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Behavioral Risk Compensation Ensuing HIV Oral Pre-Exposure Prophylaxis Use Among Female Sex Workers In Nairobi, Kenya.

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Abstract
Background: *Oral Human Immunodeficiency Virus (HIV) Pre Exposure Prophylaxis (PrEP) is a chemoprophylaxis involving use of antiretroviral medicines taken orally to prevent HIV. Oral PrEP can reduce the risk of HIV infection by more than 95%. In 2010, World Health Organization (WHO) recommends PrEP use among persons at substantial risk of HIV and since, over 300,000 people have used PrEP. However, risk compensation among Female Sex Workers (FSWs) using PrEP, raises concerns on increased risk of sexually transmitted Infections (STIs).*
Materials and Methods*: A retrospective cohort study was conducted among FSWs comprising of both HIV oral PrEP users and non-PrEP users accessing services at selected Drop-in Centers (DICEs) in Nairobi County. Multi stage sampling was used to select sites and participants. Sample size of 168 PrEP users and 168 non-PrEP users was used. A structured data abstraction tool was used to collect the desired data on condom use and average sexual acts. This data was abstracted from the participant records as documented during monthly routine data collection. Data was analyzed using STATA.This study investigated the effects of HIV oral PrEP on risky sexual behaviors among female sex workers in Nairobi. Specifically, the study determined the rate of condom use, and compared the number of sexual acts Female Sex Workers have per day, between FSWs taking HIV oral PrEP and non-PrEP user FSW in Nairobi.*
Results: *PrEP did not determine condom use among PrEP users (P=0.221, 95%CI). Average number of sexual acts per day was higher among HIV oral PrEP users than non-PrEP users (P=0.005, 95%CI). PrEP use did not significantly decrease the rate of condom use, while the average number of sexual acts per day significantly increased over time among HIV oral PrEP users.*
Conclusion: *This study has ascertained that HIV oral PrEP use does not increase condom use but may result into increased average number of sexual acts per day among female sex workers. Prevention counseling should be emphasized during PrEP initiation and throughout PrEP follow up visits.*
Key Word: *Drop In Centres, Female Sex Worker, Pre-Exposure Prophylaxis, Risk Compensation.*

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I. Introduction

Oral PrEP is a major current HIV prevention intervention that has been adopted globally for prevention of HIV among the populations at substantial ongoing risk of acquiring HIV and the World Health Organization (WHO) released a series of recommendations supporting the use for prevention of HIV among the high risk populations in 2015 [1]. Evidence has demonstrated effectiveness of Pre-Exposure Prophylaxis (PrEP) in HIV prevention [2], [3] and as reported ported by WHO in 2015. A combination of oral Tenofovir Disoproxil Fumarate and Emtricitabine (TDF-FTC) when taken daily prevent HIV transmission among HIV heterosexual adults [2] [3].

In Kenya, oral PrEP was launched in 2016 and was recommended for use by persons at substantial ongoing risk of acquiring HIV [4] including discordant couples, female sex workers (FSW), Men who have sex with men (MSM), people who inject drugs (PWID), Adolescent girls and young women (AGYW), fisher folks and lesbians. Pre Exposure Prophylaxis (PrEP) intervention has become crucial in sex workers as a result of their increased risk to acquire HIV due to multiple sexual partners and inconsistent condom use [5].

Increased incidence of Sexually Transmitted Infections (STI) has been observed in demonstration studies with some studies recording up to 50% of men initiated on PrEP presenting with STIs within twelve months of follow up [3], [6]. According to World Health Organization (WHO) Global strategy for prevention and control of Sexually Transmitted Infections 2005-2015 (World Health Organization, 2015), more than 340 million curable STI occur annually in both men and women between the ages of 15 to 49 years [8].

