Prevalence of HIV, syphilis and genital chlamydial infection among women in North-West Ethiopia

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SUMMARY

The prevalence of sexually transmitted diseases (STD) among women visiting antenatal (ANC) and gynaecological clinics in Gondar, north-west Ethiopia, was investigated. Between April and August 1995, 728 women consented to enter the study. Prevalence rates were 5·9 % (41/693) for chlamydial antigen in cervix, 18·8 % (113/600) for syphilis (*Treponema pallidum* haemagglutination assay [TPHA]) and 25·3 % (150/593) for HIV. Active syphilis (RPR)+, TPHA+ was detected in 7·4 % (44/597). HIV infection rate was higher among women with higher age of first marriage and low gravidity. It was significantly associated with young age, urban residence, and presence of genital ulcer (odds ratio [OR] = 6·3), and lymphadenopathy (OR = 2·8) on examination. Women seropositive for syphilis had married at an earlier age, were significantly older and had changed husbands. Low gravidity and age < 30 were independently significant risk factors for cervical chlamydial antigen positivity which was predominantly asymptomatic. Significant association was observed between HIV infection and syphilis (OR = 2·6). Active syphilis was associated with chlamydial (OR = 3·4) and HIV infection (OR = 4·1). The rate of 23·4 % and 15·1 % of HIV seropositivity among ANC attenders and rural women respectively is an indicator of the rapid progression of the HIV epidemic in the area.

INTRODUCTION

The HIV epidemic is spreading quickly in Ethiopia [1]. Although urban areas still account for most of the infection, with the highest prevalence seen among female sex workers, soldiers and drivers [2], seropositivity is increasing rapidly among the general population [3] and the gap between so-called high risk groups and the sexually-active adult population is narrowing. Reports indicate that the virus is infiltrating into rural areas where the vast majority (> 80 %) of the Ethiopian population resides [4, 5]. This suggests that control measures have not been effective in containing the epidemic in the urban centres [6].

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The rapid spread of HIV infection in many population groups is thought to be due to synergy with other sexually transmitted diseases (STDs) whose high prevalence facilitates the transmission of the virus from person-to-person [7, 8]. Therefore, it has been recommended that control of HIV infection should be linked to control of other sexually transmitted diseases. Because the mode of transmission of HIV and other STDs is the same, studies on the prevalence of recent infections with selected STDs in an area can provide a useful indicator of the effectiveness of control measures against the spread of HIV.

We studied the prevalence rate of active syphilis, genital chlamydial infection and HIV among un-

selected women visiting the gynaecological and obstetric clinics in a town in north-west Ethiopia. This is the first report on the magnitude of these infections among the adult female population in the area.

PATIENTS, MATERIALS AND METHODS

All women presenting at the Obstetric and Gynaecology outpatient clinics in the Gondar College of Medical Sciences and the Gondar Health Center, Gondar, Ethiopia, between April–August 1995 were included in this study, without preselection and upon informed consent. Permission for the study was obtained from the Gondar College and the Zonal Office of the Ministry of Health in Gondar. Gondar is an urban center in north west Ethiopia with a population of about 200000. The College, located in the town, runs a tertiary level referral and teaching hospital with 350 beds where it trains health professionals including medical students. The Gondar Health Center is the only other health institution in the area where specialist services are provided to women with obstetric and gynaecological problems.

Patients were interviewed by the examining physician and information on social, demographic, obstetric, sexual and clinical characteristics was collected according to a pre-tested protocol. All patients underwent physical examination upon enrollment and findings were documented. An endocervical swab was taken for each patient with the IDEIA™ Dako Chlamydial Specimen Collection kit (Dako Diagnostics, Ely, UK) after cleaning the cervical mucus and ensuring that sufficient material was collected on the swab by rotating it in the endocervix repeatedly as recommended by the manufacturers. The swabs were placed immediately into the provided specimen collection vials and stored at 2–8 °C for < 5 days or were boiled and frozen at −20 °C for < 2 weeks. They were tested for the presence of chlamydial antigen by ELISA using a genus-specific monoclonal antibody (IDEIA™ Dako Chlamydial Enzyme Immunoassay, Dako Diagnostics, Ely, UK). Quality control was conducted on the reagents by titrating the positive samples in the supplied kits and was found to conform to manufacturer standards.

