HIV SEROPOSITIVITY AND RELATED FACTORS AMONG PRISONERS IN DIRE DAWA

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HIV Seropositivity and Related Factors Among Prisoners in Dire Dawa

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DEDICATION

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Yohannes Kebede, M.D.

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SUMMARY

HIV antibody was detected in 27 of 450 prisoners (6.0%), in a cross-sectional study carried out in the major prison of Dire Dawa district, in eastern Ethiopia. Syphilis was found to be very common in the prisoners. Overall, 31.6% of the prisoners had a positive VDRL. The rate in prisoners who were HIV positive was 63% or 17 out of 27. A concurrent diagnosis of syphilis was strongly associated with HIV seropositivity. (Odd's ratio = 4.09). Recent admission to prison within the past three months was strongly associated with HIV positivity (Odd's ratio = 3.72); 21 of the 27 HIV positive prisoners had been in prison for less than three months. Factors found important in other studies on prisoners and AIDS, such as homosexuality and intravenous drug use were not found to be features of prisoners in Dire Dawa. Surprisingly, significant associations could not be proved between number of prostitute contacts or number of sexual contacts per month before prison and HIV positivity. Duration of residence in Dire Dawa town, travel outside of Dire Dawa and number of long term sex partners before prison, were not found to be associated with HIV seropositivity. Likewise, no statistically significant correlation was found between HIV seropositivity and history of injections, dental extractions or immunizations in the past. Only 8 of the 450 prisoners (1.6%) were uncircumcised. Although one of the eight was HIV positive, no relationship was found between the circumcision state and HIV infection. That all 27 HIV positive prisoners had been in prison shorter than 12 months with 21 of them (77.8%) imprisoned for less than three months, suggests that the epidemic in Dire Dawa may be of recent origin. The high prevalence seen in prisoners in Dire Dawa likely reflects infection in the surrounding community, and are a cause for serious concern.

CHAPTER I

INTRODUCTION

Infection with human immunodeficiency virus (HIV) and its clinical presentation AIDS has become a major world-wide health problem since it was first identified in the USA in 1978. Reports of AIDS cases have been increasing exponentially with an estimated 150,000 cases by the end of 1987 and a further 150,000 cases expected to develop during 1988. By 1991, WHO expects that one million people world wide will have fallen ill with AIDS[1].

Underreporting remains a problem, estimated to be as high as 10% in the United States and 50% in some areas of Europe [2]. WHO currently estimates that worldwide, less than half of all AIDS cases have been reported to it. In developing countries, with weak medical surveillance systems, many, perhaps the majority, of AIDS cases are not reported to the national authorities. As well there are a variety of logistical, economic and political reasons for supposing that official figures, especially those from the Third World significantly underestimate the real situation.

Since the first African cases were reported from Rwanda, Uganda and Zaire in late 1983, the case toll in Africa, while starting low, has increased rapidly as a result of its heterosexual spread, the difficulty in putting across appropriate health education and information about the disease and the lack of screening mechanisms for blood transfusion. By the end of 1986, 2978 cases of AIDS had been reported in Africa despite recognized, gross underreporting on the continent as a whole. By mid 1988, 11,753 cases had been reported from Africa [3].

While such figures are greatly dwarfed by the number of annual deaths from other preventable diseases on the continent, such as malaria and malnutrition, their impact is much greater than even the actual numbers, if they were known suggest, because the great majority of the deaths from AIDS are occurring in the productive, working segment of the population.

Not only is the presentation of the clinical disease different in Africa, but the mode of spread is different, with heterosexual spread being much more common than the homosexual spread noted in the developed world [4,5]. In Africa, groups such as prostitutes, soldiers, truck drivers and businessmen have been identified as high risk. Other potential high risk groups such as prisoners, about which much has been documented in the developed world, have yet to be explored.

This study was conducted in the major prison found in Dire Dawa District to assess the rate of HIV positivity in prisoners.

In addition, this study compares HIV positive prisoners with HIV negative prisoners with regard to demographic data such as age, sex, and length of stay in prison. Comparisons between the two groups were also made with regard to sexual behaviour such as average number of casual sexual contacts per month, number of long term sex partners, history of homosexuality, sexual activity in prison and history of circumcision.

Dire Dawa was chosen for this study as it is the main communication and trade route linking the capital Addis Ababa to the ports of Assab and Djibouti, and is in the district of the author. With a population of approximately 100,000, it is the main business and trading center of eastern Ethiopia, linked to the outside world by both an international airport and a railway line. People in and surrounding the town have high mobility and close contact with neighboring countries as well as with neighboring regions in their own country.

The results of this study will provide some basic demographic information about prisoners, their sexual behaviour and the prevalence of HIV in one prison in Ethiopia. The information obtained is expected to assist in providing information about the epidemiology of HIV infection within the country. The findings are expected to reflect the situation within the surrounding community from which the prisoners originated.

By identifying the extent of the rate of infection in prisoners, and factors associated with it, it is hoped to assist health professionals and decision makers to become more aware of the extent of the epidemic in

Ethiopia. In addition, in much the same way as the early information about prostitutes in Nairobi [6] lead to initiatives in public health programs directed at modifying sexual behaviour and increasing the use of condoms in prostitutes, is hoped that information obtained in this study will lead to more relevant and appropriate approaches to health prevention practices and messages in prisons in Ethiopia.

