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High Risk Behaviors and Sexually Transmitted Infections among Men in Tanzania

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Abstract

We assessed the association between risk behaviors and sexually transmitted infections (STIs) among men. We interviewed 794 men randomly selected from Moshi district of Tanzania. Blood and urine samples were tested for STIs. Forty six percent of the men tested positive for at least one STI including human immunodeficiency virus (HIV-1), herpes simplex virus (HSV-2), syphilis, chlamydia, trichomonas, and mycoplasma infection. Multiple sexual partners, casual sex, alcohol abuse, and older age were associated with higher odds of having an STI. Effective STI prevention programs in sub-Saharan Africa should have components aimed at addressing modifiable risk behaviors in men.

Keywords

High-risk behaviors; sexually transmitted infections; HIV; HSV-2; sub-Saharan Africa

Introduction

AIDS continues to be the leading cause of death in most sub-Saharan African countries. More than 25 million of people infected with HIV, i.e., two out of three HIV-infected individuals, live in sub-Saharan Africa (UNAIDS 2006). Less than a third of people living with HIV in sub-Saharan Africa have access to antiretroviral therapy. In the absence of effective vaccine and universal access to antiretroviral therapy, comprehensive control measures taking into account modifiable social and cultural-rooted behaviors that are associated with HIV transmission remain the most promising strategy to curb and reverse the spread of the epidemic in the sub-region. In sub-Saharan Africa, HIV transmission is predominantly heterosexual; interventions to target risky sexual behaviors are therefore reasonable.

The prevalence rates of sexually transmitted infections (STIs) reported from studies in sub-Saharan Africa are high. [1] STIs resulting in genital ulcers significantly increase the risk acquisition and transmission of HIV-1. Cross-sectional studies in HIV-1-infected individuals have demonstrated that bacterial STIs are associated with higher HIV-1 viral loads in genital secretions, and successful treatment of these STIs reduces the viral load and presumably reduces the risk of HIV-1 transmission. [2] Unfortunately, in sub-Saharan Africa, inadequate healthcare infrastructure prevents the early recognition and treatment of STIs. Identification

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and interventions that will control sexual behaviors and risk factors associated with the acquisition and transmission of STIs including HIV are urgently needed.

About 7% of the adult population in Tanzania is infected with HIV. [3] In the Moshi District of northern Tanzania the prevalence of HIV infection is about twice that of the national average. The HIV epidemic has disproportionally affected women in sub-Saharan Africa. [4] Moreover, HIV transmission in the sub-region is predominantly through heterosexual mode. There are limited studies on the prevalence and risk factors for the transmission of STIs in men. Risk factors that have been associated with the prevalence of STIs include condom use, multiple sexual partners, age at onset of sexual debut, alcohol abuse, and education attainment. In the current study, we analyzed data from a large community-based survey in the Moshi urban district of northern Tanzania to examine the association between high-risk behaviors and STIs in men.

Methods

Study Design

This study used data collected as part of the Moshi Infertility survey; a detailed description of the study protocol, data gathering instruments and procedures and laboratory methods have been previously published. [5] In brief, the survey was conducted from November 2002 to March 2003 in the Moshi urban district of Tanzania and involved a two-stage sampling. In the first stage of sampling, 150 clusters were selected and then a number of households were randomly selected from each of the 150 clusters. Information was collected on fertility, infertility, family planning, marriage, sexual practices, symptoms of STIs, socio-demographic characteristics, and husband–wife relations including domestic violence and alcohol use.

Study Population

Seven hundred and four men who were listed as husbands or partners of the women were also eligible for individual interviews. Information on socio-demographic characteristics and high risk sexual behaviors were collected. Blood samples were drawn from men who agreed to further testing for HIV-1, herpes simplex virus type 2 (HSV-2), and syphilis. Urine samples were obtained to test for *Chlamydia trachomatis, Trichomonas vaginalis*, and *Mycoplasma genitalium* infections.

