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Condomless sexual encounters among female sex workers included in a longitudinal coital diary study in Zimbabwe

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Abstract

Background Compared with the general female population, female sex workers (FSWs) experience a greater burden of STIs, including HIV. Consistent condom use reduces HIV risk; however, while many FSWs are aware of condom efficacy, this knowledge does not consistently translate into use. We aimed to estimate the prevalence and patterns of condomless sex by partner type at the sexual encounter level, as well as identify factors associated with condomless sex among FSWs recruited into a diary study in Zimbabwe.

Methods We conducted a longitudinal coital diary study in site A and site B between 25 November 2020 and 30 December 2021. Pictorial diaries were developed in collaboration with FSWs. We recruited participants using snowball sampling and asked them to complete a daily diary of their sexual encounters with each partner for one month, repeated over three non-consecutive months within 12 months. The following FSW characteristics were recorded: FSW age, Key Populations (KP) Programme contact, partner type and age, condom use categorized as none, partial, or full, types of sexual activity, and violence experiences. To identify factors associated with condomless sex, we used hierarchical Poisson regression modelling.

Results 404 FSWs documented 62,559 sex encounters, with 17,325 (27.7%) reported as condomless. Our adjusted analysis showed that encounters with permanent partners had the highest likelihood of being condomless (59.5%; adjusted relative risk [aRR] 3.83, 95% CI: 3.38–4.35), followed by regular partners (25.6%; aRR 1.63, 95% CI: 1.50–1.78), compared to new partners (15.0%). Compared with FSWs aged < 25 years (29.7%), those aged ≥ 35 years were less likely to have condomless sex (22.1%; aRR 0.79, 95% CI: 0.66–0.94), while sex without violence was less likely (24.1%) to be condomless than sex with violence (57.7%; aRR 2.32, 95% CI: 2.00-2.70). FSWs with the KP programme contact reported fewer condomless encounters (25.9%; aRR 0.81, 95% CI: 0.90–0.94) than those without (32.9%).

Conclusion Condomless sex was common and varied based on FSW age, partner type, experiencing violence during sex, and KP programme contact. These findings emphasize the need for continued condom promotion, counseling, violence mitigation, and training in condom negotiation skills especially given the heightened risk of HIV transmission among FSWs.

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Keywords Female sex workers, Condomless sex, Longitudinal study, Coital diary, Zimbabwe, HIV prevention

Introduction

Female sex workers (FSWs) represent a key population at high risk for sexually transmitted infections (STIs), including HIV. This increased vulnerability primarily stems from having multiple sexual partners plus suboptimal engagement with prevention including inconsistent condom and pre-exposure prophylaxis (PrEP) use [1].

In sub-Saharan Africa (SSA), HIV incidence among FSWs is alarmingly high, with studies indicating rates of 4·30 per 100 person-years (IQR 2·8–7·0 per 100 person-years) [2] and 4·60 cases per 100 person-years (95% CI: 1·53–8·45) in South Africa [3]. In a recent systematic review, Jones et al. revealed that the incidence of HIV among FSWs was eight times higher than that of general female population [2]. In Tanzania, HIV incidence among FSWs was reported to be 3.45 per 100 person-years at risk (95% CI: 2.25–5.28/100) [4]. Additionally, in Zimbabwe, HIV incidence among FSWs was 6.3/100 person-years at risk (95% CI: 5.3, 7.6) among 18–24 year-olds and 3.3/100 per year at risk(95% CI: 1.3, 4.2) among 25–39 year-olds [5]. FSWs often engage with diverse sexual networks including clients and non-client partners, where condom use may be less frequent [6].

Consistent condom use is a highly effective prevention strategy, offering dual protection against STIs and unintended pregnancies [7]. When used correctly and consistently, condoms can reduce the likelihood of HIV transmission by 90 to 95% [6, 8]. However, various factors including having regular partners, ≥ 35 years, and experiencing sexual or physical violence—can increase the likelihood of condomless sex among FSWs [1, 9–12]. The term "condomless sex" refers to sexual activity that takes place without using a condom. Although many FSWs report understanding condoms effectiveness and their availability, they are not always able to translate this knowledge into consistent use [13]. Condomless sex may be linked to poor negotiation skills [14], alcohol or substance use, threat of violence [1, 15] and economic incentives resulting from clients offering more money for condomless sex [16–19]. Power dynamics and age imbalances between FSWs and their partners complicate condom use negotiations, increasing FSWs' vulnerability to violence and risky behaviours [14, 16]. Understanding these dynamics is crucial for developing targeted interventions that address the unique challenges faced by this population.

