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Screening for Sexually Transmitted Infections in Adolescent Girls and Young Women in Mombasa, Kenya: Feasibility, Prevalence, and Correlates

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Introduction: As adolescents and young women become sexually active, they are at risk of adverse reproductive health outcomes including sexually transmitted infections (STIs). We assessed feasibility and acceptability of STI screening among 15- to 24-year-old women in Mombasa, Kenya.

Methods: After sensitization activities, participants were recruited from 3 high schools and 1 university. Study staff conducted informational sessions. Students interested in participating were given consent forms to take home, and invited to visit our clinic for STI screening. During clinic visits, participants completed a self-administered questionnaire and provided a urine specimen for STI testing using a nucleic acid amplification test.

Results: Between August 2014 and March 2015, 463 high school and 165 university students collected consent forms. Of these, 293 (63%) from high schools versus 158 (95%) from university attended clinic for STI screening ($P < 0.001$). Of the 150 (33%) who reported any history of insertive vaginal sex, 78 (52.0%) reported condom use at the last sex act, 31 (20.7%) reported using modern nonbarrier contraceptive methods, and 37 (24.7%) reported not using any contraception at the last sex act. Twenty-six (5.8%) participants were diagnosed with STIs (7 [1.6%] *Neisseria gonorrhoeae*, 16 [3.6%] *Chlamydia trachomatis*, 3 [0.7%] *Trichomonas vaginalis*). In multivariable analyses, reporting receptive vaginal sex without a condom was associated with having a laboratory confirmed STI (odds ratio, 6.21; 95% confidence interval, 1.72–22.28).

Conclusions: These findings support the need for reproductive health interventions to reduce the risk of STIs in a population of adolescent girls and young women in East Africa.

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Adolescence and young adulthood represent unique life transitions. As adolescents and young women become sexually active, they are at risk for adverse reproductive health outcomes including unwanted pregnancy and sexually transmitted infections (STIs).[1,2] There is a need to develop and tailor existing reproductive health services to meet the needs of this important population. Improving health at this crucial stage holds potential to impact the health of adolescents, young adults, and their future children.[3]

Chlamydia trachomatis, Neisseria gonorrhoeae, and *Trichomonas vaginalis* cause the majority of treatable STIs worldwide.[4] These STIs have been associated with pelvic inflammatory disease, infertility, ectopic pregnancy, chronic pelvic pain and adverse pregnancy outcomes.[5–9] In addition, these STIs have been shown to increase the risk of HIV acquisition.[10–12]

Sub-Saharan Africa bears 80% to 90% of the global STI burden.[13] Although STIs are a growing concern in the region, relatively few studies have characterized their epidemiology, owing to limited laboratory infrastructure and diagnostic capacity. We sought to explore the feasibility of school-based recruitment for STI screening in female adolescents (age, 15–17 years) and young women (age, 18–24 years), and to characterize the prevalence and correlates of STIs in this population.

METHODS

We conducted a cross-sectional study among 15 to 24 year olds recruited from 3 high schools and 1 university in Mombasa County, Kenya. Ethical approval was obtained from the ethics committees at the University of Nairobi/Kenyatta National Hospital and University of Washington.

Procedures for this study were developed after a formative qualitative phase that included adolescent girls, young women, parents, and teachers.[14] At the beginning of the STI screening phase, study staff visited the institutions to introduce the study and answer questions from students. After these information sessions, interested students were given the informed assent/consent forms to take home. Adolescents younger than 18 years were encouraged to discuss the study with their parents or guardians. Students were invited to visit the research clinic for STI

screening. For minors (<18 years old), written parental consent was required in addition to participant assent.

At the clinic visit, a brief self-administered questionnaire was administered to ascertain demographic data, obstetrical and gynecological history, and sexual risk behavior. Participants were asked to provide a 20- to 30-mL first-catch urine specimen. Two milliliters of urine were transferred into a specimen tube (Hologic, San Diego, CA), and transported to the laboratory. Results were provided to participants after 1 week. In the event of a positive test result, treatment was provided to participants and sexual partners at no charge, following Kenyan National Guidelines for treatment of STIs.

