Unlinked Anonymous Screening for

HIV Surveillance in Hong Kong 1990-1996

Scientific Committee of the Advisory Council on AIDS

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EXECUTIVE SUMMARY

In Hong Kong, HIV surveillance is conducted and coordinated by the Department of Health, under the auspices of the Scientific Working Group on AIDS (before 1993) and the Scientific Committee on AIDS (after 1993). A voluntary reporting system was first started in 1985 to monitor the local HIV/AIDS epidemics. In 1989, the World Health Organization recommended unlinked anonymous screening (UAS) as a supplement. The essential characteristics of UAS are: (a) specimens for UAS are taken from those for other purposes for which consent have been obtained, (b) all personal identifying particulars are removed prior to testing, and (c) there is no possible way of tracing back the results to individual person. Since 1990, unlinked anonymous screening has been undertaken in Hong Kong to determine HIV prevalence in selected groups so as to facilitate design, implementation and monitoring of public health programmes for the prevention, control and care of HIV infection and AIDS.

Based on the principles proposed by the WHO and the local Scientific Committee on AIDS, UAS has covered two categories of populations: (i) people vulnerable to HIV due to their behaviours, and (ii) those who are at lower or general risk. The former includes drug users attending the methadone clinics, street drug users, and correctional institute inmates while the latter group comprises patients with tuberculosis, pregnant women having deliveries in hospitals and male government recruits. Apart from blood, urine and saliva specimens have been employed for this purpose, depending on the specific setting of specimen collection for individual target groups.

As of the end of 1996, a total of 64,857 tests have been performed, including 41,845 blood samples (29,952 neonatal cord blood and 11,893 adults), 21,417 urine specimens and 1595 saliva samples. Cumulatively 28 samples were detected HIV positive. The overall annual HIV prevalence stood at below 0.12% though a small absolute rise was noted in recent 3 years, especially for prison inmates and tuberculosis patients. Prevalence among drug users was found to be similar to those with low or general risk. Participation bias was minimised by UAS though selection bias still exists.

These data echoed the finding, from other sources, of low HIV seroprevalence thusfar in Hong Kong. Nevertheless, a steadily increasing trend is noted.

INTRODUCTION

The World Health Organisation defined public health surveillance as the collection of information of sufficient accuracy and completeness regarding the distribution and spread of infection to be pertinent to the design, implementation or monitoring of prevention and control programmes and activities. HIV infection is a superb example of depicting the importance of surveillance of a communicable disease. Epidemiological surveillance of HIV has become an essential component of the AIDS programme in many countries or places, for achieving the purposes of strategic planning on the provision of appropriate, accessible and quality service as well as educational activities for the control of the disease and its impacts.

The Hong Kong government started its AIDS programme in 1984, a few months before the diagnosis of the first local AIDS patient. In 1985, the introduction of the HIV antibody test led to the introduction of the surveillance programme in Hong Kong. At that time, a voluntary reporting system of HIV/AIDS was established within the Department of Health (the then Medical & Health Department) to monitor the epidemic. Though not a notifiable disease by law, medical practitioners are encouraged to voluntarily report cases of HIV infection and AIDS. Epidemiological surveillance of HIV was later supplemented by voluntary HIV testing of specific target groups, such as sexually transmitted diseases (STD) clinic - Social Hygiene Clinic- attendees. To further augment the capacity of HIV surveillance, a third component - unlinked anonymous screening (UAS) - was introduced in November 1990, under the auspices of the then Scientific Working Group on AIDS, after endorsement by the Advisory Council on AIDS (ACA). The Scientific Working Group was subsequently renamed Scientific Committee on AIDS (SCA) in 1993. This report presents the findings and experience of UAS as a supplementary public health tool to monitor the HIV epidemic in Hong Kong from 1990 to 1996.

OBJECTIVES

The objectives of undertaking the unlinked anonymous screening in Hong Kong are to determine the HIV prevalence in selected community groups and monitor the temporal changes in these populations, for the purpose of better understanding of the local epidemic. The characterisitcs of this method is the minimization of participation bias in tested groups compared to other surveillance methods.