A study among young women selling sex aged between 18 and 24 years who participated in the DREAMS (Determined, Resilient, Empowered, AIDS-free, Mentored and Safe) programme in Zimbabwe revealed that knowledge and access to condoms did not translate into use [13]. This group differs from the emancipated FSWs ≥ 16 years who had sold sex for at least 30 days and were recruited in the current study. Additionally, reporting of condom use is often subject to social desirability and recall bias [20, 21]. As such, we remain unsure about the real patterns of condom use with different partners [13]. This disconnect between self-reported condom use and actual risk of HIV transmission among FSWs in Zimbabwe necessitates further investigation to understand the true patterns of condom use and their implications for HIV transmission.

We aimed to estimate the prevalence and patterns of condomless sex by partner type at the sexual encounter level, as well as identify factors associated with condomless sex among FSWs recruited into a diary study in Zimbabwe. We sought information on condom use at each sexual encounter with different partner types using self-reported data. This prospective approach helps reduce bias and improve data accuracy [22].

Methods

We conducted a longitudinal coital diary study across two purposively selected cities in Zimbabwe: Site A, a major urban centre with a thriving sex work industry, and Site B, a university town with a local mining industry [9]. These diverse settings provided an opportunity to examine sex work nuances across different environments.

We used a participatory process with FSWs to co-develop a pictorial coital diary for self-completion–Fig. 1. A sketch artist facilitated workshops where 20 FSWs helped design infographics and piloted the tool. Pilot tests assessed feasibility, user-friendliness, engagement, and the diary's validity as a real-time data collection tool.

While many studies characterize FSW partners as clients and non-clients, FSWs in this study categorized partners as new, regular, or permanent.

We aimed to recruit 300 participants (150 per site), eventually enrolling 430 FSWs to account for dropouts. We used snowball sampling to identify FSWs through the KP programme clinics which are nationally scaled healthcare facilities specifically designed to provide comprehensive HIV treatment, prevention, and related health services to KPs, as well as through peer educators, and subsequent referrals. FSWs were aged ≥ 16 and had lived in site A and site B for at least three months. Participants who provided written consent were trained to complete diaries at times convenient and safe for them. Diaries were completed daily for one month at a time over three non-consecutive months, recording details of up to 10

