

# Using Brothel Leadership to Improve Condom Use among Brothel-based Female Sex Workers in Abuja, Nigeria: Results of a Cluster Randomized Pilot Study

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## Abstract

Support by brothel leaders and the promotion of a conducive environment for HIV prevention programs within brothel establishments are important to promote a safe working environment for Brothel-Based Female Sex Workers (BB FSWs). This study assesses the effects of a cluster randomized pilot trial examining the use of brothel leaders to improve consistent condom use by FSWs residing in brothels and also assessed the feasibility of implementing a similar intervention on a broader scale. Ten brothels in Abuja, Nigeria were randomized and exposed to the experimental (n=5) and control (n=5) arms of the intervention. The feasibility of the intervention and consistent condom use outcomes by FSWs with different partner types as well as condom negotiation self-efficacy were measured. Condom use outcomes and condom negotiation self-efficacy outcomes were analysed using multi-level mixed regression models. A total of 243 FSWs were recruited into the study (control n=66 and experimental n=177) and 107 of them (44%) were available at 16 weeks follow-up. The intervention demonstrated feasibility and positive outcomes for consistent condom use with boyfriends, casual partners and clients of FSWs were obtained. The interaction effect between condition and time indicated increased consistent condom use with boyfriends in the experimental condition ( $p=0.02$ ). Adherence to the intervention by the FSWs was moderate with the mean sessions attended at 4.4(SD=2.0). The attrition rate during the intervention was high due to mobility of the FSWs. The intervention showed feasibility and effect outcomes indicate promise in enhancing condom use with steady partners of BB FSWs. The design of HIV prevention interventions may benefit from the inclusion of gatekeepers in the promotion of condom use within the brothel, but an adequately powered phase III trial is needed to inform large-scale implementation of this approach.

**Keywords:** intervention, gatekeepers, HIV/AIDs, prevention, sex worker, pilot trial

## 1. Introduction

In Nigeria, brothel based female sex workers (BB FSWs) have the second highest prevalence of HIV compared to other sub-populations within the country. The HIV prevalence for BB FSWs is twice that of their non-brothel based counterparts with prevalence rates of 19.4% and 8.6% respectively (FMOH, 2014). Although the HIV prevalence rate for BB FSWs has shown a decrease from 2010 to 2014, (FMOH, 2010, 2014) the prevalence is still much higher than the general population prevalence of 3.4% (FMOH, 2013). Furthermore, BB FSWs are reported to have higher number of clients and less correct knowledge about HIV transmission than the non-brothel based FSWs in Nigeria (FMOH, 2014; Ikpeazu, Momah-Haruna, Mari, Thompson, & Ogungbemi, 2014; Okafor, Crutzen, Okekearu, Adebajo, & Van Den Borne, 2017).

HIV transmission often involves the interaction of a range of social, community and institutional factors. Hence, HIV prevention efforts should incorporate at adequate scale these social and community level determinants in addition to the more widely used individualized approaches. Support by gatekeepers and the promotion of a conducive environment for HIV prevention programs within sex work establishments are key community and

institutional factors that promote a safe working environment for FSWs and reduce their vulnerability to sexually transmitted infections including HIV/AIDs (Muñoz, Adedimeji, & Olayemi, 2010; Richter, Chersich, Temmerman, & Luchters, 2013).

At the individual level, behavioural factors such as unprotected sex are associated with increased vulnerability to HIV infection. Peer support and promotion of consistent condom use are core preventive strategies for the reduction of HIV and other sexually transmitted infections (STIs) among FSWs and their partners. Several studies have shown the effectiveness of behavioural interventions using peer mediated approaches to improve condom use among FSWs (Williams, Lamson, Efem, Weir, & Lamprey, 1992; Bhave et al., 1995; Ray, van De Wijgert, Mason, Ndowa, & Maposhere, 2001; Ghys et al., 2002; Raul et al., 2002; Feldblum et al., 2005; Izugbara, 2007; Ulibarri et al., 2012; Wariki et al., 2012). Mobility of FSWs has also been shown by various studies to contribute to increased sexual risk behaviours by FSWs including the likelihood of unsafe sex and increased number of sexual partners (H. Wang, Chen, & G.B., 2010; Kummarikunta, Mathapati, & Halli, 2015).

Given the multifaceted factors influencing condom use amongst FSWs, social support from gatekeepers within the immediate environment of FSWs (i.e. brothel management, chairladies and owners of brothels) is a complex but important component in the promotion of a safe working environment for FSWs residing in brothels (Yang et al., 2005; Dandona et al., 2015; Qiao et al., 2015;). Previous studies have explored associations between condom use and social or environmental factors, including influence of gatekeepers and the working environment of FSWs (Morisky, Stein, Chiao, Ksobiech, & Malow, 2006; Li, Li, Stanton, Fang, & Zhao, 2010; Qiao et al., 2015). These studies showed that combined interventions that educate FSWs and improve gatekeeper support promote positive condom use outcomes in sex work settings as well as create a supportive environment for HIV prevention efforts.

