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RESEARCH ARTICLE

Emerging trends in contraceptive use, transitions and preferences among female sex workers screened for an HIV prevention clinical trial in Kisumu, Kenya: a cross-sectional study [version 1; peer review: 1 approved with reservations, 1 not approved]

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Abstract

Background: Globally about 210 million women conceive annually and 38% of these pregnancies are unintended. Female sex workers (FSWs) are at increased risk of both unintended pregnancy and acquiring HIV, which could lead to adverse sexual and reproductive health (SRH) outcomes. We sought to assess contraceptive use or non-use, preferences and determinants among a cohort of FSWs screened for an HIV prevention clinical trial in Kisumu, Kenya.
Methods: A cross sectional study of healthy FSWs referred for possible recruitment into the Antibody Mediated HIV Prevention (AMP) Study was conducted between December 2016 and September 2018. Potentially eligible participants were screened for HIV and data on social-demographic, contraceptive use and other SRH characteristics were collected. Those not on a method recorded their contraceptive preferences.
Results: Data on 210 FSWs with a median age of 24.5 years (interquartile range, IQR 22-26) are presented. Of these, 187 (89.1%) had two children or fewer; only 56 (26.7%) had completed secondary or higher education. At the time of the interview, 18 (8.6%) were HIV-infected and 181 (86.2%) were using a modern contraceptive. Implants

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(48.6%) and depot injections (37.6%) were the most commonly used methods. Most (41.4%) of those not on family planning preferred oral pills. Respondents who had two or more children were three times more likely than their primiparous and nulliparous counterparts to report use of a contraceptive. Use of modern contraception methods did not differ by respondent's ownership of a medical insurance cover or other occupation.

Conclusion: There is high use of modern contraception among FSWs in Kisumu with the majority using subdermal implants. Reproductive health programs should implement targeted SRH interventions for specific populations and risk groups. Effective contraceptive counselling and interventions among FSWs should consider the client's parity and level of education.

Keywords
Contraceptive use, long-acting reversible contraception, female sex workers, preferences, trends, sexual and reproductive health, Kenya

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Introduction

Contraceptive prevalence is the percentage of women married or in-union aged 15 to 49 who are currently using, or whose sexual partner is using, at least one method of contraception, regardless of the method used[1]. The term modern contraception is frequently used to refer to the 10 modern methods of family planning (female sterilization, male sterilization, contraceptive pills, intra-uterine devices [IUDs], injectables, implants, male condoms, female condoms, lactational amenorrhoea, and emergency contraception) as opposed to the two traditional methods (rhythm or calendar method and withdrawal). Despite widespread use and benefits of modern contraception, the rate of unmet need for family planning in low and middle-income countries remains unacceptably high[2,3]; with prevalence rates ranging from 15–58%[4–11]. Reasons for contraceptive nonuse vary from country to country and among different populations[12]. These include lack of knowledge, lack of access, subfecundity, postpartum amenorrhoea, opposition, side effects or health risks and infrequent or no sex. Interpersonal barriers such as peer norms and pressure from partners not to use contraception also contribute. A study on trends and drivers of contraceptive use in northern Nigeria reported that younger, low-parity women were significantly less likely than older, high-parity women to have an unmet need for contraception[6].

Globally about 210 million women conceive annually and 38% of these pregnancies are unintended[13]. A demographic and health survey from 18 sub-Saharan African countries reported that 82.6% of all sexually active adolescents were not using contraception. Furthermore, 43.3% of them already had at least one child, with 31.5% reporting that the pregnancy was not intended at the time it occurred[14]. Many sexually active, unmarried women in sub-Saharan Africa use injectable contraceptives although discontinuation rates are quite high[15]. Depot medroxy-progesterone acetate (DMPA) initiators remain at substantial risk for unintended pregnancy because most discontinue use without making the transition to consistent use of another contraceptive[16]. Incident unintended pregnancy in Kenya is context-specific, occurring mostly among poor and less educated women, and impacts negatively on the quality of life of the mother, child and family[13,17].