Blood (10 ml) was obtained from each consenting patient. Fresh serum samples were used to screen for non-specific antibodies to syphilis with RPR (Bio Mérieux, Marcy l'étoile, France) and results were reported to the physician the next day. The rest of the sera were aliquoted in pre-labelled coded cryotubes and samples were frozen until tested for syphilis by TPHA (Bio Mérieux, Marcy l'étoile, France) and for antibodies to HIV with ELISA (Welcozyme HIV1 + 2, Murex Diagnostics, Dartford, UK). HIV tests were carried out in bulk on coded serum samples unlinked and anonymous. Confirmatory tests were done on positive and equivocal samples using a second ELISA (Vironostika HIV Uni-Form II, Organon-Teknika, BV, Boxtel, Holland). Both assays are so-called third generation antigen sandwich assays, the main benefit of further testing was therefore to minimize laboratory error. In addition, the laboratory participated in the regular external quality control carried out by the National Referral AIDS Laboratory, Ethiopian Health and Nutrition Research Institute, Addis Ababa, Ethiopia. Sera reactive in both RPR and TPHA were considered to be due to active syphilis in this study.

Statistical analysis was performed using the SPSS-PC and EPI info Version 6 (CDC, Atlanta and WHO, Geneva) statistical packages and the chi-square test was used for the analysis of contingency tables.

RESULTS

A total of 728 outpatient visitors participated in the study. Of these 568 (78%) were investigated for chlamydial antigen in the cervix, for active (RPR and TPHA positive) and total (TPHA positive) syphilis and for HIV infection, while the rest (32%) were tested for at least one of these STDs. HIV tests were performed anonymously but the results of VDRL and chlamydia testing were reported to the gynaecologists, who initiated treatment. The characteristics of the study subjects is shown in Table 1. Most were urban (71%) married women (78%) with a mean age of 26·7 (±7·7) and a median of 25 years. Monthly family income was > 300, 100–300 and below 100 Birr for 35%, 24% and 15% of the women respectively, while 26% did not know, or were not willing to say, how much they earned (1 US$ = 6·4 Birr). Their husbands/partners were mostly civil servants (27%), traders (23%), farmers (19%), (ex-)soldiers (10%), drivers (6·4%) or daily labourers (4·6%).

Table 2 shows the prevalence of STD among this selected population. A house-to-house survey was conducted in April 1995 in Kebele 16 (an administrative unit in the town, population 10000) close to the hospital to register all pregnant mothers and thus

Table 1. *Characteristics of the study population*

	Number	Percent
Clinic visited		
Antenatal	331	45·5
Gynaecology	356	48·9
Family planning	41	5·6
Literacy		
Illiterate	270	37·1
Reads and writes	34	4·7
Occupation		
Housewife	459	63·0
Government employee	97	13·3
Living with parent*	46	6·3
Tella (local beer) seller	18	2·5
Bar girl	21	2·9
Daily labourer	15	2·0
Other†	76	10·4
Marital status		
Married	571	78·4
Divorced	73	10·0
Single	70	9·6
Widowed	14	1·9
Number of times married		
Once	386	58·7
Twice	210	31·9
Three times	60	9·1
Four times	2	0·3
Mean age	26·7 ($\pm$7·7) years	
Median age	25 (range: 15–65) years	
Mean age at first marriage	15·6 ($\pm$4·5) years	
Median age at first marriage	15 (range: 1–30) years	
Mean gravidity	2·88 ($\pm$2·5)	
Mean parity	1·9 ($\pm$2·2)	

* Unemployed or economically dependent.
† Includes house maids ($n = 14$), roadside peddlers ($n = 12$), students ($n = 7$), shop attendants, singers, etc.

estimate the percent of mothers enrolled in the study from this Kebele without any attempt at influencing their participation. Of 78 mothers identified as pregnant in that month, 45 (57·7%) had participated in the study before it was terminated in August 1995; participation rates in more distant Kebeles would be expected to be still lower. Another bias was observed in the virtual absence of mothers from Kebele 8 in the study. It was found out that they had a local health care provider station and preferred to be seen there. Kebele 8 is inhabited predominantly by muslims. In addition, most of the women who came for family planning services were unwilling to undergo speculum examination and endocervical swabbing for the purposes of the study and were not enrolled. Therefore, the study sample is obviously not representative of the actual population of adult women in the area.