Environmental factors interact with individual cognitive factors to influence behaviour change. Educating and involving gatekeepers in the creation of a supportive environment for condom use and HIV prevention activities addresses components of such environmental factors i.e. by influencing community and social norms within the FSW workplace and as well as the enactment of consistent condom use regulations (Kerrigan et al., 2003; Yang et al., 2005; Morisky et al., 2006; Hong, Fang, Li, Liu, & Li, 2008; Zhang et al., 2011; Fawole & Dagunduro, 2014). Despite the availability of studies on the positive association between gatekeeper support and improvements in consistent condom use in Asia and the Philippines, limited information within the Nigerian context exists.

In the current study, we designed an intervention to assess the feasibility and effectiveness of including brothel leadership in the improvement of condom use outcomes by FSWs within the Nigerian commercial sex work context. The criminalization of sex work in the country and the social stigmatization of sex work necessitates a better understanding of prevalent environmental and structural barriers to using condoms (Kerrigan et al., 2013). The stigmatization and criminalisation surrounding sex work in the country contributes to the mobility of FSWs and this makes it quite difficult to reach them with HIV prevention interventions for sustained periods thus posing significant challenges to prevention efforts (Fawole & Dagunduro, 2014; NACA, 2014). This cluster randomized pilot study aims to gain more insight into the potentials of incorporating the supportive activities of brothel leaders in an intervention to improve consistent condom use by BB FSWs with all partners. Specific objectives of this study were to gain insights into:

- 1). the feasibility of recruiting brothel leaders and implementing the intervention
- 2). the attrition rate for female sex workers residing within the brothels;
- 3). the potential effect of the intervention on correct and consistent condom use outcomes for FSWs within brothels and with all partner types.

The outcomes will provide evidence to inform a larger phase III study and future HIV prevention efforts within the Nigerian context and beyond.

## **2. Methods**

A cluster-randomized controlled trial was conducted randomizing brothels located in Abuja, Nigeria into experimental and control conditions. Randomization of the study participants at the brothel level was carried out to limit contamination between the two intervention groups. The control arm received a standard intervention while the experimental arm received the standard intervention combined with the brothel leadership intervention.

### *2.1 Participants and Procedure*

FSWs were recruited from brothels in three communities in Abuja, the capital city of Nigeria and preliminary visits were paid to the brothel management and chairladies in charge of these brothels. Twelve brothels identified in these locations were selected and received invitation letters. The consent of the brothel management was sought

after providing information about the study.

Brothels approached to participate in the study were randomly assigned to either the experimental or control conditions. Brothels were not blind to their condition as brothel leaders in the experimental condition were pooled together for trainings and discussions on the proposed intervention. One week before the start of the intervention, baseline information was collected from the FSWs residing in each brothel after informed consent was obtained.

The brothel leaders in the experimental arm were provided with condoms and leaflets containing information on the intervention. FSWs were also provided with hygiene kits and weekly distribution of free male and female condoms all through the intervention duration.

## *2.2 Inclusion Criteria*

The target group for the study consists of brothels within the three communities who provided consent for the study as well as females who reside in brothels; who reported sexual activities with men in exchange for money or benefits.

## *2.3 Interventions*

### *2.3.1 Standard Intervention*

The messages and interactions for the intervention focus on improving consistent condom use. The standard intervention was a behavioural intervention for HIV prevention using peer sessions on risks and vulnerabilities, condom use promotion and condom distribution. Trained peer educators carried out one-hour group peer sessions weekly with the FSWs. Topics discussed during the group sessions include; life skills, sexuality, risk reduction, money and conflict management and consistent condom use. More detailed description of the interventions can be found in the protocol (Okafor, Crutzen, Adebajo, Okekearu, & Borne, 2017).

### *2.3.2 Brothel Leadership Intervention*

In addition to the activities carried out in the standard intervention, the experimental group was exposed to the brothel leadership component which consisted of using trained brothel leaders (brothel managers, chairladies and owners) to deliver condom use messages to the FSWs and promote a conducive atmosphere within the brothels for communication condom negotiation and consistent condom use with all sexual partners within the brothel. The messages and interactions during the intervention focused on improving consistent condom use and self-efficacy in condom use negotiation. Brothel meetings were held weekly and each FSW was adequately exposed to the intervention when they had participated in six sessions. After 16 weeks, the FSWs in both conditions responded to the follow-up questionnaire administered by trained interviewers.