The use of HIV PrEP has the potential to increase incidences of STIs thereby posing public health concern possibly resulting from different forms of Risk Compensation (RC), including; risky sexual behaviors such as increasing the number of sexual partners, greater clustering of high-risk men associated with MSMs, greater number of sexual acts per day in FSW and reduced condom use with existing partners and/or strangers thereby increasing their vulnerability to STI [9]. Risk compensation resulting from the use of oral HIV PrEP has been sited to increase the incidence of other Sexually transmitted infections [10]. Syphilis is responsible for up to 40% of perinatal deaths worldwide while one in four gonococcal and chlamydial infections result to infertility and annually, 4000 newborn babies become blind as a result of untreated maternal gonococcal and chlamydial infections worldwide [7]. Globally, Sexually Transmitted infections (STI) constitute an enormous economic and health burden especially in developing countries where they constitute 17% of economic losses due to ill-health [9]. Kenya's National AIDS and STI Control Program (NASCOP) estimates the rate of STI among Female Sex workers to be 22% [4].

The government of Kenya rolled out PrEP use in 2016 following the WHO 2015 recommendations and developed Framework for PrEP Implementation [4]. The global strategy for control and prevention of Sexually Transmitted Infection 2006-2015 identifies prevention and control of STI as an integral part of comprehensive sexual and health services that will improve sexual and reproductive health [7].

Evidence has demonstrated up to 20 times higher rates of STIs in gay men using PrEP than gay men in the general population [11]. However, the iPrEx study reported insignificant evidence of sexual risk compensation among both participants receiving Emtricitabine/Tenofovir disoproxil Fumarate (FTC/TDF) and the placebo sighting participants who received TDF/FTC recorded more receptive anal intercourse before initiating the oral PrEP [12]. The uptake of PrEP increase while consistency in condom use rapidly decreased and can conceivably undermine PrEP effectiveness [13]; similarly, high rates of bacterial STIs are diagnosed among HIV uninfected persons using PrEP suggestive of decreased condom use for combination prevention of HIV and other STIs [14]. Both Highly Active Antiretroviral Therapy (HAART) initiation and viral suppression do not increase the prevalence of unprotected sex and sexual risk behavior, however, the prevalence rate of unprotected sex increases with an Odds ratio (OR) of 1.8, among persons who believe that HAART initiation and suppressed viral load protects against HIV transmission [15]. The mean number of partners reporting unprotected anal sex decline ($p>0.05$) while the mean unprotected anal sex episodes remain stable among the HIV negative MSMs, [16]. A small number of the participants have reported both condom and PrEP use highlighting no observable increase in risk sexual practices among those who use condom, Prep or both [17].

The number of condomless sex with casual partners increase among PrEP users [18]. The rate of unprotected sex and the number of sexual partners decreased over 12 months with data pointing effectiveness of the trial associated HIV Prevention counseling and recommended prevention counselling and messaging on different population subgroups [19]. Post Exposure Prophylaxis (PEP) for prevention of HIV as a result of sexual exposure does not result to increase in high risk behavior, 14% however had increased high risk sexual acts [20]. An increase in receptive and insertive condomless anal sex act from the baseline have been reported, while the number of anal sex and sex partners remained the same [21].

II. Materials And Methods

This study was conducted among Female Sew Workers in Nairobi County, Kenya, at the selected Key Populations Drop-in Centers (DICEs) / Prevention, particularly those handling Female Sex Workers. Nairobi County has 22 Drop-in centers/Prevention Centers distributed within 9 of the 17 Sub Counties. The DICEs serve both female sex workers and Men who have sex with men while a few DICEs serve only female sex workers.

Study Design: This was a retrospective cohort study that adopted quantitative methodologies in data collection.

Study Location: This study was conducted in Nairobi County, Kenya's Capital City, located in a geographical area of about 695 square kilometers and comprises of both formal and informal settlement.

Study Duration: May 2019 to October 2019

Sample size: 336 Participants (168 PrEP users and 168 non-PrEP users)

Sample size calculation: Haseman formula (Haseman, 1978) that incorporates continuity correction for n' was adopted for sample size calculation using PASS 15.0.5 since the study involves comparison of two populations. The test statistics used was a two-sided Z – test with un-pooled variance. The proportion for population 1 (P1), the group 1 proportion is estimated to be 0.22 and group 2 proportion (P2) 0.38, with 90% power and 5% precision (e=0.05). The power was computed using the normal approximation method. The numeric results for the sample size calculation were: n1 168 and n2 168 for population 1 and population 2 respectively with N being 336. No drop out is anticipated and therefore the sample size was not inflated.

