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Research Article

Prevalence and Factors Associated with Sexually Transmitted Infections among Men Who Have Sex with Men Initiating HIV Pre-Exposure Prophylaxis in Benin

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Abstract

Background: Men who have sex with men (MSM) are at increased risk of sexually transmitted infections (STIs). Data on STIs among MSM in Benin are scarce. This study aimed to assess the prevalence and factors associated with *Neisseria gonorrhoeae* (NG), *Chlamydia trachomatis* (CT) and *Treponema pallidum* (TP) among 204 HIV-negative MSM initiating pre-exposure prophylaxis (PrEP) for HIV prevention in Cotonou, Benin. **Methods**: In this cross-sectional study, a questionnaire was completed and participants underwent a physical examination by a physician. Blood, anal, pharyngeal, and urinary samples were collected. Prevalences are presented with a 95% confidence interval (95% CI). Poisson regression was used to determine factors associated with STIs. **Results:** The prevalence was 18.6% (95% CI, 13.3% - 24.0%), 15.2% (95% CI, 10.3% –20.1%), 9.8% (95% CI, 5.7% - 13.9%) and 27.9% (95% CI, 21.8% - 34.1%) for CT, NG-all sites, anorectal NG, and infection by either NG or CT (NG/CT), respectively. STIs were generally asymptomatic (84.2% for NG/CT) and of biological extra-genital location (70.2% for NG/CT). One case of unconfirmed syphilis was observed. In multivariate analysis, being younger, not being single, and having more than four female sexual partners were associated with CT and NG/CT, while lower monthly income was associated with NG and/or CT. Relative youth, receptive anal sex and paid sex were associated with NG. Only receptive anal sex was associated with anorectal NG. **Conclusion:** NG and CT infections are common among HIV-negative MSM in Cotonou. Their asymptomatic and extra-genital nature could make syndromic management ineffective and extra genital screening necessary. Syphilis is rare among these MSM. STI control and prevention interventions should target young MSM and their female sexual partners.

Keywords: Gonorrhea; Chlamydia; Sexually Transmitted Infections; Men who have sex with Men; Africa

Introduction

Sexually transmitted infections (STIs), such as the human immunodeficiency virus (HIV) infection, gonorrhea, chlamydia and syphilis remain a major public health problem worldwide. Sub-Saharan Africa is one of the most affected regions [1]. In 2022, it accounted for 50% of all new HIV infections and 66% of all people living with HIV worldwide [2]. Men who have sex with men (MSM) are disproportionately affected by these STIs [2-5]. Recently, a study conducted among MSM initiating pre-exposure prophylaxis (PrEP) to prevent HIV infections in four main cities in West Africa (Abidjan-Côte d'Ivoire, Bamako-Mali, Lomé-Togo, and Ouagadougou-Burkina Faso) found a high prevalence of chlamydia and gonorrhea: 17.3% and 13.7%, respectively [6].

In Benin, while HIV prevalence in the general population aged 15-49 years was 0.9% in 2017, it was 7% among MSM [2]. In 2020, the incidence of HIV was 0.21 per 1,000 person-years in the general population and 59.1/1,000 person-years among MSM [2,7]. Accordingly, the health authorities of the country have decided to include oral-PrEP within the combined HIV Prevention Package for MSM. To guide the implementation of this biomedical HIV prevention strategy, an oral-PrEP demonstration project was conducted between August 2020 and October 2021 in Cotonou, the main city of Benin. This study was part of the demonstration project and aimed to describe the prevalence and factors associated with *Chlamydia trachomatis* (CT), *Neisseria gonorrhoeae* (NG) and *Treponema pallidum* (TP) infections at baseline. As far as we know, no data address this issue among HIV-negative MSM in Benin. The oral-PrEP demonstration project in which this study was included has been described in detail elsewhere [5].

Materials and methods

To allow for an outcome of interest, the assessment of a prevalence of 50% with a precision of 7%, the study sample was set at 204 participants. They were recruited from August 24 to November 24, 2020, using a two-stage sampling procedure. First, seven of the thirteen districts of Cotonou were selected with a probability proportional to size. Second, based on the size of each, a given number of HIV-negative MSM were selected using a random route method [8]. This process was facilitated by a mapping of the MSM community of Cotonou and its suburbs that was carried out by Bénin Synergie Plus, a MSM dedicated network [9]. Overall, the recruitment was facilitated by Bénin Synergie Plus and a second identity network named Réseau Sida Bénin. Ten peer-facilitators from these two organizations mobilized the MSM community prior to recruitment. The information provided to MSM in the field was about STIs' control, the study objective and procedures. The inclusion criteria were being born male, having sex with men, being HIV-negative and at least 18 years old, being a member of one of the two MSM networks of Cotonou (Benin Synergie Plus or Réseau Sida Bénin), living in Cotonou for at least six months, and agreeing to initiate PrEP.