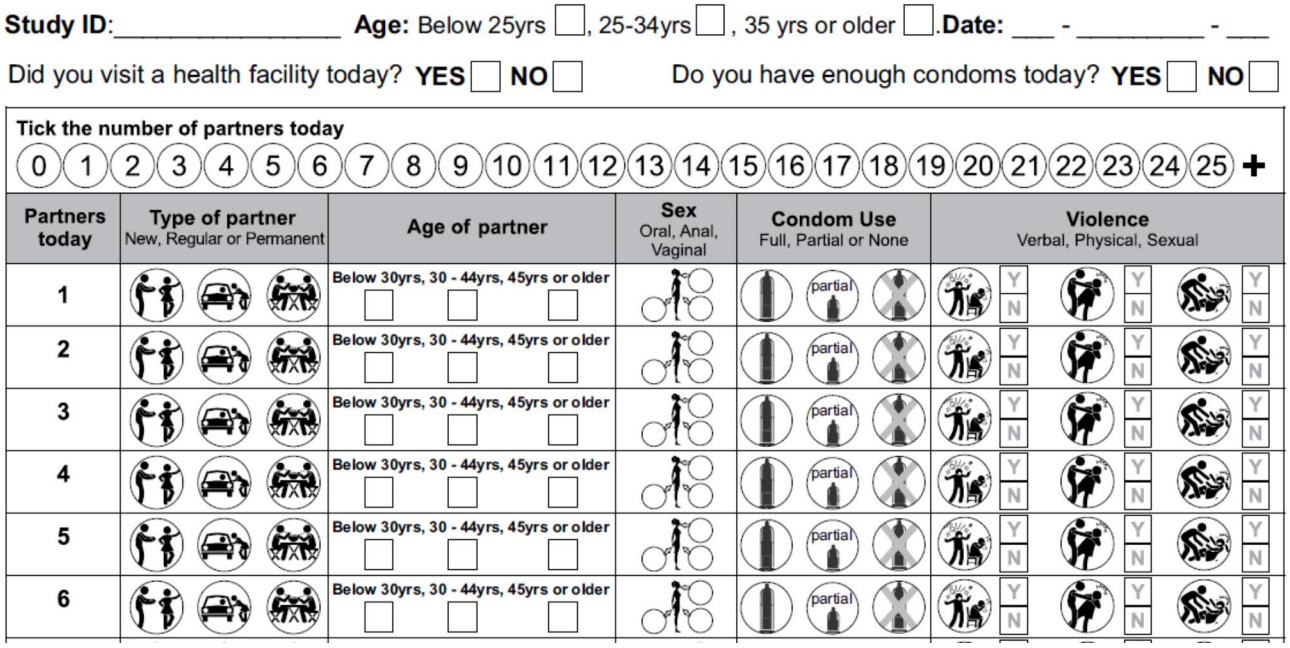

Fig. 1 Pictorial diary

sexual partners per day. FSWs could report up to 25 partners, but we collected detailed information only on the first 10 partners due to the diary's pocket-sized design for confidentiality. Study staff provided virtual support via WhatsApp and phone calls to complete the diary. Diaries were collected by study staff after each 30 days, and data were double-entered by data entry clerks for quality control.

We aimed to obtain complete diaries from participants across three rounds. This analysis included all participants who provided diary data for any combination of rounds 1, 2, and 3.

Key variables

The primary measurement was condomless sex. We classified an encounter as involving condomless sex if it included either vaginal or anal sex, and there was either no protection or only partial protection from condoms. Partial condom use entails situations when condoms are not used consistently throughout the entire sexual encounter. Independent variables included the study site, FSW age, partner age and type, experiences of violence (sexual, verbal, or physical), and KP programme contact (accessing services at the clinics regularly, non-regularly, or never). FSW categorized their ages as < 25 years, 25–34 years, and ≥ 35 years to maintain anonymity, as explicitly stating their ages could reveal their identity; they also wanted to reflect behavioural differences between young, middle-aged, and older FSWs in the data collection. They contributed to partner typologies by classifying partners as new (first-time sexual encounters), regular (occasional encounters with familiarity), or permanent (significant, often financial, relationships), with permanent partners typically engaging in sexual encounters without immediate payment expectations. FSWs categorized partner ages as < 30 years, 30–44 years, and ≥ 45 years based on their experiences with different types of clients. All independent variables were categorical.

Statistical analysis

To identify factors associated with condomless sex, we conducted a pooled analysis across both study sites, combining data from all the diaries that had data points. Descriptive summaries are presented as frequencies and percentages, and we used Chi-square tests to assess differences in FSW characteristics between study sites. Additionally, we characterized missed days and encounters, comparing study sites. Missed days were defined as the difference between the expected number of days assuming each FSW completed all 90 days and the actual number of days reported in the study. We also reported the number of days when condoms were available but condomless sex still occurred to gain insights into the behavioural and contextual factors influencing condom use.

A modified hierarchical Poisson regression analysis was performed to identify factors associated with condomless sex, adjusting for confounding variables. We used robust standard errors for clustering by individual FSW completing multiple diary rounds. We employed hierarchical modeling to account for the nested structure of the data (encounters within FSWs) and used Poisson regression to

obtain risk ratios, which are more intuitive to interpret than odds ratios. Firstly, we explored each independent variable and its association with condomless sex, followed by an adjusted analysis. All independent variables were included in the multivariable model, regardless of their statistical significance, as some variables may be theoretically and contextually important. We reported crude and adjusted relative risks (RRs) with 95% confidence intervals (CIs).

Ethics statement

This study was approved by the Medical Research Council of Zimbabwe (MRCZ/A/2559) and the Research Council of Zimbabwe (RCZ). All participants provided written informed consent, and their privacy was protected by omitting identifying information from the diaries. They were encouraged to disclose their involvement to regular partners and keep their diaries secure. Consent forms were signed by both participants and study staff, stored in a locked cabinet accessible only to staff. Participants were assigned study IDs for data collection, storage, and analysis. Diaries were submitted in cohorts to CeSHHAR offices, where staff met individually with participants to review completeness. The consent process included reviewing the form section by section with time for questions, explaining the study's purpose, risks, benefits, and emphasizing voluntary participation with the option to withdraw without affecting clinic services. A $5 transport reimbursement was specified, and participants were assured of confidentiality, with unique, non-traceable identifiers assigned to their diaries. A $5 transport reimbursement was provided for each diary submission.

