

## ORIGINAL ARTICLE

## Baseline survey of sexually transmitted infections in a cohort of female bar workers in Mbeya Region, Tanzania

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**Objectives:** To determine baseline prevalence of sexually transmitted infections (STI) and other reproductive tract infections (RTI) and their association with HIV as well as sociodemographic and behavioural characteristics in a newly recruited cohort of female bar workers in Mbeya Region, Tanzania

**Methods:** 600 female bar workers were recruited from 17 different communities during September to November 2000 and underwent gynaecological examination, laboratory testing for HIV/STI, and interviews using structured questionnaires.

**Results:** HIV-1 seroprevalence was 68%. Prevalences of STI/RTI were high titre syphilis (TPPA/RPR  $\geq 1/8$ ), 9%; herpes simplex virus 2 antibodies, 87%; chlamydia, 12%; gonorrhoea, 22%; trichomoniasis, 24%; and bacterial vaginosis, 40%. HIV infection was associated with TPPA and HSV-2 seropositivity, bacterial vaginosis and clinically diagnosed genital ulcers, blisters, and warts. Reported high risk sexual behaviour during the past year (having multiple casual partners) was associated with prevalent STI.

**Conclusion:** Female bar workers in Mbeya are at high risk of STI and HIV infection. Targeted STI/HIV prevention interventions for these women and their sexual partners need to be reinforced. Methods should be sought to improve healthcare seeking and to provide easily accessible and affordable STI care services.

In Tanzania, as in other countries of sub-Saharan Africa, trading centres along the major highways have facilitated the spread of HIV from urban to rural areas. These settlements are characterised by frequent transit of short term visitors with ample opportunities for social interactions and casual sexual contact between travellers and local inhabitants. In particular, women working in the trading, hotel, and catering businesses in such communities together with their sexual partners may form part of a sexual network of individuals at increased risk of HIV and sexually transmitted infections (STI). Though sex work is illegal in Tanzania, the nature of the sexual relationships is often commercial, involving the exchange of gifts or money. Regarding payment women are usually totally dependent on the generosity of their client. This type of informal and unprotected sex work renders women especially vulnerable to demands for unsafe sex by their clients and to violence.

In 1991, a cross sectional survey among 106 sex workers in Moshi, Tanzania reported high prevalences of HIV (73%), syphilis (27%), and gonorrhoea (51%).<sup>1</sup> Since the mid 1990s little information has been published on the extent, trends, and determinants of HIV and STI among women engaging in sex work and their clients in Tanzania.

In the context of a study of HIV superinfection with different viral subtypes, an open cohort of 600 women working in bars, hotels, and guesthouses was established in late 2000 in roadside settlements in Mbeya Region, Tanzania. In addition to investigations on the immunological, behavioural, and clinical correlates of HIV superinfections, several studies of STI and their interrelation with HIV infection and of interventions to control them are under way.

The objectives of the present study were: (1) to assess baseline prevalences of STI and reproductive tract infections (RTI), (2) to determine sociodemographic and behavioural risk factors for prevalent STI, and (3) to investigate associations between HIV infection and STI/RTI among bar workers recruited to the cohort.

## METHODOLOGY

## Study population and design

In late 2000, a cohort of 600 women working in modern and traditional bars, guesthouses and hotels, was established in Mbeya Region, south west Tanzania. The region is well connected with other parts of Tanzania and with neighbouring Malawi and Zambia through international highways. Women were recruited from 17 sites located in Mbeya town, trading centres along the main roads, and one gold mining area. Distances between these sites were in the order of 20–240 km. Eligibility criteria for cohort participants included (1) age between 18 and 35 years, and (2) presence at the project site during the past 6 months. On the days of recruitment at each site, one group (and at three sites two groups) of 30 women fulfilling these criteria was enrolled consecutively.

## Interviews and clinical examinations

All 600 women were interviewed in Swahili, using a structured questionnaire. Information collected included sociodemographic characteristics, living conditions, sexual behaviour, lifetime history of genital ulcers and vaginal discharge, contraceptive use, and pregnancy.