Study Variables

Demographic and socio-economic characteristics including age, length of stay in Moshi, education, ethnicity, religion, occupation, and participant's first sexual partner were obtained. Moreover, participants were asked if the current relation was their first marriage or if they were living with a partner for the first time. High-risk behaviors including age at first sex (<18, 18-19, and 20+), number of sexual partners (in the last 1 and 3 years [1 and 2+ partners]), frequency of condom use in the last 12 months (never, sometimes, and always/ often), and alcohol abuse were obtained. Alcohol abuse was measured by the CAGE score [6] which is defined as the sum of 'yes' answers to the following four questions: (1) Have you ever felt you should cut down on drinking?, (2) Have people annoyed you by criticizing your drinking?, (3) Have you ever felt bad or guiltily about your drinking?, and (4) Have you ever had a drink first thing in the morning to steady your nerves or to get rid of a hangover? The CAGE score ranged from 0 to 4. Alcohol abuse was defined as a CAGE score of 2-4 and alcohol non-abuse as a CAGE score of 0-1.

Sexually Transmitted Infections (STIs)

Five hundred and sixty-seven men provided blood samples for HIV, HSV-2 and syphilis testing. HIV and HSV-2 testing were done according to manufacturer's instructions. Active and past syphilis infections were diagnosed if the serum was reactive on the Rapid Plasma Reagin (RPR) card test and/or the Treponema Pallidum Hemagglutination Assay (TPHA). Urine samples were collected from 588 men and were tested for *C. trachomatis, T. vaginalis*, and *M. genitalium* infections using a real-time multiplex polymerase chain reaction (M-PCR) assay.

Statistical Analysis

Univariate analyses were carried out using Pearson's Chi-square test to asses the association between socio-demographic characteristics, high-risk behaviors and STIs. Multivariate analyses using two-level mixed models, with men nested in geographic clusters, were used to examine the effect of socio-demographic variables and high-risk behaviors on STIs. Univariate and multivariate analyses were done for all STIs including HIV and HSV-2, and then separate analyses for HIV and HSV-2. All the analyses were done using SAS soft ware.

Results

Prevalence of STIs in the study population

We found a high prevalence of STIs among the men tested as shown in Table 1. Five hundred and sixty seven out of the 794 (71.4%) men enrolled into the study agreed to full interview on history of sexual behavior and gave blood samples for HIV, HSV-2, and syphilis infections testing. Moreover, 588 (74.1%) of the men provided urine samples for testing of *C. trachomatis, T. vaginalis*, and *M. genitalium* infections. Forty six percent of the men tested positive for at least one STI. The most prevalent STI among the study participants was HSV-2 (39.2%), followed by HIV infection (6.5%). The prevalence rates for other STIs tested were; trichomonas (6.4%), mycoplasma genitalium (5.1%), syphilis (4.1%), and Chlamydia (0.7%) (Table 1).

Characteristics of the study population

Table 1 presents descriptive characteristics of the study participants. The average age of the men was 37 years with a standard deviation of 8.9 years. The majority (58%) of study participants were Christians; either Protestants (24%) or Catholics (34%). The rest were either Muslims or belonged to other religions. About two-thirds of the participants had only pre-secondary education. About half of the men (52%) worked as either skilled or unskilled laborers. Since migrant workers have contributed to the HIV epidemic in the sub-region, we investigated the residential status of the men. About 18% of the men had lived in Moshi all their lives, 54% had lived in Moshi for ten or more years. We found a high prevalence of premarital sexual relationships; only 16% of the men had their first sexual intercourse at marriage or with a cohabiting partner. Majority of the men (83%) were in their first marriage or were living with a partner for the first time.

We assessed the association between the characteristics of the study participants and their STI status in a univariate analysis (Table 2). We found a significant association between testing positive for an STI and age (χ^2 (2)=30.5, p<0.01), partner at first sex (χ^2 (2)=6.0,p<0.05), and living with a marital partner for the first time (χ^2 (1)=12.9, p<0.01). With HSV-2, age (χ^2 (2)=32.0, p<0.01) and living with a marital partner for the first time (χ^2 (1)=8.4, p<0.01) remained significant. The only significant association with HIV was living with a marital partner for the first time (χ^2 (1)=9.8,p<0.01). There was no significant association between testing positive for an STI and ethnicity, religion, education, occupation, or the length of stay in Moshi.