Results

We recruited 430 FSWs across the two sites: 218 (50.7%) from site A and 212 (49.3%) from site B between 25 November 2020 and 30 December 2021. A flow diagram (Fig. 2) illustrates the recruitment process and participant dropouts at various follow-up stages. Ultimately, results are presented for 404 participants (94.0% of the total sample) who contributed data at least once during the study, including 203 participants (50.2%) from site A and 201 participants (49.8%) from site B. Importantly, not all women who participated completed the diaries for 90 days of data collection. Participation was defined as completing at least one diary entry, and all 404 women who submitted an entry were included in the analysis. Of the 430 women recruited, 34 were lost to follow-up during round 1. However, 6 of those 34 returned for round 3, implying that 28 women started the study but did not fill out any daily diaries during the 90 days of data collection. The expected total number of participation days was 90, assuming each FSW made a diary entry every day over the 3 months. However, the median number of days FSWs recorded a diary entry across the 3 rounds was 63 (interquartile range [IQR]: 47–74).

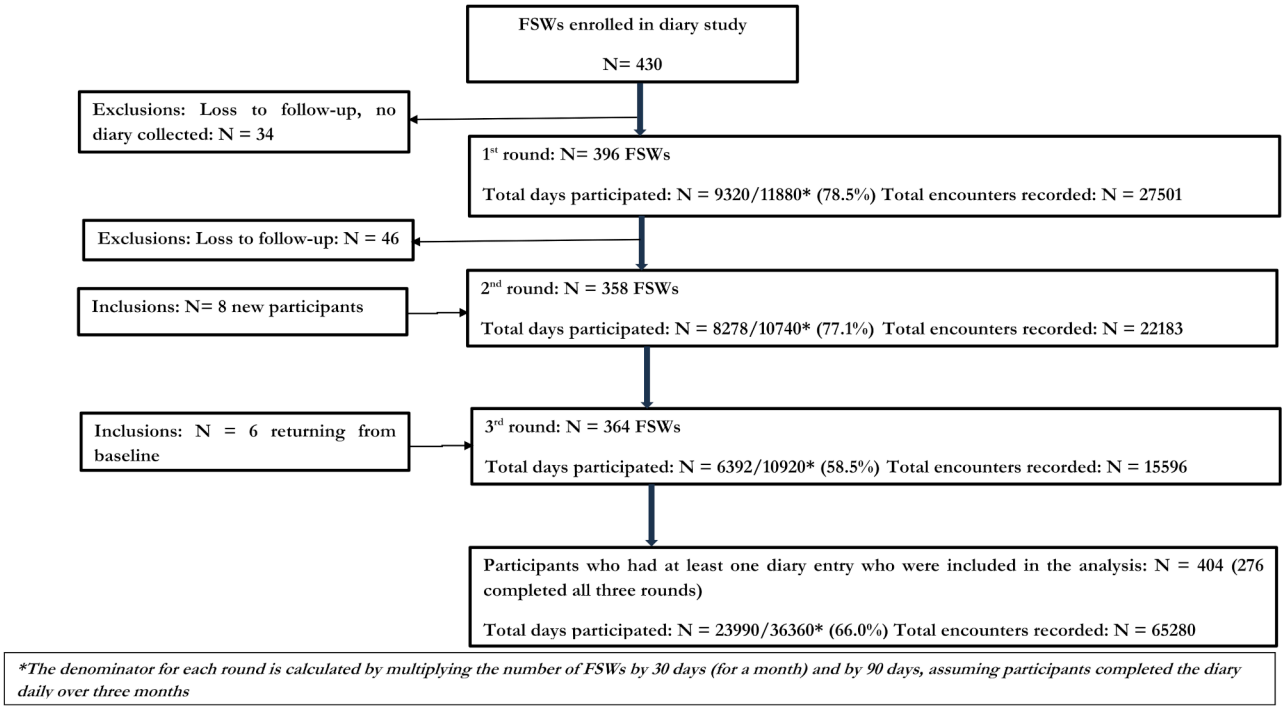

Fig. 2 Flow chart of the longitudinal follow-up of study participants

Table 1 Characteristics of FSWs recruited in the diary study

Details	Site A *N* = 203	Site B *N* = 201	Total *N* = 404	*P*-value
FSW age				
< 25 years old	101(49.8)	117(58.2)	218(54.0)	0.209
25–34 years old	57(28.1)	44(21.9)	101(25.0)	
≥ 35 years old	45(22.2)	40(19.9)	85(21.0)	
Contact with KP programme				
No	77(37.9)	35(17.4)	112(27.7)	**< 0.001**
Yes	126(62.1)	166(82.6)	292(72.3)	
Total expected days in the study*	18,270	18,090	36,360	
Total days recorded in the study	15,987(87.5)	14,758(81.6)	30,745(84.6)	
Total days with no sexual activity	3577(22.4)	3179(21.5)	6756(22.0)	
Total days with sexual activity	12,410(77.6)	11,579(78.5)	23,989(78.0)	
Total diary entries	38,800	33,245	72,045	
No sexual encounters (zero partners)	3586(9.2)	3179(9.6)	6765(9.4)	
Sexual encounters with partners	35,214(90.8)	30,066(90.4)	65,280(90.6)	
Total encounters with partners where condom use information was provided	33,858(96.1)	28,801(95.8)	62,659(96.0)	