At each site, clinical examinations were carried out in a suitable locality, usually a local government health facility, ensuring privacy and confidentiality. Consenting women were interviewed, a blood sample was taken and a gynaecological examination performed, during which genital specimens were collected for laboratory diagnosis. Women with signs or symptoms suggestive of STI were treated on the spot by study clinicians following the Tanzanian national syndromic STI case management guidelines.

## Laboratory methods

Swabs from the vaginal fornix were immediately inoculated onto a culture medium for *Trichomonas vaginalis* (InPouch TV; Biomed Diagnostics, San Jose, CA, USA), which was read

according to manufacturer's instructions after 3 and 5 days. Smears obtained from the vaginal wall were examined microscopically for bacterial vaginosis using the Nugent score criteria.<sup>2</sup> Cervical swabs were tested with the Amplicor *C trachomatis* and *N gonorrhoeae* polymerase chain reaction (PCR) (Roche Diagnostics, Branchburg, NJ, USA). Ulcer swabs were examined by Multiplex PCR<sup>3</sup> for *T pallidum* (TP), *H ducreyi* (HD), and HSV (Roche Diagnostics, Branchburg, NJ, USA).

Syphilis serology was assessed by means of the Serodia *Treponema pallidum* particle agglutination assay (TPPA; Fujirebio Inc, Tokyo, Japan) and with the rapid plasma reagin test (RPR; VD25, Murex Diagnostics Ltd, Cambridge, UK). RPR/TPPA positive results were categorised into high titre RPR ( $\geq 1/8$ ), suggestive of early latent, untreated syphilis, and low titre RPR ( $\leq 1/4$ ), suggestive of late latent, and/or treated syphilis.

All sera were tested with a dual ELISA strategy (HIV-Determine, Abbott Laboratories, USA and Enzygnost HIV1+2 plus, Behring, Germany).

### Statistical methods

Data were entered in Microsoft Access 2000 (Microsoft Inc, USA) and statistical analysis was performed using STATA 6.0 (Stata Inc, 1999).

The association of STI prevalence with increasing age (grouped as <20 years; 20–24 years; 25–29 years, and 30+ years) was examined using the Mantel-Haenszel test for trend controlling for site of recruitment. Adjusting for age and site of recruitment, logistic regression was used to calculate odds ratios (ORs) for the association between (1) STI pathogens and selected sociodemographic and behavioural variables, and (2) HIV serostatus and STI. To analyse independent effects of sociodemographic and behavioural variables on STI risk logistic regression was used to adjust ORs for all variables that were statistically significant ( $p < 0.05$ ) in the age and site adjusted model.

## RESULTS

### General characteristics of the study population

At recruitment the mean age of the 600 women was 25.4 years. All 583 women, who reported on their educational status, had some formal education, 433 (74%) had completed primary education and 54 (9%) had attended secondary school for some time. In all, 127 of 600 women (21%) were married or living with a partner, 264 (44%) were widowed or divorced, and 209 (35%) were single; 289 (48%) worked in modern bars, 169 (28%) in traditional bars (*vilabu*), 113 (19%) in restaurants/guesthouses, and 29 (5%) in kiosks serving drinks; 408 (68%) had been working in their current profession less than 2 years. Mobility was high, and one fifth of the women had changed residence during the past year.

### Prevalence of STI/RTI symptoms, signs and pathogens

Prevalences of symptoms and signs of STI/RTI are shown in table 1.

There was a poor correlation between reported symptoms and clinically diagnosed signs. For example, 56% of clinically diagnosed STI signs were not reported by the women, while about 20% of symptoms women complained of could not be verified upon clinical examination. Out of 181 women complaining of STI symptoms, 33 (18%) had already sought treatment.

Prevalence of infection with HIV and STI pathogens by age is shown in table 2.