Laboratory Methods

Urine samples were tested for *C. trachomatis, N. gonorrhoeae,* and *T. vaginalis* by transcription mediated amplification using the Hologic Aptima Detection System (Hologic). Testing was performed at the University of Washington/University of Nairobi HIV & STD Research Laboratory in Mombasa.

Statistical Methods

The outcome of this study was laboratory confirmed STI (composite variable of the 3 tested STIs). Potential correlates included age, marital status (single or married), religion (Muslim vs Christian), parity, reporting receptive vaginal sex (none, receptive sex with condom, receptive sex without a condom), anal sex (yes, no), nonpenetrative sex (yes, no), reported substance use (alcohol, tobacco, *Catha edulis* [khat], *Cannabis sativa* [marijuana], polysubstance use), prior STI diagnosis, and sexual reproductive health education (ever taught about STIs in school, ever taught about HIV/AIDS in school, and sexual health discussion with parents/guardians). Nonpenetrative sex was defined as sexual activity that does not involve penetration of the vagina or anus. Polysubstance use was defined as reporting the use of more than 1 drug. For comparability to earlier work, we used questions from the US Centers for Disease Control and Prevention youth risk behavior surveillance system. The main explanatory sex risk variable, "Receptive Vaginal Intercourse" was an independent variable in response to the question, "The last time you had vaginal sexual intercourse, did you or your partner use a condom?" Possible responses included: (a) I have never had vaginal intercourse, (b) Yes [we used a condom], and (c) No [we did not use a condom]. We used this variable to identify women who had never had vaginal intercourse (response "a" to this question).

We used logistic regression to determine correlates of having any STI. First, potential predictors of STIs were assessed in bivariable analyses. Variables associated with any STI ($\alpha \leq 0.10$) in the bivariable analysis were included in the final multivariable model, which was assessed for collinearity. Because condomless sex could be in the causal pathway linking substance use to STI, adjusting for condomless sex could mask a true association between substance use and STI. Therefore, we explored the association between substance use and STI in a model that excluded condomless sex but retained other potential confounding factors. In addition, we conducted sensitivity analyses limited to participants who reported being sexually active. In these analyses, we included sexual risk behavior predictors that were only collected among those who reported being sexually active: age at sexual debut, number of lifetime sex partners, number of sex partners in the last 3 months, alcohol or drugs before last sex act, and condom use at last sex act. Analyses were performed using IBM SPSS 19.0 (IBM, Kirkland, WA) and STATA 12 (StataCorp, College Station, TX).

RESULTS

Between August 2014 and March 2015, 463 high school and 165 university students collected consents during the informational sessions as illustrated in the flow diagram (Fig. 1). Of these, 293 (63.3%) from high schools versus 158 (95.8%) from universities attended the clinic for STI screening ($P < 0.001$).

Median age of the 451 participants was 18 years (interquartile range, 17–19 years), with 195 (43.2%) being below 18 years (Table 1). One hundred fifty (33.3%) reported ever having receptive vaginal sex. Most reported being 17 years older at first sex (N = 120, 80.0%). About half reported only 1 lifetime sexual partner (N = 76, 50.7%). Anal intercourse was rarely reported (10 students, 2.2%). Nonpenetrative sex was reported by 107 (23.7%) students. Of the 150 students reporting vaginal sex, 78 (52.0%) reported condom use, 31 (20.7%) reported using modern nonbarrier contraception, and 37 (24.7%) reported no contraception at last sex. Only 7 (4.7%) reported dual protection, defined as using condoms to prevent both STIs and pregnancy plus an additional modern contraceptive method, at last sex act.