Individual patients, both the HIV positive and the HIV negative, were provided with counseling. The results of this study will also be utilized by the district health team for planning and organizing appropriate health education within the prisons in Dire Dawa. Results will be shared with the larger community, as the epidemiology of AIDS in Africa unfolds.

OBJECTIVES OF THE STUDY

1. Determine the point prevalence of HIV seropositivity among prisoners in the Dire Dawa district prison.

2. Examine the occurrence of HIV seropositivity in relation to:

2.1. Demographic characteristics
- age
- sex
- nationality
- education
- marital status
- duration of residence in Dire Dawa
- travel outside of Dire Dawa
- prison stay

2.2. Sex practices:
- long term sex partners
- sexual contacts per month before prison
- sex contacts with prostitutes
- circumcision
- homosexuality
- sexually-transmitted disease (syphilis).

2.3. OTHERS
- injections within the past five years
- dental extractions in the past
- immunizations in the past.

CHAPTER II

LITERATURE REVIEW

HIV infection and its clinical form, AIDS has become one of the major health problems that confront the continent of Africa, particularly the countries of central and eastern Africa. Following recognition of the disease in east African countries, several sero-surveys were conducted among some of the risk groups in Ethiopia such as prostitutes and military recruits in the capital Addis Ababa. The first few clinical cases of AIDS in Ethiopia were diagnosed in 1986 [7].

In June 1987, only 4 (6.7%) of 60 prostitutes tested in Addis Ababa were sero-positive. In the same study, none of the 70 clients' of the prostitutes were found to be sero-positive [8].

Clinical cases of AIDS have shown an alarming increase. A total of 81 AIDS cases have been reported to the National AIDS Prevention and Control Unit as of October 30, 1988 [9]. 62 (76.5%) of the 81 were reported during the year of 1988. These 81 cases were reported from 10 of the 16 regions of the country. Of these, Addis Ababa accounted for 57 (70.4%) of the cases. This may reflect higher mobility and more prostitute contact, but it also reflects greater accessibility to health care, increased awareness among health care providers and their patients and an overall higher rate of diagnosing cases.

Even though accurate population-based data on the incidence of sexually-transmitted diseases in Ethiopia is generally lacking, health workers in this area agree that the magnitude of the problem is particularly large in developing countries.

Information on syphilis is generally lacking from developing countries, although WHO data show that syphilis is becoming more frequent in parts of Africa and in countries of the Far East, and is endemic in some urban areas [10]. Reports of positive serological tests among antenatal clinic attendants ranges between 0.03% in developed countries to

22% in developing countries [11]. Thus, developing countries show very high prevalence rates of syphilis.

Of all pregnant women and their babies admitted to an MCH center in Addis Ababa, slightly more than 15% had positive serological test results for syphilis; 21% of the live-born children of the positive women had clinical signs of congenital syphilis. Still-births and abortion among the sero positive women were two times higher than in the general population of pregnant women who attended the center [12].

People who contract HIV very often have a history of repeated infection with other sexually-transmitted diseases [13,14]. A high level of sexually-transmitted diseases is clearly related to a high rate of sexual partner change, with numerous, different sexual partners undoubtedly playing a major role in the AIDS epidemics [4,5,6].

There is well documented evidence that having certain other sexually transmitted diseases makes it more likely for the HIV virus to be transferred from one partner to the other during sex [13,14]. In particular, women infected with genital ulcer disease, according to a study carried out in Nairobi, Kenya, are four times more likely to contract HIV infection during sexual intercourse with an infected partner than are women without such ulcers [15]. In a group of women studied in Harare, Zimbabwe, the risk of catching HIV tripled for those with a history of genital ulcer disease [16].

Genital ulcers are themselves a result of such sexual infections as syphilis, herpes, and chancroid and are therefore common in many countries where access to health care is poor, awareness is low and sexually transmitted diseases are undertreated and badly controlled.

In men, genital ulcers can provide an entry point for the passage of the virus from female to male. One African study found that men who have had sex with a woman with a genital ulcer had a 5-10% chance of contracting HIV from a single sexual exposure [17]. By contrast, studies of couples where one partner is HIV positive as a result of blood transfusion show that for the uninfected partner the risk of acquiring the AIDS virus

is 7-23% over a period of years [18]. Prostitution, which is another of the high risk practices, is a world wide phenomenon. In a number of east and central African cities, prostitutes currently run a very high risk of contracting AIDS. In 1980, none of the female prostitutes tested in Nairobi were positive for the AIDS virus. By 1983, 63% of them were HIV positive, and seven years later in 1987, the figure had risen to 80% [19].

While homosexuality is the major risk factor for contracting AIDS in the developed world, it has not been documented to any appreciable extent among AIDS patients or HIV infected persons in sub-saharan Africa. Similarly, studies indicate that transfusion of HIV-infected blood and the use of unsterile needles or other skin piercing instruments within the health system or as part of traditional healing practices accounts for only a small proportion of HIV infections at present [13,20].