At least one classic STI pathogen (*T vaginalis*, *N gonorrhoeae*, *C trachomatis*, *H ducreyi*, *T pallidum*, HSV) was detected in 282/600 (47.0%) women. Including women with bacterial vaginosis and candidosis and women with high titre active

**Table 1** Prevalence of STI/RTI symptoms and signs among 600 female bar workers

STI/RTI symptom or sign	No (%)
<b>Reported current STI/RTI symptoms</b>	
Any STI/RTI symptom	181 (30.2)
Genital discharge	56 (9.3)
Genital ulcer	18 (3.0)
Genital warts	61 (10.2)
Genital itching	80 (13.3)
Lower abdominal pain	45 (7.5)
Swollen inguinal lymph nodes	14 (2.3)
<b>Clinically diagnosed STI/RTI signs</b>	
Any STI/RTI sign	326 (54.3)
Abnormal genital discharge	213 (35.5)
Cervicitis	113 (18.8)
Genital ulcer(s)	52 (8.7)
Genital blister(s)	12 (2.0)
Genital warts	39 (6.5)
Inguinal lymphadenopathy	62 (10.3)
Lower abdominal tenderness	38 (6.3)
<b>Reported lifetime STI/RTI symptoms</b>	
Ulcer	106 (17.7)
Discharge	141 (23.5)

syphilis, 89% of all women were diagnosed with one or more STI and/or RTI.

Of pathogens causing cervicitis or colpitis, *N gonorrhoeae* was present in 133 (22.2%) of the women, *C trachomatis* in 75 (12.5%), concurrent *C trachomatis* and *N gonorrhoeae* in 28 (4.7%), and *T vaginalis* in 142 (23.7%); 8.7% had a syphilis serology suggestive of current untreated syphilis (RPR $\geq 1/8$ /TPPA+ve).

The prevalence of *C trachomatis* and syphilis (RPR $\geq 1:8$ ) decreased with increasing age. The prevalence of *N gonorrhoeae* peaked in the age group 20–24 years and decreased thereafter. In contrast, antibodies to HIV-1, HSV-2, and *T pallidum* were more prevalent among older women. The highest relative increase of the latter infections occurred between the youngest age group (<20 years) and the second youngest (20–24 years): HIV-1 prevalence increased from 46% to 72%, HSV-2 seropositivity from 60% to 88%, and TPPA seropositivity from 27% to 42%.

HSV and *T pallidum* were detected in 13.5% and 9.6% and *H ducreyi* in none of specimens of 52 women with genital ulcerative/erosive lesions respectively.

Among women with clinically diagnosed vaginal discharge and/or cervicitis, the prevalence of *T vaginalis* (25.8%), *C albicans* (59.6%), *N gonorrhoeae* (23.5%), and *C trachomatis* (13.2%) was not significantly higher than among those without discharge.

### Sociodemographic and behavioural risk factors for STI

Detailed data on self reported risk behaviour and their analysis will be published elsewhere.<sup>4</sup> In the present analysis only selected behavioural variables have been included. The majority of the women (90%) currently had a sexual partner, whom they perceived as a "regular" as opposed to a "casual" partner; 57% reported "casual" partners besides their regular partner during the past year. In 75% of these casual sexual relationships some payment was involved. "Ever condom use" was as low as 50% with both regular and casual partners. The reported age at first sexual intercourse ranged between 9 and 26 years (mean 16 years).

In the multivariate analysis no association was found between any STI and the following characteristics: frequency of condom use with regular and casual partners, age when first working as bar worker, duration of work as bar worker, and mobility. Associations were found with some variables

**Table 2** Prevalence of STI/RTI pathogens and STI/HIV seromarkers by age

Prevalence of positive laboratory test result by age group						
Pathogen	Age <20 (n = 52)	Age 20–24 (n = 210)	Age 25–29 (n = 222)	Age 30+ (n = 116)	All ages (n = 600)	Test for trend
<b>Genital swabs</b>						
<i>N gonorrhoeae</i> (NG)	21.2%	30.0%	19.4%	13.8%	22.2%	(p<0.01)
<i>C trachomatis</i> (CT)	17.3%	15.7%	9.9%	9.5%	12.5%	(p<0.01)
NG/CT	36.5%	37.6%	26.1%	20.7%	30.0%	(p<0.01)
<i>T vaginalis</i>	32.7%	24.3%	22.1%	21.5%	23.7%	(p=0.12)
<i>C albicans</i>	63.5%	61.6%	61.9%	56.9%	60.5%	(p=0.64)
Bacterial vaginosis	42.3%	45.2%	39.4%	31.9%	40.2%	(p=0.04)
<i>T pallidum</i> (ulcer)					0.8%	
<i>H ducreyi</i> (ulcer)					0.0%	
HSV (ulcer or blister)					1.7%	
<b>Serology</b>						
HIV	46.2%	71.9%	68.0%	70.7%	68.0%	(p<0.01)
TPPA+ve	26.9%	41.9%	46.4%	50.0%	44.2%	(p<0.01)
TPPA+/RPR+ (all titres)	17.3%	16.7%	18.0%	16.4%	17.2%	(p=1.0)
TPPA+/RPR+ (titre≥1:8)	11.5%	10.5%	6.8%	5.2%	8.2%	(p=0.07)
HSV-2	59.6%	88.1%	90.1%	89.7%	86.8%	(p<0.001)