Female sex workers (FSWs) are at increased risk of acquiring HIV and unintended pregnancy[18–20] due to various behavioral and structural challenges, including inconsistent condom use, multiple sexual contacts with different partners, drug use, violence, stigma, discrimination and criminalization of sex work[21]. This could limit healthcare access and lead to adverse sexual and reproductive health (SRH) outcomes, including unsafe abortions, neonatal, as well as maternal and infant morbidity and mortality[21,22]. Since unmet need for contraception is closely associated with high female illiteracy, gender inequality, and poverty, it could also negatively affect women's ability to participate in economic and educational activities necessary to achieve their full potential, as well as the sustainable development goals. Low literacy levels, poverty and unplanned deliveries not only push young women into sex work, but also perpetuate increased financial dependence on sex work, which in

turn increases risk of HIV, other sexually transmitted infections (STIs), violence and repeat pregnancies[23].

In Kenya where the average maternal mortality rate is 488 deaths/100,000 live births with infant mortality rates of 52 deaths/1,000 live births, 43% of pregnancies are unplanned[24]. Preventing unintended pregnancies is an urgent public health need[13], especially in Kenya where an estimated 50.1–69.3% of sexually active single women aged 15–24 do not use any form of contraception[24]. Current research and public health interventions involving FSWs prioritize prevention and control of infectious diseases while ignoring their broader reproductive health needs[25,26].

Use of modern contraception averages 58% in Kenya and 59.3% in Kisumu County[24]. This falls below the SDG target for contraceptive prevalence rate of 70%[1]. Correct use of modern contraceptives remains the best measure to reduce the incidence and sequelae of pregnancy-related adverse outcomes. Since introducing contraceptive implants over 20 years ago in Kenya, demand for this contraceptive method has remained high, significantly reducing reliance on short-term hormonal methods such as combined oral pills and periodic injectables, and subsequently lowering the prevalence rate of unintended pregnancy[27].

A better understanding of FSWs' contraceptive preferences is needed to help them effectively achieve their broader sexual and reproductive health needs and improve SRH outcomes. We sought to assess contraceptive use/non-use and preferences, and to examine the factors associated with use of modern contraception among a cohort of FSWs screened for an HIV prevention clinical trial in Kisumu, Kenya. We also sought to characterize and explore reasons for contraceptive method transitions in the same cohort.

The Antibody Mediated HIV Prevention (AMP) Study is a phase 2b randomized controlled clinical trial to evaluate the safety and efficacy of VRCO1 broadly neutralizing human monoclonal antibody (mAb) in reducing acquisition of HIV-1 infection in women in 21 sites in sub-Saharan Africa, including Kisumu (see trial registration – NCT02568215). Safety of mAbs during pregnancy is not known. So, to be included in the AMP study, women were required to be on effective contraception for at least 21 days before initiation of study product and to remain on effective contraception throughout the 2 years' study follow-up period. Therefore, contraception preference of a potential study participant is of critical interest to the study. Only volunteers who elected to use long-acting reversible contraception (LARC) were eligible to enroll in the study.

Methods

A cross sectional study of healthy FSWs from Kisumu, Kenya was conducted as part of baseline assessment for possible recruitment into the AMP Study between December 2016 and September 2018. The Kisumu Clinical Research Site (CRS) is located in western Kenya, which bears the heaviest burden of malaria, tuberculosis (TB), and HIV in the country. All study

participants were recruited from within the city and its immediate suburbs where hotspots for transactional sex are located. Kisumu is the largest city in western Kenya with a population of 968,879 in 2017 and has a thriving entertainment industry, with an estimated cohort of over 4500 FSWs.

Potentially eligible participants were young women of childbearing potential. The study utilized a robust high throughput recruitment approach that mainly targeted FSWs. Respondent-driven sampling was used starting with 6 charismatic sex workers and peer educators identified by the Kisumu Sex Workers Alliance (KISWA), the umbrella body for all FSWs within western Kenya. With the help of peer recruiters, potential participants were identified from known hotspots where young women sell sex within the city and its metropolis and referred to the study clinic for possible screening into the study. HIV-uninfected women at risk of infection aged 18-50 willing to use effective contraception were eligible to participate. They would also need to be in good general health as shown by medical history, physical exam, and screening laboratory tests. Volunteers capable of becoming pregnant required a negative serum or urine beta human chorionic gonadotropin (β-HCG) pregnancy test and had to be willing to consistently use effective contraception. The complete inclusion and exclusion criteria is available from the trial registration – NCT02568215. Potentially eligible participants who provided written informed consent were screened for HIV at the clinical research site using a parallel testing algorithm with commercially available test kits: Uni-Gold™ Recombigen® HIV-1/2, TRINITY BIOTECH PLC, Bray Co. Wicklow, Ireland, REF 1206506; Determine™ HIV-1/2, Alere Medical Co. Ltd, 357 Matsuhidai, Matsudo-shi, Chiba, 270-2214, Japan, REF 7D2342, 7D2343 and; OraQuick ADVANCE® Rapid HIV1/2 Antibody Test, OraSure Technologies, Inc. 220 East First Street, Bethlehem, PA 18015, REF3001-1215rev. 03/16B). Data on their social-demographic, contraceptive use and other SRH characteristics were collected by qualified and trained study staff using standardized case report forms (see extended data[28]) and in compliance with Good Clinical Practice guidelines. Additional data on contraceptive use and preference were abstracted from participant chart notes and family planning master book [see extended data[28]]. Those not on a method recorded their contraceptive preferences.