The spread of HIV in closed institutions such as prisons is a major public health concern. Prison authorities in the developed world are discovering not only that more and more of their inmates are ill with AIDS or carrying HIV, but that the prison environment itself is conducive to spread of the virus. Prisons have long been known to lead to an increase in homosexual encounters, both voluntary and forced, while the presence of drugs, together with contraband needles and no means of sterilization, leads to rapid transmission through intravenous drug use.

In the developed world, where prisoners have been screened for HIV, they have often shown higher rates of infection than the general population with the rates ranging from 11 to as high as 26%. In the Canton of Berne, Switzerland, 11% of the inmates were reported sero positive in 1987 [21], while in the same year in Italy, new prisoners were reported to have an infection rate of 16.8% and in Spain the rate has been reported to be as high as 26% [21].

The first comprehensive study done on AIDS in New York State Correctional Institutions revealed that more than half of all prisoner deaths were due to AIDS [22]. Overall there were an estimated 21,000 to 42,000 prisoners infected with HIV in State prisons across the United States in 1986 with 420 diagnosed cases of AIDS among inmates [23,24].

The response of authorities to the AIDS epidemic in prisons has varied from country to country. The question of whether or not to isolate prisoners with AIDS or HIV positivity has been debated. Isolation units have been reported from such places as Dublin [21]. Prisoners in France and West Germany as well as in Belgium, have demanded to be segregated from inmates who were known or believed to have AIDS [21].

CHAPTER III

MATERIALS AND METHODS

Study Design:

Cross-sectional design with case-control applied to analysis.

Study Population:

All 450 prisoners from Dire Dawa District prison who were present in the prison at any time during the twelve day period between November 12 to November 23 were enrolled in the study. The study purpose and general information about AIDS was shared with prison staff and inmates during a one day seminar that was marked by active participation and interest. Following the seminar, prisoners were given the opportunity during a confidential interview not to participate if they didn't want to, but 100% agreed to participate.

Measurement and Data Collection:

Four members of the Dire Dawa District Health Team served as interviewers. Each interviewer received two day's training, which was followed by pretesting of the questionnaires on thirty prisoners in a smaller prison in the same town. The questionnaire was prepared in English and translated into Amharic and checked back by translating into English. The interviewers, all of whom were fluent in Oromingna, Somaligna and Amharic, standardized translation from Amharic into the other languages during the pretesting time. Each respondent was interviewed in his or her native language. A copy of the questionaire in English is attached as Appendix A.

From the questionnaire, characteristics of prisoners, such as age, sex, ethnicity, religion, education, marital status and time in prison were determined. As well, aspects of sexual behavior, such as a history of homosexuality, the average number of casual sexual contacts per month

and the number of long-term sex partners were obtained during confidential interviews. Information about circumcision was obtained by physical exam.

The interviewers were supervised at daily follow-up sessions by the principal investigator throughout the period of data collection. Completion of forms was checked at this time and arrangements made to supply omissions by re-interview. Names of respondents were coded after the interviews were completed and the forms were kept in a locked filing cabinet in order to maintain confidentiality.

10 cc of blood was taken from each prisoner after the interview was completed for Eliza, Western Blot,and VDRL tests. Samples were refrigerated at the District Health Center and transported in bulk in a cold box. All laboratory tests were done in the AIDS Laboratory of the National Research Institute of Health (NRIH), in Addis Ababa. An on-going record was maintained of the performance of all procedures.

Further health education on sexually transmitted diseases, HIV infection and condom use was provided to all respondents at the time of the interview.

Counseling was offered to all prisoners who were still in prison in February, 1989 when the results were known. 368 of the 450 received counseling. Those with positive VDRL were offered Benzathine penicilline G, 2.4 million units intramuscularly, weekly, for three successive weeks with all receiving treatment. Those with positive HIV were informed about prognosis and prevention. Those with negative HIV were counseled about prevention.

Laboratory Methods:

Serum samples were stored at 20 ^{o}C before testing. All were tested by the Wellcozyme competitive enzyme linked immunosorbent assay (ELISA) (Wellcozyme anti-HTLV-III, Wellcome Diagnostics, Dartford, U.K.) according to the manufacturers instructions. Each initially reactive specimen was re-evaluated by ELISA. All repeatedly reactive specimens were analyzed by Western blot (The Bio-Rad Novapath Immunoblot Assay). The presence of

antibody was indicated by the appearance of purple colour bands at specific HIV viral positions on the strip. Western blots were considered positive if bands corresponding to at least one core protein (P24, P18, P15) and one envelope protein (gp 120 and gp41) were visualized.

Serology for syphilis was performed using the VDRL test.

Data Analysis:

To address the objectives of the study the following analyses were conducted. Prevalence rates for population were calculated. Associations between HIV positivity and sociodemographic, sex behaviours and other risk behaviours were examined using crosstabulation, chi-square tests, t-test and odd's ratios with their 95% confidence limits.

For this particular study, this may not be indicated, as the study is a census survey rather than a sample survey. However, they would be necessary, if it was assumed that the Dire Dawa prisoners were a sample of prisoners in Ethiopia, and we wished to extrapolate to other Ethiopian prisoners. This should be taken into consideration when reading the tables.

Data analysis was carried out using the SPSS/PC+ statistical program.

CHAPTER IV

RESULTS

Between November 12 and November 23, 1988, 450 prisoners were enrolled in the study. Overall, 27 (6.0%) of the prisoners were positive for HIV. HIV positivity was defined as being positive on two sequential ELISA tests and the Westernblot test.