*The total expected days in the study is calculated by multiplying the number of FSWs by 90 days (3 months)

Table 2 Conditions of encounters by site

Variable	Site A	Site B	Total	*P*-value
Vaginal sex				
No	1868(5.4)	1870(6.4)	3738(5.8)	< 0.001
Yes	32,787(94.6)	27,595(93.7)	60,382(94.2)	
Anal sex				
No	31,924(92.1)	24,271(82.4)	56,195(87.6)	< 0.001
Yes	2732(7.9)	5193(17.6)	7925(12.4)	
Oral sex				
No	31,166(89.9)	24,501(83.2)	55,667(86.8)	< 0.001
Yes	3490(10.1)	4963(16.8)	8453(13.2)	
At least 2 sex types				
No	31,001(89.5)	22,934(77.8)	53,935(84.0)	< 0.001
Yes	3653(10.5)	6530(22.1)	10,183(16.0)	
Verbal violence				
Yes	2482(7.1)	2780(9.3)	5262(8.1)	< 0.001
Physical violence				
Yes	2164(6.2)	2757(9.2)	4921(7.5)	< 0.001
Sexual violence				
Yes	2751(7.8)	2785(9.3)	5536(8.5)	< 0.001
Had both verbal and physical violence	1431(4.1)	1923(6.5)	3354(5.2)	< 0.001
Had both verbal and sexual violence	1503(4.3)	1948(6.5)	3451(5.3)	< 0.001
Had both physical and sexual violence	1461(4.2)	1991(6.7)	3452(5.4)	< 0.001

Most participants were under 25 years old, with a higher proportion recruited from Site B than in Site A, (58.2% vs. 48.8%, $p = 0.209$). Additionally, 72.3% of participants had contact with the KP programme, with a greater percentage of contact among FSWs in site B than site A (82.6% vs. 62.1%, $p < 0.001$)– Table 1.

Overall, 404 women reported 30,745 days of study participation across the 3 rounds. Of these, 6,756 (22%) days reported zero partners, leaving 23,989 days (78%) with recorded sexual encounters. On these 23,989 days, a total of 65,280 sexual encounters were reported.

Condom use was reported during vaginal or anal sex on 23,569/23989 (98.2%) days of sexual activity, resulting in 62,659 sex encounters. On 15,970/23569 days (68.0%), sex was fully protected by condoms, while condomless sex occurred on 7,599/23569 days (32.0%). FSWs reported that they had condoms available on 6178/7599 (81.3%) of the days that they reported condomless sex. Among the 62,659 sexual encounters, 17,325 (27.7%) were reported as condomless. The prevalence of unprotected sex during anal versus vaginal intercourse differed significantly. Over a quarter (15,756, 26.3%) of vaginal encounters were unprotected, compared to nearly half (3,955, 50.5%) of anal sex encounters. The largest proportion of encounters was with 'new' partners (30,826; 49.2%), followed by 'regular' partners (18,076; 28.9%) and 'permanent' partners (13,099; 20.8%), with 748 encounters (1.2%) missing partner information.

The majority of encounters included vaginal sex (60,382; 94.2%), while 7,925 (12.4%) included anal sex and 8,453 (13.2%) included oral sex. Overall, 16% of encounters involved more than one sex type. Violence was common, occurring in at least 8,470 (13.3%) of sexual encounters. Verbal, physical, and sexual violence were reported with similar frequency, ranging from 7.3 to 8.3% of encounters. Encounters involving any two violent types ranged between 5.2% and 5.4% - Table 2.