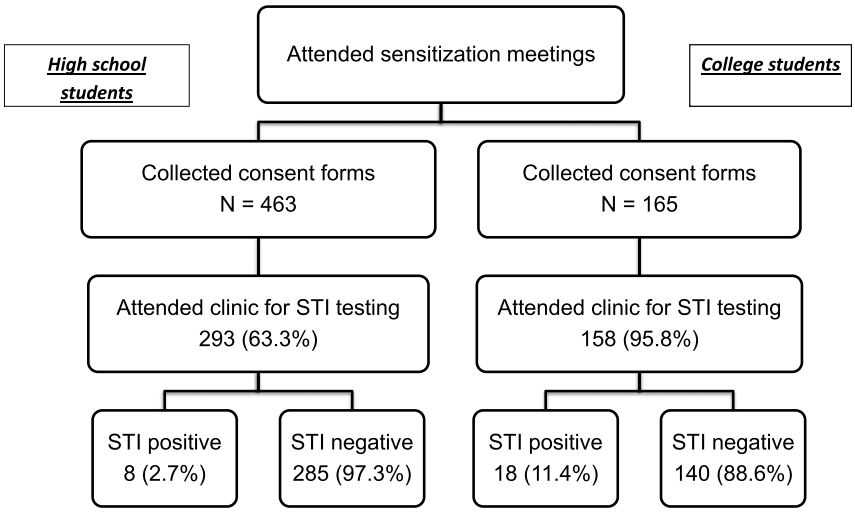

Figure 1. The flow diagram is based on high school versus college numbers rather than by age group, because this is how the sensitization meetings were conducted. Consent documents were collected at the sensitization meetings.

TABLE 1. Characteristics of 451 Adolescent Girls and Young Women

Characteristics	*Adolescent Girls (15–17 Years)* Median (Range) or Number (Percent), n = 195	*Young Women (18–24 Years)* Median (Range) or Number (Percent), n = 256	All Median (Range) or Number (Percent), n = 451
Age, y	17 (15–17)	19 (18–24)	18 (15–24)
Single	195 (100)	252 (98.4)	447 (99.1)
Religion			
Christian	78 (40.0)	180 (70.3)	258 (57.2)
Muslim	117 (60.0)	74 (28.9)	191 (42.4)
Other	0	2 (0.8)	2 (0.4)
Parity	0 (0–2)	0 (0–4)	0 (0–4)
Sexual history			
Ever had vaginal intercourse	21 (10.8)	129 (50.4)	150 (33.3)
Receptive vaginal intercourse			
None	174 (89.2)	127 (49.6)	301 (66.7)
With a condom	9 (4.6)	69 (27.0)	78 (17.3)
Without a condom	12 (6.2)	60 (23.4)	72 (16.0)
Age at first vaginal sex act*			
11 y or younger	1 (4.8)	2 (1.6)	3 (2.0)
12–14 y	1 (4.8)	5 (3.9)	6 (4.0)
15–16 y	12 (57.2)	9 (7.0)	21 (14.0)
17 y or older	7 (33.3)	113 (87.6)	120 (80.0)
Lifetime vaginal sex partners*			
1 partner	16 (76.2)	60 (46.5)	76 (50.7)
2–3 partners	4 (19.1)	47 (36.4)	51 (34.0)
4–5 partners	1 (4.8)	12 (9.3)	13 (8.7)
6 or more partners	0	10 (7.8)	10 (6.7)
Vaginal sex partners in the last 3 mo*			
No sex in the last 3 mo	8 (38.1)	28 (21.9)	40 (26.7)
1 partner	13 (61.9)	78 (60.9)	93 (62.0)
2–3 partners	0	13 (10.2)	13 (8.7)
4 or more partners	0	5 (3.9)	4 (2.7)
Alcohol or drugs before last sex act*	2 (9.5)	7 (5.4)	9 (6.0)
Condom use at last sex act*	9 (42.9)	69 (53.5)	78 (52.0)
Contraception at last sex act*			
None	4 (19.1)	33 (25.6)	37 (24.7)
Oral contraceptive pills	4 (19.1)	23 (17.8)	27 (18.0)
Condoms	9 (42.9)	58 (45.0)	67 (44.7)
IUD/implant/injection	0	4 (3.1)	4 (2.7)
Withdrawal	3 (14.29)	9 (7.0)	12 (8.0)
Not sure	1 (4.8)	2 (1.6)	3 (2.0)
Anal intercourse	5 (2.6)	5 (2.0)	10 (2.2)
Nonpenetrative sex	21 (10.8)	86 (33.6)	107 (23.7)
Reported alcohol and drug use			
Alcohol (≥1 drink per day)	5 (2.6)	34 (13.3)	39 (8.7)
Tobacco			
< 1 cigarette per day	2 (1.0)	6 (2.3)	8 (1.8)
≥ 1 cigarette per day	1 (0.5)	0 (0.4)	1 (0.2)
Khat (ever used)	16 (18.2)	38 (14.8)	54 (12.0)
Marijuana (ever used ≥1 times)	2 (1.0)	11 (4.3)	13 (2.9)
Cocaine (ever used ≥1 times)	0	0	0
Glue or aerosolized drugs (ever used ≥1 times)	1 (0.5)	4 (1.6)	5 (1.1)
Intravenous drug use	1(0.5)	0	1 (0.2)
Any drug use	21 (10.8)	64 (25.0)	85 (18.8)
Monodrug use	16 (8.2)	43 (16.8)	59 (13.1)
Polydrug use	5 (2.6)	21 (8.2)	26 (5.8)
Reported presence of STI symptoms			
Genital itching	75 (38.5)	124 (48.4)	199 (44.1)
Abnormal vaginal discharge	24 (12.3)	63 (24.6)	87 (19.3)
Dysuria	21 (10.8)	46 (18.0)	67 (14.9)
Ever diagnosed with STI?			
Yes	8 (4.1)	15 (5.9)	23 (5.1)
Not sure	7 (3.6)	16 (6.3)	23 (5.1)
Sexual reproductive health education			
Ever taught about STIs in school	192 (98.5)	248 (96.9)	440 (97.6)
Ever taught about HIV/AIDS in school	194 (99.5)	255 (99.6)	449 (99.6)