METHODOLOGY

Principle

In 1989, Global Programme on AIDS of World Health Organization (WHO) established an international guideline proposing unlinked anonymous screening for public health surveillance of HIV infection. In that document, UAS was defined as "the testing of specimens for markers of infection after elimination (unlinking) of all personal identifying information from each specimen"[1]. The Scientific Working Group on AIDS officially formulated its local guideline[2] for UAS in 1993, basing on the principles proposed by WHO. Under this system, there is no possible way of tracing back the test results to individuals. Voluntary testing is also in place for the UAS-targeted populations in Hong Kong.

Organization

The government's Department of Health is responsible for the co-ordination and conduction of the unlinked anonymous screening programme. Other public, and to a lesser extent, private institutions are involved where appropriate. Blood or urine or saliva samples were collected from accessible groups in each specific setting. A proportion of, or the left-over specimen, was sent to the Department's Virus Unit - a central laboratory for HIV diagnosis and surveillance since the start of the local epidemic. Before transferring the specimens, all personal identifying particulars, except age and sex, were removed.

Targets

Population groups that have been included for UAS in Hong Kong thus far can be broadly divided into two groups: (a) those with an apparent behavioural risk for HIV infection and (b) those with no known risk. The first group consists of the drug users attending the government methadone clinics, street drug users, correctional institute inmates whereas the latter include patients with tuberculosis, government male recruits and pregnant women having deliveries in hospitals.

Specimen collection

The settings for the collection of specimens for UAS are depicted in Table 1 and are detailed below.

Drug users attending methadone clinics (DUM)

There are 21 methadone clinics in Hong Kong. Upon and after admission to the government Methadone programme, all drug users undergo drug/HIV risk assessment by the attending health care workers. As part of the monitoring, urine is collected from each drug user and sent to the central laboratory for opiate testing[3]. Since 1992, the urine samples were aliquoted for HIV testing by UAS. The screening was conducted in rotation for both the day and night methadone clinics; on average 4-6 clinics participate at each time, and for a duration of about 3 months to hopefully cover all the existing clients. After all the clinics have contributed, a second round will be started.

Drug users in street (DUS)

Saliva specimen was collected from drug users in the street by trained peer counsellors who were ex-drug users. This was performed as a yearly exercise since 1993 as part of the outreaching prevention and education programme. Existing drug users are identified in places of aggregation and they are asked to surrender a sample of saliva for HIV surveillance. All personal identifying data were de-linked before transporting the samples to the laboratory. This is a modified system as the clients are aware that their saliva samples are taken for HIV tests.

Correctional institute inmates (CII)

Since 1992, unlinked anonymous screening has been performed for prisoners using either blood (collected for routine VDRL screening) or urine samples (collected for opiate testing for security reasons). Only urine specimen was used for testing after 1995 as the correctional institute abandoned the practice of routine VDRL investigations for the inmates. For administrative convenience, UAS was undertaken in a few selected centres and time period in each year.

Tuberculosis patients

Tuberculosis patients (TBO) at the Chest Clinics of the Department of Health are asked to have a blood test (liver function test) and urinalysis (for glucose and protein) before initiating the supervised outpatient treatment. Unlinked anonymous screening in 1991 to 1993 was undertaken using sera whereas in 1995 and 1996, urine. A batch of serum was obtained from tuberculosis patients undergoing inpatient treatment in a thoracic medicine hospital (TBI) in 1991.

Pregnant women having deliveries in hospitals

In Hong Kong, routine screening for glucose-6-phosphate-dehydrogenase (G6PD) deficiency and congenital hypothyroidism is performed using neonatal cord blood samples collected at delivery in Hong Kong. The remaining samples are collected for HIV testing, the results of which reflected that of the mothers. This exercise lasted one month each year since 1991, covering both public and private hospitals.

Male government new recruits

Before 1992, government recruits had to undergo a medical examination including routine VDRL testing before the commencement of their employment. Unlinked anonymous screening using blood specimens collected at this occasion was performed once in 1991. Such routine blood testing was abandoned afterwards and thus UAS was no longer possible in this target group.