## *2.4 Measurements*

Questionnaires were adapted from standardized models and survey instruments used in similar studies in Nigeria (UNAIDS & WHO, 2009; FMOH, 2014; NPC, 2014). Workshops were carried out with the interviewers and research specialists to discuss improvements to the assessment instrument as well as to train on questionnaire administration and the interviewing of illiterate participants. Assessments were carried out at baseline and 16 weeks follow-up. At baseline, demographic characteristics of participants' age, marital status, educational attainment and availability of other sources of income were assessed. Knowledge of prevention of sexual transmission of HIV and rejection of major misconceptions were also assessed using the UNGASS indicator for most at risk populations (UNAIDS & WHO, 2009). This consisted of five questions: Can one avoid getting HIV by using condoms every time? Can a healthy-looking person be HIV positive? Can one avoid HIV by staying faithful to an uninfected partner? (all true). And the following misconceptions: Can a person get HIV from mosquito bites? Can a person get HIV by sharing a toilet with an HIV infected person? (all false). The sum of the correctly answered knowledge questions was calculated (range: 0-5).

The primary outcomes of this study (in line with the objectives) are ease of recruitment of brothel leaders for condom use promotion and facilitation; the attrition rate of FSWs residing within the brothels; the evaluation of the intervention processes as well as the effect of the intervention on condoms use outcomes by FSWs with all partner types in order to inform adequate sample size estimation. Consistent condom use with different partner types was assessed with the questions; the last time you had sex with a client was a condom used and the last time you had sex with a non-paying partner was a condom used (ticked for boyfriend and casual partners separately). The responses were dichotomized to 0 (No and Sometimes) and 1 (Yes).

The secondary outcome of the study was enhancing condom negotiation self-efficacy with all clients and steady partners of FSWs. Condom negotiation self-efficacy was assessed with the questions: I feel confident in my ability to discuss condom use with my clients and I feel confident in my ability to discuss condom use with my boyfriend

and casual partners. Participants had to respond on a five point scale (0-4; strongly disagree-strongly agree).

Process outcomes were assessed during follow-up by asking the participants to respond “agree, disagree or neutral” to the following questions: the quality of the condom promotion activities in the brothels was good, the frequency of the monthly condom demonstration activities was adequate, the weekly brothel meeting is a suitable avenue for condom promotion activities, the condom promotion messages were adequate, the combination of peer education sessions and the condom promotion activities with the chairladies was effective, the chair ladies are effective facilitators of the condom promotion activities received in the brothel and the number of condoms received during the intervention was adequate.

### 2.5 Analyses

The ability to recruit brothels and its leadership for the intervention as well as adherence to the intervention by the FSWs was used to assess the feasibility of the study. Adherence was assessed by the number of intervention sessions (excluding the baseline or follow-up assessments) each FSW participated in (range 0-6). Attrition rates were calculated by the percentage of participants in the baseline assessment that were also present at the follow-up assessments.

The data were analysed using SPSS version 23. Descriptive statistics were used to describe the characteristics of the baseline sample. Differences between the conditions during baseline were assessed using *t* tests for continuous variables and chi-square tests for discrete variables. This study constituted a design with 3 levels: The first level consisted of the repeated measures within the participants (baseline and follow-up measurements), the second level are the FSWs and the third level are the brothels, where the FSWs are nested.

To determine the potential effectiveness of the program, we analysed the data with multi-level mixed logistic regression model for the outcomes condom use with clients, casual partners and boyfriends. Multi-level mixed linear regression model was used for the outcome self-efficacy (Sullivan, 2012; Bernhardt, Wang, & Zhang, 2015). These models allow for dependencies among observations obtained for FSWs within a brothel as well as data missing at random (instead of completely at random) (Molenberghs & Kenward, 2007; Dziura, Post, Zhao, Fu, & Peduzzi, 2013;). The effects of wave (baseline or follow-up) and condition, as well as their interaction were analysed; marital status, which differed between conditions at baseline (as described below), was entered as a predictor into the models. Main effects were considered significant if  $P \leq .05$ . Interaction effects were considered significant if  $P \leq .10$ .

### 2.6 Ethical Approval and Consent to Participate

The study was approved by the Institutional Review Board (IRB) of the Institute of human virology, Nigeria. Protocol number: NHREC/10/15/2014a-026. Due to the illegal nature of sex work in the country, respondents did not want to sign the consent form. Hence, verbal informed consent was obtained from all participants. Permission was obtained from the brothel management and chairladies prior to the study. Respondents were free to decline to participate in the study or not to answer questions they were not comfortable with.

## 3. Results

A total of 10 brothels and 243 FSWs were included in the baseline assessment for the study. The mean age of the participants at baseline was 28 years (SD=5.4) and no significant difference in age was observed between the experimental and control groups. FSWs in the control and experimental arms did not also significantly differ in educational attainment, age of commencing sex work and HIV knowledge. However, a significant difference was recorded for marital status with more participants in the experimental condition being single compared to the control condition. (Table 1)

### 3.1 Participation and Attrition

Figure 1 is a flow chart showing the brothels participating in the study. Twelve brothels were approached to participate in the study and were randomized into the control and the experimental conditions. Two brothels in the control condition withdrew their participation before the baseline assessment was carried out. The brothels withdrew due to its management not accepting to be part of the conduct of the intervention within the brothel.

