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Effect of follow-up program on HIV prevention among serodiscordant couples in Kicukiro District, Rwanda

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Abstract

To date, no studies within the Rwandan context have assessed the impact of a follow-up program on HIV prevention among sero-discordant couples. To explore this question, this study aimed at assessing the effect of a follow-up program for HIV discordant couples in Kicukiro District, Rwanda. This was a case-control study comparing subjects who are in the follow-up program (cases) with subjects who are not in the program but are otherwise similar (controls). The sample size was 137 cases and 137 controls, as determined by the formula of Casagrande et al. (1978). Raw data from a quantitative questionnaire was entered and analyzed in SPSS version 20. Pearson's chi-square test (P-value <0.05) and odds ratio with corresponding 95% confidence interval were computed to establish the association between the dependent variable (Follow up program) and independent variables (sociodemographic characteristics and the prevalence of sero-status and sero-discordance). Binary logistic regression analysis was performed to adjust for confounding factors in the relationship between dependent and independent variables. Qualitative data collected from focus group discussions were analyzed manually and results presented in the form of quotes. The study finds two new HIV infection among controls (non-enrolled) group and zero HIV infection among cases (enrolled) group. Out of 137 cases, 104(59.1%) have condoms compared to 72(40.9%) of controls; out of 137 cases, 10(29.4%) have pregnancy intention compared to 24(70.6%) of controls; out of 113(53.8%) used condoms compared to 97(46.2%) of controls. After multivariable logistic regression having condom at home was about 3 times more likely among study participants enrolled (cases) in the follow up program than controls and having intention for children was 2.42 times more likely among controls who were not enrolled in the follow up program compared to cases. Although this study shows that there is an increased effect of being in follow up program for HIV prevention among sero-discordant in bivariate analysis but there were not sustained at multivariate analysis. The study however highlights the need for the Ministry of Health and other concerned stakeholders to promote discordant couples to be enrolled in the follow up program by having condoms, not having pregnancy intention and use condoms while having sex with their partner.

Key words: Follow-up, Prevention, serodiscordant couple
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1. Introduction

Serodiscordant couples play a role in maintaining the global HIV epidemic [1]. In surveillance studies, it is common to detect large numbers of serodiscordant couples: in concentrated epidemics, 0 to 6% of all couples may be serodiscordant, while in generalized epidemics this figure ranges from 9 to 17% [2,3]. HIV transmission within serodiscordant couples can contribute substantially to the overall burden of disease. In high prevalence areas like sub-Saharan Africa, approximately half of HIV-positive persons have negative partners, and in low prevalence settings, this proportion may be as high as 75% [2].

In Africa, the number of serodiscordant couples and infections acquired through heterosexual contact has continued to increase [4]. The prevalence of HIV discordance among married and cohabitating couples in Africa is high, ranging from 3-20% in the general population [5].

The existing research suggests that discordant couples who have received VCT and other interventions have lower sero-conversion rates; however, incidence within these couples remains high, ranging from 3-8% annually [6]. A comprehensive understanding of the experiences of HIV- discordant couples in Sub-Saharan Africa could inform efforts to improve the efficacy of couples VCT and other interventions for these couples. Such interventions are needed as the evidence indicates that transmission within regular, established discordant partnerships is higher than it is within non-regular discordant partnerships [7,8].

HIV transmission within stable heterosexual partnerships is thought to be a major contributor to new HIV infection in Sub-Saharan Africa [9]. In the pre-antiretroviral therapy (ART) era, HIV incidence has been estimated at approximately 5 cases per 100 person-years among men and 10 cases per 100 person-years among women in serodiscordant relationships in East African Countries like Tanzania and Uganda [10]. Higher HIV incidence among women in serodiscordant relationships may be related to higher per-act probability of HIV transmission among women than men [11].

In Rwanda, the government public health facilities historically offered Health Care Trust (HCT) which was found to be ineffective in reducing HIV-infection risk within couples. To manage this, Project San Francisco (PSF) provided a follow up program to support, training, and technical assistant in the nationwide expansion of Community health care trust (CHCT) in Rwanda. However, little is known about the effect of a follow-up program among HIV discordant couples. This study therefore aims to assess the effect of a follow up program among HIV discordant couples in Kicukiro district, the district with high percentage (5.5%) of discordant couples in Kigali city [12].

2. Material and Methods

This is a case-control study using only quantitative approach. The study was used to identify the effect of a follow-up program on HIV prevention among serodiscordant couples by comparing subjects who are in the follow-up program (cases) with subjects who are not in the program but are otherwise similar (controls). By definition, a case control study is always retrospective because it starts with an outcome then traces back to investigate exposures. Case-control studies determine the relative importance of a predictor variable in relation to the

presence or absence of the disease by calculating odds ratio which is usually an approximate to the relative risk.

