

HIV Infection and Sexual Behaviour among Women with Infertility in Tanzania: A Hospital-Based Study

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Background. Infertility is common in Africa, but virtually no data exist on HIV prevalence among infertile women. Mainly anthropological studies in Africa have shown that infertile women have higher risks of marital instability and possibly also have more sexual partners than fertile women.

Method. This study was conducted in a hospital in northwest Tanzania during 1994 and 1995. Women presenting themselves with infertility problems to the outpatient clinic were interviewed, examined and blood was drawn. Women who came to deliver in the hospital, excluding primiparae, were taken as a control group. The analysis was limited to women ≥ 24 years. In total, 154 infertile and 259 fertile women were included in the study.

Results. HIV prevalence was markedly higher among infertile women than among fertile women: 18.2% and 6.6% respectively (adjusted odds ratio [OR] for age, residence and occupation 2.7; 95% confidence interval [CI]: 1.4–5.3). Data on past sexual behaviour showed that infertile women had more marital breakdowns, more lifetime sexual partners and a higher level of exposure to sexually transmitted diseases (STD).

Conclusion. Women with fertility problems appear to have higher HIV prevalence, which justifies more attention for such women in the context of AIDS programmes. In addition, caution is needed when using sentinel surveillance data from antenatal clinics to monitor HIV prevalence.

Keywords: HIV infection, infertility, sexual behaviour, Tanzania

Infertility in Africa, mostly resulting from reproductive tract infections is an important public health problem, even though levels of infertility have declined during the past decades.^{1,2} Infertility may have far-reaching consequences for the individual or couple, the health system, family planning programmes, sexual behaviour and the spread of HIV/AIDS. Several anthropological and demographic studies have reported that unions with fertility problems have more extra-marital partners^{3,4} and are more likely to be short-lived and lead to divorce.^{5,6} Marital instability, in turn, has been shown to be associated with higher risks of HIV infection.⁷

Only a few studies have examined the association between infertility and HIV prevalence. In Gabon HIV prevalence was highest among women with primary infertility (9.3%), followed by secondary infertility (2.1%) and fertile women (0.7%).⁸ Numbers however were small (a total of nine seropositive women). In

Zimbabwe women admitted to a hospital with infertility were compared with controls from the maternity ward.⁹ HIV infection was more common among infertile women (9/227:3.9%) than the 104 fertile women (none had HIV infection).

This study examines whether HIV infection, marital instability and multiple sexual relationships are more common among women with fertility problems than among women without fertility problems in a hospital population in Tanzania.

DATA AND METHODS

The study was conducted in Bugando Medical Centre in Mwanza town, northwest Tanzania during 1994 and 1995. Women presenting themselves with infertility problems to the outpatient infertility clinic were interviewed using a standardized questionnaire on socio-economic background, obstetric and sexually transmitted disease (STD) history and other known behavioural risk factors for HIV. The interview was followed by a physical examination, including a vaginal and cervical swab, and drawing of blood to test for HIV antibodies

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and syphilis. For the purpose of this study infertility was defined as not having had a birth during the past 5 years while exposed to the risk of pregnancy among women who presented themselves to the infertility outpatient clinic. It is noted that female infertility may be due to infertility of the male partner. However, we assume that the majority of women who present themselves with infertility are infertile themselves, as most of these women have had multiple sexual partners during their lifetime.

The infertile women were compared to women who came to deliver in the hospital. Since virtually all women in Mwanza town deliver in this hospital, these women present an adequate sample of fertile women. These women were only included if they had a previous birth during the past 5 years. The analysis was restricted to women aged ≥ 24 years. Younger women were less likely to have had 5 years of regular exposure to the risk of pregnancy and to have developed the anticipated behavioural changes required for the acquisition of HIV. The median age at first marriage in Tanzania is 18.3 years.¹⁰ Primiparae aged ≥ 24 years were excluded because these women were much younger than women with infertility, and HIV prevalence is strongly associated with age.