Adherence to the sessions was calculated to be average with the mean session attended being 4.4(S.D=2.0) and 86(48.6%) completing all six sessions, 18(10.2%) completing five sessions, while 27(15.3%), 1(0.6%), 30(16.9%) and 15(8.5%) completed four, three two and no sessions respectively. Although the remaining ten brothels participated in the 16 weeks follow-up assessment, only 108 of 243 FSWs were part of the follow-up assessment; i.e., an attrition rate of 55.6%. One brothel in the control group had only two FSWs present during the follow-up assessment as a result of a recent raid of the brothel by law enforcement. Just before the commencement of the

intervention two brothels in the experimental condition had an influx of FSWs.

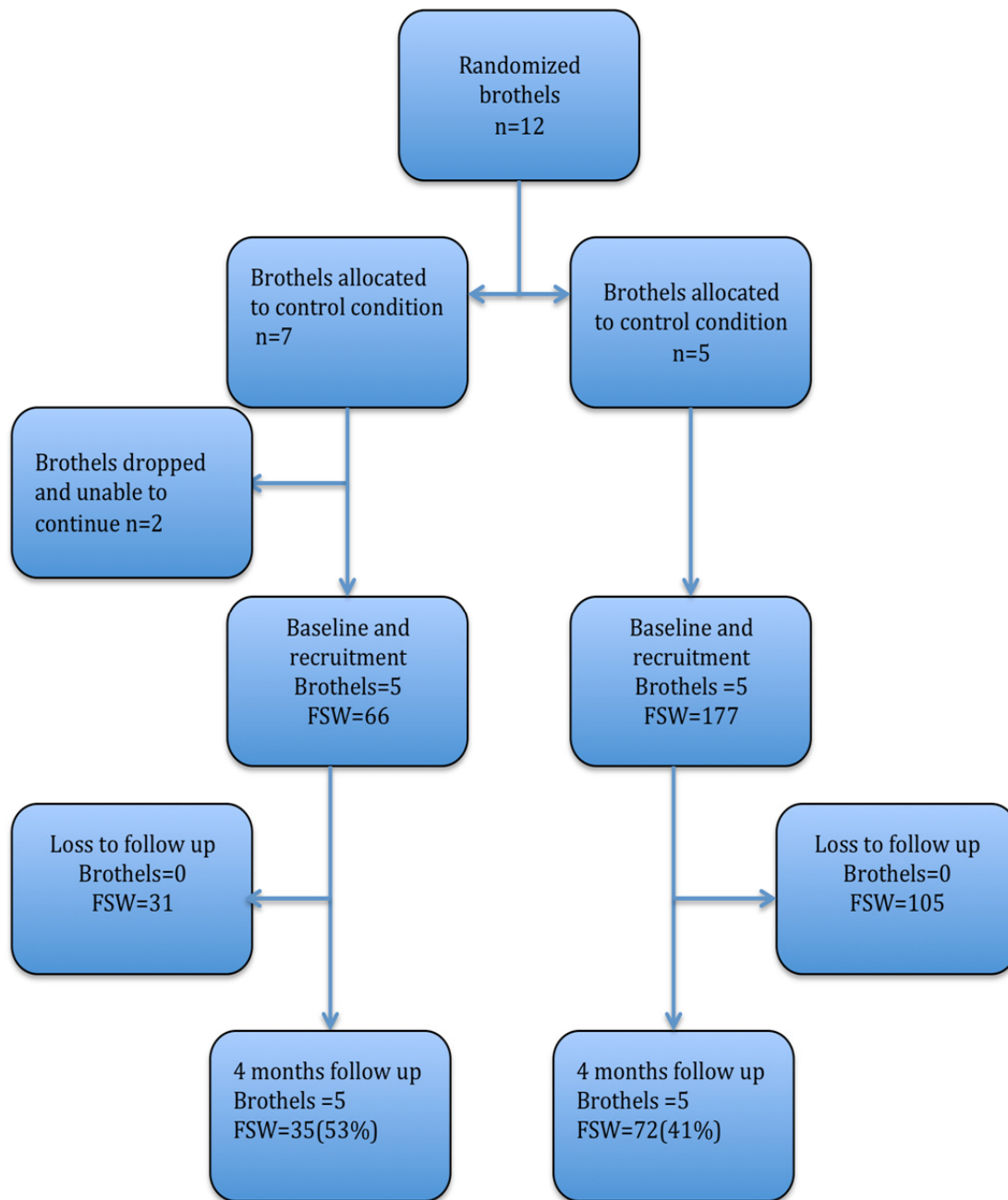


Figure 1. Participant flow chart

Table 1. Baseline characteristics of participants and differences between the experimental and the control condition