NG, CT, and TP infections were explored at three different sites (pharyngeal, urethral and anal). NG/CT laboratory diagnosis was based on a real-time nucleic acid amplification technique using the GeneXpert platform (Cepheid, Sunnyvale, CA, USA). Fingertip and venous blood samples were collected for a rapid treponemal test and a rapid plasma reagin test for the diagnosis of syphilis using the One Step Multi-Infectious Disease Test (InTec Products, Inc., Xinyang, China). The One Step Multi-Infectious Disease

Test was also used to confirm the HIV-negative status of the participants. HIV-positive men received immediate antiretroviral therapy. Following the clinical examination performed by the physician, all men with symptomatic STIs were treated according to national guidelines.

The potential determinants of STIs included sociodemographic variables such as age, marital status, education level, occupation, income, place of residence, religion, and nationality; variables related to sexual practices with men: sexual preference (homosexuality, bisexuality, or heterosexuality), sexual role (insertive, receptive, or versatile), type of sexual activity (oral sex, anal sex, or mutual sexual masturbation), type of partner (stable or casual), number of male partners in the past six months, concurrent male partners at the time of recruitment, condom use during sex, paid sex, and substance use; variables related to sexual practices with women: number and type (casual, regular) of female partners in the past six months; and information on STIs' symptoms: irritation, sores in the genital region, and urethral discharge in the past six months and four days prior to recruitment. Information on these independent variables was collected through a validated questionnaire administered face-to-face by trained investigators.

Descriptive analyses were computed in terms of means (±standard deviation, sd) for continuous variables and percentages with their 95% confidence intervals (95% CI) for categorical variables. Bivariate analyses between the outcomes (NG, CT, NG/CT, and anorectal NG), and independent variables of interest were performed. Variables with a $p < 0.20$ (Pearson chi-square test) were entered into a multivariate Poisson regression model. The final Poisson multivariate model was based on a backward elimination method and adjusted for potential confounders. The statistical significance level was set at $p < 0.05$. SAS version 9.4 software (SAS Institute Inc, Cary, NC, USA) was used for the data analysis.

This project was approved by the National Ethics Committee for Health Research of Benin and the Ethics Committee of the CHU de Québec-Université Laval, Canada. Each man willing to participate signed a written free and informed consent form. For those unable to write, a fingerprint was used as a signature mark, in the presence of a witness who validated the appropriateness of the process. No personal information was disclosed. Participants could stop participating at any time during the process. To compensate for the time dedicated to the study, each participant received $8 US. All treatments provided in the context of the study were free of charge (early antiretroviral therapy for men who tested HIV-positive and antibiotics for NG/CT, whether the diagnosis was symptomatic or based on laboratory testing).

Results

A total of 204 MSM initiating PrEP were enrolled in this study. Their mean age was 25.9 ± 4.8 years. Approximately four out of five men were single. Most men (91.7%) reported anal intercourse at least once during the six months that preceded recruitment. Of the 187 participants who reported anal sex in the past six months, 118 (63.1%), 39 (20.9%), and 30 (16.0%) preferred insertive, receptive, and versatile roles, respectively. Consistent condom use was reported in 40.5% of the cases of insertive anal sex versus 32.9% for receptive anal sex (Table 1).

Variables	Number	%	95% CI
Socio-demographic characteristics			
Age (years) (n=204)			
18 - 24	89	43.6	36.8-50.4
25 - 41	115	56.4	49.6-63.2
Occupation (n=204)			
Unemployed	14	6.9	3.4-10.3
Occupation with income	137	67.1	60.7-73.6
Students	53	26.0	20.0-32.0
Marital status (n=204)			
Married/Cohabiting	34	16.6	11.6-21.8
Single	165	80.9	75.5-86.3
Divorced/Widowed/Separated	5	2.5	3.3-4.6

Variables	Number	%	95% CI
Level of education (n=204)			
Never been in school	1	0.5	0.0-1.5
Primary	14	6.9	3.4-10.3
Lower secondary	34	16.7	11.6-21.8
Upper secondary	57	27.9	21.8-34.1
Higher education	98	48.0	41.2-54.9
Monthly income in CFA *francs* * (n=203)			
< 40,000	89	43.8	37.0-50.7
40,000-80,000	67	33.0	26.6-39.9
>80,000	47	23.2	17.5-29.6
Living as a couple* (n=201)			
Yes	64	31.8	25.5-38.8
No	137	68.2	61.7-74.6
Religion (n=204)			
None	8	3.9	1.3-6.6
Traditional	3	1.5	0.0-3.1
Catholic	128	62.8	56.1-69.4
Other Christian religion	39	19.1	13.7-24.5
Islam	26	12.7	8.2-17.3
Nationality (n=204)			
Beninese	195	95.6	92.8-98.4
Other†	9	4.4	2.0-8.2
Sexual behaviours with men			
Sexual preference* (n=203)			
Homosexuality	76	37.5	30.8-44.1
Bisexuality	116	57.1	50.3-64.0
Heterosexuality	11	5.4	2.3-8.5
Sexual activity with men in the past 6 months‡ (n=204)			
Anal sex	187	91.7	87.9-95.5
Oral sex	143	70.1	63.8-76.4
Mutual masturbation	118	57.8	51.07-64.6
Anal/oral sex/mutual masturbation	198	97.1	94.7-99.4
Concurrent partners at recruitment (n=204)			
Yes (≥ 2)	136	66.7	60.2-73.1
No (0-1)	68	33.3	26.9-39.8