Specimen testing

Methods employed for HIV antibody screening were enzyme linked immunosorbent assay (ELISA) and particle agglutination test whereas Western blotting (WB) was used for confirmation of positive result from screening, following WHO recommendations for selection and use of HIV antibody tests[4]. The sequence of testing for different samples were as follows: (a) blood - ELISA, followed by another ELISA, and then WB; (b) urine - IgG Antibody Capture Particle Agglutination Test (GACPAT), followed by IgG Antibody Capture ELISA (GACELISA), and then WB; (c) saliva - GACELISA followed by WB. In general, the specimens are processed and tested as soon as possible after collection though blood/urine could be stored for a short while if necessary. The correlation of HIV antibody test results by the employed methods using urine and saliva specimens with that of the conventional test with blood has been proved to be good (Table 2), in the validation exercises undertaken in 1991 and 1992[5].

RESULTS

Overview & temporal changes

The first round of unlinked anonymous screening was done in 1990 on neonatal cord blood with 933 specimen samples obtained. Up to the end of 1996, a total of 64,857 tests were performed, including 41,845 blood samples (29,952 neonatal cord blood and 11,893 adults), 21,417 urine specimens and 1595 saliva samples. Cumulatively 28 samples were detected HIV positive. Number of specimens tested was stable at around 9000-13000 per year since 1992. The overall annual HIV prevalence stood at below 0.12% though a small absolute rise was noted in recent 3 years.

HIV prevalence in individual groups

Drug users attending methadone clinics (DUM)

Some 2000 to 4000 urine samples from drug users attending methadone clinics were tested each year in the years 1992 to 1996 (Table 3). The average daily attendances of all the methadone clinics ranged from 6401 to 7361 for the same years. Under the UAS scheme, only two HIV positive samples were identified in 1994 and one each in 1995 and 1996 (Table 4), giving an annual HIV prevalence that ranged from 0.0269% to 0.0486%.

Drug users in street (DUS)

Saliva samples ranging from 229 to 475 in number were collected from street drug users and tested for HIV antibody from 1993 to 1996. None of the 1595 specimens in total was tested positive.

Correctional institute inmates (CII)

HIV infection is apparently more prevalent in this group of clients on which testing of blood/urine samples has been undertaken since 1992 (Table 3) on a yearly basis. Of the 9714 samples collected cumulatively from 1992 to 1996, 13 HIV infections were detected (Table 4). Twelve (92%) of which were noted in or after 1994. Ten infections were detected among 2297 female samples

tested whereas only 3 were found among 7407 male samples. HIV prevalence detected among CII had apparently increased over the past 2-3 years, up to a level of about 0.4-0.5% in 1995 and 1996.

Patients with tuberculosis

Started in 1990 and with the exception of 1994, some 485 to 1548 blood/urine samples were collected annually for UAS from patients undergoing treatment for tuberculosis (Table 3). All but the exercise in 1990 was conducted for outpatients. Detection rate for HIV had again apparently increased in 1996 to 0.4% (Table 4).

Pregnant women having deliveries in hospitals

Of the total 29,952 neonatal cord blood samples collected in the past 6 years, one positive result was noted for each year of 1995 and 1996 (Table 4). HIV prevalence in women of reproductive age in the territory was thus found to be around 0.02-0.025%. The corresponding number of annual deliveries in Hong Kong in the corresponding period was about 70,000[6]. Nearly all of the births in Hong Kong are currently delivered in public or private hospitals.

Male government new recruits

Of the 1553 blood specimens collected in 1991, one, in the age group 20 to 29, was found to be HIV positive.

HIV positivity and prevalence across age & sex

All tested community groups had their age and sex recorded for each collected sample as far as possible. The only exception was the neonatal cord blood specimen for which no data on age of the mothers were recorded. HIV situation in males and females within different target groups are summarised in Table 5.

DISCUSSION

Unlinked anonymous screening for HIV surveillance has been carried out extensively in many European countries, e.g. England and Wales, in the past few years. Nevertheless, its application in countries of Asia Pacific region and South-East Asia has been relatively infrequent. The conduction of UAS in Hong Kong since 1990 has contributed to the regional experience of an additional public health tool to supplement and complement epidemiological investigation of HIV infection in the society. From the strategic point of view, unlinked anonymous screening in Hong Kong has been successfully incorporated into the existing health care mechanism to allow periodic and consistent measurement for regular monitoring of the local HIV epidemic at the lowest possible manpower and cost. Two pre-requisites are identified for achieving this: (1) the presence of an extensive network of sentinel sites for specimen collection, and (2) the presence of a central virus laboratory.