Continued next page

TABLE 1. *(Continued)*

Characteristics	*Adolescent Girls (15–17 Years)* Median (Range) or Number (Percent), n = 195	*Young Women (18–24 Years)* Median (Range) or Number (Percent), n = 256	All Median (Range) or Number (Percent), n = 451
Do parents/guardians talk about sexual health			
Yes	144 (73.9)	176 (68.8)	317 (70.3)
No	47 (24.1)	76 (29.7)	125 (27.7)
Not sure	4 (2.1)	4 (1.6)	9 (2.0)
Laboratory diagnosis of STIs			
Any STI	7 (3.6)	19 (7.4)	26 (5.8)
Trichomonas vaginalis	0	3 (1.2)	3 (0.7)
Chlamydia trachomatis	2 (1.0)	14 (5.5)	16 (3.6)
Neisseria gonorrhoeae	5 (2.6)	2 (0.8)	7 (1.6)
Site			
High school	194 (99.5)	99 (38.7)	293 (65.0)
University	1 (0.5)	157 (61.3)	158 (35.0)

*Analyzed among 21 adolescent girls and 129 young women who reported ever having vaginal sexual intercourse.
IUD indicates intrauterine device.

Of the 451 participants, 54 (12.0%) reported use of khat, and 39 (8.7%) reported having 1 or more alcoholic drinks per day. Compared with students younger than 18 years, more students 18 years or older reported substance use (21 [10.8%] vs 64 [25.0%]; odds ratio [OR], 2.76; 95% confidence interval [CI], 1.62–4.71, $P < 0.001$). Twenty-six students (5.8%) reported polysubstance use. Of these, 12 (46.2%) reported using a combination of alcohol and khat.

Twenty-six students (5.8%; 95% CI, 3.6%–7.9%) were diagnosed with STIs (7 [1.6%] with *N. gonorrhoeae*, 16 [3.6%] with *C. trachomatis,* and 3 [0.7%] with *T. vaginalis*). There was no student with concurrent infections. The prevalence of STIs was 19 (12.7%) of 150 in those who reported receptive vaginal sex versus 7 (2.3%) of 301 in those who did not (OR 6.09; 95% CI 2.50–14.00, $P = <0.001$). Almost all students reported having received reproductive health education about STIs (N = 440, 97.6%) and HIV (N = 449, 99.6%) in school, and 317 (70.3%) students reported that their parents or guardians had discussed sexual health with them.