Characteristics	Total n=243	Control n=177	Experimental n=66	P
<b>Age of FSW</b>	n=239			
<i>Mean Age (SD)</i>	28 (5.4%)	28 (4.9%)	29 (5.8%)	0.768
<b>Age start sex work</b>	n=215			
<i>Mean Age (SD)</i>	26 (6.0%)	25(6.8%)	26 (5.7%)	0.169
<b>Education Attainment</b>	n=240			
<i>Primary/No education/Vocational</i>	148 (61.7%)	34 (53.1%)	114 (64.8%)	0.101
<i>Secondary/tertiary</i>	92 (38.3%)	30 (46.9%)	62 (35.2%)	
<b>Marital Status</b>	n=243			
<i>Married/co-habiting</i>	44 (18.1%)	19 (28.8%)	25 (14.1%)	0.008
<i>Single/divorced/widowed</i>	199 (81.9%)	47 (71.2%)	152 (85.9%)	
<b>Reported source of income</b>	n=243			
<i>Sex work only</i>	140 (57.6%)	32 (48.5%)	108 (61.0%)	0.079
<i>Sex work and other jobs</i>	103 (42.4%)	34 (51.5%)	69 (39.0%)	
<b>Knowledge</b>	n=226			
<i>Low knowledge</i>	184(81.4%)	57 (87.7%)	127 (78.9%)	0.123
<i>High Knowledge</i>	42(18.6%)	8 (12.3%)	34 (21.1%)	

Table 2. Baseline characteristics of intervention participants who completed or dropped out

Characteristics	Completed	Dropped out	P
<b>Age of FSW</b>			
<i>Mean Age (SD)</i>	29(6.0)	28(5.2)	0.085
<b>Education Attainment</b>			
<i>Primary/No education/Vocational</i>	56.7	65	0.193
<i>Secondary/tertiary</i>	43.3	35	
<b>Marital Status</b>			
<i>Married/co-habiting</i>	19.4	17.2	0.670
<i>Single/divorced/widowed</i>	80.6	82.8	
<b>Knowledge</b>			
<i>Low knowledge</i>	84.8	79.1	0.281
<i>High Knowledge</i>	15.2	20.9	
<b>Consistent condom use</b>			
<i>Boyfriends</i>	53.2	76.7	0.001
<i>Casual partners</i>	79.7	87.2	0.221
<i>Clients</i>	83.9	94.2	0.011
<b>Condition</b>			
<i>Control</i>	26.5	27.6	0.856
<i>Experimental</i>	73.5	72.4	

3.2 Condom Use Outcomes

Condom use with boyfriends, casual partners and clients increased for both the experimental and control arms of the intervention. However, the interaction between wave and condition for condom use with clients was not significant ( $p=0.68$ ). Marital status was a significant predictor of condom use with clients ( $p=0.002$ ) and showed that married FSWs are 2.4 times more likely to use condoms compared to their unmarried counterparts. Condom use with casual partners showed significant increase over time for both groups ( $p=0.04$ ), but showed no significant interaction between wave and condition ( $p=0.45$ ). The interaction between wave and condition showed a statistically significant effect for condom use with boyfriends ( $p=0.02$ ). Consistent condom use with boyfriends for the experimental arm significantly increased at follow-up compared to the control arm which declined. Condom use outcomes are summarised in Table 2, and Figures 2, 3, and 4.