Ethical and regulatory review, informed consent, and Good Clinical Practice

The AMP protocol and Informed consent documents were reviewed and approved by the KEMRI Scientific and Ethics Review Unit (KEMRI/SERU/SSC # 3175), the Kenya Pharmacy and Poisons Board (PPB/ECCT # 16/04/01) as well as the Institutional Review Board of the U.S. Centers for Disease Control and Prevention (CDC-IRB Approval for protocol # 6931). All participants provide written informed consent before implementation of any study procedures.

Data analysis

Data were analyzed using STATA 13. Descriptive statistics were used to characterize participants and the proportion of women per method used. Any associations with contraceptive use/non-use were evaluated using logistic regression and reported within 95% confidence intervals and 5% significance levels. Cut off for inclusion into the multivariate regression model was set at p<0.25.

Results

670 potentially eligible FSWs from Kisumu were approached, of whom 213 (31.8%) consented to participate in the study. Data on 210 FSWs aged 18–40 are presented (3 participants had incomplete data and were excluded from subsequent analysis; see underlying data[28]). The median age was 24 years (IQR 22–26) with 93% being younger than 30 years. 187 (89.1%) had two children or fewer while 12.4% had no children. Only 56 (26.7%) completed secondary or higher education. In total, 18 (8.6%) were HIV-infected, while 54 (25.7%) reported a previous history of incarceration. A previous or present history of an inter-current medical illness of mild to moderate severity was reported by 32.4%, (Table 1). Almost half of the respondents (49.1%) had an additional occupation besides sex work, while 3.8% were also students at local universities and tertiary colleges.

Among the 210 women evaluated, 181 (86.2%) were using a modern contraceptive at the time of the survey, while 13.8% had an unmet need for family planning. Implants and depot injections were the most commonly used modern methods at 48.6% and 38.1% of women respectively, whereas only 1.7% adopted IUDs. 11.6% of the women (21) were using oral pills, (Table 2a). Of those not on family planning, 27 (93.1%) considered a modern contraceptive method as their preferred choice with the majority (41.4%) adopting oral pills. (Table 2b).

More women with primary education or less (75.7%) were using a contraceptive method compared to women who had completed secondary education or higher. Respondents who had two or more children were three times more likely than their primiparous and nulliparous counterparts to report use of modern contraceptive method (OR 2.48, 95% CI 1.05-5.89). Nearly all respondents with ≥3 children (95.6%) were using a contraceptive method, whereas of nulliparous women 38.5% were not on any method.

Table 3 shows the determinants of modern contraception use or non-use together with the crude odds ratios (COR) and adjusted odds ratios (AOR) after multivariate logistic regression to assess association. FSWs not currently on a contraceptive method were more likely to be younger than 25 years compared to those ≥25 years, 79.3% vs 20.7% for women (OR 2.09, 95% CI 0.81, 5.41); HIV uninfected (OR 2.9, 95% CI 0.37, 22.69); less educated (OR 0.13, 95% CI 0.03, 0.60) and nulliparous or have less than one child (OR: 2.48, 95% C: 1.05, 5.89). Women with BMI ≤24.5 were 4 times more likely to be on a modern contraceptive compared to those with BMI >24.5 (OR 3.98, 95% CI 1.45-10.88, p=0.007). Use of modern contraception methods did not differ by respondent's ownership of a medical insurance cover. There was also no significant correlation between contraceptive use and having an alternative occupation, preexisting medical condition or history of incarceration (Table 3).

Table 1. Demographic profiles of female sex workers screened for an HIV prevention trial in Kisumu, Kenya.