and these data are shown in table 3. After adjusting for age and site of recruitment, lifetime infection with syphilis (TPPA+ve) was significantly associated with a lower educational level (*p* < 0.001). Women working in “modern bars”—in contrast with other establishments—were at higher risk of lifetime syphilis as well as HSV-2 infection (*p* < 0.01), while current infection with *N gonorrhoeae*/C *trachomatis* occurred most frequently in women working in traditional bars (0.01). *N gonorrhoeae*/C *trachomatis* infections were associated with partner change (*p* < 0.001) and with the receipt of money for sexual favours (data not shown). There was a statistically non-significant association between early age at first sex and lifetime risk of syphilis or HSV-2 infection (data not shown).

### Association of STI with HIV infection

A total of 408 (68.0%) of the 600 women were HIV positive (table 4). HIV positive women had a significantly higher prevalence of markers of lifetime infection with *T pallidum*

(50% *v* 33%) and HSV-2 (91% *v* 77%) and of current bacterial vaginosis (44% *v* 32%) than HIV negative women. More HIV positive than HIV negative women were clinically diagnosed with genital ulcers (11% *v* 4%), enlarged inguinal lymph nodes (13% *v* 4%), and warts (10% *v* 0%) and they also reported higher numbers of lifetime STI. Adjusting for the effect of age and site of recruitment, these associations were independent of the coexistence of other STI and other sociodemographic and behavioural variables.

### DISCUSSION

This cross sectional study collected baseline information on a newly recruited cohort of 600 women working in modern and traditional bars, restaurants, and guesthouses/hotels at settlements along the highways in Mbeya Region. The study found high infection rates with HIV and other STI, comparable to rates reported in other studies of female sex workers in sub-Saharan Africa during recent years.<sup>5–7</sup>