The network for sentinel surveillance included 21 methadone clinics and 17 outpatient chest clinics distributed all over the territory. These clinics provide the health and related services free (chest clinics) or at an extremely low cost (a nominal fee of HK$1 in methadone clinics (US$1=HK$7.8)) and have thus attracted a significant portion of lower social class population. It was estimated that the Department of Health's chest clinics took care of over two-thirds of the tuberculosis patients while nearly half of the existing drug users in Hong Kong attended methadone clinics. Infrastructure established within the correctional institute also allowed smooth implementation of UAS within its setting. On the other hand, pregnant women offered an ideal opportunity for surveillance of females of reproductive age.

The presence of a central HIV testing laboratory with good quality control is another essential element for implementing UAS and other serosurveillance programmes. In Hong Kong, the Virus Unit of the Department of Health is responsible for the vast majority of HIV testing in the public service. A substantial proportion of the confirmatory test for private samples was also performed by it. Over the years, the laboratory has taken stringent measures, including joining international quality assurance programme, to ensure the generation of quality results of the HIV testings. The excellent correlation between blood samples and urine or saliva specimens allowed the flexibility of extending the collection of feasible samples beyond blood. This is advantageous in terms of expansion of target setting and populations for surveillance. Moreover, collection of sufficient amount of urine/saliva samples may sometimes be more acceptable to both the clients and staff than using blood.

Results gathered from the on-going unlinked anonymous screening since 1990 has provided better insight into the local epidemic. Some community groups were found to have a higher HIV

prevalence than the general population though the overall prevalence or within specific groups has remained relatively low currently. In contrast to some Western and Asian countries where HIV has spread extensively in the circle of drug users, HIV prevalence among accessible drug users in Hong Kong, by 1996, was still low at less than 0.05%. There was no evidence of significant increase in their HIV infection as judged from the temporal data obtained by UAS. One may be concerned about the representation of the surveilled drug users compared with the overall drug-taking community in Hong Kong. Yet, according to the data of the government's Central Registry of Drug Abuse, about half of the known drug users use the service of the Methadone clinics at some points of their drug-taking practice.

The correctional institute inmates were found to have the highest HIV prevalence among all groups targeted under our UAS. Although a heterogeneous group in their behavioural patterns, the incarcerated ones have always been recognized as a group with considerable risks from their behaviours and various HIV screening programmes have been conducted actively in developed and developing countries. Western studies had found a varying but higher rate of HIV/AIDS in prison inmates than general population. In Hong Kong, HIV prevalence among prison inmates was found to have apparently increased since 1994 but the small number of positive cases and still absolutely low prevalence in the HIV prevalence rendered definite conclusion difficult. The HIV prevalence among the tested prison inmates were 0.2% and 0.45% in 94 and 95. Nevertheless, even though the HIV prevalence detected in 1996 among correctional institute inmates was still <0.5%, the observed rising trend deserved closer attention.

Tuberculosis is closely associated with HIV infection. The annual rate of progression to active tuberculosis is quoted as 2 per 1000[7] whereas in the presence of HIV infection, the rate is 40 times greater[1]. Already a prevalent disease in Hong Kong with an annual incidence of 6,000 to 7,000, no significant upsurge in cases of tuberculosis in relation to HIV co-infection has yet been observed locally. Nevertheless, about 17% of the local AIDS patients had tuberculosis (extrapulmonary and/or with a CD4 count <200/uL) as their primary AIDS-defining illness[9]; most of these reported in recent few years. It is therefore conceivable to conduct HIV surveillance for patients with tuberculosis even though they are not known to have more risk behaviours than the general population. Unlinked anonymous screening in outpatient chest services has really shown relatively higher and rising HIV prevalence (0.13%-0.40%) in this group. Voluntary testing in the same setting revealed an HIV prevalence rate of 0.078-0.128% from 1994 to 1996. The higher detection rate by UAS indicated the

need to improve the uptake of voluntary screening by at risk people and also usefulness of continuing UAS in near future.