Variables	Number	%	95% CI
Average number (±sd) of male partners with whom the participant had anal sex (last six months)	2.1± (1.7)		
Average number (±sd) of monthly anal sex with males (past six months)	3.1± (2.8)		
Insertive anal sex with an HIV-positive partner (past 6 months) (n=187)			
Yes	7	3.8	1.0-6.5
No	162	86.6	81.8-91.5
Unknown	18	19.6	11.9-24.1
Type of partner during last insertive anal sex with a man (last 6 months) (n=187)			
Occasional	34	18.2	12.7-23.7
Regular	124	66.3	59.4-73.1
No insertive anal sex	29	15.5	10.3-20.7
Condom use during last insertive anal sex with a man (past 6 months) (n=158)			
Yes	100	63.3	55.8-70.8
No	58	36.7	29.2-44.7
Frequency of condom use during insertive anal sex (past 6 months (n=158)			
Never (0%)	13	8.2	3.9-12.5
Sometimes (1-49%)	53	33.6	26.2-40.9
Often (50-99%)	28	17.7	11.8-23.7
Always (100%)	64	40.5	32.9-48.2
Type of partner during last receptive anal sex with a man (last 6 months) (n=187)			
Casual	19	10.2	5.8-14.5
Regular	60	32.1	25.5-39.3
No receptive anal sex	108	57.7	50.7-64.8
Condom use during last receptive anal sex with a man (past 6 months) (n=79)			
Yes	45	57.0	46.0-68.0
No	34	43.0	32.1-54.0
Frequency of condom use during receptive anal sex with men (past 6 months) (n=79)			
Never (0%)	8	10.1	3.5-16.8
Sometimes (1-49%)	23	29.1	19.1-40.4
Often (50-99%)	22	27.9	18.0-37.7
Always (100%)	26	32.9	22.7-44.4
Receptive oral sex with men (past 6 months) (n=204)			
Never (0%)	118	57.9	51.1-64.6
Less than half the time (1-49%)	57	27.9	21.8-34.1

Variables	Number	%	95% CI
Half the time or more (50-99%)	29	14.2	9.4-19.0
Condom use during receptive oral sex with men (past 6 months) (n=86)			
Never (0%)	71	82.5	74.5-90.6
Sometimes (1-49%)	9	10.5	4.0-16.9
Often (50-99%)	5	5.8	0.8-10.8
Always (100%)	1	1.2	0.0-3.4
Practice of receptive oral sex (past 6 months) (n=204)			
Never (0%)	73	35.8	29.2-42.4
Less than half the time (1-49%)	71	34.8	28.3-41.3
Half the time or more (50-99%)	52	25.5	19.5-31.5
Always (100%)	8	3.9	1.4-6.6
Frequency of condom use during insertive oral sex (past 6 months) (n=131)			
Never (0%)	112	85.5	79.5-91.5
Sometimes (1-49%)	9	6.9	2.5-11.2
Often (50-99%)	7	5.3	1.5-9.2
Always (100%)	3	2.3	0.5-6.5
Alcohol use* (past six months) (n=202)			
Never	40	19.8	14.3-25.3
<Once a week	95	47.0	40.1-53.9
Once-twice a week	38	18.8	13.4-24.2
>Twice a week	29	14.4	9.5-19.2
Marijuana use (past 6 months) (n=204)			
Yes	19	9.3	5.3-13.3
No	185	90.7	86.7-94.7
Received money or a gift for sex with a man (past 6 months) (n=204)			
Yes	40	19.6	14.2-25.1
No	164	80.4	74.9-85.8
Gave money or a gift for sex (past 6 months) (n=204)			
Yes	28	13.7	9.0-18.4
No	176	86.3	81.5-91.0
Sexual behaviours with women			
Number of female partners (last 6 months) (n=204)			
0	79	38.7	32.0-45.4
1-4	113	55.4	48.6-62.2

Variables	Number	%	95% CI
>4	12	5.9	2.6-9.1
Condom use during last sexual intercourse with a woman (last 6 months) (n=125)			
Yes	64	51.2	42.4-60.0
No	61	48.8	40.0-57.6
Types of female sexual partners‡ (past 6 months) (n=125)			
Wife	28	22.4	15.1-29.71
Regular partner	94	75.2	67.6-82.8
Casual partner	53	42.4	33.7-51.1
Sex worker	13	10.4	5.0-15.7
Multiple types of partners	54	43.2	34.5-52.4