Subjects & selection method: The study Population consisted of Female Sex Workers aged 18 years and above. It is estimated that there are over 133,000 female sex workers in Kenya and Nairobi hosts over 29,000 FSWs. Both HIV PrEP users and non-PrEP users were selected to participate in the study. A Multi Stage and Simple Random Sampling (SRS) was used to select Sub County, DICE/Prevention center and participants. Of

the 9 sub-counties, one third of was selected by simple random sampling giving 3 Sub-Counties. Out of the 22 DICEs/Prevention Centers in Nairobi County, one third, 7 DICEs/prevention centers were selected by simple random sampling from the 3 Sub-Counties. The number of participants per DICE/prevention center was allocated proportionately by factor of 0.0184321685 according to the total numbers of FSWs in each site's cohort. .A simple random sampling was done at every selected site using the FSWs listing as the sampling frame at the selected sites.

Inclusion criteria:

i. Should be 18 years and above and has signed informed consent to participate
ii. Being in sex work for at least six months while residing in Nairobi County
iii. If on oral PrEP, should be a period of at least six months with least at 85%;
iv. Must have been accessing preventive and curative services at the selected DICE for at least six months
v. Complete records on STI treatment, condom use and average number of sexual acts recorded at every visit

Exclusion criteria:

i. STI test positive during enrolment into the DICEs/prevention centers cohorts
ii. Inadequate client history.
iii. Accessing HIV and other STIs preventive and curative services at any other DICE/Prevention center or health facility other than the one she is selected to participate in the study.
iv. Known HIV positive status.
v. Use of any other HIV prophylaxis technology.

Procedure methodology:

Quantitative data was collected using a data abstraction tool containing data elements that answered the questions on condom use and sexual acts. The data abstraction tool was adopted from the Ministry of Health Key Populations Monitoring and Evaluation tools [22]. Research assistants were trained on data abstraction tool, abstraction process, documentation and data management before the study commenced. Each data elements listed in the data abstraction tools was obtained from every participant records. The tool was completed for each participant. 168 files for the active PrEP and 168 non-PrEP clients were identified. The clients' unique identifiers on every file were randomly sampled for participation. Clients' files were identified and withdrawn from the shelves. The participants were called for consenting. A systematic six months' retrospective data was abstracted from the patient records of each participant. In order to eliminate zero-time bias, only clients screened negative for STI during enrolment into the DICEs/prevention centers were eligible to participate in the study. At the time the clients were enrolled at the DICE/Prevention Center, they were free from STIs so that an STI free client were followed up for STI incidences in the cohort of PrEP and non-PrEP female sex workers.

Statistical analysis: Data was analyzed using statistical software STATA [23] and Microsoft excel. Relative risk and Rate were determined as measures of association between PrEP use and sexual behavior. Relative risk of STI was therefore computed to establish the association between oral PrEP and risk compensation among female sex workers. Chi-square statistics was used to test differences in proportions of categorical data between two or more groups. Consequently, the level of statistical significance of hypothesis was determined at $P< 0.05$ level of error.

Ethical considerations

Ethical approval was obtained from the Kenyatta National Hospital- University of Nairobi Ethical Review Committee (KNH-UoN ERC No: P876/12/2018). Academic approval was obtained from the JKUAT Board of Postgraduate Studies (BPS), and an authorization from the partners implementing prevention services at the DICEs/prevention centers was also obtained. Informed consent was obtained from all eligible participants after the disclosure of study information. There were no physical risks involved in the study.