Factors associated with condomless sex

Encounters with permanent partners were the most likely to involve condomless sex (59.5%; adjusted risk ratio [aRR] 3.83, 95% CI 3.38–4.35), followed by

encounters with regular partners (25.6%; aRR 1.63, 95% CI 1.50–1.78), compared to encounters with new partners (15.0%). Additionally, sexual encounters reported by older FSWs aged ≥ 35 were less likely to be condomless (22.1%, aRR = 0.79, 95% CI: 0.66–0.94) compared to younger FSWs (< 25 years), 29.7%. Sexual encounters with partners aged 30–44 years were the most likely to be condomless (30.2%, aRR = 1.12, 95% CI: 1.05–1.20) compared to partners (< 30 years old), 24.3%. Encounters involving all forms of violence at the same sex encounter were the most likely to involve condomless sex (57.7%; adjusted risk ratio [aRR] 2.32, 95% CI 2.00-2.70), followed by encounters with any type of violence (45.5%; aRR 1.77, 95% CI 1.61–1.95), compared to encounters with no violence (24.1%). Conversely, sexual encounters reported by FSWs who had KP programme contact were less likely to be condomless (25.9%, aRR = 0.81, 95% CI: 0.90–0.94) compared to those who did not(32.9%). All variables in our univariable analysis were considered as confounding and were included in our multivariable analysis– Table 3.

Table 3 Unadjusted and adjusted multivariable modified hierarchical Poisson regression analysis of individual FSW and sex encounter characteristics with condomless sex

Variable	Total *N*	*n*(%) condomless sex	Unadjusted Relative Risk (RR)	Adjusted model Relative Risk (RR)	*P*-value
Study site					
Site A	33,858	8429(24.9)	1	1	
Site B	28,801	8896(30.9)	1.24(1.06–1.46)	1.18(1.03–1.35)	**0.016**
Partner type					
New	30,826	4626(15.0)	1	1	
Regular	18,076	4626(25.6)	1.71(1.56–1.86)	1.63(1.50–1.78)	**< 0.001**
Permanent	13,009	7746(59.5)	3.97(3.49–4.51)	3.83(3.38–4.35)	**< 0.001**
Partner age					
< 30 years	24,210	5888(24.3)	1	1	
30–44 years	26,137	7665(29.3)	1.21(1.10–1.32)	1.12(1.05–1.20)	**< 0.001**
45 + years	11,682	3526(39.1)	1.23(1.08–1.41)	1.04(0.94–1.15)	0.390
FSW age					
< 25 years old	30,250	8988(29.7)	1	1	
25–34 years old	18,377	5231(28.5)	0.95(0.79–1.14)	0.95(0.82–1.11)	0.545
35 + years old	14,032	3106(22.1)	0.74(0.59–0.92)	0.79(0.66–0.94)	**0.008**
Violence experience					
None	53,625	12,904(24.1)	1	1	
Had all 3 types of violence	2794	1611(57.7)	2.40(2.08–2.78)	2.32(2.00-2.70)	**< 0.001**
Any one of 3 types of violence	5845	2658(45.5)	1.89(1.68–2.12)	1.77(1.61–1.95)	**< 0.001**
KP programme contact					
No	16,001	5256(32.9)	1	1	
Yes	46,658	12,069(25.9)	0.79(0.66–0.94)	0.81(0.90–0.94)	**0.005**

Discussion

We aimed to assess the frequency of condomless sex among FSWs in Zimbabwe and identify factors linked to FSW characteristics, partner types, and encounter conditions. The current study is one of the few to use a longitudinal coital diary to assess condom use among FSWs in Sub-Saharan Africa. Our study revealed that 17,325/62,659 (27.7%) sexual encounters were condomless. The risk of condomless sex was significantly higher with regular partners and permanent partners compared to new partners. Additionally, encounters involving any form of violence doubled the risk. Conversely, older FSWs and those with KP contact reported fewer instances of condomless sex than their counterparts did.

Our study collected valuable information on sensitive sexual risk behaviours or socially stigmatized activities that are often under-reported and particularly difficult to ascertain over extended periods. With 404 women participating over 90 days, our study offers a more solid dataset for examining patterns of sexual activity than earlier research with smaller sample sizes [23]. The study benefited from a large sample size and a high follow-up rate. The prospective design of the daily coital diary reduced the chances of long recall bias or memory bias, enabling accurate and reliable data collection. Pictorial diaries can be used by individuals with varying literacy levels, enhancing comprehension and engagement. They also provide insights into each sexual encounter that are often not captured in traditional survey methodologies. Longitudinal diaries offer significant advantages over traditional survey methods by being less intrusive, reducing social desirability bias, and providing greater granularity through more natural data collection. They allow for a more detailed and accurate understanding of behaviours like condom use, issues that crude questionnaire measures often fail to address.