A nurse-interviewer explained the purpose of the study to the patient and asked for consent; if the patient agreed a consent form was signed. The interviewer specifically asked whether the patient wanted to know the HIV test results and, if so, referred the patient to a nurse-counsellor for pre-test counselling. After one month the results of the investigations were reported and appropriate treatment was given. Post-test counselling on HIV status was given by the nurse-counsellor if the patient had received pre-test counselling and still wanted to know the result.

Serum was tested for HIV antibodies using ELISA Vironostika HIV-MIXT (Organon Teknika, Boxtel, The Netherlands). All positive samples were tested with a second ELISA, Enzygnost anti HIV1/HIV2 (Behring, Marburg, Germany). All consistently weak reactive samples at the first ELISA, or in case of a discrepancy of results between first and second ELISA, were subject to Western Blot (Organon; Epitope, Beaverton, Oregon, USA). Western Blot was considered positive if at least two of the gp41, gp120 and gp160 bands were present. Indeterminate blot results were classified as negative (seven cases). Syphilis infection was determined using a *Treponema pallidum* hemagglutination test (TPHA; Fujirebio, Tokyo, Japan), and a rapid plasma reagin test (VDRL carbon antigen; Murex, Dartford, UK). A positive TPHA with a positive VDRL was interpreted as active or recently treated syphilis, while a positive

TPHA and negative VDRL was considered evidence of a past cured syphilis infection. Cervical swabs were taken from all women and examined for *Chlamydia trachomatis* and *Neisseria gonorrhoea*. A Gram stain and culture on MTM plates (two samples per plate) were done on the cervical smear to identify intracellular diplococcal infections. For chlamydia, an antigen capture enzyme immunoassay (IDEAI Chlamydia; Novo Nordisk Diagnostika, Cambridge, England) was done with confirmatory assay for positive cases.

With regard to sexual behaviour, questions were asked in the questionnaire-guided interview about lifetime partners, partners in the last year, age at first sexual intercourse, and condom use. In addition, women were asked how many times they had been married or cohabited with a man. Marital instability was defined as having a history of at least one marital dissolution. In-depth interviews were conducted with infertile women to assess the consistency of self-reported data on sexual behaviour and marriage/cohabitation. Twenty women were randomly selected and re-interviewed by a social scientist during a follow-up visit 4 weeks after the initial interview. The interviews were recorded and transcribed, and compared with the results of the interview using a structured questionnaire.

In the analysis the crude odds ratios (OR) are presented for HIV prevalence and a range of indicators of marital and sexual behaviour to compare infertile and fertile women. Stepwise logistic regressions were run to assess potential confounders of the effect of infertility on HIV and on marital dissolution rates. As a result all final models included controls for age, education and occupation of the woman. Six dependent variables were used to assess past sexual behaviour: past syphilis (TPHA test positive and VDRL negative), ever had genital ulcer (self-reported), had at least one marital dissolution (self-reported), had at least three lifetime sexual partners, was in a polygamous union at the time of the interview, and recalled age at first sex (< 15 years or later). An additional five indicators were used to assess current sexual behaviour: active or recent syphilis (TPHA and VDRL tests positive), gonorrhoea (intracellular diplococcus in Gram stain, or positive culture), chlamydia infection (positive ELISA) and perception of the partner's sexual behaviour (infidelity or not sure versus faithful).