Reproducing women is undoubtedly an important sentinel group for HIV surveillance. They are generally believed to be a group practising heterosexual behaviours with low apparent risk of HIV infection. In the England unlinked anonymous study, the HIV prevalence rate in pregnant women of London, tested by using dried blood specimens of neonates, in 1995 is 0.18% as compared with 0.50% of the women attending genitourinary clinics[10]. However, in areas with a general high HIV prevalence rate like Rwanda, antenatal women seroprevalence was 23-26%[11]. Different from that of most western countries, we use neonatal cord blood collected at the time of delivery for determination of maternal HIV antibody status. Results of the territory-wide UAS under this setting confirmed low HIV prevalence (<0.03%) among reproducing women. Positive cases were recorded only since 1995 which echoed the observed trend of increasing heterosexual transmission and women infection in Hong Kong.

Through the UAS, we have attempted to discern and monitor the HIV situation in people with varying levels of HIV-related risk. Both subjects with higher risk because of their behaviours as well as subjects without apparent risk were included in the scheme. More than one target groups within each broad category have been tested over the years. People practising high risk sexual behaviours have not been included in the UAS as this group was well-covered by the wide acceptance of voluntary HIV antibody testing by patients who attended the Social Hygiene Clinics.

The annual HIV prevalence documented thus far remained low at less than 0.5% for all groups. However, the pooled result has demonstrated a progressive rise in the proportion of HIV infected samples over the years. The rise was apparently more marked in certain community groups like the correctional institute inmates and patients with tuberculosis. These UAS data supported the findings from the voluntarily reported statistics and voluntary screening of other selected groups.

CONCLUSIONS & RECOMMENDATIONS

In the past 6 years, unlinked anonymous screening has been successfully conducted in Hong Kong which generated useful and informative epidemiological data. It has become an integral component of the local surveillance mechanism for HIV infection. Results of UAS, in combination

with data collected from other channels, has allowed the construction of scenarios of the local situations and projections made for the coming few years. This in turn enabled better assessment of the effectiveness of AIDS prevention programme, and the planning of medical, social and other related support services for the infected people. Monitoring the trend and direction of the epidemic will also point to the targets who deserve more intensive prevention and education activities.

Despite the fact that participation bias can be reduced to a minimum for unlinked anonymous screening selection bias remains a problem with this tool. Whether the samples obtained and thus the people tested will be a good representative portion of the community group of concern may be a question in some settings. Also, due to inaccessibility of targets, UAS has not been able to be conducted continuously in certain worthy groups in the society, e.g. marginal youths with risk behaviours and adult males with no apparent risk. The data collected so far all came from the selected groups.

In conclusion, the programme of unlinked anonymous screening should definitely be continued in the future. Besides maintaining the current quality of the programme, the scope of sentinel groups should, however, be expanded to fill the gaps and define more clearly the HIV situation in Hong Kong.

Table 1. Target population and settings for unlinked anonymous screening in Hong Kong (1990-1996)

Target group	Specimen type	Reason for specimen collection
With apparent risk		
Drug users attending methadone clinics	Urine	opiate screening
Drug users in street	Saliva	voluntary collection
Correctional institute inmates	Blood	VDRL screening
	Urine	opiate screening for security check
At lower or general risk		
Patients with tuberculosis	Blood	baseline liver function test
	Urine	baseline screening for renal pathology
Pregnant women delivering in hospitals	neonatal cord blood	screening for G6PD deficiency and hypothyroidism
Male government recruits	Blood	pre-employment VDRL screening

Table 2. Comparison of the results of blood, urine and saliva as specimen for HIV antibody testing

A. Blood and urine samples tested in 1991

	Blood	Urine
No. Positive	134	134
No. Negative	447	447(11)*
Total tested	581	581

*11(2.4%) showed initially non-specific reactions which were successfully eliminated by absorption with unsensitized particles