The prevalence of the STD did not differ by reason for visit or clinic seen except for a higher prevalence (35%) of TPHA positivity among family planning (FPC) than among ANC (17%) or gynaecological outpatient (GOPD) visitors (18%) ($\chi^2 = 6\cdot5$, $P = 0\cdot04$). The positivity rate for the various STDs among ANC, GOPD and FPC attenders, respectively was: HIV infection – 23·4, 28·7 and 14·3%; active syphilis – 7·3, 6·9 and 11·8%; chlamydial antigen – 6·8, 5·1 and 5·7%; TPHA – 17·2, 18·5 and 32·4%; and RPR – 14·8, 14·5 and 11·2%. FPC attenders were older (mean age 29·1 $\pm$ 7·7 years, median age 28 years) and had a median of four pregnancies but were otherwise similar in other variables to women attending the other clinics.

HIV infected women were younger (mean age 24·6 $\pm$ 6·6 and median 23 years) than their sero-negative counterparts (mean = 27·3 $\pm$ 7·7; median = 26 years) ($P < 0\cdot0001$) whereas TPHA positive women were older (mean = 28 $\pm$ 8·8 *vs*. 26·1 $\pm$ 7·2 and median = 27 *vs*. 25 years) ($P = 0\cdot049$). The prevalence rates among ANC attenders aged 15–24 years were: HIV infection, 29·7%; active syphilis, 7%; chlamydial antigen in cervix, 7·4%; TPHA positivity, 14·7% and RPR positivity, 14·8%. Seropositivity to HIV and TPHA was found to be associated with low income. HIV infection was higher among women with a monthly family income of < 100 Birr (37/97 or 38·1%) than among women with 100–300 Birr (32/136 or 23·5%) or > 300 Birr (53/211 or 25·1%) ($\chi^2 = 7\cdot1$, $P = 0\cdot02$). The TPHA positivity rate was similarly higher among those with low income: 27/98 (27·5%), 19/137 (13·9%) and 30/216 (13·9%) respectively ($\chi^2 = 10\cdot1$, $P = 0\cdot006$). There was no significant difference in prevalence of active syphilis and chlamydial antigen positivity in the different income groups. Women < 30 years of age had a higher infection rate with chlamydia, 34/474 (7·2%) *vs*. 7/219 (3·2%), than older women. Low gravidity (< 5) was associated with a higher prevalence of chlamydial infection, 39/545 (7·1%) *vs*. 2/148 (1·3%), OR = 1·23 (1·13–1·33), $P < 0\cdot05$. This was true after correction for age as well. Although not statistically significant, HIV positive women tended to have married at a later age (mean age in years 16·3 $\pm$ 4·5 *vs*. 15·3 $\pm$ 4·5; $P = 0\cdot05$) whereas TPHA positive women tended to have married younger (mean age in years 14·7 $\pm$ 5 *vs*. 15·8 $\pm$ 4·3; $P = 0\cdot06$) than their negative counterparts.

Table 3 shows the association of the STD with clinical and socio-demographic variables. Chlamydial

Table 2. *Prevalence of selected sexually transmitted diseases among outpatient visitors to women's clinics in Gondar, Ethiopia, 1995*

	Number tested	Number positive	Positive (%)
Overall prevalence of infection			
Chlamydial cervicitis (antigen positive)	693	41	5·9
Active syphilis (RPR and TPHA+)	597	44	7·4
HIV infection	593	150	25·3
TPHA positive	600	113	18·8
Single infections			
Chlamydial antigen in cervix	568	16	2·8
Syphilis: active	568	18	3·2
Syphilis: non-active (TPHA+RPR−)*	568	40	7·0
HIV infection	568	88	15·5
Multiple infections			
Active syphilis, HIV-infection and chlamydial antigen in cervix	568	6	1·0
HIV-infection and TPHA positivity	568	46	8·1
HIV-infection and Chlamydial antigen in cervix	568	13	2·3
Negative for all of the markers	568	311	4·7

* = Serological evidence for syphilis (treated, healed or inactive currently) indicating prior exposure.