In bivariable analyses, each additional year of age (OR, 1.28; 95% CI, 1.07–1.53), religion (Christian vs Muslim/other: OR, 2.11; 95% CI, 0.87–5.13), reporting receptive vaginal sex with a condom (OR, 3.50; 95% CI, 1.14–10.73), and without a condom (OR, 9.25; 95% CI, 3.54–24.18), reporting nonpenetrative sex (OR, 3.52; 95% CI, 1.58–7.85), alcohol use (OR, 3.81; 95% CI, 1.42–10.19), smoking (OR, 5.82; 95% CI, 1.12–30.37), chewing khat (OR, 2.96; 95% CI, 1.18–7.42), and reporting polysubstance use (OR, 5.21; 95% CI, 1.74–15.59) were associated with STIs (Table 2).

TABLE 2. Bivariable and Multivariable Analyses of Covariates Associated With STI Diagnosis Among All 451 Participants

Characteristics	STI (N = 26) N (%) or median (IQR)	No STI (N = 425) N (%) or median (IQR)	*Bivariable Analyses* OR (95% CI)	*P*	*Multivariable Analyses* OR (95% CI)	*P*
Age (continuous)	19 (17–21)	18 (17–19)	1.28 (1.07–1.53)	0.006	1.04 (0.82–1.31)	0.74
Married/cohabiting	1 (3.9)	3 (0.7)	5.63 (0.56–56.06)	0.14		
Religion* (Christian vs Muslim)	19 (73.1)	239 (56.5)	2.11 (0.87–5.13)	0.10	1.30 (0.44–3.89)	0.64
Parity (ever pregnant)	1 (3.9)	5 (1.2)	3.36 (0.38–29.9)	0.28		
Receptive vaginal intercourse						
None	7 (26.9)	294 (69.2)	1.00		1.00	
With a condom	6 (23.1)	72 (16.9)	3.50 (1.14–10.73)	0.03	1.96 (0.49–7.86)	0.34
Without a condom	13 (50.0)	59 (13.9)	9.25 (3.54–24.18)	<0.001	6.21 (1.73–22.28)	0.005
Anal intercourse	1 (3.9)	9 (2.1)	1.85 (0.23–15.17)	0.57		
Nonpenetrative sex	13 (50.0)	94 (22.1)	3.52 (1.58–7.85)	0.002	1.33 (0.50–3.52)	0.57
Reported drug use						
Alcohol (≥1 drink per day)	6 (23.1)	31 (7.3)	3.81 (1.43–10.19)	0.01	2.03 (0.37–11.30)	0.28
Tobacco (ever smoked)	2 (7.7)	6 (1.4)	5.82 (1.12–30.37)	0.04	1.29 (0.13–12.40)	0.83
Khat (ever used)	7 (26.9)	47 (11.1)	2.96 (1.18–7.42)	0.02	1.90 (0.95–3.80)	0.07
Marijuana (ever used ≥1 times)	1 (3.9)	12 (2.8)	1.38 (0.17–11.01)	0.76		
Drug use pattern						
No drug use	16 (61.5)	350 (82.4)	1.00		1.00	
Monodrug use	5 (19.2)	54 (12.7)	2.03 (0.71–5.75)	0.19	0.47 (0.09–2.36)	0.36
Polydrug use	5 (19.2)	21 (4.9)	5.21 (1.74–15.59)	0.003	0.50 (0.05–4.63)	0.54
Ever diagnosed with STI	3 (11.5)	20 (4.7)	2.64 (0.73–9.54)	0.14		
No sexual health discussions with parent/guardian	10 (38.5)	124 (29.2)	1.52 (0.67–3.44)	0.32		

*N = 449. Analysis excludes 2 participants who reported religion as "other."