Of the 450 prisoners there were 424 (94.2%) males and 26 (5.8%) females. The mean age of the prisoners was 27.1 $\pm$ 9.3 and the mean prison stay in years was 1.10 $\pm$ 2.1. Most prisoners were from Dire Dawa town itself. The majority of the prisoners, that is, 268 (59.6%) were labourers without permanent employment and 114 (25.3%) were those who earn their living through trade. The remaining 68 (15.1%) belonged to a variety of professions. Most of the prisoners were imprisoned for theft and violence.

The educational level of the prisoners was as follows: 53 (11.8%) were illiterate (by illiterate it is meant anyone who could not read or write in any one language), 80 (17.8%) had participated in the literacy program and 317 (70.4%) claimed to have had some formal schooling.

43(9.6%) prisoners reported no sex contact before imprisonment, 43 (9.6%) reported one sexual contact, 244 (54.2%) reported 2-5 contacts and 120 (26.7%) reported six or more sexual contacts per month before imprisonment. No sexual contacts were reported to have taken place in the prison.

138 (30.7%) of the prisoners reported no long term sex partner before prison, 188 (41.8%) claimed one long term sex partner and 124 (27.6%) reported two or more partners.

176 (39.1%) of the prisoners claimed to have never taken any injections of medications during the past five years, 161 (35.8%) reported 1-4 injections and 113 (25.1%) more than four injections of medications.

A. DEMOGRAPHIC CHARACTERISTICS

1. AGE

This was recoded to reduce it to two categories: $\leq$ 24 and $\geq$ 25 years of age and then cross tabulated with HIV positives and negatives to determine whether any association existed. A chi-square test which was used to determine whether the association was significant revealed a statistically significant result $x^2_{(1)} = 4.95$. Older prisoners were two and a half times more likely to be HIV positive. See Table 1.

2. SEX

Two out of 26 females (7.7%) and 25 out of 424 males (5.9%) contributed to the positivity rate. The difference was not statistically significant, but the small number of females in the population means that the confidence limits for the proportion who are positive are wide (95% CI = 2.5, 17.9%). See Table 1.

3. NATIONALITY

There were only three non-Ethiopian prisoners. None of them were positive for HIV.

4. EDUCATION

70.4% of HIV positives claimed to have attended school. However, there was no statistically significant association between HIV positivity and educational status when the prisoners are divided into three educational groups. See Table 1.

TABLE 1 COMPARISON OF SELECTED DEMOGRAPHIC CHARACTERISTICS IN HIV POSITIVE AND HIV NEGATIVE PRISONERS

	HIV Positive N (%)	HIV Negative N (%)	Odd's Ratio (95% Confidence Interval)
Age (years)*			
24 or younger	8 (29.6)	218 (51.5)	0.40 (0.17,0.93)
25 or older	19 (70.4)	205 (48.5)	2.53 (1.09,5.92)
Sex Male	25 (92.6)	399 (94.3)	0.75 (0.17,3.35)
Female	2 (7.4)	24 (5.7)	1.33 (0.30,5.98)
Marital Status			
Married	10 (37)	176 (41.6)	0.83 (0.37,1.85)
Others	17 (63)	247 (58.4)	1.21 (0.54,2.70)
Education			
Illiterate	2 (7.4)	51 (12.1)	0.58 (0.13,2.53)
Literacy program	6 (22.2)	74 (17.5)	1.35 (0.53,3.46)
Formal schooling	19 (70.4)	298 (70.4)	1.00 (0.43,2.34)
Duration of Residence in Dire Dawa (years)			
< 5	14 (51.9)	181 (42.8)	1.44 (0.66,3.12)
≥ 5	13 (48.1)	242 (57.2)	0.69 (0.32,1.52)
Travel outside of Dire Dawa			
No	4 (14.8)	42 (9.9)	1.58 (0.52,4.80)
Yes	23 (85.2)	381 (90.1)	0.63 (0.20,1.93)
Prison stay (months)**			
≤ 3	21 (77.8)	205 (48.5)	3.72 (1.47,9.46)
> 3	6 (22.2)	218 (51.5)	0.27 (0.11,0.68)

* $P<.05$ ** $P<.01$

5. MARITAL STATUS

The prisoners were divided into two categories: those who were married in one group and those who were single, divorced, widowed and others in the second category. The association with HIV positivity was not statistically significant. See Table 1.

6. DURATION OF RESIDENCE IN DIRE DAWA

This variable was recoded to reduce it to two categories: those who had lived in the town for less than five years and those who had lived for five or more years. The association with HIV positivity was not statistically significant. See Table 1.

7. TRAVEL OUTSIDE OF DIRE DAWA

It was coded in the following way : those who had never traveled outside of the town in one category and those who gave a history of travel outside of Dire Dawa in another. The association with HIV positivity was not statistically significant. See Table 1.

8. PRISON STAY

This was recoded to reduce it to two categories : those who stayed in the prison for three months and less and those who were imprisoned for more than three months. A chi-square test revealed the association between prison stay and HIV positivity was significant $x^2_{(1)} = 8.72$ with a shorter stay being associated with a higher rate of positivity. Odd's ratio and 95% confidence limits were calculated to assess the strength of the association. See Table 1. The mean duration of stay in prison in years for the HIV positives and negatives were 0.17 ± 0.23 and 1.12 ± 2.33, respectively.