**Table 3** Association of STI with sociodemographic and behavioural characteristics

Variable	(n)	Lifetime syphilis infection (TPPA+ve)		Lifetime HSV-2 infection (HSV-2 +ve)		Current infection with <i>N gonorrhoeae</i> /C <i>trachomatis</i>	
		% +ve	OR* (95% CI)	% +ve	OR** (95% CI)	% +ve	OR*** (95% CI)
Age (years)			<i>p</i> = 0.01		<i>p</i> = 0.0004		<i>p</i> = 0.0001
<20	(52)	26.9	1.00	59.6	1.00	36.5	1.00
20–24	(210)	41.9	2.28 (1.11 to 4.69)	88.1	4.54 (2.04 to 10.13)	37.6	0.93 (0.47 to 1.85)
25–29	(222)	46.4	2.76 (1.34 to 5.66)	90.1	6.03 (2.54 to 14.29)	26.1	0.40 (0.19 to 0.81)
30+	(116)	50.0	3.41 (1.54 to 7.58)	89.7	5.29 (1.94 to 14.39)	20.7	0.34 (0.14 to 0.86)
Education (17 missing values)			<i>p</i> = 0.002		<i>p</i> = 0.08		<i>p</i> = 0.5
primary incomplete	(96)	58.3	1.00	90.6	1.00	34.0	1.00
primary complete	(433)	41.6	0.47 (0.29 to 0.77)	84.7	0.55 (0.24 to 5.65)	28.6	1.02 (0.60 to 1.70)
secondary	(54)	31.5	0.31 (0.14 to 0.66)	92.6	1.47 (0.39 to 5.52)	30.3	1.50 (0.68 to 3.27)
Marital status			<i>p</i> = 0.5		<i>p</i> = 0.02		<i>p</i> = 0.6
single	(209)	37.8	1.00	78.9	1.00	34.4	1.00
cohabiting/married	(127)	47.2	0.48 (0.70 to 2.20)	87.4	1.47 (0.66 to 3.23)	22.8	0.70 (0.37 to 1.36)
widowed/divorced	(264)	47.7	1.28 (0.83 to 1.96)	92.4	2.55 (1.30 to 4.98)	30.3	0.88 (0.55 to 1.38)
Workplace			<i>p</i> = 0.04		<i>p</i> = 0.009		<i>p</i> = 0.01
Modern bar	(289)	45.7	1.00	90.3	1.00	33.9	1.00
Traditional bar	(169)	52.7	1.29 (0.70 to 2.37)	89.3	0.52 (0.19 to 1.37)	32.5	1.88 (0.96 to 3.67)
Guesthouse/hotel	(113)	25.7	0.57 (0.33 to 0.98)	74.3	0.31 (0.15 to 0.63)	14.2	0.52 (0.27 to 0.99)
Kiosk (minibar)	(29)	51.7	1.38 (0.61 to 3.11)	82.8	0.34 (0.09 to 1.14)	27.9	1.21 (0.51 to 2.82)
Number of casual partners			<i>p</i> = 0.7		<i>p</i> = 0.3		<i>p</i> = 0.0007
No casual partner past year	(255)	42.0	1.00	84.3	1.00	23.9	1.00
≥ One casual partners past year	(205)	45.4	1.19 (0.78 to 1.82)	85.8	1.32 (0.72 to 2.44)	30.2	1.82 (1.14 to 2.92)
Any new partner past month	(140)	46.4	1.16 (0.71 to 1.87)	92.1	1.90 (0.83 to 4.32)	40.7	2.63 (1.56 to 4.43)

\**p* Value and OR adjusted for site of recruitment, age, education and workplace; \*\**p* value and OR adjusted for site of recruitment, age, marital status and workplace; \*\*\**p* value and OR adjusted for site of recruitment, age, workplace, and number of casual partners.

Women participating in the cohort are clearly working in a high risk environment, although not all of them report that they engage in sex work. For instance, only 58% of the women reported having had one or more casual partners during the past 12 months and approximately 45% reported having received money for sexual favours.

### HIV and STI/RTI prevalence

The prevalence of HIV infection was high (68%), indicating a high exposure to infected sexual partners during their lifetime. In fact, many HIV infections may have occurred before women started working in their current profession, as the duration of work in the profession was not associated with increased HIV risk.<sup>8</sup> In comparison, rates among antenatal care attenders in this region are significantly lower (21.7% in Mbeya town and 17.4% in roadside settlements).<sup>9</sup> In such a situation, even though Tanzania experiences a generalised HIV epidemic, male clients of female bar workers may function as a bridging group for HIV transmission in the general population.<sup>10 11</sup>

The prevalence of STI among the women in the cohort generally lies within the range of prevalences reported from studies among sex workers in other countries in sub-Saharan Africa in recent years. For example, in Nairobi, Kenya,<sup>5</sup> and Kwa Zulu Natal, South Africa<sup>7</sup> genital ulcers have been observed in 2.7% and 12.7% of sex workers respectively, active syphilis in 8.8% and 12.7%, *N gonorrhoeae* in 10.5% and 14.3%, *C trachomatis* in 9.1% and 16.7%, *T vaginalis* in 13% and 40.8%, and bacterial vaginosis in 46% and 71%. HSV-2 antibodies were found in around 80% of sex workers in Zimbabwe,<sup>12</sup> Eritrea,<sup>13</sup> and Nigeria.<sup>14</sup> These STI prevalences indicate a high rate of exposure to STI and inadequate treatment. In our study, only few women complaining of STI symptoms had sought treatment. Data on obstacles to treatment seeking were not systematically collected, but "lack of money" was frequently mentioned in this context to study clinicians. These findings indicate that the regionwide introduction in the late 1990s of free STI services in public health facilities has so far failed to adequately reach this highly vulnerable group. Further investigations into the availability and quality of these STI services, and their

accessibility to high risk groups, might shed light on existing constraints and ways to overcome them.