In multivariable analyses, reporting receptive vaginal sex without a condom remained significantly associated with STI diagnosis (OR, 6.21; 95% CI, 1.73–22.28).

We also assessed the association between substance use and STIs in a multivariable model that did not adjust for condomless sex. In this model, neither the use of individual substances (data not shown) nor the combined drug use variable (OR, 0.89; 95% CI, 0.10–8.18) was associated with STIs. We also explored correlates of STIs in the subset of participants who reported any history of receptive vaginal sex (N = 150). In bivariable analyses, reporting receptive vaginal sex with 1 (OR, 3.65; 95% CI, 0.79–16.79), and with 2 or more partners (OR, 2.53; 95% CI, 0.33–19.66) in the past 3 months were associated with increased likelihood of STIs. Condom use at last sex was associated with lower odds of any STI (OR, 0.38; 95% CI, 0.14–1.06; $P = 0.06$) (Table 3). However, none of these associations were statistically significant.

DISCUSSION

A substantial number of adolescent girls and young women at secondary schools and universities in Mombasa, Kenya were willing to undergo clinic-based urine STI screening. Of students who collected a consent form during informational meetings, a larger proportion of students from the university visited the clinic for STI testing compared with high school students. The additional step of parental consent for minors may have been a barrier to participation for younger girls. The overall STI prevalence was 5.8%, with the highest prevalence being for *C. trachomatis* (3.6%). Participants who reported receptive vaginal sex without using condoms had a 6-fold higher likelihood of being diagnosed with an STI. Prevalence of STIs among students aged 15 to 17 years was 3.6% compared with 7.4% among those aged 18 to 24 years. The proportion of students with gonorrhea was higher in the younger age group compared with the older age group (5/195 [2.6%] vs. 2/256 [0.8%]). In contrast, the proportion of students with chlamydia was lower in the younger age group compared with the older age group (2/195 [1%] vs 14/256 [5.5%]).

The prevalences for chlamydia and gonorrhea in this population were similar to those reported in other studies of adolescent girls and young women in the African region. A recent survey of adolescent girls in rural Kenya reported *C. trachomatis, N. gonorrhoeae*, and *T. vaginalis* prevalence at 2.5%, 0.6%, and 2.5%, respectively.[15] The girls in this study were younger at enrollment, and it is likely that the majority were non-Muslim, unlike our population. A cross-sectional study of female adolescents in Uganda found a *C. trachomatis* prevalence of 4.5%.[16] In Addis Ababa, Ethiopia, the combined prevalence of *C. trachomatis* and *N. gonorrhoeae* among sexually active youth aged 15 to 24 years was 4.8% (2.7% for each pathogen).[17] Significantly higher prevalences of chlamydia and gonorrhea, ranging from 13.5% to 16.0% have been reported among out-of-school youth in the region.[17,18] Although *T. vaginalis* accounts for more than half of all curable STIs worldwide,[4] the prevalence in our study was very low. This finding is not entirely unexpected, because the prevalence of trichomoniasis generally increases with age.[19]

Compared with university students, a smaller proportion of high school students visited the clinic for the urine STI test, despite picking up a consent form after our informational meetings. This may be due to the mandatory parental consent required in our

TABLE 3. Bivariable and Multivariable Analyses of Covariates of STI Diagnosis—Restricted to Those Who Report Receptive Vaginal Sex (N = 150)