High risk behaviors among study participants

We assessed the prevalence of the high-risk behaviors among study participants as illustrated in Table 3. Five hundred and forty-four men provided complete information on alcohol use. Thirty three percent of the participants were categorized as alcohol abusers with CAGE scores of 2 to 4. The percentage distribution of age at first sex was 34%, 26% and 40% for ages <18, 18-19 and 20 years or more. Most of the participants were in a monogamous relationship for the last 12 months (88%) or 3 years (78%). The low usage of condoms in the last 12 months is therefore not surprising. With chronicity of some of the STIs, number of partners in the last three years may better represent risk of infection as compared to the number of partners in the last 12 months. Thus, the number of partners in the last three years was used in the univariate and multivariate analyses. The reported number of partners in the last three years ranged from 1 to 10.

Table 4 presents distribution of the high risk behaviors in the study population by STIs status. The prevalence of an STI was significantly associated with alcohol abuse (χ^2 (1)=4.9, p<0.05), and number of sexual partners in the last 3 years (χ^2 (1)=7.3, p<0.01). The only risk behavior found to have statistically significant association with HIV was number of sexual partners in the last 3 years (χ^2 (1)=4.2, p<0.05). Number of sexual partners in the last 3 years (χ^2 (1)=4.9, p<0.05) was also significantly associated with HSV-2. Most of the men with an STI had their first sex before their 20th birth day; however, the association between age at first sex and STIs was not statistically significant. Moreover, condom use in the last twelve months had no statistically significant association with the prevalence of an STI.

Predictors of STIs in the study population

We used a two-level mixed model with men nested in geographic clusters to examine high risk behaviors that could predict the prevalence of an STI. We adjusted for the socio-demographic factors that were found to be associated with STIs. That is, all the high risk behaviors and socio-demographic factors that were associated with STIs at the 0.10 level in the univariate analysis were included in the multivariate analysis (Table 5).

The unadjusted results in Table 5 show that not being in a first marriage, alcohol abuse, and age were significant predictors for the presence of an STI. The odds of an STI increased in men not in a first time marriage or first time living with a partner (OR=2.27[1.33-3.88], p<0.01). Men who abused alcohol were more likely to have STIs (OR=1.53[1.01-2.32], p<0.05). Older men were more likely to have STIs compared to younger men. For example, the odds of having an STI in a 41+ year old man was 3.51 times higher than that of a man aged between 20 and 30 years (OR=3.51[2.04-6.06], p<0.01). First marriage/partner remained a significant predictor of HIV (OR=2.60[1.15-5.88], p<0.05) and HSV-2 (OR=2.24[1.32-3.79], p<0.01). Furthermore, the odds of HSV-2 were higher in men 31 years or older. In the adjusted analysis, only old age was found to be associated with STIs (data not shown).

Discussion

We found high prevalence rates of STIs among men in the Moshi district of Tanzania; the most prevalent STI was HSV-2 (39.2%), followed by HIV (6.5%). The observed rates are consistent with previous studies from Tanzania and other sub-Saharan Africa countries, though, most of these studies involved convenience sampling (e.g., study participants were recruited from STI clinics, or drinking bars). High prevalence rates of STIs have also been reported among women in the Moshi district of Tanzania. [7] The prevalence of HSV-2 was 43.8% and the prevalence of HIV, *T. vaginalis*, and *C. trachomatis* in women was about 2-

fold higher than the prevalence we observed in the men in Moshi district. STIs have been reported to significantly increase the risk of HIV acquisition and transmission. The high prevalence of STIs found in the study is of public health concern.