Characteristics		Mean, median (IQR), (range)
Age in years		24.49, 24 (22-26), (18-38)
Number of children		1.46, 1 (1-2), (0-4)
BMI		24.37, 23.5 (20.95-26.93), (16.6-47.5)
	Categories	**Frequency (%)**
Level of education	Some Primary	36(17.1%)
	Completed Primary	118(56.2%)
	Completed Secondary	39(18.6%)
	National Diploma + >	17(8.1%)
Number of children	1 and below	114(54.3%)
	2 and above	96(45.7%)
BMI Classification	Underweight	8(3.8%)
	Normal	123(58.6%)
	Overweight	55(26.2%)
	Obese	24(11.4%)
Age in years	25 and Below	140(66.7%)
	Above 25	70(33.3%)
Medical Aid need	No	192(91.4%)
	Yes	18(8.6%)
Pre-existing Condition	None	142(67.6%)
	Yes	68(32.4%)
Incarceration	No	156(74.3%)
	Yes	54(25.7%)
Other occupation	No	99(47.1%)
	Yes	111(52.9%)
HIV Status	Negative	192(91.4%)
	Positive	18(8.6%)

Table 2a. Current Contraception use by female sex workers (FSWs) screened for an HIV prevention clinical trial in Kisumu, Kenya.

FP Method	Frequency (%)
DMPA	69(38.1%)
Implants	88(48.6%)
IUCD	3(1.7%)
Pills	21(11.6%)

N=181; DMPA=depot medroxyprogesterone acetate; IUCD =intrauterine contraceptive device; Modern contraception = (sterilization, oral contraceptive pill, intra-uterine device (IUD), diaphragm, injection, emergency contraception, or implant), FP – family planning.

Table 2b. Contraception preference among female sex workers (FSWs) currently not using a method, Kisumu, Kenya.

FP Method	Frequency (%)
DMPA	8(27.6%)
Implants	6(20.7%)
Pills	12(41.4%)
Condoms	1(3.4%)
Herbs	1(3.4%)
None	1(3.4%)

N=29; DMPA=depot medroxyprogesterone acetate, FP – family planning.

Discussion

Among the 210 women evaluated for modern contraceptive use, 86.2% were using a modern contraceptive at the time of the survey while 13.8% had an unmet need for family planning.

Table 3. Determinants of Contraceptive use/nonuse among female sex workers (FSWs) in an HIV prevention clinical trial in Kisumu, Kenya.

Demographic Characteristics	Categories	On Family Planning		Crude OR (95% CI)	P-value	AOR (95% CI)	P-value
		No	Yes				
Level of Education	Some Primary	3 (10.3%)	33 (18.2%)	Ref			
	Completed Primary	14 (48.3%)	104 (57.5%)	0.68 (0.18-2.49	0.56	0.72 (0.19-2.72)	0.62
	Completed Secondary	5 (17.2%)	34 (18.8%)	0.62 (0.14-2.79)	0.53	0.9 (0.19-4.32)	0.90
	National Diploma+>	7 (24.1%)	10 (5.5%)	0.13 (0.03-0.60)	0.009	0.2 (0.04-0.99)	0.05
No. of Children	1 and below	21 (72.4%)	93 (51.4%)	Ref			
	2 and above	8 (27.6%)	88 (48.6%)	2.48 (1.05-5.89)	0.04	1.49 (0.56-3.97)	0.43
BMI Classification	Normal	24 (82.8%)	99 (54.7%)				
	Not normal	5 (17.2%)	82 (45.3%)	3.98 (1.45-10.88)	0.007	3.59 (1.27-10.13)	0.02
Age categories	25 and Below	23 (79.3%)	117 (64.6%)	Ref			
	Above 25	6 (20.7%)	64 (35.4%)	2.09 (0.81-5.41)	0.13	1.78 (0.63-5.06)	0.28
Medical Aid need	No	27 (93.1%)	165 (91.2%)	Ref			
	Yes	2 (6.9%)	16 (8.8%)	1.31 (0.29-6.02)	0.73		
Incarceration	No	23 (79.3%)	133 (73.5%)	Ref			
	Yes	6 (20.7%)	48 (26.5%)	1.38 (0.53-3.6)	0.51		
Other occupation	No	13 (44.8%)	86 (47.5%)	Ref			
	Yes	16 (55.2%)	95 (52.5%)	0.89 (0.41-1.97)	0.79		
HIV status	Negative	28 (96.6%)	164 (90.6%)	Ref			
	Positive	1 (3.4%)	17 (9.4%)	2.9 (0.37-22.69)	0.31		
Preexisting condition	None	20 (69%)	122 (67.4%)	Ref			
	Yes	9 (31%)	59 (32.6%)	1.08 (0.46-2.5)	0.87		