			Bivariable Analyses		*Multivariable Analyses*	
Characteristics	**STI (N = 19) N (%) or Median (IQR)**	**No STI (N = 131) N (%) or Median (IQR)**	**OR (95% CI)**	***P***	**OR (95% CI)**	***P***
Age (continuous)	20 (19–21)	20 (18–21)	0.99 (0.77–1.27)	0.92		
Married/cohabiting	0	2 (1.5)	Did not converge			
Religion* (Christian vs Muslim)	3 (15.8)	18 (13.1)	0.80 (0.21–3.05)	0.81		
Parity (ever pregnant)	1 (5.3)	3 (2.2)	2.37 (0.23–24.03)	0.47		
Age at first vaginal sex act (≥17 vs <17 y)	16 (84.2)	104 (79.4)	1.38 (0.38–5.10)	0.63		
Life time sex partners (≥2 vs 1 partner)	11 (57.9)	63 (48.1)	1.48 (0.56–3.93)	0.43		
Sex partners in the last 3 mo						
No sex in the last 3 mo	2 (10.5)	38 (29.0)	1.00		1.00	
1 partner	15 (79.0)	78 (59.5)	3.65 (0.79–16.79)	0.10	3.30 (0.71–15.36)	0.13
≥ 2 partners	2 (10.5)	15 (11.5)	2.53 (0.33–19.66)	0.37	2.69 (0.34–21.23)	0.35
Condom use at last sex act	6 (31.6)	72 (55.0)	0.38 (0.14–1.06)	0.06	0.41 (0.14–1.16)	0.09
Anal intercourse	1 (5.3)	7 (5.2)	0.98 (0.11–8.47)	0.99		
Nonpenetrative sex	13 (68.4)	65 (49.6)	2.20 (0.79–6.14)	0.13		
Reported drug use						
Alcohol (≥1 drink per day)	6 (31.6)	27 (20.2)	1.78 (0.62–5.11)	0.29		
Tobacco (ever smoked)	2 (10.5)	4 (3.0)	3.74 (0.64–21.96)	0.15		
Khat (ever used)	6 (31.6)	24 (17.9)	2.06 (0.71–5.96)	0.18		
Marijuana (ever used ≥1 times)	1 (5.3)	9 (6.7)	0.67 (0.08–5.57)	0.71		
Alcohol or drugs before last sex act	2 (10.5)	12 (9.0)	2.08 (0.40–10.86)	0.38		
Drug use pattern						
No drug use	10 (52.6)	85 (64.9)	1.00			
Monodrug use	5 (26.3)	29 (22.1)	1.17 (0.34–4.03)	0.80		
Polydrug use	4 (21.1)	17 (13.0)	2.50 (0.76–8.24)	0.13		
Ever diagnosed with STI?	3 (15.8)	15 (11.2)	1.45 (0.38–5.57)	0.59		
No sexual health discussions with parent/guardian	7 (36.8)	40 (29.9)	1.15 (0.42–3.14)	0.78		

*N = 149. Analysis excludes 1 participant who reported religion as "other."

study. This finding highlights the ongoing regulatory and ethical challenges surrounding adolescent clinical research. Such challenges may contribute to the fact that adolescents continue to be an understudied population.[20] In addition, in most universities, undergraduate students have flexible schedules with free time between classes on weekdays (Monday to Friday). In contrast, high school students have a fixed schedule with free time only during the weekends. Recognizing this, we held Saturday clinics. University students were, therefore, able to attend clinic on weekdays or Saturdays, whereas the high school girls could only attend clinic on Saturdays. This may also have contributed to the differences in the proportions of college versus high school students attending the clinic. Previous studies have reported that extending hours of operation to include evening and weekend would be ideal for youth, due to conflicting school schedules.[21,22] During the formative work for this study, which included in-depth interviews and focus group discussions with students, we explored the possibility of making services available at schools. However, due to confidentiality concerns, girls participating in this formative work felt strongly that they would prefer to receive services at the clinic.[14]

Use of male condoms was associated with a substantially lower likelihood of STIs in our population, reaffirming the effectiveness of condoms in preventing STI transmission.[23] Among students who reported vaginal sex, only half reported condom use at the last sexual encounter. About 20% reported using modern nonbarrier contraceptive methods. Only 5% reported dual protection with barrier and nonbarrier methods. Low rates of contraceptive use among those who report being sexually active highlights the risk for pregnancy and STIs. We did not inquire about fertility desire. However, we anticipate that the rate of fertility intent would be low in this population of girls and young women continuing school.

Over a quarter of STIs identified in this study (7 of 26) were in girls who did not report being sexually active. This finding underscores the potential importance of offering STI screening and other reproductive health services to this population, regardless of whether they acknowledge sexual activity.