RESULTS

Table 1 presents the background characteristics of 154 infertile and 259 fertile women. For most variables there were only minor differences between the two groups. The age distribution was similar. The mean age was

TABLE 1 *Background characteristics*

Variable	Category	Per cent of	
		Infertile (n = 154)	Fertile (n = 259)
Age	<25	5.8	7.7
	25–29	42.2	48.3
	30–34	37.0	27.8
	35+	14.9	16.2
Education (years)	None	15.6	19.7
	1–4	19.5	12.0
	5–7	57.8	62.9
Occupation	8+	7.1	5.4
	None	64.9	55.6
	Farming	11.0	27.4
Tribe	Trader/manual	14.9	15.1
	Professional	9.1	1.9
	Sukuma	30.5	46.7
Residence	Other	69.5	53.3
	Urban	92.2	98.5
Marital status	Rural	7.8	1.5
	Single	0.0	0.4
Parity	Married: monogamous	57.1	56.0
	Married: polygamous	32.4	17.4
	Divorced/widowed/ separated	10.4	26.3
	0	39.0	0.0
Blood transfusion in last 5 years	1–2	45.5	29.0
	3–4	14.3	37.8
	5+	1.3	33.2
Number of injections received in last year	Yes	9.1	8.1
	None	31.8	52.5
Condom use	1–5	40.9	32.1
	≥6	27.3	15.4
	Never heard of	9.7	1.5
	Ever used	5.8	8.5
	Never used	84.4	90.0

29 years among infertile women and the control women. There were no differences in educational levels, but infertile women were more likely to be in professional occupations ($P < 0.001$). A significantly larger proportion of the women giving birth were divorced, separated or widowed (26.3%), compared to only 10.4% of infertile women ($P < 0.001$). Among the women with infertility, the majority of women had problems of secondary infertility: 61% of infertile women had ever given birth, but not during the last 5 years.

Blood transfusions and injections may also transmit HIV. A similar proportion of infertile women and women giving birth had received a blood transfusion in the last 5 years. Women with infertility problems had received more injections than the women giving birth.

Table 2 presents the prevalence of various indicators among infertile and fertile women with a crude OR. The prevalence of HIV was markedly higher among infertile women: 18.2% and 6.6% respectively (adjusted OR 2.6; 95% CI : 1.3–5.4) but HIV prevalence did not differ significantly between primary and secondary cases of infertility (20.0% and 17.0% respectively; $P > 0.05$).

A number of indicators were used to assess past sexual behaviour. Consistently infertile women showed higher levels of sexual activity than fertile women. This pertains to marital instability, number of lifetime sexual partners, age at first intercourse, and evidence of past STD. Women with infertility problems were also more likely to be in a polygamous union than fertile women.

A second group of indicators in Table 2 refers to current sexual behaviour. There were no major differences between the two groups of women with regard to prevalence of current STD. Gonorrhoea and chlamydia infection were more commonly found in cervical swab material among women from the maternity ward, but differences were not significant at the 5% level and prevalences were low throughout. Chlamydia infection could be demonstrated by two positive immunoassays for three fertile and no infertile women (Fisher exact test: $P > 0.05$). Detailed physical examination was only done for infertile women. Seven women (4.6%) had genital ulcers, five women (3.2%) had genital warts and 20 infertile women (13.0%) had vaginal discharge. Six of the seven women with ulcers had herpetic lesions.

Infertile women were less certain about the fidelity of their current sexual partners than fertile women. Other indicators of current sexual behaviour, such as number of partners in the last year or last month, could not be used since the fertile women had been pregnant for the past 9 months or so. Only 3.3% of the infertile women reported more than one sexual partner during the last year, compared to none of the women who had been pregnant during the past year.

The comparison of qualitative and quantitative data for 20 women with infertility problems showed good agreement between the structured questionnaire interview and the recorded in-depth interview one month later. All but one woman reported exactly the same number of children. One woman reported three children in the questionnaire-guided interview and four during the in-depth interview, including one additional child from another man. With regard to marriage, all women reported the same current marital status on both occasions, except one divorced woman who originally had said she was single. Four women, however, reported more marriages during the in-depth interview (two marriages versus one in the first interview). In one

TABLE 2 Prevalence of HIV, sexually transmitted diseases and indicators of sexual behaviour among infertile and fertile women with crude and adjusted odds ratios