We found that alcohol abuse, age at first sex, multiple sexual partners, and casual sex were associated with high prevalence of STIs in men. These findings are consistent with previous studies from sub-Saharan Africa. [1] We found that first time marriage or cohabitation with a partner for the first time was associated with low prevalence of STIs. Contrary to previous studies, we did not find an association between condom use and the prevalence of STIs. The apparent lack of association between condom use and prevalence of STIs in our study population may be partly due to: 1) the low prevalence of condom use among study participants; 2) most of the study participants were in monogamous relationships during the study; 3) the early age at sexual debut of participants might have contributed to the high prevalence of STIs prior to current relationship; and 4) STI diagnostic testing used in the study did not discriminate between acute and chronic infections. In the sub-region, prompt diagnosis and treatment of STIs among men present several hurdles. HIV prevention programs in northern Tanzania specifically targeted at men could benefit from strategies such as: encouraging a delay in the onset of sexual debut, prompt diagnosis and treatment of STIs, and pre-marital testing for STIs. In the early 1990s, Uganda launched an aggressive national anti-HIV/AIDS campaign with the key intervention of “ABC” – Abstinence, Be faithful, use Condoms. The dramatic decline in HIV prevalence in Uganda has been attributed to interventions targeted at the reduction of risk behaviors associated with STIs including HIV. [8]

Successful intervention programs should target risk behaviors that predict the prevalence of STIs. In an unadjusted analysis we found that not being in a first marriage, alcohol abuse, and older age (31+) significantly predict the presence of an STI. In the adjusted model only older age (31+) was a significant predictor of STI. With high percentage of the men initiating sex before their 18th birth day in a population with high prevalence of STIs, older men are more likely to have been exposed to previously infected partners. This is of interest in a culture where sexual mixing of older men and younger women has been identified as a risk factor for HIV infection in younger women and girls. [9] Other studies in the sub-region have reported direct relationship between alcohol abuse, number of sexual partners and STIs symptoms. [10]

The present study has several strengths compared to previous studies; it has a large sample size and a laboratory-confirmed STI diagnosis in a population based sample. However, the study had some limitations. As a cross-sectional study, the associations observed may not be causal. The original survey questions did not have details on the number and/or timing of previous partners, therefore, we could not comment on the temporal association of partnership and STI. Furthermore, the accuracy of the information given may be affected by the sensitive nature of information regarding sexual behavior and recall bias. Moreover, alcohol use was measured by self-report, which may have introduced respondent and recall biases. The findings from this study could be an underestimation of the true association between STIs and the risk behaviors observed. Moreover, the study population does not represent the higher risk population

In conclusion, the finding of high prevalence of STIs in men is of public health significance especially in sub-Saharan Africa where women are disproportionally affected by the HIV epidemic. [4] HIV prevention programs should target sexually active young men to make an impact in preventing HIV in women and the community at large. Effective intervention programs should focus on the predictors of STIs including HIV, particularly in young men.

Since it may be difficult and too late to prevent STIs in the older men as most of them were now in stable and monogamous relationships.

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Table 1

Prevalence of Sexually Transmitted Infections and Socio-demographic Characteristics of Study Population, Moshi Men, Tanzania, 2002-2003.

Sexually Transmitted Infections (STIs)		
HIV(n=566)		
Negative	529	93
Positive	37	7
HSV-2(n=567)		
Negative	345	61
Positive	222	39
Past syphilis(n=565)		
Negative	542	96
Positive	23	4
Chlamydia(n=588)		
Negative	584	99
Positive	4	1
Trichomonas(n=588)		
Negative	550	94
Positive	38	6
Mycoplasma genitalium (n=588)		
Negative	558	95
Positive	30	5
Sociodemographic Characteristics	**N**	**%**
Age in years (*n*=790)		
20-30	199	25
31-40	344	44
41+	247	31
Ethnicity (*n*=753)		
Chaga	325	43
Pare	84	11
Other	344	46
Religion (*n*=789)		
Muslim/other	328	42
Catholic	271	34
Protestant	190	24
Education (*n*=792)		
Pre-secondary	550	69
Secondary & above	242	31
Job (*n*=794)		
Farming	116	15