### Association between STI and HIV

Current infection with *N gonorrhoeae*, *C trachomatis*, *T vaginalis*, *C albicans*, or active syphilis (TPPA/RPR+ve) was not associated with prevalent HIV infection in this cross sectional study. However, different findings were obtained for some clinical signs of STI. There was a strong correlation between HIV infection and the following STI signs: genital warts, genital ulcers (including those not associated with an identifiable causative agent), inguinal lymphadenopathy, and genital blisters. This confirms findings from other studies that HIV infection may exacerbate symptomatic HPV and HSV infection and directly cause an enlargement of inguinal lymph glands and possibly genital ulcerations.<sup>15 16</sup>

Women with bacterial vaginosis, a recurrent imbalance of the vaginal microbial flora, were more likely to be HIV infected. The reasons for this correlation, which has also been found in other studies,<sup>17 18</sup> remain unclear and warrant further investigation. The altered vaginal milieu with a high pH and a lack of H<sub>2</sub>O<sub>2</sub>, may predispose to HIV infection.<sup>19</sup> Bacterial vaginosis also occurs together with other STI/RTI.<sup>20 21</sup> In our study bacterial vaginosis was associated with vaginal discharge, with cervicitis, with *N gonorrhoeae*, *T vaginalis*, and with HIV seropositivity. Alternatively, HIV infection may predispose to bacterial vaginosis, as concluded in a study of HIV positive women in Thailand.<sup>22</sup>

### Sociodemographic and behavioural characteristics and STI

In the present study few sociodemographic and behavioural variables correlated with STI risk. This may partly reflect methodological limitations, as information on risk behaviour obtained in interviews is known to be inaccurate.<sup>23</sup> It is possible that women under-reported risk behaviours, as observed in other studies on AIDS related risk behaviours,<sup>24</sup> especially in a situation (baseline survey), where interviewers and cohort participants were not yet familiar with each other. In addition, women may not have been able to recall accurate

**Table 4** Association of HIV status with STI/RTI pathogens, clinical STI/RTI signs, and reported lifetime STI/RTI syndromes

STI/RTI pathogens, signs and symptoms	HIV+ve (n = 408)	HIV - ve (n = 192)	OR*
	No (%)	No (%)	(95% CI)
<b>Genital swabs</b>			
<i>N gonorrhoeae</i>	102 (25.0%)	31 (16.1%)	1.33 (0.83 to 2.14)
<i>C trachomatis</i>	52 (12.5%)	23 (12.4%)	1.00 (0.56 to 1.76)
<i>N gonorrhoeae/C trachomatis</i>	132 (32.4%)	48 (25%)	1.22 (0.80 to 1.88)
<i>T vaginalis</i>	98 (24.0%)	45 (23.5%)	1.01 (0.65 to 1.57)
<i>C albicans</i>	245 (60.0%)	119 (62.0%)	0.83 (0.55 to 1.24)
Bacterial vaginosis	179 (43.9%)	62 (32.3%)	1.65 (1.12 to 2.45)
<b>Serology</b>			
TPPA+ve	202 (49.5%)	63 (32.8%)	1.60 (1.09 to 2.35)
TPPA/RPR+ve (all titres)	71 (17.4%)	32 (16.7%)	0.81 (0.49 to 1.33)
TPPA/RPR+ve (≥1/8)	35 (8.6%)	17 (8.9%)	0.74 (0.37 to 1.47)
HSV-2	372 (91.2%)	148 (77.1%)	2.77 (1.62 to 4.73)
<b>STI/RTI signs (clinically diagnosed)</b>			
Abnormal genital discharge	147 (36.0%)	66 (34.4%)	1.26 (0.85 to 1.88)
Cervicitis	84 (20.6%)	29 (15.1%)	1.63 (0.97 to 2.73)
Genital ulcer(s)	44 (10.8%)	8 (4.2%)	3.54 (1.52 to 8.26)
Genital blister(s)	11 (2.7%)	1 (0.5%)	3.70 (0.44 to 30.91)
Genital warts	39 (9.6%)	None	
Inguinal lymphadenopathy	54 (13.2%)	8 (4.2%)	4.66 (1.95 to 11.12)
Lower abdominal tenderness	29 (7.1%)	9 (4.7%)	1.38 (0.59 to 3.23)
<b>Reported lifetime STI/RTI syndrome</b>			
Ulcer	84 (20.6%)	22 (11.5%)	2.31 (1.34 to 3.98)
Discharge	109 (26.7%)	32 (16.7%)	1.85 (1.16 to 2.96)