III. Results

The average number of sexual acts per day among FSWs in Nairobi

Average number of sexual acts per day was recorded for all the FSW at each visit. The total daily average sexual acts among the FSWs using HIV oral PrEP was overly higher from the first visit to trough to the end of the study period, than the total average daily sexual acts among non-PrEP users. At enrolment, the FSWs using PrEP recorded a total of 1031 average daily sexual acts compared to 900 among non-PrEP users. At visit six, PrEP users recorded a total of 1022 average daily sexual acts against a total 876 average daily sexual acts among non-PrEP users. The mean average daily sexual acts among PrEP users remained fairly the same, about 6, throughout the study period but higher than the mean average daily sexual acts among non-PrEP users, which equally remained fairly the same, about 5, throughout the study period. Non-PrEP users with one or more

children are likely to have higher average number of sexual acts per day (P=0.0002, 95%Cl) than PrEP users with equal number of children (Table no. 1).

Table no. 1: Sexual acts per day among FSWs in Nairobi County through the study period

	Number of sexual acts		
Visit	**PrEP Users**	**Non-PrEP Users**	**Statistics**
Month 1	1031	900	X^2= 1.322, P= 0.250
Month 2	1006	843	X^2= 2.222, P= 0.136
Month 3	1050	846	X^2= 3.332, P =0.068
Month 4	1059	855	X^2= 3.274, P= 0.070
Month 5	1046	841	X^2= 3.395, P= 0.065
Month 6	1022	876	X^2= 1.696, P= 0.193
Marital status			
single	5564	4768	X^2= 1.486, P= 0.223
Married	387	662	X^2= 1.193, P= 0.275
Children			
No Child	2094	1095	X^2= 0.446, P= 0.504
1 & more Children	3857	4335	X^2= 14.03, P= **0.0002***
Education			
Primary	2591	2844	X^2= 0.002, P= 0.964
Secondary & Tertiary	3360	2586	X^2= 1.375, P= 0.240

*Chi-square statistic significant at 95% confidence level.

Relationship between the average number of Sexual acts and PrEP use among FSWs

Association between the average number of sexual acts per day and PrEP use as well as the association between the average sexual acts per day and socio-demographic components were evaluated. The association between the average number of sexual acts per day and HIV oral PrEP use is at 0.005 (95%CI) significance level. The association between age and average number of sexual acts is 0.112 (95%CI) significance level. The significance level of association between average sexual acts per day and the marital status as married, divorced/separated, and widowed is 0.738, 0.519, and 0 (95%CI) respectively. The significance of association between the average number of sexual acts and the number of children is 0.401 (95%CI). The significance level of association between the average number of sexual acts per day and educational levels; Secondary school, College and University is 0.95, 0.714, 0.355 ((95%CI), respectively (Table no. 2).

Table no. 2: Multivariate linear regression for association between average sexual acts per day and HIV oral PrEP use across Socio-demographics characteristics

Variable		b	[95% Conf.	Interval]	P>|z|
Age		-0.0498833	-.1114476	.0116811	0.112
Marital_status					
Single	Ref				
Married		0.2035549	-.9898667	1.396977	0.738
Divorced/separated		0.3687526	-.7520246	1.48953	0.519
Widowed		5.852186	3.001572	8.702801	0
No Child	Ref.				
1 or more Children		0.1375244	-.1832967	.4583456	0.401
Educational level					
Primary Education	Ref				
Secondary School		-0.021456	-.6988108	.6558986	0.95
College		-0.516751	-3.275679	2.242177	0.714
University		-2.877349	-8.980285	3.225587	0.355
PrEP_use					
No	Ref.				
Yes		0.9922144	.3009468	1.683482	***0.005**

Condom use among FSWs in Nairobi

Condom use was recorded throughout the study period for all the participants. Both the HIV oral PrEP users and non-PrEP users, used condoms but the total number of condoms used among the HIV oral PrEP users was slightly lower than the total number of condoms used by non-PrEP users across all the visits. In visit 1, PrEP users recorded a total of 777 condom use while non-PrEP users recorded 838 condom use; In visit 5 and 6, PrEP users recorded 749 and 745 condom use compared to 829 and 852 condom use recorded in non-PrEP user. The average daily condom use per day per FSW among PrEP users range between 4.4 to 4.9 in every visit while the average daily condom use per day per FSW among non-PrEP users range between 4.8 to 5.1 in every visit (Table no. 3).