Table 3: shows Bivariate and Multivariate analysis of the determinants of Contraceptive use or nonuse among respondents. Ref=Reference parameter used for calculation of odds ratios (ORs); AoR=Adjusted Odds Ratio; cut off for inclusion into the multivariate regression model was set at p<0.25; BMI=Body Mass Index.

After controlling for age and number of children, only level of education and BMI were found to be significantly associated with use of modern contraceptive method.

The rate of modern contraceptive use in this cohort is relatively high compared to national and local county estimates reported in the national KDHS (Kenyan Demographic and Health Survey) 2014[24] and most surveys of young women at high risk for HIV in other clinical trial settings[6,12,13,22,29–31]. Subdermal implants were the most commonly used modern methods of contraception by 48.6% of the women followed by depot injections, pills and IUDs. Although this finding contradicts most studies with similar cohorts of women which have consistently reported injectable as the most preferred method among young women of child bearing potential[1,10,14], we find it intuitive since most SRH programmes have aggressively promoted the adoption of long-acting reversible contraceptive methods. This could represent a shift in the trend of FP use from injectables to implants. It could also reflect the fact that subdermal implants come in different lengths of use, which could be appealing to women. Subdermal hormonal implants could also be gaining popularity due to their high efficacy in preventing unintended

pregnancies even with typical use unlike short active methods like oral pills and periodic injectables which experience high failure rates due to inconsistent use[32]. Ross et al. also showed that many sexually active, unmarried women in sub-Saharan Africa use injectable contraceptives, although discontinuation rates are quite high[15]. Among women who were not on family planning, 93.1% considered using a modern contraceptive method after provision of appropriate contraceptive counselling, with most women (41.4%) electing oral pills as their preferred choice and none elected to use IUDs. (Table 2b). Although the unmet need for family planning in this study was only 13.8% of the women, it was possible to optimize the met need with targeted counselling specific to the present context and individual circumstances of the woman. Results from community studies and some randomized controlled clinical trials have demonstrated that targeted counselling messages cannot only enhance uptake but also ensure method continuation and long term adherence[25,30,33].

More women with primary education or less were using a contraceptive method (75.7% vs 24.3%). However, they were also likely to have 2 or more children and a higher BMI. Our study demonstrated that respondents who had 2 or more children

were 3 times more likely than their primiparous and nulliparous counterparts to report use of a modern method (OR 2.48, 95% CI 1.1–5.9), consistent with findings from studies among women in the UK[31], US[34] and sub-Saharan Africa[3]. Previous studies have shown that women with secondary education or higher are more likely to be unmarried, have none or fewer children and therefore feel less need for family planning[5]. Women in stable unions would in most cases require partner approval for family planning use as opposed to those who are not married[5,7,8,12].

Nearly all respondents with ≥3 children were using a contraceptive method compared to their nulliparous counterparts. A likely explanation is that the women with no children are more interested in pregnancy compared with those who have already had children. Furthermore, none of the respondents with ≥3 children had acquired higher than primary education. However, this contradicts the findings of a descriptive study to evaluate contraceptive use in Vietnam which demonstrated that education had a clear impact on both contraceptive knowledge and use by women, with higher educated women being more likely to use a contraceptive method[35]. They also found that women not desiring additional children were significantly more likely to use contraceptive methods than those desiring more children.

Our study found that BMI was independently associated with use of a contraceptive method. However, because of study design and the inherent limitations of a post hoc analysis, we were not able to establish whether the increase in BMI resulted from contraceptive use or whether having a higher BMI could influence a woman's decision to adopt a contraceptive method. Although it is expected that possession of medical insurance would increase access to and uptake to health care services including contraception services, our study did not find any association between us of modern contraception method and respondent's ownership of medical insurance cover. It is well established that some insurance schemes are limited in coverage and may not include contraceptive services. There was also no significant correlation between contraceptive use and availability of alternative occupation, preexisting medical condition or history of incarceration.