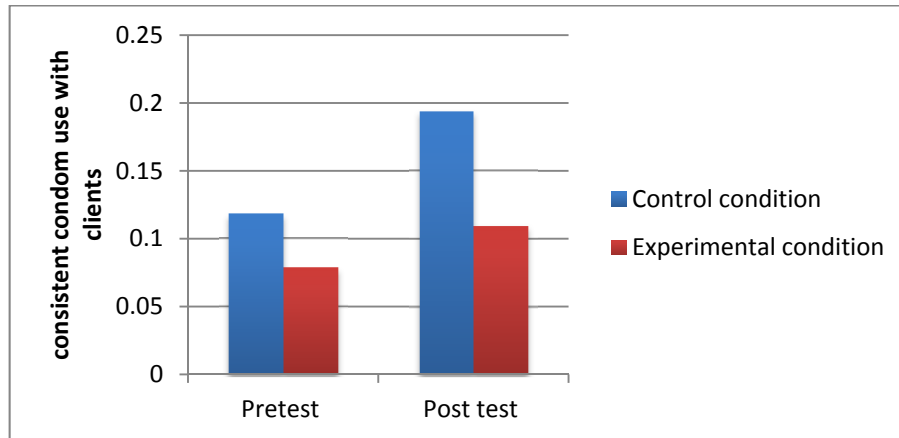


Figure 2. Estimated means for intervention effects on condom use with clients

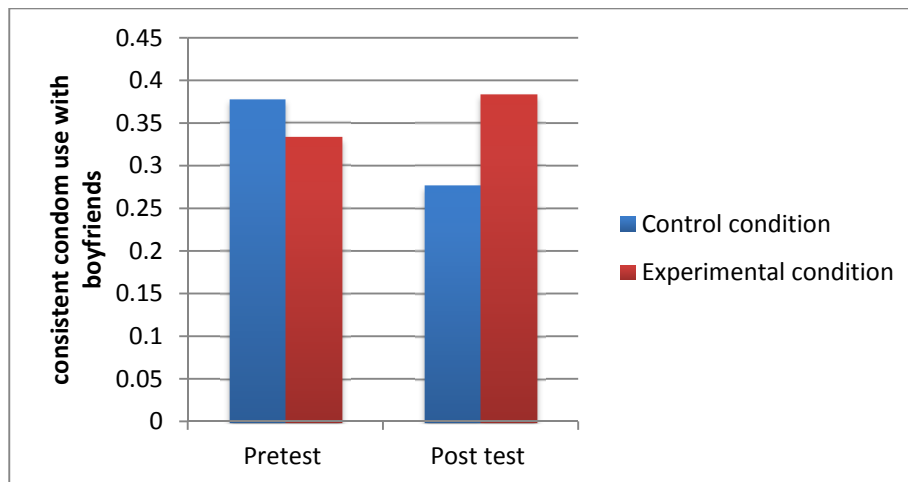


Figure 3. Estimated means for intervention effects on condom use with boyfriends

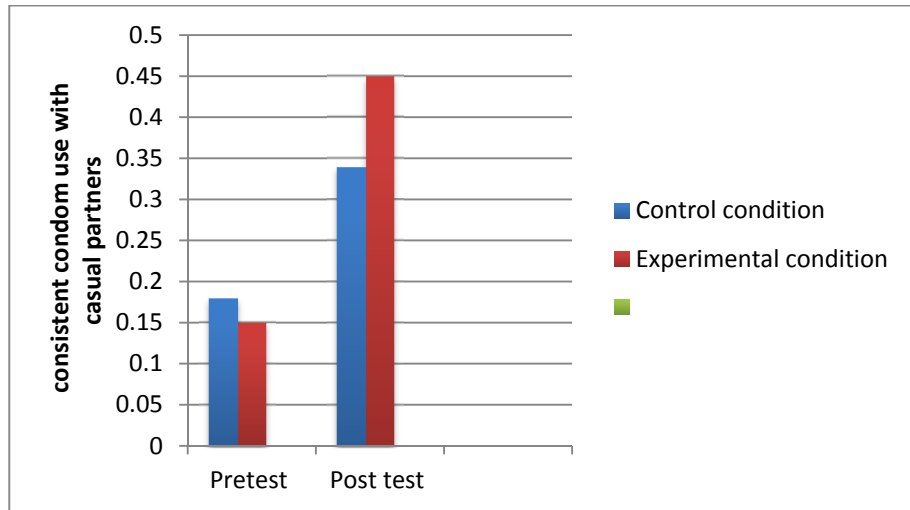


Figure 4. Estimated means for intervention effects on condom use with casual partners

### 3.3 Condom Negotiation Self-Efficacy Outcomes

Self-efficacy for condom negotiation with boyfriend and casual partners increased significantly over time for both the experimental and control conditions ( $p=0.02$ ) with the experimental group showing more increase. However, the interaction between wave and condition was not significant ( $p=0.68$ ). Self-efficacy for condom negotiation with clients showed a decline for both arms of the study and the interaction effect between wave and condition was also insignificant ( $p=0.95$ ). Self-efficacy for condom use negotiation outcomes are summarized in Table 3, and Figures 5 and 6.

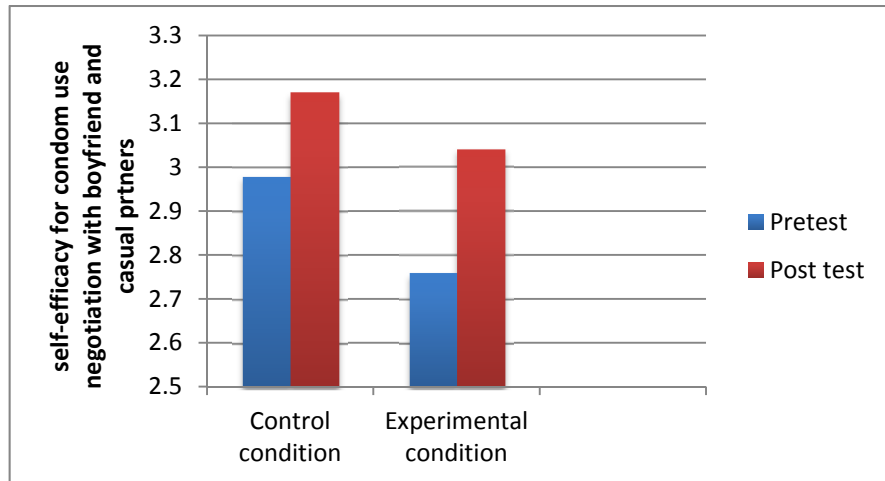


Figure 5. Estimated means for intervention effects on self-efficacy with boyfriend and casual partners