Table no. 3: Average Condom use among FSWs in Nairobi County

	Condom use		
Visit	**PrEP Users**	**Non-PrEP Users**	**Statistics**
Month 1	777	838	X^2= 0.397, P= 0.528
Month 2	733	804	X^2= 0.589 P= 0.443
Month 3	791	820	X^2= 0.090, P= 0.764
Month 4	826	840	X^2= 0.0197, P= 0.888
Month 5	749	829	X^2= 0.713, P= 0.398
Month 6	745	852	X^2= 1.25, P= 0.264
Marital status			
Single	4165	4595	X^2= 0.917, P= 0.338
Married	263	582	X^2= 3.235, P= 0.072
Children			
No Child	1566	1019	X^2= 0.154, P= 0.694
1 or more Children	2862	4157	X^2= 1.219, P= 0.270
Education			
Primary	1990	2717	X^2= 2.004, P= 0.157
Secondary & Tertiary	2438	2459	X^2= 0.335, P= 0.563

*Chi-square statistic significant at 95% confidence level.

Relationship between Condom use and PrEP use among Female Sex workers in Nairobi

The rate of condom-use across the socio-demographic components and as compared between PrEP and non-PrEP users was evaluated. A 0.215 (95%Cl) significance level of association between condom use and age was demonstrated. Also demonstrates was a 0.981, 0.52 and 0 condom use association with married, divorced/separated and widowed FSWs respectively at 95%CI. The Association between the number of children and condom use is at 0.0258 (95%CI). The association between condoms use and level of educational was determined as follows; Secondary School 0.546 (95%CI), College 0.096 (95%CI) and university 0.25 (95%CI). The association between PrEP use and condoms use was determined to be 0.221 (95%CI) while non-PrEP use was used as the reference (Table no. 4).

Table no. 4*:* Panel linear regression of Rate of Condom use among PrEP users and Non-PrEP users in Nairobi County.

Variable	Coef.	[95% Conf.	Interval]	P>|z|
Age	-0.0320957	-.0828748	.0186834	0.215
Marital status				
Single	Ref.			
Married	-0.0122253	-.9965761	.9721256	0.981
Divorced/separated	0.303319	-.6211137	1.227752	0.52
Widowed	4.690176	2.33895	7.041403	0
No child	Ref.			
1 or more Children	0.1525776	-.1120401	.4171954	0.258
Education level				
No Education	Ref.			
Secondary School	-0.1723138	-.7310054	.3863778	0.546
College	-1.934964	-4.210567	.3406381	0.096

University		-2.952942	-7.986729	2.080846	0.25
PrEP use					
No	Ref.				
Yes		-0.3562593	-.9264265	.2139079	0.221

Sexually Transmitted Infections Hazard Estimate between PrEP and non-PrEP users

Sexually Transmitted Infection risk among FSW over six months was evaluated using Nelson-Aelen cumulative hazard estimate. The blue line on the graph represents non- PrEP users while the red line in the graph represents PrEP users. As illustrated on the graph, the risk of STI among the PrEP users at the baseline was very low but constantly increased over time in each month of the cohort with the trend suggestive of a constant increased risk of STI beyond the study timeline. STI risk among the Non-PrEP users looks considerably lower than that of PrEP users and does not increase so significantly as compared to that of PrEP users.