Table 3. *Prevalence of sexually transmitted diseases among visitors to women's clinics in relation to selected socio-demographic and clinical variables, Gondar, Ethiopia, 1995*

Variable	Number (%) positive for			
	HIV-infection	Active syphilis	TPHA	Chlamydial antigen
Literacy				
Illiterate	41/219 (18·7)	20/218 (9·2)	55/220 (25)	16/255 (6·3)
Literate	109/374 (29·1)*	24/379 (6·3)	58/380 (15·3)*	25/438 (5·7)
OR	1·8 (1·16–2·75)	—	0·54 (0·35–0·8)	—
Number of times married				
Once	69/314 (22)	16/320 (5)	42/321 (13·1)	22/366 (6)
More than once	81/279 (29)	28/277 (10·1)	58/223 (26)*	14/258 (5·4)
OR	1·4 (0·98–2·1)	2·1 (1·1–4·26)	2·3 (1·5–3·7)	—
First coitus in relation to menarche				
Before	38/174 (21·8)	15/172 (8·7)	39/172 (22·7)	9/199 (4·5)
After	112/419 (26·7)	29/425 (6·8)	74/428 (17·3)	32/494 (6·5)
History of STD				
Never	109/496 (22)	34/498 (6·8)	87/501 (17·4)	34/581 (5·9)
Ever	41/97 (42)*	10/99 (10·1)	26/99 (26·3)	7/112 (6·3)
OR	2·6 (1·6–4·2)	—	1·7 (1–2·9)	—
Condom use				
Never	135/569 (23·7)	40/573 (7)	103/576 (17·9)	39/666 (5·9)
Ever	15/24 (62·5)*	4/24 (16·7)	10/24 (41·7)*	2/27 (7·4)
OR	5·3 (2·1–13·7)	—	3·28 (1·3–8·2)	—
Genital ulcer at visit				
Absent	132/552 (23·9)	36/557 (6·5)	97/560 (17·3)	38/662 (5·7)
Present	16/24 (66·7)*	7/25 (28)*	11/25 (44)*	3/30 (10)
OR	6·3 (2·5–16·8)	5·6 (1·9–15·6)	3·7 (1·5–9·2)	—

Chi-square test: $P < 0.01$; Odds ratio (95% CI).

Table 4. *Association in the prevalence of sexually transmitted diseases among visitors to women's clinics, Gondar, Ethiopia, 1995*

Sexually transmitted disease	Number (%) positive for		
	HIV-infection	Active syphilis	TPHA
Chlamydial antigen in cervix			
Negative	135/537 (25·1)	36/542 (6·6)	97/545 (17·8)
Positive	13/35 (37·1)	7/36 (19·4)	10/36 (27·8)
Odds ratio*	3·39 (1·2–8·9)		
Active syphilis			
Negative	124/543 (22·8)		
Positive	24/44 (54·5)		
Odds ratio	4·05 (2·06–8)		
TPHA			
Negative	102/475 (21·5)		
Positive	47/113 (41·6)		
Odds ratio	2·6 (1·64–4·13)		

* = Odds ratio (95 % CI).

antigen was not found to be associated with any of the factors. The infected patients did not have symptoms and findings such as yellow endocervical swab or cervical discharge were not significantly more frequent among them than among those negative for the antigen. Fever, lower abdominal pain, pelvic and cervical tenderness were more frequent in women negative for the antigen.

Association among the STD is shown in Table 4. Chlamydial antigen positivity was found to be associated with presence of active syphilis (Fisher's exact test, 2-tailed $P = 0.01$). The relative risk ratio (RR) for the association between active syphilis and HIV infection was 1·7 (95 % CI: 1·2–2·3), $P < 0.00001$ whereas that for the association between TPHA positivity and HIV infection was 1·34 (1·14–1·58), $P = 0.00002$.

DISCUSSION

The prevalence of HIV infection among unselected women attending the antenatal and gynaecological services of an urban center in north-west Ethiopia was found to be alarmingly high. It was far more prevalent than syphilis and chlamydial cervicitis, as measured by detection of genus specific antigen.

Prevalence of chlamydial antigen was lower than expected from serological studies that estimated active infection based on IgM and high IgG levels. Overall exposure was 84 %, with a rate of 54 % for ANC attenders in a 1977 study that involved 1846 women seen at various women's clinics in Addis Ababa [9].