Table 1: Characteristics of men who have sex with men initiating HIV pre-exposure prophylaxis in Cotonou, Benin, 2020. Frequency of condom use during receptive anal sex with men (past 6 months) (n=79); MSM, Men who have sex with men; n, Number; GMW, Guaranteed minimum wage: 40,000 CFA francs in 2020 in Benin (US$1 = 500 CFA francs, approximately); SD, Standard deviation; %, Proportion; *Missing values (1, monthly income, sexual preference; 2, alcohol use; 3, living as a couple); †Togo, Nigeria, Ghana, Cameroon; ‡non-mutually exclusive categories

Most men did not receive (80.4%) or give (86.5%) money or gifts in exchange for sex in the six months prior to recruitment. Over three out of five participants reported at least one female partner in the past six months (Table 1). Among the bisexual men, 48.0% had multiple female partners. The proportion of participants with more than three male sexual partners in the last six months was 41.7% among those with more than four female partners, compared with 6.2% among those with one to four female partners, and 21.5% among those without a female partner.

The prevalence of CT and NG at any site were 18.6% (95% CI, 13.3% - 24.0%) and 15.2% (95% CI, 10.3% –20.1%), respectively. For CT infection, the highest prevalences were observed at the anal (8.8% [95% CI, 4.9% - 12.7%]) and urethral (9.8% [95% CI, 5.7% - 13.9%]) sites. For NG infection, the anal site had the highest prevalence (9.8% [95% CI, 5.7% - 13.9%]), followed by the pharyngeal site (6.4% [95% CI, 3.0% - 9.7%]). The proportion of participants with NG/CT infection was 27.9% (95% CI, 21.8% - 34.1%) for at least one anatomical site and 6.9% (95% CI, 3.4% - 11.3%) for at least two anatomical sites. NG/CT co-infection was observed in 12 of 57 cases (Table 2). For syphilis, only one man had a positive rapid treponemal test followed by a negative Rapid Plasma Reagin test.

Infection	NG/CT			**NG**			**CT**		
Site	**n**	**%**	**95% CI**	**n**	**%**	**95% IC**	**n**	**%**	**95% CI**
At least one site	57	27.9	21.8-34.1	31	15.2	10.3-20.1	38	18.6	13.3-24.0
Anal	32	15.7	10.7-20.7	20	9.8	5.7-13.9	18	8.8	4.9-12.7
Urethral	22	10.8	6.5-15.0	5	2.5	0.3-4.6	20	9.8	5.7-13.9
Pharyngeal	17	8.3	4.5-12.1	13	6.4	3.0-9.7	5	2.5	0.3-4.6
Two sites*	14	6.9	3.4-11.3	7	3.4	0.9-5.9	5	2.5	0.3- 4.6

Table 2: Prevalence of NG and CT infections among men who have sex with men initiating HIV pre-exposure prophylaxis in Cotonou, Benin, 2020. CT: Chlamydia Trachomatis; CI: Confidence interval; n, Number; NG: Neisseria gonorrhoeae; *multisite localization involved only two sites in this study; %, Proportion

The majority of MSM (90.7%) reported no symptoms of STIs in the four days prior to recruitment. Of the participants with a positive NG test, 80.7% were asymptomatic. This proportion was 84.2% for CT and NG/CT (Table 3).

		Modalities	**n (%)**
Self-reported information (symptom)			
In the past six months	Burning/irritation of private parts	Yes	35 (17.2)
		No	169 (82.8)
	Intimate area wounds	Yes	9 (4.4)
		No	195 (95.6)
	Urethral discharge	Yes	17 (8.3)
		No	187 (91.7)
	Other symptoms†	Yes	14 (6.9)
		No	190 (93.1)
In the past four days	Burning/irritation of private parts	Yes	14 (40.0)
		No	21 (60.0)
	Intimate area wounds	Yes	2 (22.2)
		No	7 (77.8)
	Urethral discharge	Yes	6 (35.3)
		No	11 (64.7)
	Other symptoms‡	Yes	3 (21.4)
		No	11 (78.6)
	No symptoms		185 (90.7)
Presence of symptoms (last four days)	NG/CT	Positive	9 (47.4)
		Negative	10 (52.6)

		Modalities	n (%)
Urethral discharge/hot urine	NG/CT urethral	Positive	4 (66.7)
		Negative	2 (33.3)
Urethral discharge/hot urine	NG/CT	Positive	5 (83.3)
		Negative	1 (16.7)
Burning/irritation of private parts	NG/CT urethral	Positive	5 (35.7)
		Negative	9 (64.3)
Physical examination by the physician (clinical sign)			
Urethral signs (n=7)	NG/CT	Positive	7 (100.0)
		Negative	0 (0.0)
Anal signs (n=8)	NG/CT	Positive	4 (50.0)
		Negative	4 (50.0)
Oral signs only (n=4)	NG/CT	Positive	1 (25.0)
		Negative	3 (75.0)

Table 3: Distribution of signs and symptoms of sexually transmitted infections among men who have sex with men initiating HIV pre-exposure prophylaxis in Cotonou, Benin, 2020. †Abscess, pimples, hot urine, flaking testicles, left testicle pain, slight pain, swelling of testicles; n, Number; %, Proportion; ‡Pimples, hot urine

The proportion of positive laboratory tests without any clinical signs of STI based on the physical examination by the study doctor was 74.2%, 73.7% and 75.4% for NG, CT, and NG/CT, respectively. For participants with a positive laboratory diagnosis without symptoms or clinical signs of STI, the proportion was 71.0% for NG and 73.7% for CT and NG/CT. Among positive laboratory diagnosed cases, the proportion of extra-genital STIs (pharyngeal and/or anal sites) was 83.9% for NG, 57.9% for CT and 70.2% for NG/CT.