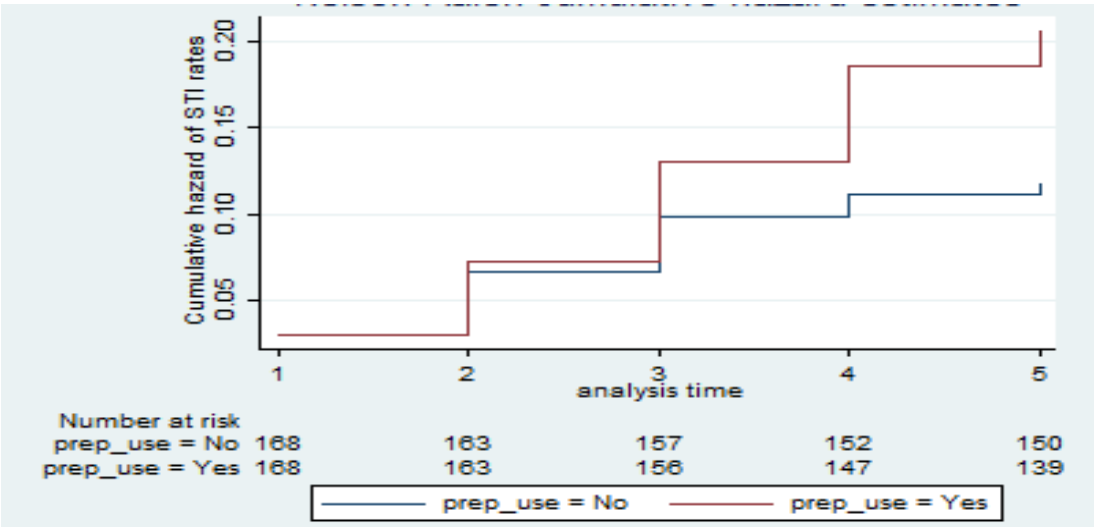

Figure no. 1: Cumulative hazard of contracting STI over time between the FSW who used PrEP and the FSW who did not use PrEP for HIV prevention in Nairobi.

IV. Discussion

The average number of sexual acts per day, between HIV oral PrEP users and non-PrEP users

The average number of sexual acts per day among the FSWs using HIV oral PrEP was much higher than that of non-PrEP users. The study has established an association between the average number of sexual acts per day and PrEP use among female sex workers P=0.005 (95%CI), suggesting that female sex workers using oral PrEP for HIV prevention are likely to have more sexual acts per day compared with the female sex workers who do not use HIV PrEP, suggestive of behavioral risk disinhibition. This observation is coherent with a studies that have pointed behavioral risk compensation among PrEP users (Marcus et al., 2013). Prevention of HIV using PrEP conceivably pose sexual acts associated behavioral disinhibition by promoting increase in number of sexual acts per day, among the FSWs using oral PrEP. Similarly, other studies have suggested an increase in receptive and insertive anal sex among PrEP users [19] and [21]. These findings controverts other findings that however, have attributed the decrease in the rate of unprotected sex and the number partners to trial associated HIV prevention counselling have [16], [17] and [19]. This could conceivably mean that, in the absence of the prevention counselling, risky sexual behavior can possibly been observed. This study also disagrees with another study which demonstrates that the number of sexual acts remain the same among persons using PrEP [18].

Condom use among female sex workers using HIV oral PrEP and non- PrEP users

The finding of the study has demonstrated insignificant association between PrEP use and condom use and do not statistically support any difference in the rate of condom use between FSWs using PrEP for HIV prevention and non-PrEP users. The basically demonstrates that there is no conclusive evidence to support decrease in condom use among female sex workers using HIV oral PrEP is coherent with [15]. Other studies have as well found no conclusive evidence to support reduced condom use among persons using HIV PrEP, [17] documents no increased risky sexual practices among PrEP users, and [12] has as well reiterated that there is no significant change in sexual behavior that could be observed when PrEP users were compared with non-PrEP users in the same period of time while [24] did not find evidence of risk compensation associated with condom use

among persons using PrEP for HIV prevention. However, [13] recorded contrary findings suggesting that while the uptake of PrEP for HIV prevention increased, condom use decreased and further suggested that this could conceivably undermine the prevention benefits of PrEP while [14] highlighted increase in STI cases as a result of reduced condom use among PrEP users and [18] findings as well demonstrated increased number of condomless sexual acts among persons using HIV PrEP.