B. SEX PRACTICES

1. NUMBER OF LONG-TERM SEX PARTNERS BEFORE PRISON

In this study, a long-term sexual partner is defined as a partner with whom the prisoner has lived for some time (usually more than one month). Thus casual sexual partners and prostitutes are excluded from this category. The variable was recoded to three categories, those without a long term sex partners in one group, those with only one long-term sex partner in another group and those with two or more long-term sex partners in a third group. The association with HIV positivity was not statistically significant. See Table 2.

2. NUMBER OF SEXUAL CONTACTS PER MONTH BEFORE PRISON

This was recoded to four categories : those without any sex contact per month before prison in one category, with one sexual contact per month in another category, between 2-5 sex contacts per month in a third category and those with six or more contacts in a fourth category. The association with HIV positivity was not statistically significant. See Table 2.

Comparison of the mean number of sex contacts per month in HIV positive and negative prisoners was also done. Those who were positive had a mean number of sex contacts per month of 6.3 (S.D = 7.5). Those who were negative had a mean number of sex contacts per month of 5.0 (S.D = 6.0). The difference was not statistically significant.

3. SEXUAL CONTACT WITH PROSTITUTES PER MONTH

This variable was recoded in the following way to reduce it to two categories: those who never had contact with prostitutes in the first and in the second category those who had contact with one or more prostitutes. A chi-square test was used to determine whether the association was significant. No significant association was found. Odd's ratio and 95% confidence limits were calculated. See Table 2. The mean number of prostitute contacts per month was compared between HIV positive and

negative prisoners. For HIV positive prisoners it was 4.6 (S.D = 5.2) and for HIV negative it was 3.1 (S.D = 4.5). The difference was not statistically significant.

TABLE 2

COMPARISON OF SELECTED SEXUAL BEHAVIOUR IN HIV POSITIVE AND HIV NEGATIVE PRISONERS

	HIV Positive N (%)	HIV Negative N (%)	Odd's Ratio (95% Confidence Interval)
Number of long-term sex partner before prison 0	9 (33.3)	129 (30.5)	1.09 (0.50,2.39)
1	11 (40.8)	177 (41.8)	0.97 (0.47,2.00)
≥ 2	7 (25.9)	117 (27.7)	0.94 (0.40,2.22)
Number of sexual contact per month before prison 0	1 (3.7)	42 (9.9)	0.37 (0.05,2.80)
1	1 (3.7)	42 (9.9)	0.37 (0.05,2.80)
2-5	15 (55.6)	229 (54.1)	1.03 (0.54,1.98)
≥ 6	10 (37.0)	110 (26.0)	1.42 (0.67,3.02)
Sex contacts with prostitutes per month 0	5 (18.5)	156 (36.9)	0.39 (0.15,1.05)
≥ 1	22 (81.5)	267 (63.1)	2.57 (0.95,6.90)
Circumcision			
Circumcized	26 (96.3)	416 (98.3)	0.44 (0.05,3.70)
Uncircumcized	1 (3.7)	7 (1.7)	2.29 (0.27,19.35)

4. *CIRCUMCISION*

Two categories were used: uncircumcised and circumcised. Crosstabulation was done with HIV positives and negatives to determine whether any association existed. The result was not significant. See table 2.

5. *HOMOSEXUALITY*

None of the prisoners reported homosexuality.

6. *SEXUALLY-TRANSMITTED DISEASE (SYPHILIS)*

The VDRL (Venereal Disease Research Laboratory) test was used as described in the methods. Recoding was done to reduce the results of the test to two categories: those who were positive on the VDRL test in the first category and those who were equivocal or negative in the second category. A chi-square test revealed that the association between VDRL and HIV positivity was significant $x^2_{(1)} = 14.28$. Odd's ratio and 95% confidence limits were calculated to assess the strength of the association. See Table 3.

TABLE 3

SYPHILIS AND HIV INFECTION

	HIV Positive N (%)	HIV Negative N (%)	Odd's Ratio (95% Confidence Interval)
*VDRL Status:			
Positive	17 (63.0)	124 (29.3)	4.09 (1.82,9.21)
Negative & Equivocal	10 (37.0)	299 (70.7)	0.24 (0.11,0.55)

*VDRL = Venereal Disease Research Laboratory

P < .001

C. OTHERS

INJECTIONS, DENTAL EXTRACTIONS AND IMMUNIZATIONS

Injections taken in the past five years was recoded to reduce it to two categories: those who did not have any and those who had one or more injections. Dental extraction was also recoded in the same way as injections. Immunizations was categorized into two: those who had and those who did not have. Cross tabulation with HIV positives and negatives was done to each variable to determine whether any association existed. As shown in table 4, there was no statistically significant association between parenteral injections received in the past five years and HIV infection. The mean number ofinjections was compared between HIV positive and negative prisoners. Positive prisoners had a mean of 2.4 (S.D = 3.4) and negative prisoners had a mean of 4.1 (S.D = 7.4). The difference was not statistically significant. Dental extraction likewise did not correlate with HIV seropositivity. The same was true with immunizations.