In bivariate analyses, the sociodemographic variables with a $p < 0.20$ were age, occupation and income for NG; age and marital status for CT; age, occupation, marital status and income for NG/CT; and age, occupation and income for anorectal NG. Behavioural factors included anal sex, usual sexual role during anal sex with men, concurrent male partners and sex with a man in exchange for money or a gift for NG; number of female partners in the past six months for CT; usual sexual role during anal sex with men and number of female partners in the past six months for NG/CT; and usual sexual role during anal sex with men for anorectal NG. These risk factors were considered in the Poisson multivariate regression model along with potential confounders (Table 4).

	Gonorrhea			Chlamydia			Gonorrhea and/or Chlamydia			Anal Gonococcal infection		
	Positive (%)	Negative (%)	P-value	Positive (%)	Negative (%)	P-value	Positive (%)	Negative (%)	P-value	Positive (%)	Negative (%)	P-value
Socio-demographic characteristics of participants												
Age (years)												
18 - 24	21 (23.6)	68 (76.4)	0.0033	22 (24.7)	67 (75.3)	0.0493	34 (38.2)	55 (61.8)	0.0041	16 (18.0)	73 (82.0)	0.0006
25 - 41	10 (8.7)	105 (91.3)		16 (13.9)	99 (86.1)		23 (20.0)	92 (80.0)		4 (3.5)	111 (96.5)	
Occupation												
Unemployed	5 (35.7)	9 (64.3)	0.0030	1 (7.1)	13 (92.9)	0.2799	6 (42.9)	8 (57.1)	0.0500	4 (28.6)	10 (71.4)	0.0024
Occupation with income	13 (9.5)	124 (90.5)		24 (17.5)	113 (82.5)		31 (22.6)	106 (77.4)		7 (5.1)	130 (94.9)	
Students/pupils	13 (24.5)	40 (75.5)		13 (24.5)	40 (75.5)		20 (37.7)	33 (62.3)		9 (17.0)	44 (83.0)	
Marital status												
Single	25 (15.2)	140 (84.8)	0.9709	28 (17.0)	137 (83.0)	0.2110	43 (26.1)	122 (73.9)	0.2182	17 (10.3)	148 (89.7)	0.7711
Others	6 (15.4)	33 (84.6)		10 (25.6)	29 (74.4)		14 (35.9)	25 (64.1)		3 (7.7)	36 (92.3)	
Monthly income in CFA francs *												
< 40.000	21 (23.6)	68 (76.4)	0.0129	20 (22.5)	69 (77.5)	0.2391	35 (39.3)	54 (60.7)	0.0063	16 (18.0)	73 (82.0)	0.0019
40,000-80,000	5 (7.5)	62 (92.5)		13 (19.4)	54 (80.6)		14 (20.9)	53 (79.1)		1 (1.5)	66 (98.5)	
>80,000	5 (10.6)	42 (89.4)		5 (10.6)	42 (89.4)		8 (17.0)	39 (83.0)		3 (6.4)	44 (93.6)	
Sexual behaviour with men												
Sexual activity with men in the past 6 months												
Anal sex Yes	31 (16.6)	156 (83.4)	0.0810	34 (18.2)	153 (81.8)	0.5287	53 (28.3)	134 (71.7)	0.7842	20 (10.7)	167 (89.3)	0.3840
Anal sex No	0 (0.0)	17 (100.0)		4 (23.5)	13 (76.5)		4 (23.5)	13 (76.5)		0 (0.0)	17 (100.0)	
Usual sexual role during anal sex with men												
Insertive	14 (11.9)	104 (88.1)	0.0066	20 (16.9)	98 (83.1)	0.7200	27 (22.9)	91 (77.1)	0.0442	4 (3.4)	114 (96.6)	<.0001
Receptive	13 (33.3)	26 (66.7)		7 (17.9)	32 (82.1)		17 (43.6)	22 (56.4)		13 (33.3)	26 (66.7)	
Versatile	4 (13.3)	26 (86.7)		7 (23.3)	23 (76.7)		9 (30.0)	21 (70.0)		3 (10.0)	27 (90.0)	
Concurrent partners at recruitment Yes	17 (12.5)	119 (87.5)	0.1293	26 (19.1)	110 (80.9)	0.7992	37 (27.2)	99 (72.8)	0.7406	11 (8.1)	125 (91.9)	0.2439
Concurrent partners at recruitment No	14 (20.6)	54 (79.4)		12 (17.6)	56 (82.4)		20 (29.4)	48 (70.6)		9 (13.2)	59 (86.8)	
Condom use during anal/oral sex with men in the past 6 months												
Never for at least 1 type of sex	21 (16.3)	108 (83.7)	0.5720	27 (20.9)	102 (79.1)	0.2679	40 (31.0)	89 (69.0)	0.2005	14 (10.9)	115 (89.1)	0.5088
Other	10 (13.3)	65 (86.7)		11 (14.7)	64 (85.3)		17 (22.7)	58 (77.3)		6 (8.0)	69 (92.0)	
Participant received money or a gift to have sex with a man (last 6 months)												
Yes	3 (7.5)	37 (92.5)	0.1305	9 (22.5)	31 (77.5)	0.4829	10 (25.0)	30 (75.0)	0.6438	3 (7.5)	37 (92.5)	0.7704
No	28 (17.1)	136 (82.9)		29 (17.7)	135 (82.3)		47 (28.7)	117 (71.3)		17 (10.4)	147 (89.6)	
Sexual behaviour with women												
Number of female partners (past 6 months)												
0	13 (16.5)	66 (83.5)	0.5179	14 (17.7)	65 (82.3)	0.0152	23 (29.1)	56 (70.9)	0.1724	10 (12.7)	69 (87.3)	0.5517
1-4	15 (13.3)	98 (86.7)		18 (15.9)	95 (84.1)		28 (24.8)	85 (75.2)		9 (8.0)	104 (92.0)	
>4	3 (25.0)	9 (75.0)		6 (50.0)	6 (50.0)		6 (50.0)	6 (50.0)		1 (8.3)	11 (91.7)	
Type of female partners in the past six months												
Wife/regular partner	10 (14.9)	57 (85.1)	0.9400	10 (14.9)	57 (85.1)	0.3422	18 (26.9)	49 (73.1)	0.8108	6 (9.0)	61 (91.0)	0.7756
Other	21 (15.3)	116 (84.7)		28 (20.4)	109 (79.6)		39 (28.5)	98 (71.5)		14 (10.2)	123 (89.8)	