Conclusion
There is high use of modern contraceptive among the FSWs in Kisumu with the majority preferring subdermal implants. This preference of implants over Depo-Provera (DMPA) is encouraging as the latter is prone to discontinuation due to adverse experiences leading to contraceptive failure, leading to unintended pregnancies, unsafe abortions, high maternal and infant morbidity and mortality, stigma and discrimination, increased reliance on sex work and increased risk for STIs including HIV.

This is particularly important because randomized clinical trials investigate novel products whose safety during pregnancy are not yet fully well understood; hence, any women of child bearing potential participating in such a trial would need to be on long-acting contraceptive for the duration of the study to avoid any unintended pregnancies. Understanding the preferences of

individual women also ensures that every woman not only chooses a long-acting method she is comfortable with, but also that which she will most likely adhere to and continue using as required. That is critical in achieving the primary study objectives that are largely end-point driven.

The factors associated with contraceptive use or nonuse in this study are similar to those reported in other developing countries globally[2]. Effective contraceptive counselling and interventions among FSWs should consider the client's parity and level of education. Key messaging and contraception packages for nulliparous FSWs should emphasize the safety and effectiveness of long-acting reversible contraceptives compared to combined oral contraceptives, which are user dependent and therefore have higher failure rates. The interventions should also be tailored to the specific SRH needs of each individual client. There is need for strengthening of contraceptive services for FSWs irrespective of HIV status, level of education, availability of medical insurance, alternative occupation and body habitus.

SRH programmes should ensure sustainable access to a comprehensive method mix that not only meets the rising demand for implants but also targets specific needs of key populations such as FSWs in order for the global community to achieve its Family Planning commitments to expand family planning access to 120 million new users. Promoting effective long-acting reversible contraceptives for all women of reproductive potential will serve as both a poverty reduction strategy as well as health strengthening and economic empowerment strategy.

Limitations of the results
The sample size of 210 is relatively small making generalizability and subset analyses less easy. Data for this study was collected as part of baseline assessment for possible enrolment into a Phase 2b randomized controlled clinical trial hence participant recruitment relied heavily on the eligibility criteria for the trial. The study did not include a qualitative component to understand why women chose their preferred methods.

Data availability
Underlying data
Figshare: Emerging trends in contraceptive use, transitions and preferences among Female Sex Workers screened for an HIV prevention clinical trial in Kisumu, Kenya. https://doi.org/10.6084/m9.figshare.8113286.v1[28]

This project contains the following underlying data:

- Emerging trends in Contraceptive use among FSWs...Raw Dataset May 2019.xlsx (contraceptive use raw dataset)

Extended data
They include contraceptive use raw dataset, demographics and pregnancy prevention case report forms, screening source document and copy of the family planning master book.

Figshare: Emerging trends in contraceptive use, transitions and preferences among Female Sex Workers screened for an HIV

prevention clinical trial in Kisumu, Kenya. https://doi.org/10.6084/m9.figshare.8113286.v1[28]

This project contains the following extended data:

- Emerging trends in Contraceptive use among FSWs... Demographics case report form_May 2019.pdf (Demographic case report form)

- Emerging trends in Contraceptive use among FSWs... Pregnancy Prevention case report form_May 2019.pdf (Pregnancy prevention case report)

- Emerging trends in Contraceptive use among FSWs... Screening Source Document_May 2019.pdf (Screening Source Document)

- Emerging trends in Contraceptive use among FSWs... Copy of Family Planning Master Book_May 2019.pdf (Copy of Family Planning Master Book)

Data are available under the terms of the Creative Commons Attribution 4.0 International license (CC-BY 4.0).

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Reviewer Report 28 July 2020

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❌ **Célia Landmann Szwarcwald** [iD]

Oswaldo Cruz Foundation, Rio de Janeiro, Brazil

The article provides interesting information on the use of contraceptives among female sex workers. However, the methodology used for sample selection was flawed and the sample size was too small for some of the estimates presented.

In relation to the sample, the initial recruitment was carried out by RDS. As already known, the homophily effect generates a design effect, in general, greater than 2, meaning that the sample cannot be treated as random, as it was considered in the study. In addition, another important bias was that of the 670 potentially eligible FSWs only 213 consented to participate in the study. There are no explanations for this low percentage of acceptance and this may have affected the results.