Variable	Test/Category	Per cent of		Odds ratio		
		Infertile (n = 154)	Fertile (n = 259)	Crude	Adjusted ^a	95% CI
HIV	HIV serology+	18.2	6.6	3.2	2.7	(1.4-5.3)
<i>Indicators of past sexual behaviour</i>						
Ever syphilis	THPA+ & VDRL-	13.0	5.4	2.6	2.4	(1.1-5.1)
Genital ulcers	Ever had	22.1	7.3	3.6	4.0	(2.1-7.8)
Marital dissolution	At least one	43.5	27.8	2.0	2.1	(1.4-3.4)
Lifetime partners	At least three	29.2	14.7	2.4	2.4	(1.4-4.0)
Marital status	Polygamous	32.5	17.4	2.3	2.5	(1.5-4.2)
Age at first sex	<15 years	23.4	11.2	2.4	3.0	(1.6-5.3)
<i>Indicators of current sexual behaviour</i>						
Active syphilis	THPA+ & VDRL+	6.5	7.3	0.9	0.8	(0.3-1.8)
Gonorrhoea	Gram stain intracell.	5.8	10.8	0.5	0.6	(0.3-1.3)
Gonorrhoea	Culture MTM	0.0	1.2	na		
<i>Chlamydia trachomatis</i>	ELISA(confirmatory)	0.0	1.2	na		
Partner's behaviour	Infidelity/not sure	55.2	35.9	2.2	1.9	(1.3-3.2)

^a Adjusted for age, education and occupation in a logistic regression model with 95% confidence interval (CI) for each of the indicators.

interview the woman had reported three marriages in the structured questionnaire interview, compared to two marriages in the in-depth interview. In both interviews the women were asked about their use of modern and traditional health services. The results were remarkably consistent, for both hospital use and use of traditional medical practitioners (who have been used very frequently). In one case the structured questionnaire interview resulted in a higher number of traditional medical practitioners, in two cases the opposite occurred.

DISCUSSION

The HIV prevalence was markedly higher among women presenting themselves to an infertility clinic than among non-primiparous women who delivered in the same hospital. The risk of HIV infection could be higher among infertile women because of higher levels of exposure to HIV through multiple sexual partners of the woman herself or because her partner has multiple partners. Several indicators showed that past sexual behaviour of women with infertility had been different from the fertile women. The infertile women had more marital dissolutions, reported more lifetime sexual partners, and appeared to have had more STD than fertile women. The qualitative data suggested that the interview data were of reasonable quality, although under-reporting of sexual partners at both interviews is still

possible. Data on childbearing, marriage and health services utilization among the 20 infertile women agreed well with data obtained through interviews using a structured questionnaire one month earlier. The main difference was the reporting of the number of marital dissolutions. One in five women did not report one of their previous marriages. This suggests that there may also be some underreporting of lifetime sexual partners. The qualitative evaluation was only done for women with fertility problems and not for the other women, so we cannot assess whether a differential bias affected our study results. The low level of misclassification among infertile women, however, is encouraging.

Indicators of current sexual behaviour did not show significant differences, but this may be due to a selection bias. Women who present themselves with infertility problems to a hospital clinic may be in more stable unions than infertile women who are not in such relationships. In fact, 90% of infertile women reported themselves as currently in union, compared to 73% of the women giving birth. A similar bias was observed in a study in Uganda where the infertile women presenting themselves to a clinic usually had long durations of marriage and good relations with their present husbands.¹¹ In this case our indicators of sexual behaviour provide an underestimate of sexual partners, divorces etc. and actual differences between infertile women and other women may even be larger.

The current prevalence of STD was not higher among infertile women. Prevalence of active syphilis and gonorrhoea and chlamydia infection was similar among both groups. Gonorrhoea and chlamydia infection were low in both groups, which may be due to inadequate specimen collection or laboratory techniques. The procedures followed were exactly the same as in a recent study among rural women in the same region where STD prevalence was higher than in our study.¹² The low prevalence of STD among infertile women may in part be due to high utilization of health services, which may result in high use of antibiotics. For instance, infertile women reported on average 1.7 visits to modern health facilities and 5.9 visits to traditional medical practitioners in association with their fertility problems. Antibiotics are used in both modern and traditional treatments. It may also be that the group of infertile women visiting the infertility clinic were now in more stable unions and therefore less exposed to STD pathogens, as was argued above.