Table 4: Factors associated in bivariate analyses with NG and CT infections among men who have sex with men initiating HIV pre-exposure prophylaxis in Cotonou, Benin, 2020. CT, Chlamydia Trachomatis; NG, Neisseria gonorrhoeae; %, Proportion; * $1US = 500 CFA francs, approximately.

For the results of multivariate analyses, participants aged 18-24 years were more likely to test positive for NG/CT: adjusted prevalence ratio (aPR); 95% CI=1.80; 1.03- 3.12. MSM who had more than four female partners in the six months prior to recruitment were at higher risk of having NG/CT (aPR 2.30; 95% CI 1.19- 4.43). Participants with higher monthly income had a lower risk of NG/CT (aPR 0.41; 95% CI 0.21- 0.81). Finally, MSM who were not single had a higher risk of having NG/CT (aPR 2.83; 95% CI 1.52- 5.27) (Table 5).

Variables	Modalities	aPR (95% CI)†	P-Value
Gonorrhea/Chlamydia[1]			
Age	18-24 years	1.80 (1.03- 3.12)	0.0376
	25-41 years	Referent	
Marital status	Single	Referent	
	Others†	2.83 (1.52- 5.27)	0.0010
Number of female partners (past 6 months)	0	Referent	
	1-4	0.87 (0.47- 1.60)	0.6528
	>4	2.30 (1.19- 4.43)	0.0128
Monthly income in CFA francs *	< 40,000	Referent	
	40,000-80,000	0.58 (0.32- 1.04)	0.0693
	> 80,000	0.41 (0.21- 0.81)	0.0103
Gonorrhea[2]			
Age	18-24 years	2.41 (1.18-4.95)	0.0163
	25-41 years	Referent	
Participant received money or a gift to have sex with a man (last 6 months)	Yes	0.29 (0.09- 0.94)	0.0384
	No	Referent	
Usual sexual role during anal sex with men	Insertive/No anal sex	Referent	
	Receptive	2.78 (1.40- 5.51)	0.0034
	Versatile	1.02 (0.34- 3.04)	0.9673
Chlamydia[3]			
Age	18-24 years	2.49 (1.23- 5.06)	0.0115
	25-41 years	Referent	
Marital status	Single	Referent	
	Others‡	2.70 (1.32- 5.50)	0.0064
Number of female partners (past 6 months)	0	Referent	
	1-4	1.03 (0.50- 2.11)	0.9388
	>4	2.95 (1.32- 6.59)	0.0082
Anorectal gonococcal infection[4]			
Usual sexual role during anal sex with men	Insertive/No anal sex	Referent	
	Receptive	8.12 (2.82-23.40)	0.0001
	Versatile	2.35 (0.53-10.38)	0.2589

Table 5: Factors associated in multivariate analysis with NG and CT infections among men who have sex with men initiating HIV pre-exposure prophylaxis in Cotonou, Benin, 2020. †Apart from age in model 4, adjustment was made for variables assessed over the last six months; * $1 US = 500 CFA francs, approximately; aPR, adjusted prevalence ratio; CI, Confidence Interval; CT, Chlamydia Trachomatis; NG, Neisseria gonorrhoeae; ‡married, cohabiting, divorced, widowed, or separated.