As to the small sample size, if the sample was randomly selected, the minimum required size would be 400 FSW to calculate a 50% proportion with a 95% confidence interval (95% CI) and bilateral error of 5%. So, considering the design effect, this sample is insufficient to carry out many of the prevalence estimates presented in the article.

In this context, prevalence estimates in Table 1 and Table 2a should be presented with their respective 95% CIs. Table 2b should be eliminated as the estimates are based on a sample of 29 women.

Regarding Table 3, my suggestion is to present prevalence estimates (and 95% CI) of FSW on family planning for each of the considered covariates. Also, to use a multivariate logistic regression model, a conceptual model should be used for the better understanding of the adjusted OR. For example, the influence of the number of children and age on the association between educational level and the outcome.

Another suggestion is to consider results on condom use together with the use of other contraceptive methods as this is a study among FSWs.

Finally, the sample should be weighted to represent the population of FSWs in the city.

I consider the article cannot be accepted for indexing in its current form. I recommend that the article be submitted again after a detailed revision of the statistical analysis. The results should be based on an underlying conceptual model.

Is the work clearly and accurately presented and does it cite the current literature?

Partly

Is the study design appropriate and is the work technically sound?

No

Are sufficient details of methods and analysis provided to allow replication by others?

No

If applicable, is the statistical analysis and its interpretation appropriate?

No

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

No

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Epidemiology, quantitative research, sample size, AIDS.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to state that I do not consider it to be of an acceptable scientific standard, for reasons outlined above.

Reviewer Report 25 July 2019

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? **Lawrence Gelmon**
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At first look, this study of contraceptive usage amongst female sex workers (FSWs) in Kisumu, Kenya would seem to be refuting at least two widely-held assumptions – that FSWs have a lower

prevalence of contraceptive use, and that lower education status is a factor associated with low uptake of modern contraception.

The study demonstrated a much higher rate of contraceptive use amongst this FSW population than the general female population in Kisumu Country (86.2% versus 59.3%). The rate of uptake of contraception increases with both age and parity (age and parity of course being linked – the older a woman, the more likely she is to have more children). But the question of why the FSWs in the study are using contraception more than the general population could have been examined more closely. One answer could be that being sex workers they recognise their heightened risk of pregnancy and are therefore taking precautions. However, what was the prevalence of contraceptive usage amongst the women screened who were not analysed? It would have been of interest to look at the women who were not accepted into the study – 670 were screened but only 210 were analysed. One of the criteria for entering the study was a willingness to use modern contraception – was this known to the women ahead of time? It could be that the sample of 210 was self-selected to include only those who were on contraception or willing to have it. Therefore an analysis of the contraceptive prevalence of the full 670 might have demonstrated a contraceptive usage rate closer to the overall rate for Kisumu.

The study also notes that those with only primary education had a higher uptake of contraception than those with secondary education or higher. However, those with only primary education had more children, and the study also demonstrated that contraceptive uptake also increased along with increased parity. But rather than assume that this study also refutes the notion that illiteracy is associated with decreased contraceptive use, it should be remembered that having only a primary education is not a proxy measure for "illiteracy" as most Kenyans achieve a primary level education and illiteracy levels are very low.

A third finding that is noted but not well discussed is why those few FSWs who were studied and who were not on contraception said that they would prefer the oral pill (OCP) if they were to go on contraception. This is despite the fact that the rate of OCP use was only 11% amongst those FSWs who were on contraception. If those FSWs not on modern contraception were to decide tomorrow to begin contraception, would OCP be available to them, or would the health system or others persuade them to opt for injectibles or implants like the 77% of FSWs who are on contraception? Why are they thinking about OCP when most of their colleagues are opting for injectables or implants?

The study provides some useful information and highlights the need for integration of reproductive services with HIV and STI. The study reveals several factors associated with contraceptive uptake (age, parity, etc.) but does not delve very deeply into the social, cultural and/or economic factors that lead to decision-making. The stated goal of the study – "to characterise and explore reasons for contraceptive method transitions in the cohort" – is not well answered.

Is the work clearly and accurately presented and does it cite the current literature?
Yes

Is the study design appropriate and is the work technically sound?
Partly

Are sufficient details of methods and analysis provided to allow replication by others?

Yes

If applicable, is the statistical analysis and its interpretation appropriate?

Partly

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

Partly

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Infectious diseases, HIV/AIDS/STI epidemiology, HIV in Africa, key populations

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.