STI Risk: Cumulative hazard of contracting STIs among the HIV oral PrEP users increased steadilyover the studied period whereas the cumulative hazard of STI among the non-PrEP users was slightly higher than that of non-PrEP users at the beginning but remained low with very slight increase over time, similar to [25] meta-analysis in which the STI incidence rate ratio was over 25 times that of non-PrEP users, however, the STI hazard ratio between PrEP users and non-PrEP users was lower in this study. While [6] has demonstrated an overall high STI incidences but did not increase over time among MSM using PrEP for HIV prevention, this study has suggested similarly higher STI incidences among PrEP users which increased over time

V. Conclusions and Recommendations

Risk compensation associated with increased number of average number of sexual acts per day was evident in this study, suggesting that female sexual who use Oral HIV PrEP are more likely to have increased number of average sexual acts per day. This fact may outweigh the HIV prevention benefits of PrEP as well as increase the PrEP user's exposure to other sexually transmitted infections and possibly increase the rates of these sexually transmitted infections among the PrEP users. The findings therefore suggests that the use of PrEP for HIV prevention plausibly increases the average number of daily sexual acts among PrEP using female sex workers. The study however, did not find enough evidence to support decreased rate of condom use among female sex workers using HIV oral PrEP for HIV prevention sighting no evidence of condom use associated risk compensation as a result of oral HIV PrEP use. This therefore infers that the use of PrEP for HIV prevention does not influence condom use among FSWs.

Emphasis to be made on reduction in the number of sexual acts per day among the FSWs right at the point of enrolment into the prevention program in the DICEs, to minimize their exposure to both HIV and other STIs . There is need to tailor STIs prevention intervention among HIV oral PrEP users and other non-PrEP using key populations according to their behavioral profile. Promotion of combination Prevention including biological and structural interventions which includes both PrEP and condom use. More studies involving FSWs are recommended, particularly on PrEP uptake, effectiveness, safety, and especially in Sub Saharan Africa where HIV prevalence among FSWs is high. Little research has been done on the use of PrEP among FSWs with most studies focusing on MSMs.

References

[1]. WHO. World Health Organisation. Published 2015. Accessed March 26, 2018. http://www.who.int/hiv/topics/prep/en/

[2]. Thigpen MC, Kebaabetswe PM, Paxton LA, et al. Antiretroviral Preexposure Prophylaxis for Heterosexual HIV Transmission in Botswana. *N Engl J Med*. 2012;367(5):423-434.

[3]. Jenness SM, Weiss KM, Goodreau SM, et al. Incidence of Gonorrhea and Chlamydia Following Human Immunodeficiency Virus Preexposure Prophylaxis Among Men Who Have Sex With Men: A Modeling Study. *Clin Infect Dis*. 2017;65(5):712-718.

[4]. NASCOP. Framework for the Implementation of Pre-Exposure Prophylaxis of HIV In Kenya. Published online 2017. https://www.prepwatch.org/wpcontent/uploads/2017/05/Kenya_PrEP_Implementation_Framework.pdf

[5]. Shannon K, Strathdee SA, Goldenberg SM, et al. Global epidemiology of HIV among female sex workers: influence of structural determinants. *Lancet Lond Engl*. 2015;385(9962):55-71.

[6]. Liu AY, Cohen SE, Vittinghoff E, et al. Preexposure Prophylaxis for HIV Infection Integrated With Municipal- and Community-Based Sexual Health Services. *JAMA Intern Med*. 2016;176(1):75-84.

[7]. World Health Organization. *Global Strategy for the Prevention and Control of Sexually Transmitted Infections: 2006-2015 : Breaking the Chain of Transmission*. World Health Organization; 2007.

[8]. Katz AR, Komeya AY, Soge OO, et al. Neisseria gonorrhoeae With High-Level Resistance to Azithromycin: Case Report of the First Isolate Identified in the United States. *Clin Infect Dis*. 2012;54(6):841-843. doi:10.1093/cid/cir929

[9]. Seale A, Broutet N, Narasimhan M. Assessing process, content, and politics in developing the global health sector strategy on sexually transmitted infections 2016–2021: Implementation opportunities for policymakers. *PLoS Med*. 2017;14(6).