1: Adjusted for the number of male partners with whom the participant has had anal sex, usual sexual role during anal sex with men, condom use during anal/oral sex with men and type of female partners (exclusively wife and/or regular partner versus other).

2: Adjusted for the number of male partners with whom the participant had anal sex, condom use during anal/oral sex with men, number of female partners, and type of female partners.

3: Adjusted for the number of male partners with whom the participant had anal sex, condom use during anal/oral sex with men, usual sexual role during anal sex with men, and type of female partners

4: Adjusted for age and the number of male partners with whom the participant had anal sex, condom use during anal/oral sex with men, number of female partners, and type of female partners.

Regarding NG, participants younger than 25 were more likely to test positive (p=0.0163). A receptive sexual role was associated with an increased risk of NG (p=0.0034). MSM who received money or a gift to have sex with a man in the past six months had a lower risk of testing positive for NG (p=0.0384) (Table 5).

For CT, there were more cases among MSM under 25 years of age: aPR 2.49; 95% CI: 1.23- 5.06; p=0.0115. Participants who were not single had an increased risk of acquiring CT (aPR 2.70; 95% CI: 1.32- 5.50; p=0.0064). MSM with more than four female partners in the six months prior to recruitment had an elevated risk of CT (aPR 2.95; 95% CI: 1.32- 6.59; p=0.0082) (Table 5). For anal gonococcal infection, only the receptive sexual role was associated with higher risk (aPR 8.12; 95% CI: 2.82-23.40; p=0.0001) (Table 5).

Discussion

The prevalence of CT, NG, and NG/CT infections in all three anatomical sites (anal, urethral and pharyngeal) combined was 18.6% (95% CI, 13.3% - 24.0%), 15.2% (95% CI, 10.3% -20.1%), and 27.9% (95% CI, 21.8% - 34.1%), respectively. These infections were also common in a study of 497 MSM in Abidjan, Bamako, Lomé, and Ouagadougou, with a prevalence of 17.3% for CT and 13.7% for NG [6]. According to the 2020 estimates of the World Health Organization (WHO), the prevalence of NG and CT among adult men in the general population was 1.2% for NG and 4.0% for CT in the WHO African region [1]. Factors such as multiple and concurrent sexual partnerships, and use of psychoactive substances put MSM at high risk of STIs [10]. No active case of syphilis was identified in our study. In a study conducted in Lomé, Abidjan, Bamako, and Ouagadougou, only one case of active syphilis was found, representing a prevalence of 0.2% [11]. This finding suggests a low prevalence of syphilis among HIV-negative MSM in West Africa. The systematic use of antibiotics for genital infections may account for this low prevalence.

In our study, 84.2% of NG/CT cases (80.7% for NG and 84.2% for CT) were asymptomatic. The proportion of asymptomatic NG/CT infections was also high (88.2%) in the study conducted in the four Western African cities [6]. These results suggest that syndromic management, which is the standard treatment for STIs in many resource-limited countries, including Benin, could be ineffective in preventing their transmission among MSM. Hence, whenever possible, laboratory screening should be encouraged in MSM.

The proportion of extra-genital STIs (pharyngeal and/or anal sites) was high: 83.9% for NG, 57.9% for CT and 70.2% for NG/CT. These results are consistent with those of previous studies [6, 12, 13]. In the study conducted in the four Western African cities [6], for example, 77.6% of NG/CT cases were extra-genital. Therefore, a high proportion of STIs could remain undiagnosed if screening is limited to the urethral site in MSM. Extra-genital infections were mostly asymptomatic. To avoid low-noise transmission of these infections, screening should be extended to anal and pharyngeal sites.

Consistent condom use was low. It was 40.5% for insertive anal sex and 32.9% for receptive anal sex. Cheng et al (2014) found comparable results among MSM in Guangzhou, China, with 41.6% consistent condom use during anal sex [14]. Results from a meta-analysis of studies conducted in China showed 47% consistent condom use by MSM during sex with their male partners [15]. In this meta-analysis, condom use was more frequent with non-regular partners compared to regular ones [15]. Given the high prevalence of curable STIs, promotion of regular condom use should be strengthened among MSM. Sixty-one percent of the study participants had at least one female sexual partner in the last six months. Among bisexual men, 48.0% had multiple female partners. Godbole et al (2014) found that 44.0% of MSM had at least one female sexual partner in the last six months in India [16]. In another study from Nigeria, 48.1% of MSM had at least one female sexual partner in the last two months. Among those men who have sex with men and women, 69.0% had multiple female partners [17]. Because of the predominance of asymptomatic NG and CT infections, MSM could contribute to maintaining their transmission within the general population through their female sexual partners [18, 19].