B. Blood, urine and saliva tested in 1992

Specimen	No. tested	No. Positive	No. Negative
Blood	104	28	76
Urine	104	28	76
Saliva	104	28	76*

*2 initially false positive were found negative on retesting

Table 3. Study period and source of specimen for unlinked anonymous screening 1990 - 1996

Target group	Year	Study period	Specimen type	Sample size
Drug users attending methadone clinics	92	9 months	urine	2189
	93	12 months	urine	3219
	94	12 months	urine	4113
	95	12 months	urine	2240
	96	12 months	urine	3714
Drug users in street	93	1 day	saliva	229
	94	1 day	saliva	444
	95	1 day	saliva	475
	96	1 day	saliva	447
Correctional institute inmates	92	2 months	blood	1681
	92 - 93	4 months	urine	2546
	93	3 months	blood	1945
	94	9 months	blood	1386
	95	5 month	blood	653
	96	3 month	urine	1503
Tuberculosis patients	90 - 91	2 months	blood	1548
	[@] 91	2 months	blood	485
	92	2 months	blood	1469
	93	2 months	blood	1173
	95	3 months	urine	895
	96	3 months	urine	998
Pregnant women delivering in hospitals	90	10 days	blood	993
	91	1 month	blood	5253
	92	1 month	blood	5796
	93	1 month	blood	4532
	94	1 month	blood	4762
	95	1 month	blood	4648
	96	1 month	blood	3968
Male government recruits	91	3 months	blood	1553

[@] TB inpatients

Table 4. HIV unlinked anonymous screening - Pooled result 1990 -1996

A. Result in real numbers for different groups and years

Target group	1990	1991	1992	1993	1994	1995	1996
DUM	-	-	2189	3219	4113 (2)	2240 (1)	3714 (1)
DUS			-	229	444	475	447
CII	-	-	4227 (1)	1945	1386 (3)	653 (3)	1503 (6)
TBP	1548	485	1469 (2)	1173	-	895 (2)	998 (4)
DWH	933	5253	5796	4532	4762	4648 (1)	3968 (1)
MGR	-	1553 (1)	-	-	-	-	-
Total	2541	7291 (1)	13,681 (3)	11,098	10,705 (5)	8,911 (7)	10630 (12)

Sample size in boxes and number of HIV positives in brackets

B. HIV prevalence in individual groups across years

Target group	1990	1991	1992	1993	1994	1995	1996
DUM	-	-	0	0	0.0486%	0.0446%	0.0269%
DUS	-	-	-	0	0	0	0
CII	-	-	0.0237%	0	0.2165%	0.4594%	0.399%
TBP	0	0	0.1361%	0	-	0.2234%	0.401%
DWH	0	0	0	0	0	0.0215%	0.0252%
MGR	-	0.0643%	-	-	-	-	-
Total	0	0.0113%	0.0219%	0	0.0467%	0.0785%	0.113%

Notes
DUM=Drug users attending methadone clinics
DUS=Drug users in street
CII=Correctional institute inmates
TBP=Patients with tuberculosis
DWH=Pregnant women delivering in hospitals
MGR=Male government recruits

Table 5. Unlinked anonymous screening for HIV in different sex and target groups (1990-1996)

	Years of test	No. Tested	No. +ve	Range of annual prevalence (%)
Male				
DUM	1992-1996	14626	3	0-0.051
DUS	1994-1996	1503	0	0
CII	1992-1996	7407	3	0-0.172
TBP	1990-1996	4512	7	0-0.558
MGR	1991	1553	1	0.064
Female				
DUM	1992-1996	849	1	0-0.463
DUS	1994-1996	71	0	0
CII	1992-1996	2297	10	0-1.16
TBP	1990-1996	2041	0	0
DWH	1990-1996	29952	2	0-0.025

Notes
DUM=Drug users attending methadone clinics
DUS=Drug users in street; 21 patients were of unknown sex and age, none of whom tested positive
CII=Correctional institute inmates; 10 patients were of unknown sex and age, none of whom tested positive
TBP=Patients with tuberculosis; 15 patients were of unknown sex and age, one of whom tested positive
DWH=Pregnant women delivering in hospitals
MGR=Male government recruits

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