Business	50	6
Labor	408	52
Professional	58	7
Unemployed	162	20
Stay in Moshi (*n*=789)		
Always	146	18
<10 years	218	28
10+ years	425	54
Partner at first sex (*n*=794)		
Wife/cohabiting partner	126	16
Regular non- cohabiting partner	163	20
Other†	505	64
First Marriage/Partner†† (*n*=783)		
No	131	17
Yes	652	83

†Friends, casual acquaintance, commercial sex customer, relative

††First time marriage or first time living with a partner

Table 2

Sociodemographic Characteristics by STIs (all STIs including HIV-1 and HSV-2), HIV-1 and HSV-2 Status in Moshi Men, Tanzania, 2002-2003.

	Any STI			HIV-1			HSV-2		
	No	**Yes**	**χ^2**	**No**	**Yes**	**χ^2**	**No**	**Yes**	**χ^2**
	N (%)	**N (%)**		**N (%)**	**N (%)**		**N (%)**	**N (%)**	
Age in years			30.50**			3.57			32.0**
20-30	112(35)	51(18)		145(28)	5(14)		114(33)	37(17)	
31-40	139(43)	117(42)		218(41)	19(51)		149(44)	88(40)	
41+	72(22)	112(40)		162(31)	13(35)		79(23)	96(43)	
Ethnicity			1.43			1.12			0.81
Chaga	145(47)	114(43)		225(45)	13(36)		142(43)	97(46)	
Pare	29(9)	32(12)		56(11)	5(14)		40(12)	21(10)	
Other	138(44)	118(45)		218(44)	18(50)		145(44)	91(44)	
Religion			2.35			1.02			2.55
Muslim/other	142(44)	107(38)		217(41)	17(46)		151(44)	83(37)	
Catholic	105(32)	105(37)		185(35)	10(27)		113(33)	83(37)	
Protestant	76(24)	69(25)		124(24)	10(27)		78(23)	56(25)	
Education			1.31			0.21			0.61
Pre-secondary	233(72)	213(76)		396(75)	29(78)		255(74)	171(77)	
Secondary & above	92(28)	68(24)		132(25)	8(22)		89(26)	51(23)	
Job			7.39			4.06			7.32
Farming	45(13)	54(19)		89(17)	7(19)		51(15)	45(20)	
Business	28(9)	12(4)		37(7)	1(3)		28(8)	10(5)	
Labor	168(52)	137(49)		264(50)	22(59)		183(53)	104(47)	
Professional	21(6)	20(7)		34(6)	0(0)		18(5)	16(7)	
Unemployed	64(20)	58(21)		105(20)	7(19)		65(19)	47(21)	
Stay in Moshi			3.42			2.45			3.07
Always	65(20)	42(15)		95(18)	3(8)		64(19)	34(15)	
<10 years	95(29)	77(28)		143(27)	12(32)		101(29)	55(25)	

	Any STI			HIV-1			HSV-2		
	No	**Yes**	**χ^2**	**No**	**Yes**	**χ^2**	**No**	**Yes**	**χ^2**
	N (%)	**N (%)**		**N (%)**	**N (%)**		**N (%)**	**N (%)**	
10+ years	165(51)	160(57)		288(55)	22(60)		179(52)	131(60)	
Partner at first sex			5.99*			1.59			3.44
Wife/cohabiting partner	58(18)	33(12)		75(14)	3(8)		50(15)	29(13)	
Regular non-cohabiting partner	76(23)	58(21)		118(22)	7(19)		84(24)	41(18)	
Other†	192(59)	190(67)		336(64)	27(73)		211(61)	152(69)	
First Marriage/Partner††			12.86**			9.84**			8.39**
No	42(13)	67(24)		89(17)	14(38)		50(15)	53(24)	
Yes	281(87)	208(76)		431(83)	23(62)		291(85)	164(76)	

** $P<0.01$

* $P<0.05$

† Friends, casual acquaintance, commercial sex customer, relative;

†† First time marriage or first time living with a partner

Table 3

Distribution of the Study Population by High-Risk Behaviors in Moshi Men, Tanzania, 2002-2003.