Anthropological, demographic and clinical studies in Africa have described the changes in marriage and sexual behaviour among infertile couples or infertile women. A man may be more likely to have extra-marital partners if his wife is unable to bear children.^{3,4,13} There are also multiple examples of higher marital dissolution rates in childless marriages.^{5,6,14} In national survey data from Cameroon and Nigeria infertility (including secondary infertility) was associated with greater marital instability.¹⁵ In some settings infertility is not a reason for divorce.^{5,16,17} Men, however, tend to marry one or more additional wives without divorcing the childless woman. Survey data from Cameroon also indicated an association between infertility and polygamous unions.¹⁵ In our study, women with infertility were also more probable to be in polygamous unions.

It appears that infertile women had an earlier sexual debut than other women. Almost one in four infertile women started sexual intercourse prior to the age of 15 compared to 11% of fertile women. Similar findings are reported from Cameroon and Nigeria.¹⁵ Early childbearing was markedly more common in the secondary infertility cases: the mean age at first birth of 120 infertile women was 17.8 years compared to 18.8 years among fertile women (t-test for difference of means: $P < 0.001$). A few studies have suggested that early childbearing is a risk factor for contracting STD, pelvic inflammatory disease (PID) and subsequent infertility.^{18,19} This may be due to early onset of sexual activity, or to consequences of early childbearing or a combination of these factors. In Ethiopia, first coitus before menarche was found to be associated with the

risks of STD and PID.²⁰ In our study the proportions of women reporting their first sexual intercourse prior to menarche were similar among fertile and infertile women (5.2% and 6.8% respectively).

From our cross-sectional study it is not possible to assess whether infertility causes marital breakdown, multiple sexual partnerships and HIV infection. Two arguments can be used in favour of the causal role of infertility in the HIV epidemic. First, many anthropological studies have described the adverse effects of infertility on marital stability. Second, controlling for age at first sex in our multivariate analysis did not attenuate the infertility effect on the risk of HIV. On the other hand, early onset of sexual intercourse and multiple sexual partners during adolescence may cause reproductive tract infections and subsequent infertility and HIV. Also, the association infertility-HIV may be due to a fertility-reducing effect of HIV infection on fertility. There is some evidence from other studies that HIV infection has an effect on fertility.²¹ Women with HIV infection more often have amenorrhoea and other menstrual problems^{22,23} and may have increased fetal wastage rates, although evidence is not conclusive.²⁴⁻²⁶ The effects however appear to be fairly small and mostly limited to women with advanced infection. In our study none of the women could be classified as having AIDS on clinical grounds.

Our study has several implications. First, sentinel surveillance of the HIV epidemic is often based on serum samples obtained from antenatal women. Since infertile women are not included these estimates may be too low. This was also found in a Tanzanian study comparing HIV prevalence among antenatal attenders with a population-based survey.²⁷ Second, women attending infertility clinics should routinely be offered voluntary HIV testing. Not only is the HIV prevalence high, counselling and testing may also help to plan their future. During our study we found most infertile women highly motivated to know their HIV status (62% of infertile women compared to 8% of fertile women). Third, the problem of infertility needs more attention as it may be one of the underlying forces of the HIV epidemic in Africa through the association infertility—marital instability—number of sexual partners. In fact, the threat of infertility may sometimes be a more powerful argument to induce behavioural changes than the threat of AIDS. Fourth, reduction of the incidence of STD and preventing the sequelae of STD has a direct impact on HIV transmission, but may also have an indirect long-term reducing effect through a reduction of the prevalence of infertility. Control of STD, especially in adolescence, should be a priority intervention in HIV prevention programmes.

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