TABLE 4

POTENTIAL RISK FACTORS SUCH AS INJECTIONS, DENTAL EXTRACTIONS, AND IMMUNIZATIONS AND HIV INFECTION

	HIV Postive N (%)	HIV Negative N (%)	Odd's Ratio (95% Confidence Interval)
Injections during the past five years			
0	9 (33.3)	163 (38.5)	0.80 (0.35,1.80)
$\geq$ 1	18 (66.7)	260 (61.5)	1.25 (0.55,2.87)
Dental extractions in the past			
0	22 (81.5)	319 (75.4)	1.43 (0.53,3.88)
$\geq$ 1	5 (18.5)	104 (24.6)	0.70 (0.26,1.89)
Immunizations in the past			
Yes	15 (55.6)	235 (55.6)	1.00 (0.46,2.19)
No	12 (44.4)	188 (44.4)	1.00 (0.46,2.19)

To determine whether age was a confounder in the association between HIV positivity and other variables, chi square analyses were performed, to assess whether any significant association existed between age and some selected independent variables. Variables included were time in prison, prostitute use, number of long-term sex partners before prison and VDRL status. Age was significantly associated with time in prison ($P < .001$) $x^2_{(1^{df})} = 14.22$ such that younger prisoners were more likely to have short stay (59.3%) than older prisoners (41.1%). Odd's ratio and 95% confidence limits were calculated to assess the strength of the association (OR = 2.09, 95% CI = 1.44, 3.05). However, because youth and short stay were not related in the same way to HIV positivity, age cannot be a confounder in the relation between prison stay and HIV positivity. No other variables were related to age.

Once the number of HIV positives was known the power of the study to detect differences was calculated. For example, the power of being able to detect a difference of 1.5 in the mean number of prostitute contacts per month between HIV positive and HIV negative prisoners is calculated as follows:

$$n = 2\left[\frac{(Z_\alpha - Z_\beta)\sigma}{\delta_1}\right]^2$$

Where n = # in each group = 27

Z_α = 1.96 for an α level of .05

δ_1 = 1.5

σ = 4.59

Solving for Z_β gives 0.85. This is equivalent to a β of .80 or a power of 1-.80 = 0.20.

Therefore, there is a 20% chance of being able to show a difference in mean number of prostitute contacts per month in my study, if a difference really exists in the whole prisoner population.

CHAPTER V

DISCUSSION

The 27 HIV positive prisoners in this study represent a prevalence of 6.0% for the 450 prisoners. The prevalence of HIV positivity varies widely around the world. Seroprevalence rates among healthy populations range from 0.7% for blood donors in the Congo to as high as 18% for blood donors in Kigali, Rwanda [25]. Seroprevalence rates among high-risk groups such as female prostitutes, have been reported to range from 27 to 88%, depending on selection, socioeconomic status, and geographic location [26,27].

A study done in Ethiopia on prostitutes in 1987 showed a prevalence rate of 6.7% [8]. The increase in HIV seroprevalence among prostitutes in Nairobi from 4 to 59% between 1980 and 1986 demonstrated the rapid dissemination of HIV infection in one high-risk group in Africa, similar to that observed among homosexual men in San Francisco [28,29].

There have been no studies done in prisoners in Ethiopia. Prisoners may exhibit more high risk behavior such as intravenous drug use or prostitute contact, than the rest of the population. It is also possible that there may be homosexual contact among prisoners while they are in prison. These factors may put prisoners at a higher risk for HIV infection.

In Switzerland, 11% of the inmates were reported to be seropositive in 1987 [21], while in the same year in Italy an infection rate of 16.8% and in Spain 26% [21] was reported in new prisoners.

In this study, a number of variables determined from the interview and laboratory results were evaluated as possible correlates of HIV seropositivity among the groups of prisoners.

Significant associations were demonstrated between HIV seropositivity, prison stay and sexually transmitted disease (syphilis). No significant association was found between HIV positivity and travel

outside Dire Dawa town, duration of stay in the town, marital status, prostitute contact, number of long-term sex partners before prison, number of sexual contacts per month before prison, history of injections of medications within the past five years, immunizations in the past, dental extractions and being uncircumcised.

The association between HIV infection and prison stay in this study was quite interesting. Short duration of stay in the prison (< three months) was significantly associated with HIV seropositivity. This may suggest that HIV infection was introduced in the town recently. Another explanation could be selection bias in that HIV positive prisoners could be imprisoned for shorter duration (those who committed less severe crimes).

Syphilis was strongly associated with HIV positivity in this study. Syphilis, and other causes of genital ulcers have been highly associated with prostitutes in Africa and elsewhere [30,31,32]. In studies among Nairobi prostitutes, HIV seropositivity was significantly associated with VDRL and prostitute use [6]. Thus, syphilis may be a marker for prostitute use. However, this study failed to show a relation ship between prostitute use and HIV infection.

The other explanation could be that of causal association. Syphilis could alter the susceptibility of the prisoners to HIV by providing a portal of entry for the virus. However, only prospective studies can fully assess this type of association.

There were eight uncircumcised prisoners among the 450 studied. One was HIV positive and the other seven HIV negative. A significant association was not found between HIV seropositivity and the uncircumcised state.