[10]. Montaño MA, Dombrowski JC, Dasgupta S, et al. Changes in Sexual Behavior and STI Diagnoses Among MSM Initiating PrEP in a Clinic Setting. *AIDS Behav*. 2019;23(2):548-555.

[11]. Montaño MA, Dombrowski JC, Barbee LA, Golden MR, Khosropour CM. Changes in sexual behavior and STI diagnoses among MSM using PrEP in Seattle, WA. Published online 2017:1.

[12]. Marcus JL, Glidden DV, Mayer KH, et al. No Evidence of Sexual Risk Compensation in the iPrEx Trial of Daily Oral HIV Preexposure Prophylaxis. *PLOS ONE*. 2013;8(12):e81997.

[13]. Wise J. Pre-exposure prophylaxis may increase risky behaviour when introduced, study finds. *BMJ*. 2018;361:k2514.

[14]. Mayer KH, Wang L, Koblin B, et al. Concomitant Socioeconomic, Behavioral, and Biological Factors Associated with the Disproportionate HIV Infection Burden among Black Men Who Have Sex with Men in 6 U.S. Cities. *PLOS ONE*. 2014;9(1):e87298.

[15]. Crepaz N, Hart TA, Marks G. Highly Active Antiretroviral Therapy and Sexual Risk Behavior: A Meta-analytic Review. *JAMA*. 2004;292(2):224-236.

[16]. Liu AY, Vittinghoff E, Chillag K, et al. Sexual risk behavior among HIV-uninfected men who have sex with men (MSM) participating in a tenofovir pre-exposure prophylaxis (PrEP) randomized trial in the United States. *J Acquir Immune Defic Syndr 1999*. 2013;64(1):87-94.
[17]. Sagaon-Teyssier L, Suzan-Monti M, Demoulin B, et al. Uptake of PrEP and condom and sexual risk behavior among MSM during the ANRS IPERGAY trial. *AIDS Care*. 2016;28(sup1):48-55.
[18]. Hoornenborg E, Coyer L, Achterbergh RCA, et al. Sexual behaviour and incidence of HIV and sexually transmitted infections among men who have sex with men using daily and event-driven pre-exposure prophylaxis in AMPrEP: 2 year results from a demonstration study. *Lancet HIV*. 2019;6(7):e447-e455.
[19]. Guest G, Shattuck D, Johnson L, et al. Changes in Sexual Risk Behavior Among Participants in a PrEP HIV Prevention Trial. *Sex Transm Dis*. 2008;35(12):1002.
[20]. Martin JN, Roland ME, Neilands TB, et al. Use of postexposure prophylaxis against HIV infection following sexual exposure does not lead to increases in high-risk behavior. *AIDS*. 2004;18(5):787.
[21]. Hoornenborg E, Coyer L, van Laarhoven A, et al. Change in sexual risk behaviour after 6 months of pre-exposure prophylaxis use: results from the Amsterdam pre-exposure prophylaxis demonstration project. *AIDS*. 2018;32(11):1527–1532.
[22]. NASCOP. Key population data collection tools in Kenya | Children & AIDS. Published 2014. Accessed February 25, 2020. http://www.childrenandaids.org/node/602
[23]. STATA. Stata: Software for Statistics and Data Science. Published 2016. Accessed February 25, 2020. https://www.stata.com/
[24]. Kong X, Kigozi G, Nalugoda F, et al. Assessment of Changes in Risk Behaviors During 3 Years of Posttrial Follow-up of Male Circumcision Trial Participants Uncircumcised at Trial Closure in Rakai, Uganda. *Am J Epidemiol*. 2012;176(10):875-885.
[25]. Kojima N, Davey DJ, Klausner JD. Pre-exposure prophylaxis for HIV infection and new sexually transmitted infections among men who have sex with men. *AIDS*. 2016;30(14):2251.

Kennedy Owino Radeny, et. al. "Behavioral Risk Compensation Ensuing Hiv Oral Pre-Exposure Prophylaxis Use Among Female Sex Workers In Nairobi, Kenya." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 20(02), 2021, pp. 56-63.