Cases were serodiscordant couples in Kicukiro District already enrolled in the follow-up program for HIV prevention while the controls were other serodiscordant couples not enrolled in the follow-up program. Serodiscordant couples who are in the follow-up program for HIV prevention in the health center of Kicukiro district was recruited consecutively as cases and serodiscordant couples attending VCT services was recruited consecutively as controls. They were part of the study after consent is sought and obtained from both cases and controls. Every serodiscordant couples meeting the inclusion criteria was included in the study until the desired number was attained. Data were collected from a sample of 274 participants and collected by four research assistants trained on data collection tools and the principal investigator was supervising the team. Data were collected using a piloted semi-structured questionnaire for both cases and controls. The structured questionnaire was translated into Kinyarwanda. For qualitative data, focus group discussions with study respondents were done to explore their perceptions on HIV prevention. It was tested in the interview from health center of Nyarugenge district. The results from the interview showed that the guide is clear and questions have logical sequence.

Raw data from a quantitative questionnaire was entered and analyzed in SPSS version 20. Pearson's chi-square test (P-value <0.05) and odds ratio with corresponding 95% confidence interval were computed to establish the association between the dependent variable (Follow up program) and independent variables (sociodemographic characteristics and the prevalence of sero-status and sero-discordance). Binary logistic regression analysis was performed to adjust for confounding factors in the relationship between dependent and independent variables.

Ethical approval to conduct the study sought from Mount Kenya University (MKU) Research committee. The researcher sought permission from Kicukiro district. The sample target populations were informed about the study purposes and procedures. Each respondent of the study was voluntarily signing an informed consent form

3. Results and Discussion

3.1 Socio-demographic characteristics

Table 1 illustrates some of the selected socio-demographic characteristics among cases and controls. The characteristics include age of the respondents, district where they live, level of education, religion, as well as monthly income.

Table 1: Socio-demographic characteristics for cases and controls

Variable	Total n(%) n=274	Cases n(%) n=137	Controls n(%) n=137	$\chi 2$ value	p value*
Age group in years					
<38	27(9.9)	17(63.0)	10(37.0)	6.39	0.094
38-47	122(44.5)	55(45.1)	67(54.9)		
48-57	93(33.9)	44(47.3)	49(52.7)		
>57	32(11.7)	21(65.6)	11(34.4)		
Resident District					
Kicukiro	272(99.3)	136(50)	136(50)	2.00	0.368
Bugesera	1(0.4)	1(100)	0(0)		
Nyarugenge	1(0.4)	0(0)	1(100)		
Religion					

Christian	268(97.8)	132(49.3)	136(50.7)	3.06	0.217
Muslim	2(0.7)	2(100)	0(0)		
No religion	4(1.5)	3(75)	1(25)		
Education level					
Primary	168(61.3)	87(51.8)	81(48.2)	2.83	0.419
Secondary	73(26.6)	35(47.9)	38(52.1)		
Post-secondary	20(7.3)	7(35)	13(65)		
None	13(4.7)	8(61.5)	5(38.5)		
Monthly income					
<50,000	87(31.8)	49(56.3)	38(43.7)	6.48	0.091
50,000-100,000	129(47.1)	58(45)	71(55)		
100,001-150,000	42(15.3)	25(59.5)	17(40.5)		
>150,000	16(2.2)	5(31.3)	11(68.8)		

Source: Primary source

As indicated in Table 4.1, collectively the highest percentages (44.5%) of the study participants were aged 38 to 47 years with more in control groups (54) compared to cases (45.1%), however this proportion difference was not statistically significant (p=0.094). overall most of the respondents were Christians (97.8%), with primary education (61.3%) and with income salary of 50,000 to 100,000 Rwandan Frank (47.1%). However there was no significant variation between cases and controls.

3.2 HIV infection among serodiscordant couples enrolled in a follow-up program (cases) and non-enrolled (controls)

The first objective was to determine the prevalence of new HIV infection among serodiscordant couples enrolled in a follow-up program (cases) and non-enrolled (controls) and the result is presented in Table 2.

Table 2: HIV infection among serodiscordant couples enrolled in a follow-up program (cases) and non-enrolled (controls)

HIV Status	Cases, n(%) n=137	Controls, n(%) n=137	χ^2 value	p value*
Negative	137(50.4)	135(49.6)	2.02	0.156
Positive	0(0.0)	2(100.0)		

Source: Primary source

The study finds that there were two (2) new HIV infections among controls (non-enrolled) group while there is no new HIV infection among cases (enrolled) group. This explains that being in a follow up program; prevent the new HIV transmission among sero-discordant couples as shown in table 2.