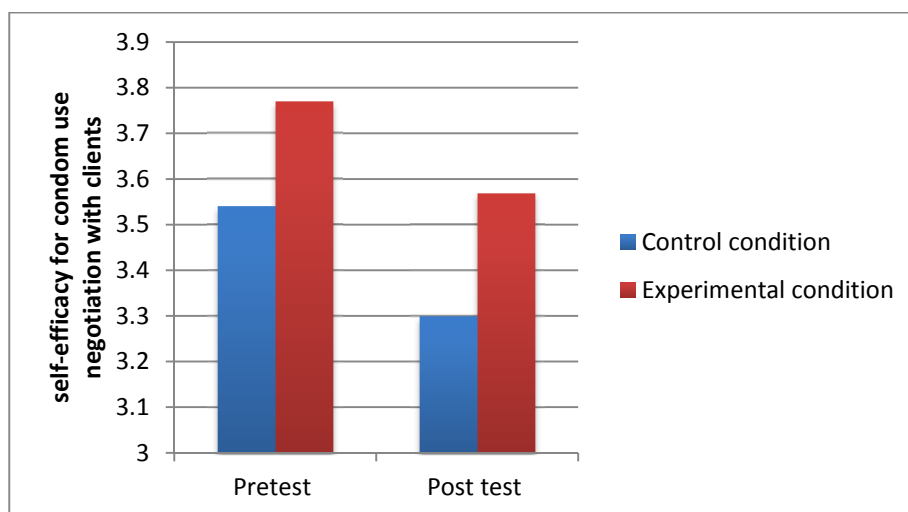


Figure 6. Estimated means for intervention effects on self-efficacy with clients

3.4 Process Outcomes

Process outcomes measured showed that above 80% of the participants in the experimental group during the follow-up assessments reported positive outcomes for most of the questions on intervention quality, acceptability, content and delivery mode (Table 5). Eighty six percent of the participants reported that the condom promotion activities within the intervention were good and 82% also agreed that the chairladies were effective facilitators of condom promotion activities within the brothel. However, only 52.9% were satisfied with the free condoms provided during the intervention.

Table 3. Condom use outcomes for different partner types

Model Term	Condom use with clients					Condom use with casual partners					Condom use with boyfriends				
			Odds	95% CI				Odds	95% CI				Odds	95% CI	
	T	P	Ratio	Lower	upper	T	P	Ratio	lower	upper	T	P	Ratio	lower	upper
Intercept	-4.454	0.000	0.097	0.034	0.271	-0.228	0.820	0.836	0.178	3.926	-1.726	0.085	0.595	0.330	1.075
Wave	-0.529	0.597	0.751	0.260	2.174	-2.056	0.041	0.225	0.054	0.942	-1.235	0.218	0.811	0.581	1.132
Condition	0.982	0.327	1.800	0.555	5.843	-0.440	0.660	0.661	0.103	4.234	-1.739	0.083	0.576	0.308	1.075
Wave*condition	-0.412	0.681	0.781	0.241	2.537	0.751	0.454	1.842	0.370	9.176	2.299	0.022	2.045	1.109	3.772
Marital status	3.113	0.002	2.393	1.379	4.153	-0.580	0.563	0.823	0.823	1.596	1.189	0.235	1.293	0.845	1.977

Table 4. Self-efficacy regarding condom use negotiation for different partner types

Model Term	Self-efficacy regarding condom use negotiation with boyfriend and casual partners				Self-efficacy regarding condom use negotiation with clients			
	T	P	95% CI		T	P	95% CI	
			Lower	Upper			lower	upper
Intercept	36.876	≤0.001	2.880	3.205	16.644	≤0.001	3.148	3.991
Wave	-2.276	0.023	-0.524	-0.038	0.576	0.565	-0.475	0.870
Condition	0.836	0.404	-0.172	0.425	-0.708	0.479	-1.005	0.473
Wave*Condition	0.415	0.678	-0.360	0.554	0.065	0.948	-1.223	1.317

Table 5. Process outcomes

Process outcome	Agree	Disagree	Neutral
The quality of the condom promotion activities during the intervention was good (n=140)	121 (86.4%)	10 (7.1%)	9 (6.4%)
The frequency of the monthly condom demonstration was adequate (n=140)	116 (82.9%)	13 (9.3%)	11 (7.9%)
The chairladies were effective facilitators of the condom promotion activities in the brothel (n=140)	115 (82.1%)	12 (8.6%)	13 (9.3%)
The weekly brothel meeting is a suitable avenue for condom promotion activities (n=141)	118 (83.7%)	7 (5.0%)	16 (11.3%)
The number of condoms received during the intervention was adequate (n=140)	74 (52.9%)	31 (22.1%)	35 (24.3%)
The condom promotion messages were adequate (n=141)	116 (82.3%)	10 (7.1%)	15 (10.6%)
The combination of the education sessions with condom promotion activities of the chairladies was effective (n=141)	115 (81.6%)	4 (2.8%)	22 (15.3%)