A statistically significant association between prostitute contact and HIV positivity was not found. This was somewhat surprising. Although the odd's ratio was 2.57, the 95% confidence limit included unity. We simply may not have had a large enough sample size to demonstrate that this odd's ratio was statistically significant. However, if repeated

epidemiological surveys with adequate sample size were carried out in different prisons, a better estimate could be obtained. Another explanation for the failure of this study to show an association between prostitute use and HIV seropositivity, could be desirability bias affecting the response to the question about prostitute contact.

There was no attempt made to validate the answers given by the prisoners. Due to the high number of illiterates, the interviews were face to face interviews conducted by the district health team members. It is possible that a desirability bias made the prisoners indicate that they had fewer sexual contacts than they had actually had. This may have also affected the responses to the question about homosexual contact. Homosexuality is unacceptable in Ethiopian society, so that it would be difficult for the prisoners to admit to it in a face to face interview.

Statistically significant correlations were also lacking in this study between HIV positivity and number of long-term sex partners before prison and number of sexual contacts per month before prison. Unlike the findings in this study, high rates of partner change or frequent exposure by men to a relatively small number of infected prostitutes may have contributed to the observed epidemiological pattern of HIV infection in other parts of East Africa [33,6].

A history of injections of medications, immunizations in the past and dental extractions were obtained from the prisoners, raising the possibility of transmission of the virus through these routes. However, no association with the prevalence of HIV antibody was found. In a prevalence study of 2384 hospital workers in Kinshasa, significantly more HIV seropositive than seronegative workers reported receiving medical injections during the previous three years [20]. The potential for HIV transmission by the above routes, therefore, should not be underestimated, and further studies should be undertaken to assess risk associated with these factors and to develop effective means of prevention.

Duration of residence in Dire Dawa town, history of travel outside of the town, marital status, and education were not significantly associated with HIV seropositivity.

CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS

27 of 450 prisoners tested in a prison in Dire Dawa town, eastern Ethiopia, were found to be HIV sero-positive in November 1988, giving a prevalence rate of 6.0%.

Eight years have elapsed since AIDS was first noted in the USA, with the first cases reported in Ethiopia in 1986. In just over two years, rates of HIV sero-positivity in prostitutes have been risen from 6.0% to 20.0% in several urban centers of Ethiopia. This study revealing a 6.0% HIV positivity in prisoners is further evidence that AIDS is of serious concern in Ethiopia.

Recent admission to prison, that is, within the past three months and HIV seropositivity were shown to have strong correlation.

Syphilis, as has been noted elsewhere, was found to have a strong association with HIV seropositivity. This is of particular importance as a high rate (31.6%) of syphilis was found in the prison population.

Homosexuality and injections, especially intravenous drug use, that feature prominently in studies in prisoners in the developed world were absent among the prisoners.

Although one of the eight uncircumcised prisoners was HIV seropositive, no relationship was found between the circumcision state and HIV infection.

Significant association was not proved between HIV seropositivity and prostitute contact, number of long-term sex partners and number of sexual contacts per month before prison.

As data on the general population of Dire Dawa is not known, it can not be determined whether the prevalence of 6.0% in prisoners is higher or lower than the general population. However, it is clear that HIV infection is a serious public health problem, that it has been recently introduced into the prison system and that it is strongly associated with syphilis.

RECOMMENDATIONS

1. Prisoners with positive VDRL should be tested for HIV.

2. Regular physical check-up of prisoners for STD's and regular health education sessions including information about the prevention of HIV infection.

3. Health education programs involving the general population and STD clinic attenders directed at modifying sexual behaviour, limiting sexual contacts to a single partner and use of condoms.

4. Strengthening of Awraja Health Management Team (AHMT) to enable them to provide appropriate health promotion and education outreach systems with special emphasis on HIV infection and AIDS.

5. Further surveys be carried out in the area of Dire Dawa to determine the prevalence in the population and identifying high-risk populations.

CHAPTER VII

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APPENDICES

APPENDIX A

Dire Dawa District Prison
Point - Prevalence of HIV Seropositivity Study

QUESTIONAIRE

Date _____

Name of interviewer _____

Code Number _____

1. Age _____
2. Sex _____
3. Nationality _____
4. Did you live outside of Dire Dawa town in the past, if yes where _____
5. For how long have you lived in Dire Dawa town?