In bivariable analyses, students who reported substance use were more likely to be diagnosed with an STI compared with those who reported no use. Previous studies have shown that polysubstance users are at a higher risk of acquiring STIs.[24,25] Use of substances may be a marker for risk-taking, which may in turn lead to exposure to STIs. In addition, substance users are likely to be involved in high-risk sexual networks, where they are more likely to be exposed to STIs.[26] In future studies, it will be important to explore the relationship between substance use and sexual networks among adolescent girls and young women in Africa.

Sexually transmitted infection prevalences in this study were relatively low. Attending school and receiving a basic education has been shown to be effective in delaying sexual debut and reducing the risk of STIs.[27] The benefits of being in school include having stronger decision-making and negotiation skills and higher self-esteem. Adolescent girls and young women in school may also have higher earning potential, making them less likely to engage in transactional sex.[28] In addition, almost all students in our study reported having received some reproductive health education in school as part of the education curriculum in Kenya. This knowledge may have contributed to informed choices regarding sexual relationships and use of condoms.

One strength of this study was the use of nucleic acid amplification based testing for STIs, which has excellent sensitivity (91.3–95.2%) and specificity (98.9–99.3%) for detection of *C. trachomatis*, *N. gonorrhoeae and T. vaginalis* on first-catch urine samples.[29,30] In addition, this study adds to the limited literature on STIs in adolescents in Africa. In particular, this study highlights the strengths and weaknesses of using school-based sensitization as an approach to prompt adolescents and young women to seek diagnosis and care at health clinics. The main strength of this approach is being able to target large groups of students for sensitization education. The challenges include obtaining parental consent for the minors, and providing flexible hours for clinic visits due to school attendance. The latter was addressed by holding clinics on Saturdays.

There were also limitations to this study. We documented the number of students collecting consents and the proportion who eventually visited the clinic for STI testing. However, we did not document the number of students attending the sensitization sessions. Therefore, selection bias is possible, because students who collected a consent form may differ from those who did not. Despite this limitation, we believe these data are useful in identifying some of the important bottlenecks to STI testing among adolescents and young women in resource-limited settings. In addition, we were unable to collect data on those who did not visit the clinic. As a result, we could not compare the characteristics of those who attended clinic versus those who did not. Information on participants who did not attend clinic would be valuable in informing interventions targeted toward STI screening in these populations. Our sample size was calculated based on the proportion accepting STI testing in the 2 age groups (18–24 vs 15–17) rather than the estimated STI prevalence. This could have resulted in an underpowered analysis of risk factors for STIs. In addition, our sensitivity analyses restricted to participants reporting vaginal sex excluded more than half of the participants and as such this analysis also had less power. Despite these limitations, these data highlight modifiable predictors of STI diagnosis among adolescent girls and young women in sub-Saharan Africa. Sexual risk behavior was self-reported, introducing the possibility of recall and social desirability bias. To mitigate these effects, we used self-administered questionnaires and explained to the participants that their data were anonymous. Another limitation was the lack of event-level data that would allow a more detailed understanding of how exposures such as alcohol use influence outcomes like unprotected sex at the time of specific events. However, because untreated STIs persist for months to years, we may gain valuable insights from examination of the interval-level data collected in this study. Finally, this was a cross-sectional study, limiting our ability to prove causal associations.

In conclusion, uptake of STI testing in this study provides evidence that school-based recruitment linked to facility-based testing is feasible and acceptable when conducted in collaboration with students, parents, and teachers. Although uptake through school-based sensitization was lower than for university, there still appeared to be substantial demand in this population. Uptake of STI screening might be higher if the requirement for parental consent was waived. The STI prevalence in girls who reported receptive vaginal intercourse was high (12.7%) compared with those who did not report vaginal intercourse (2.3%). Tiered services, providing risk reduction education to all adolescent girls and young women, plus a more aggressive STI screening approach for those who report vaginal intercourse, might provide an efficient way of addressing STIs in this population. Adaptable interventions, such as a behavioral risk assessment survey during the sensitization sessions, would be useful in identifying adolescents and young women with the greatest need for STI testing.

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