The authors estimated overall recent infection at 42 %. Earlier, Forsey and colleagues [10] had reported an overall prevalence rate of 45·3 % and an active infection rate of 28·9 % for women attending STD clinics in Addis Ababa ($n = 159$). There is to our knowledge no similar study in Ethiopia that has used ELISA to detect chlamydial antigen in endocervical specimens. It is therefore difficult to compare previous reports with our findings. We have run quality control tests early in the study on the endocervical specimen sampling technique and the kits themselves to rule out technical errors. The low prevalence rate for chlamydial cervicitis in this study needs further confirmation with other techniques and in combination with serological studies on the same patients.

Reports from other studies in Africa using antigen detection assays have demonstrated variable prevalence rates. Among 181 black South Africans attending an antenatal clinic 4·7 % were positive for *C. trachomatis* with direct fluorescence staining [11]. Another report from the same country showed a rate of 11 % among ANC attenders ($n = 206$) [12]. In Gabon [13], postpartal women ($n = 598$) had a prevalence of 10 %, while women with vaginal discharge had a rate of 18 % with the same technique. Nkya and colleagues [14] reported a rate of 25 % among prostitutes in Arusha and Moshi, Tanzania. Fertile women ($n = 39$) from the high socio-economic bracket of the South African population had a prevalence of 7·3 % [15].

Although it can be misleading to compare the various studies done in different parts of Ethiopia

over the years, seropositivity to syphilis was generally higher in earlier reports. Prevalence rates based on VDRL reactivity were given as 39 % for a population sample from a roadside town in the Gondar area in 1962 [16]. In a study of female sex workers in Addis Ababa in 1968 ($n = 642$), 80 % were seroreactive with 16·3 % showing active illness [17]. Surveys conducted in 1977 [18] and 1990 [19] in the same city reported TPHA positivity rates of 50·5 % and 37·3 % respectively among this population group. In the 1990 survey, 13·8 % of sera ($n = 272$) were indicative of active illness. ANC attenders in Addis Ababa had a TPHA seropositivity rate of 27 % in a 1977 study [20]. In 1982, Feleke and colleagues [21] reported a seropositivity rate of 24·8 % for syphilis among unselected medical ward inpatients in the same city using FTA, a specific treponemal test. In a study of 21846 serum samples from blood donors collected between 1987 and 1989 from five major cities in Ethiopia, sex-specific RPR reactivity was 3 % in females [22]. In Gondar, we had reported an increasing rate of 2, 6·5 and 9·3 % RPR reactivity rate among women blood donors for the years 1991–3 [3]. The current prevalence of 17·2 % for TPHA, 14·8 % for RPR and 7·3 % for RPR and TPHA among ANC attenders in Gondar indicates that syphilis is still a major health problem in the area and underlines the importance of antenatal screening to prevent congenital syphilis.

The prevalence of HIV among female blood donors in Gondar [3] had increased from 7 % in 1989 to 16·8 % in 1992 and decreased to 13·4 % in 1993. When controlled for year and age, seroprevalence was not significantly different from men. This reflects the continued dramatic rise of the HIV epidemic in Ethiopia [1]. Elsewhere in the country, the prevalence of HIV infection among urban ANC attenders had risen from 2·8 % in 1991 to 20·2 % in 1993 [23].

Ulcerative [8] and non-ulcerative [7] STDs have been implicated in aggravating the spread of HIV in many population groups. Interaction between syphilis and HIV infection is evident from the statistically significant higher rate of co-infection observed in this study. A similar finding had been reported for blood donors in Gondar where HIV 1 seropositive subjects were found to be more likely to be seroreactive to syphilis (RPR) than HIV negative donors (odds ratio 2·36; 1·7–3·2) [3].

The various variables associated with the STDs studied generally reflect the higher prevalence of STDs in urban areas in the context of more frequent exposure to new partners. The higher rate of STDs among women who have used condoms than among those who have never used one probably suggests its irregular use among women who have exchanged partners. This study did not corroborate the report by Duncan and colleagues that first coitus prior to menarche is associated with a higher prevalence of STDs in the Ethiopian population [24] although such a tendency was noted for syphilis.

It is evident from the high prevalence of HIV and syphilis seen among women in Gondar that control measures undertaken against STDs in general and HIV infection in particular have not made an impact here. There is a very urgent need to address this problem if any hope to limit the galloping spread of the HIV epidemic in the area is to be entertained.

ACKNOWLEDGEMENTS

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