#### 4. Discussion

The pilot study showed feasibility and indicates preliminary evidence of efficacy that can be used to inform sample size estimates when undertaking a larger phase III trial. Brothel owners and chairladies were willing to cooperate with the program to enhance condom use within the brothels. FSWs residing within the brothels were also willing to participate in the intervention and the study. The attrition rates recorded during the intervention was significant and could have been caused by various reasons i.e. seeking for more sexual partners, non-conducive climate and more sex work income.

Mobility of female sex workers continues to pose a challenge to HIV prevention efforts and should be taken into consideration when designing such programs (H. Wang et al., 2010; Ramesh, Ganju, Mahapatra, Mishra, & Saggurti, 2012). The high attrition rate observed during the pilot goes to further buttress this. Sample size estimations for similar programs should incorporate this possibility when calculating the required sample size to ensure studies are adequately powered. The recruitment of gatekeepers for trainings and their active participation in the facilitation of a conducive environment for condom use promotion within the brothel establishment is enhanced by educating them on the benefits to the establishment, the FSWs themselves and their immediate environment.

Our findings indicate also that the study had a positive effect in increasing consistent condom use outcomes with boyfriends, casual partners and clients. Unprotected sex with steady partners of FSWs remains a great concern for HIV prevention efforts across the globe and may contribute more to FSWs' HIV/STI risk (Zhao, Wang, Fang, Li, & Stanton, 2008). Several publications in Nigeria (Asowa-Omorodion, 2000; Eluwa et al., 2012; FMOH, 2014) and other countries (C. Wang et al., 2007; Voeten, Egesah, Varkevisser, & Habbema, 2007; Kayembe et al., 2008; Ulibarri et al., 2012) have shown that FSWs' use condoms more with their commercial clients compared to their steady partners. Most sex workers have at least one steady sexual partner at any given time (Kerrigan et al., 2003) and the study conducted by Murray et al indicates that perceived relationship intimacy is a strong predictor of consistent condom use among FSWs (Murray et al., 2007). FSWs view the use of condoms with their steady partners as an emotional barrier separating their professional lives as sex workers from their lives as girlfriends and mothers (Castañeda, Ortiz, Allen, Garcia, & Hernandez- Avila, 1996). Thus, convincing their steady partners to use condoms may call for a higher self-efficacy and control over their sexual activities (Pickering, Quigley, Pépin, Todd, & Wilkins, 1993; Bandura, 1994; Walden, Mwangulube, & Makhumula-Nkhoma, 1999).

Our intervention was developed using participatory approaches at the individual, community and organizational levels with FSWs, brothel leaders and HIV experts. The intervention targeted individual level changes (attitudinal changes for both brothel leaders and FSWs) and socio-structural changes (increased access to condoms, condom use policy enactment at the brothel level and environmental changes). This is different from the typical micro level individual approach for the promotion of condom use and included an additional layer of influence and support from brothel managers and chair ladies for the facilitation of consistent condom use and condom negotiation self-efficacy. Future interventions for HIV prevention amongst this target group are encouraged to adopt this approach.

The pilot study is subject to the following limitations: firstly, the generalization of the study to other sex work

settings and countries may be limited and should be carried out with caution. Measuring condom use and condom negotiation outcomes among FSWs is difficult and the self-reported nature of the result could be subject to social desirability bias. Lastly, the high attrition rate and the varied number of FSWs in the brothels may have affected the representativeness of the sample and the effect outcomes.

## 5. Conclusion

Our findings indicate the feasibility of engaging brothel leaders in condom promotion interventions within brothels and the possible benefits of this for HIV prevention efforts among BB FSWs in Nigeria. A larger pilot study to provide more insight to the roles and effects of gatekeeper engagement in promoting condom use within brothels including consistent condom use with steady partners is necessary.

In addition to the support provided by brothel leaders in this study, it is also important to note that supportive strategies and policies by the government and HIV/STI prevention programs remain crucial in the prevention of HIV and STIs with sex work populations. Further adequately powered studies should focus on investigating gatekeeper support in diverse sex work settings to facilitate effective HIV prevention programs for FSWs especially within the Nigerian context.

## Authors' Contributions

UO is the principal investigator and initiated the development of the study, concepts and drafted the manuscript. RC and BV contributed to the development of the intervention and the analysis and reviewed the manuscript providing extensive feedback. IO, and SA provided intellectual input for the intervention design, and reviewed the manuscript with extensive feedback. All authors approved the final manuscript.

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## Competing Interests Statement

No competing interests declared.

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