Our study also had limitations. The study may be subject to recall bias if diaries were not filled out daily for multiple partners, potentially resulting in missing, inaccurate, or unreliable data. Recall bias may cause under or over-reporting of sexual behaviour. Additionally, social desirability bias may arise when self-reporting socially sensitive data, where FSWs may provide responses that reflect what they believe are socially acceptable. Nevertheless, this bias may be mitigated by the private nature of diary completion, reducing interviewer influence. We

did not conduct biomarker confirmation of self-reports (for example using Y chromosome testing) so we are unable to validate self-reported consistent condom use. Y chromosome testing is a useful method for validating self-reported condom use. Y Chromosome is likely present in women who have had condomless sex in the previous 14 days [24]. Comparing presence of Y chromosome with self-reported condom use can help understand where there are discrepancies in sexual behavior reporting and improve the accuracy of sexual behaviour research. It remains unclear whether diary non-completion was due to transitions in and out of sex work or participants just disengaged from the study while still selling sex. FSWs recorded qualitative data regarding reasons for diary non-completion during the diary completion process, which is yet to be analyzed. While we recruited sex workers from two diverse cities, we did not randomly sample participants, which may limit generalizability. Additionally, the nonrandom sampling strategy further restricts the applicability of the results, making it difficult to extrapolate to broader contexts. Snowball sampling may skew results and limit diversity, as individuals might hesitate to participate or refer others due to fears of exposure or mistrust of researchers, which further restricts sample diversity. Additionally, the limited number of exposure variables restricted the study's ability to comprehensively capture factors influencing inconsistent condom use among FSWs. This limitation may result in an incomplete understanding of the phenomenon, hinder the formulation of targeted interventions, and introduce risks of confounding or omitted variables, ultimately affecting the study's internal validity and reliability.

Our study revealed that 27.7% of all sex encounters were condomless. While there is no literature from other diary studies to compare with our findings, evidence from multiple surveys among FSWs in Zimbabwe shows similar levels of condomless sex [13, 14, 25–28]. A 2021 survey in Zimbabwe reported that 20.3% of FSWs had condomless sex in the past month [29]. Cross-sectional studies in Uganda and Ethiopia reported varying levels of condomless sex, with rates of 40% in 2013 [30], 17.1% in 2023, 41.6% in 2021, and 52.3% in 2015 [31–33] respectively. Possible explanations for these variations include methodological differences and study timeframes. Higher rates of condomless sex among FSWs may further drive HIV transmission, ultimately affecting their clients and, subsequently, the general population.

The current study revealed differences in condom use with FSWs among new, regular, and permanent partners. As with other studies, our study revealed more condomless sex encounters with regular and permanent partners, than with new partners. Several other studies also reported that condomless sex was more likely with regular and permanent partners compared to new partners [21, 34–37]. This trend may be driven by FSWs perceiving lower HIV risk from long-term partners. However, other studies revealed higher rates of condomless encounters with new or one-time partners, suggesting regional differences in risk perception and relationship dynamics. The consistent use of condoms with new partners may stem from heightened risk perceptions; FSWs feel more vulnerable to HIV transmission when dealing with unknown partners. This distrust often leads to a commitment to using condoms consistently in these encounters. In contrast, when FSWs have sex with someone regularly, trust often develops, and expectations change, making it more difficult to negotiate condom use [38]. Differences between studies may result from variations in healthcare systems, study designs (longitudinal vs. cross-sectional), sample sizes, population types, definitions of inconsistent condom use, measurement periods, and the timing of the studies. Given that FSWs are at high risk for HIV and that challenges to achieving effective prevention through other technologies, such as oral PrEP, persist [39, 40], it is crucial to implement effective strategies to promote condom use.

Results from this analysis indicate that encounters involving younger FSWs (aged < 25) were more likely to be condomless compared to those involving older FSWs (≥ 35). Evidence from other studies is mixed. A 2021 study from Tanzania reported that younger FSWs were less consistent in condom use with all partners [41]. In contrast, a 2023 bio-behavioural survey in Ethiopia indicated that older FSWs were less likely to use condoms consistently [31]. A biobehavioral survey is intended to gather information on the biological and behavioral characteristics of particular populations. Access to condoms may play a role; younger FSWs may face barriers that limit availability and often do not engage with FSW programs, restricting their uptake of vital health services including condoms, STI testing and PrEP [42, 43]. In Ethiopia, factors such as economic pressures and a declining clientele may reduce condom negotiation among older FSWs highlighting the need for tailored strategies to support condom negotiation and safer sex practices within different FSW age groups [31].

