802 tests), HCV (691 tests) and HTLV (679 tests). A block of samples from 1993 went missing before the HCV and HTLV testing could be completed and this accounts for almost all the change in numbers of samples. Since this was a random event it is unlikely to bias our results. Each individual sample tested came from an individual declared to be an IDU. It is impossible to know if this represents current or past injecting, though it is likely that injecting occurred close to the time of the test request since most tests are conducted because the individual is worried about being infected with HIV.

To interpret the results of this study, it is important to know when certain ‘harm reduction’ interventions, targeted at injectors in Tayside, were introduced. In 1988, the UK Department of Health approved the establishment of needle/syringe exchange facilities throughout England, Wales, Scotland and Northern Ireland [10]. By making injecting equipment freely available to injectors it was hoped that the epidemic spread of HIV, which had already occurred among the injecting populations in Tayside and Edinburgh [1], during the early to mid 1980s, would not be repeated anywhere in the United Kingdom. Since the introduction of needle/syringe exchange, no epidemics of HIV have been identified in any community-based population of injectors in the United Kingdom; one outbreak of HIV among injector inmates of HMP Glenochil in central Scotland did occur [11] but otherwise, infections have been sporadic. It is perceived widely that needle/syringe exchanges, of which there are several hundred in the United Kingdom, have led to a reduction in the frequency with which injectors share injecting equipment and, thus, the prevention of HIV in this population [12–16].

HIV prevalence among IDUs from Tayside who underwent an attributable HIV antibody test reached a plateau of 3.6% during the period 1993–7; this is a dramatic reduction from the HIV prevalence reported among a similar cohort in 1985 (99/246, 40.2%;  $P < 0.0001$ ) [1]. This decline in HIV prevalence

occurred during a period in which harm reduction measures, in particular needle and syringe exchange and methadone substitution therapy, were implemented and developed in Tayside. The low prevalence of HIV among the under 25-year-old IDUs during 1993–7 (3 of 225, 1.3%) indicates that the incidence of HIV among IDUs was generally low. Sharing of injecting equipment was most common locally between 1982 and 1987, but evidence of residual risk taking remains [17].

The HCV antibody prevalence among IDUs from Tayside was 18-fold greater than that for HIV. There are no data on the prevalence of HCV antibodies among IDUs in the mid-1980s. Accordingly it is impossible to ascertain whether the introduction and development of needle and syringe exchanges, and other harm reduction measures, have been associated temporally with any reduction in HCV antibody prevalence beyond that seen in young female injectors between 1993 and 1997. However, it is evident that these interventions have failed to control HCV transmission effectively. If harm reduction measures were having an appreciable effect on the incidence of HCV acquisition it might be anticipated that the prevalence of HCV would fall first in the youngest cohort of IDUs; this trend was only observed in young females. Females however represented only 25% of the study cohort. The absence of a decline in HCV antibodies among young male injectors is a particular cause for concern. Data on needle and syringe exchange usage in Tayside show that the number of sets of injecting equipment issued from community pharmacists and a specialist harm reduction centre rose by 73% in the period 1994–7 (17272 sets in 1994 and 29804 sets in 1997). It is impossible, however, to determine from existing data whether or not female IDUs are making more effective use of equipment from exchange facilities than male IDUs. The observation of a lower prevalence in female than male IDUs of all ages in 1997 and a greater decline in prevalence of HCV antibodies in young female injectors than young male injectors between 1993 and 1997 has not been observed in similar studies in Edinburgh and Glasgow [16, 18]. More research must be directed to confirm this pattern and explain why current interventions might be effecting safer injecting practices among female injectors. New, more effective intervention packages are urgently required to reduce the spread of HCV in Tayside’s IDU population.

That HIV transmission is more easily interrupted

than HCV transmission is consistent with the tenfold lower infectivity of HIV in needlestick injuries [19].

There is no evidence of HTLV infection among IDUs in Tayside. The only other study of HTLV prevalence in a cohort of IDUs in the United Kingdom was conducted in North London in 1991. The HTLV prevalence in our cohort is significantly lower than the 5.2% (5/96) prevalence reported in North London ( $P = 0.03$ ) [4]. However, the detail of the assay methods used in the North London study have not been published and may not be comparable to ours. The North London study was performed before the HTLV European Research Network published their consensus view of HTLV antibody assay methods [4]. The assay used for screening in our study has a sensitivity of 100% for both HTLV 1 and HTLV 2 [4]. The screening assay will not, therefore, have missed any infected subjects among our 679 samples tested and a sample of this size excludes an HTLV prevalence of 0.5% or greater.

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