\*OR adjusted for age and site of recruitment.

numbers and types of sexual partners, or frequency of condom use over periods longer than a few days or weeks.

In the multivariate analysis a weak, though recognisable pattern emerges regarding the relation between STI risk and sociodemographic and behavioural characteristics. We found an association of relatively "acute" infections (*N gonorrhoeae*, *C trachomatis*) with variables reflecting current/recent exposure (for example, multiple causal partners during past 12 months; receipt of money in exchange for sexual favours). On the other hand serological markers of lifetime infection with STI (TPPA+ve, HSV2+ve) were associated with variables reflecting cumulative exposure to STI (for example, age or marital status).

### Correlation between STI infection and clinical signs and symptoms

Clinical STI signs and self reported symptoms showed little correlation with the presence of causative STI pathogens. Because of the low sensitivity of "vaginal discharge" as a sign to detect bacterial vaginosis (46.5%), *T vaginalis* (38.5%), and *C albicans* (34.9%) and of "cervicitis" as a sign to detect infections with *N gonorrhoeae* (21%) and *C trachomatis* (24%), between 50% and 80% of the women with these infections were not treated on the spot. Conversely, because of the low specificity of these signs, approximately one third of the women diagnosed with vaginal discharge and one fifth of the women with cervicitis were treated, although they did not carry the respective causative agents. Since 83% of women were found to be affected by *T vaginalis*, *C albicans*, or bacterial vaginosis, while 30% were infected with either *N gonorrhoeae* and/or *C trachomatis*, and in the absence of practicable rapid tests for STI, it may be appropriate to consider periodic presumptive treatment together with condom promotion and treatment of partners as measures to reduce the burden of STI in this group. Periodic presumptive treatment of STIs among sex workers has recently been introduced in several South African mining communities and found to be highly effective in reducing STIs among both sex workers and the male mining population residing in the same communities.<sup>25</sup>

### CONCLUSION

Our study shows that prevalences of STI and HIV are very high among female bar workers in Mbeya Region. Taken together with the data on high risk behaviours—for example, low prevalence of reported condom use with both regular and casual partners, these findings reveal a largely unmet need for interventions supporting behaviour change and effective STI care for female bar workers and their male clients in order to reduce the transmissions of STI and HIV and the negative health and social impact of untreated infection.

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### Key messages

- Prevalence of HIV, clinically and laboratory diagnosed STI was high among 600 female bar workers who were recruited into an open cohort in late 2000 in Mbeya Region, Tanzania.
- Taken together with the data on high risk behaviours—for example, low prevalence of reported condom use, these findings reveal a largely unmet need for interventions supporting behaviour change and effective STI care for female bar workers and their male partners.

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### CONTRIBUTORS

All co-authors commented on draft versions of the paper. GR designed the study, developed data collection instruments, supervised field work, analysed the data and prepared the manuscript; MR assisted in the development of data collection instruments and was responsible for field work; OH was responsible for the cohort recruitment and the sociobehavioural data collection; FN was responsible for laboratory testing in Mbeya; EL and PH co-designed the study, supported the quality assurance of laboratory work in Mbeya and assisted in manuscript preparation; DN and LM co-designed the study and assisted in the supervision of the field work; JT, RH, and HG co-designed the study and advised on the implementation and the analysis; MH designed and implemented the cohort study on HIV superinfections in the context of which this baseline survey took place and assisted in the manuscript preparation.

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