Experiences of violence add complexity to condom use behaviours among FSWs. Our study revealed that sex encounters among FSWs who experienced violence were more likely to be condomless. Several other studies have reported similar findings. For example, a 2018 study in Uganda revealed that physical or sexual violence significantly predicts condomless sex among FSWs [11]. Similarly, a 2023 study in Ethiopia reported that a history of sexual violence in the past year was associated with inconsistent condom use [31]. Studies from Togo, Burkina Faso, and Ghana also revealed that violent encounters were more likely to be condomless [1, 11, 44,

45]. Additionally, a 2019 study in Senegal corroborated these findings, linking physical violence to inconsistent condom use [46]. A 2015 study in Gambia reported a negative association between experiencing physical and verbal violence and condom use with non-paying partners [21]. The nature of their work exposes FSWs to coercion and threats, complicating negotiations for condom use. In settings where some aspects of sex work are criminalized such as Zimbabwe, fear of arrest may deter FSWs from reporting violence [14, 16].

While addressing violence is critical, improving access to programmes targeted to the needs of FSWs can provide essential resources to reduce the risk of condomless encounters. Our study revealed that FSWs who had contact with the KP programme were less likely to report condomless sex. This programme makes condoms widely available to FSWs in communities and provides support for condom negotiation and use. As with other studies, FSWs with little programme contact were also more likely to engage in condomless sex [47]. Notably, FSWs in this study reported that condoms were available; therefore, lack of availability was not a reason for reporting condomless sex. Not self-identifying as an FSW limits access to HIV-related services; for instance, those who were aware of the KP programme demonstrated better service utilization than those who did not self-identify as FSWs in Zimbabwe [48]. These results imply that in order to promote self-identification and enhance health service participation, particularly among younger FSWs, more focused outreach and awareness initiatives are needed. Condom use during anal sex is often lower than that during vaginal sex, significantly increasing HIV risk. This highlights the need for targeted interventions promoting safer practices, especially given the additional challenges of violence associated with anal intercourse.

The high levels of condomless sex observed among FSWs in our study highlight the critical need for ongoing support to ensure their uptake of and effective engagement with prevention services. To ensure sustained uptake and engagement with prevention services among FSWs, it is crucial to reframe risk messaging to reduce stigma, focusing on general prevention to reach a broader audience without labeling specific groups as "at risk." Efforts to engage younger FSWs must address barriers such as economic pressures, limited access to healthcare, and the fear of stigma, which often prevent them from seeking services. Additionally, digital tools such as mobile health applications (mHealth) and social media platforms can effectively disseminate HIV prevention information, especially through animated videos that emphasize the importance of consistent condom use across all age groups, including adolescent girls and young women.

Conclusions

Our findings highlight the importance of considering local contexts, partner types, violence experiences, program contact, and the ages of both FSWs and their partners when designing targeted interventions for safer sexual practices. Tailoring interventions to specific contexts and demographics effectively addresses unique challenges, reducing risks associated with condomless sex. Younger FSWs, more likely to engage in condomless sex, require interventions addressing challenges like economic pressures and limited healthcare access for example DREAMS partnership [49]. Violence reduction policies can enhance safer sex negotiations, and KP programs need further support to provide effective violence risk reduction counseling. Future research could utilize mobile health applications (mHealth) and use cross-sectional studies with representative FSW samples to explore more variables, though such studies may not establish causality or capture temporal changes. Additional factors influencing condom use include cultural norms, social networks, community support, and structural elements like legal frameworks and healthcare access. Understanding these nuances will guide culturally sensitive interventions and policies to promote safer sexual practices and improved health outcomes for FSWs and their partners.

Abbreviations

CI	Confidence Interval
FSW	Female Sex Worker
HIV	Human Immunodeficiency Virus
KP	Key Populations
MRCZ	Medical Research Council of Zimbabwe
PrEP	Pre-exposure Prophylaxis
RCZ	Research Council of Zimbabwe
RR	Relative Risk
SSA	Sub-Saharan Africa
STI	Sexually Transmitted Infection

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Author contributions

GM planned and conducted the analysis and wrote the first draft. FM, TK, MM, and GM led the data collection. JH, EF, STC, and HJ provided critical revisions to the article, particularly the discussion. FMC and JH were involved in the conception of the study, interpretation of the results, and critical revision of the article. All the authors contributed to the writing and have read and approved the final version.

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Data availability

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate
Ethics approval and consent to participate were obtained in accordance with the principles outlined in the Declaration of Helsinki, ensuring that the study adhered to ethical standards for research involving human subjects. This study received ethical approval from the Medical Research Council of Zimbabwe (MRCZ/A/2559), the Research Council of Zimbabwe (RCZ), and the Liverpool School of Tropical Medicine (LSTM) under Research Protocol 19–115. All participants provided written informed consent.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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