High-Risk Behaviors	N	%
Alcohol Abuse (*n*=544)		
No	363	67
Yes	181	33
Age at first sex (*n*=735)		
<18	253	34
18-19	190	26
20+	292	40
Number of partners† (n=793)		
1	695	88
2+	98	12
Number of partners†† (n=789)		
1	612	78
2+	111	22
Condom use††† (n=792)		
Never	630	80
Sometime	115	14
Often/always	47	6

† Number of sexual partners in the last 12 months

†† Number of sexual partners in the last 3 years

††† Condom use in the last 12 months

Table 4

High Risk Behaviors by STIs (all STIs including HIV-1 and HSV-2), HIV-1 and HSV-2 Status in Moshi Men, Tanzania, 2002-2003.

	Any STIs			HIV-1			HSV-2		
	No	**Yes**	**χ^2**	**No**	**Yes**	**χ^2**	**No**	**Yes**	**χ^2**
	N (%)	**N (%)**		**N (%)**	**N (%)**		**N (%)**	**N (%)**	
Alcohol Abuse			4.78*			1.89			3.15
No	152(69)	122(59)		236(64)	15(52)		156(67)	96(59)	
Yes	68(31)	85(41)		130(36)	14(48)		76(33)	68(41)	
Age at first sex			2.57			4.16			0.25
<18	101(33)	98(37)		173(35)	17(46)		117(36)	74(36)	
18-19	80(26)	73(28)		133(27)	12(32)		87(26)	58(28)	
20+	128(41)	92(35)		190(38)	8(22)		124(38)	74(36)	
Number of partners †			4.22*			8.14**			4.42*
1	295(90)	239(85)		470(89)	27(73)		311(90)	187(84)	
2+	31(10)	42(15)		59(11)	10(27)		34(10)	35(16)	
Number of partners ††			7.29**			4.20*			4.89*
1	263(81)	202(72)		406(77)	23(62)		272(79)	158(71)	
2+	61(19)	79(28)		121(23)	14(38)		71(21)	64(29)	
Condom use †††			0.18			2.34			0.36
Never	262(81)	225(80)		426(81)	26(70)		276(80)	177(80)	
Sometime	47(14)	40(14)		74(14)	8(22)		48(14)	34(15)	
Often/always	16(5)	16(6)		28(5)	3(8)		20(6)	11(5)	

** *P*7lt;0.01

* *P*<0.05

† Number of sexual partners in the last 12 months

†† Number of sexual partners in the last 3 years

††† Condom use in the last 12 months

Table 5

Predictors of STIs (all STIs including HIV-1 and HSV-2), HIV-1 and HSV-2 Status in Moshi Men, Tanzania, 2002-2003:

	Any STIs		HSV-2		HIV	
	OR	**(95% CI)**	**OR**	**(95% CI)**	**OR**	**(95% CI)**
Number of partners [±]						
1	1.00		1.00		1.00	
2+	1.47	(0.93-2.31)	1.36	(0.86-2.16)	1.81	(0.82-3.98)
First Marriage/Partner [††]						
Yes	1.00		1.00		1.00	
No	2.27**	(1.33-3.88)	2.24**	(1.32-3.79)	2.60*	(1.15-5.88)
Alcohol Abuse						
No	1.00		1.00			
Yes	1.53*	(1.01-2.32)	1.49	(0.98-2.28)		
Age in years						
20-30	1.00		1.00			
31-40	2.11**	(1.26-3.54)	2.03*	(1.14-3.60)		
41+	3.51**	(2.04-6.06)	3.94**	(2.18-7.11)		
Partner at first sex						
Wife/cohabiting partner	1.00					
Regular non-cohabiting partner	1.73	(0.85-3.53)				
Other [†]	1.65	(0.89-3.05)				

** $P<0.01$

* $P<0.05$

[±] Number of sexual partners in the last 3 years

[†] Friends, casual acquaintance, commercial sex customer, relative

[††] First time marriage or first time living with a partner