   _____Years; _____ Months.

6. For how long have you been in prison now?

   _____ Days

   _____ Weeks

   _____ Months

   _____ Years

7. To what ethinic group do you belong?

   _____ Oromo

   _____ Issa

   _____ Somalie

   _____ Amhara

   _____ Other

8. What is your religion?

   _____ Muslim

   _____ Orthodox Christian

   _____ Catholic Christian

_____ Protestant Christian

_____ Other

9. Current health status?

_____ Healthy

_____ Sick

10. What is your educational status?

_____ No schooling

_____ Participated in adult literacy programme

_____ Other

11. What is your present marital status?

_____ Single

_____ Married

_____ Divorced

_____ Widowed

_____ Other

12. On average, how many sexual partners did you have per month before being imprisoned? _____

While in prison? _____

13. What was the average number of different sexual encounters per month before being imprisoned? _____

While in prison? _____

14. What was the average number of sexual encounters with prostitutes per month before being imprisoned? _____

15. What type of sexual activity do you practice?

Peno - Vaginal _____

Peno - Rectal _____

16. History of injections of medications with in the past five years:

If yes _____ How many _____

No _____

17. History of dental extractions

Yes _____ No _____

18. History of induced abortions:

If yes _____ How many times _____

No _____

19. Past history of immunizations

Yes _____ No _____

20. History of circumcision

Yes _____ No _____

21. Test results

a. Elisa 1 _____

b. Elisa 2 _____

c. Western Blot _____

d. VDRL _____

በድረጓዋ ከተማ ወህኒ ቤት በሚገኙት ለስረፆቸ ኤች አይ ቪ በተሰኘው ህዋስ ለሚደረገው ጥናት የተዘጋጀ የመጠይቅ ቅጽ

ሶን _____

የጠያቂው ስም _____

መለያ ቁጥር _____

1. ዕድሜ _____

2. ጾታ _____

3. ዜግነት _____

4. የሥራ ዓይነት _____

5. ከድረጓዋ ከተማ ውጭ ኑረው ያውቁ ስንደሆነ፤

አልፆር ኩሎ _____

ፆሬ ያለሁ _____

6. በድረጓዋ ካተማ ለምን ያህል ጊዜ ፆረ ዋለ?

_____ አመታት

_____ ወራት

7. በእስር ቤት ውስጥ ምን ያህል ጊዜ ቆይተዋል?

_____ ቑተ

_____ ሳምንታት

_____ ወራት

_____ አመታት

8. ዘር ዎ ምንድን ነው?

_____ ኦሮሞ

_____ ኢሣ

_____ ሶማሌ

_____ አማራ

_____ ሌላ

9. ቶሚካ ተሉት ሪይማ°ት ምንድን ነው?

_____ እስልም°

_____ አር ቶይክስ ክርስቲያን

_____ ካቶሊክ

_____ ኘሮቴስታንት

_____ ሌላ

10. ጤንነትዎ በሥን ሁኔታ ላይ ይገ°ል?

_____ ጤ-ማ ነኝ

_____ ህመም ተ° ነኝ

11. የትምህርት ደረጃዎን በተመለከተ?

_____ ምንም አልተማርኩም

_____ በመሰረተ ትምህርት ኘሮግራም ውስጥ ተሳትፌአለሁ

12. የጋብቻ ሁኔታ

_____ ያገባ

_____ ያላገባ

_____ የፈታ

_____ በሞት የተለየ

_____ ሌላ

13. ምን ያህል የወንድ /የሴት/ ጓደ° ነበረ°ት? ወይም አለዎት?

_____ ከመታሰር ዎ በፊት

_____ አሰር ቤት አያሉ

14. በወር ውስጥ ያደር ጉ የነበረው የግብረ ሥጋ ግንኙነት ብዛት

_____ ከመታሰር ጋ በፊት

_____ በአሰር ቤት አያሉ

15. ከመ ታሰር ዎ በፊተ በወር ውስጥ ከሴተ፫ አዳሪ ዎች ጋር ያደር ጉ የነበረ ው የግብረ ሥጋ ግንኙነት መጠን _____

16. የገብረ ሥጋ ግንኙነት ሲያደር ጉ፤

_____ በተለመደ ው ሁኔታ ነው

_____ ሶደማዊ በሆነ ሁኔታ ነው

17. ባለፈ ተ አምስተ ዓመ ታት በከንዱ መር ፌ የወሰዷ ቸው ህክም- ዎች ካሉ፤

_____ አዎ _____ ምን ያህል _____ አልወሰዱ ኩም

18. በዕድሜ ከገፉ በኋላ የርስ ዎን ተነቀለ ው ያውቁ እንደ ሆነ?

_____ አዎን _____ ምን ያህል ጊዜ _____ አልተነ ቀለ ኩም

19. ፅንስ አስወር ደ ው ያውቃሉ?

_____ አዎን _____ ምን ያህል ጊዜ _____ አላስወረ ዱኩም

20. ክትባ ቶች ወስደ ዋል?

_____ አዎን _____ አልወሰዱ ኩም

21. ተገር ዘ ው ከሆነ

ተገር ዝ ለሁ _____ አል ተገረ ዘኩ ም _____

22. የደም ሥር መራ ዉጤ ት

APPENDIX B

Verbal Consent

In this study the following information was told to the prisoners in order to get their consent for the testing:

1. The significance of the test, i.e. that the test will help to assess the magnitude of the spread of infection in this risk group;

2. Their right to refuse if they don't want the test;

3. Their right to know the results if they want to. This might motivate the individual to change behaviours that puts others at risk;

4. Names of individuals will not be used. Only code numbers will be utilized;

5. High - quality laboratory and data services will be used. This will help to avoid false positive results;

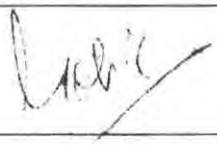
6. The confidentiality of tested individuals will be protected. The results of the test will not be put on their records and prison officials will not be informed of results;

7. Disposable syringes and needles will be used.

DECLARATION

I, the undersigned, declare that this thesis is my work and that all sources of material used for this thesis have been duly acknowledged.

Name YOHANNES KEBEDE, M.D.

Signature 

Place Addis Ababa, Ethiopia

Date of Submission April 1989