Consistent with our results, Adamson et al (2022) found a higher prevalence of CT and NG/CT infections among MSM under 25 years of age: 24.0% for men under 25 years versus 16.9% for 25-34 years and 15.9% for ≥ 35 years for CT. For NG/CT, this distribution was 30.2%, 24.6%, and 26.2%, respectively [20]. In our adjusted multivariate analyses, young men (<25 years) were at higher risk for NG/CT (aPR; 95% CI: 1.80; 1.03- 3.12), NG (aPR 2.41; 95% CI: 1.18-4.95), and CT (aPR 2.49; 95% CI: 1.23-5.06) when considering all three anatomic sites (anal, urethral, and pharyngeal). In Nigeria, Kashniro et al (2016) also found that the risk of NG/CT infections decreased with increasing age among MSM [21]. Various biological, cultural, and behavioural factors can explain the vulnerability of younger men to STIs [22]. For example, youth are reluctant to talk openly about their sexual life

with health care providers, which may limit their access to health services [23]. They are also reportedly engaged in high-risk STI behaviours such as concurrent sexual partnerships and unprotected sex more often than those who are older [24].

Compared to single MSM, other men were at higher risk of NG/CT (aPR, 2.83; 95% CI: 1.52- 5.27) and CT (aPR 2.70; 95% CI: 1.32- 5.50). The majority (89.7%) of the participants who were not single have reported at least one female partner in the previous six months compared to 54.5% for single men. The number of female sexual partners was also associated with STIs. Men who reported more than four female partners in the past six months were at higher risk of STIs: NG/CT (aPR 2.30; 95% CI: 1.19-4.43) and CT (aPR 2.95; 95% CI: 1.32- 6.59). The participants with multiple female partners also had multiple male partners. In the last six months, the proportion of participants with more than three male sexual partners was 41.7% among those with more than four female partners, compared with 6.2% among those with one to four female partners, and 21.5% among those without a female partner, p-value=0.022. These results are consistent with several studies showing that multiple or concurrent sexual partners are a risk factor for STIs [3, 25-27].

More than two out of five men had a monthly income below the state-guaranteed minimum wage of 40,000 CFA francs at the time of the study. An income above 80,000 CFA francs per month was a protective factor against NG/CT infections: aPR 0.41; 95% CI: 0.21- 0.81. Harling et al (2013) found in the United States of America a positive association between low-income individuals and STIs [28]. A low income would limit the choice of sexual partners and the ability to negotiate safe sex (condom use).

A receptive sexual role was associated with NG at the anal site (aPR 8.12; 95% CI: 2.82-23.40) and when all sites were combined (aPR 2.78; 95% CI: 1.40- 5.51). Passaro et al (2018) also found in Lima, Peru, that the receptive sexual role was associated with anorectal NG infection among MSM [29]. Biological factors may explain the high risk of developing NG during receptive anal sex. The rectal mucosa lacks natural lubrification and a protective barrier such as humoral immunity seen in cervico-vaginal secretions in women [30, 31]. Therefore, it is at high risk for lesions, which may facilitate the acquisition of STIs [30].

This first study on the prevalence and factors associated with CT, NG, and TP infections among MSM in Benin has limitations. Because of the face-to-face questionnaire that explored participants' intimate lives, a social desirability bias was possible. Such a bias could explain why participants who received money/gifts for sex had a lower prevalence of NG: (aPR 0.29; 95% CI: 0.09- 0.94). Indeed, this result is not in line with the literature showing that sex with a paying partner is a risk factor for STIs [32]. Furthermore, all cases of NG observed in participants who received money/gifts for sex occurred among those who reported consistent condom use during paid sex. This suggests that the participants likely provided misinformation about condom use during paid sex. The Poisson multivariate model was adjusted for different potential confounders cited in the literature. However, residual confounding could arise from unmeasured risk factors such as sexual and/or physical abuse. The sample size was limited to 204 participants due to financial constraints. This did not allow us to assess the determinants of NG and CT infections at each anatomic site. Since all participants were affiliated with two identity organizations, some of their characteristics such as exposure to STIs prevention interventions could be different from those of the MSM who did not participate in the study. In addition, as MSM affiliated with identity-based associations are generally more exposed to STIs training and sensitization activities, the generalizability of the results to all MSM in Benin may be limited.

Conclusion

Chlamydia trachomatis and *Neisseria gonorrhoeae* infections are common among HIV-negative MSM in Benin. They are most often asymptomatic with a high proportion of co-infections and extra-genital locations. Prevention programs targeting these infections among men who have sex with men should consider biological screening at urethral, anal, and pharyngeal sites. In addition, they should strengthen preventive interventions for young MSM and extend them to their female sexual partners.

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Authors' Contributions

MA, SD, LB, FAG, FG and DMZ conceived the study. AD contributed to the supervision of all activities in the field and at the study clinic. EG-M contributed to the lab tests. ON, MO, MA-G, SD, MA and LB contributed to data analyses. The first version of the manuscript was written by ON and revised by SD. All authors read and approved the final version of the manuscript.

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Conflict of interest

The authors declare no conflict of interest.

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