3.3 Clinical and lifestyle services between sero-discordant couples enrolled (cases) and non-enrolled (controls) in a follow up program

Table 3 shows the bivariate analysis of service delivery including clinical and lifestyle between sero-discordant couples enrolled (cases) and non-enrolled (controls) in a follow up program.

Table 3: Bivariate analysis of the follow up program and predisposing factors of sero-status of HIV among cases and controls

Variable	Total, n(%)	Cases, n(%)	Controls, n(%)	COR	95%CI		p value
					Lower	Upper	
HIV Positive partner under ART							
Yes	271(98.9)	135(49.8)	136(50.2)	Ref			
No	3(1.1)	2(66.7)	1(33.3)	2.02	0.18	22.48	0.569
Missed ART in the last three months							
Yes	37(13.5)	14(37.8)	23(62.2)	Ref			
No	237(86.5)	123(51.9)	114(48.1)	1.77	0.87	3.61	0.115
Last viral load results							
<20 (Suppressed)	260(94.9)	134(51.5)	126(48.5)	3.90	1.06	14.30	**0.040**
>20-100 (Moderate/high)	14(5.10)	3(21.4)	8(78.6)	Ref			
Ever had unprotected sex in the last 3 months							
Yes	29(10.6)	11(37.9)	18(62.1)	Ref			
No	245(89.4)	126(51.4)	119(48.6)	1.73	0.79	3.82	0.173
Ever had unprotected sex in the last month							
Yes	25(9.1)	8(32)	17(68)	Ref			
No	249(90.9)	129(51.8)	120(48.2)	2.28	0.95	5.49	0.065
Have condoms at home							
Yes	176(64.2)	104(59.1)	72(40.9)	2.85	1.70	4.76	**<0.001**
No	98(35.8)	33(33.7)	65(66.3)	Ref			
Have Intimate partner sex violence in the past 3 months							
Yes	13(4.7)	5(38.5)	8(61.5)	Ref			
No	261(95.3)	132(50.6)	129(49.4)	1.64	0.52	5.14	0.398
Number of sex violence in the past 3 months							
None	262(95.6)	133(50.8)	129(49.2)	2.06	0.19	23.02	0.557
One	9(3.3)	3(33.3)	6(66.7)	1.00	0.06	15.99	1.000
Two	3(1.1)	1(33.3)	2(66.7)	Ref			
Ever had Alcohol abuse in past 3 months							
Yes	36(13.1)	13(36.1)	23(63.9)	Ref			
No	238(86.9)	124(52.1)	114(47.9)	1.92	0.93	3.98	0.077

COR=Crude Odds Ratio; CI= Confidence Interval

Viral load results was significantly different between cases and controls where the proportion of high/moderate viral load was statistically significantly more among controls compared to cases [COR=3.90; 95%CI=10.6-14.30; p value=0.040]. Having condom at home was also significantly different between the groups where it was significantly higher among cases than controls [COR=2.85; 95%CI=1.70-4.76; p value <0.001]. The proposition of alcohol consumption was more among the controls compared to the cases but it was marginally significantly [COR=1.92; 95%CI=0.93-3.98; p value= 0.077] as demonstrated in Table 4.3.

3.4 Family planning uptake between sero-discordant couples enrolled (cases) and non-enrolled (controls) in a follow up program

Table 4.4 shows the bivariate analysis of family planning uptake between sero-discordant couple's enrolled (cases) and non-enrolled (controls) in a follow up program.

Table 4: Bivariate analysis of the follow up program and predisposing factors of sero-status of HIV among cases and controls

Variable	Total, n(%)	Cases, n(%)	Controls, n(%)	COR	95%CI		p value
	n=274	n=137	n=137		Lower	Upper	
Have biological children together							
Yes	267(97.4)	132(49.4)	135(50.6)	Ref			
No	7(2.6)	5(71.4)	2(28.6)	2.56	0.49	13.41	0.267
Number of children born after HIV discordant							
None	11(4)	7(63.6)	4(36.4)	1.75	0.45	6.80	0.419
One	28(10.2)	14(50)	14(50)	1.00	0.39	2.56	1.000
Two	88(32.1)	40(45.5)	48(54.5)	0.83	0.41	1.70	0.617
Three	101(36.9)	53(52.5)	48(47.5)	1.10	0.55	2.22	0.781
Four and above	46(16.8)	23(50.0)	23(50.0)	Ref			
Have intension of kids							
Yes	34(12.4)	10(7.2)	24(17.5)	Ref			
No	240(87.6)	127(92.2)	113(82.5)	2.70	1.24	5.88	**0.013**
Use of condom							
Yes	210(76.6)	113(53.8)	97(46.2)	1.94	1.09	3.45	**0.024**
No	64(23.4)	24(37.5)	40(62.5)	Ref			
Family planning methods currently using							
Jadelle	146(53.3)	70(47.9)	76(52.1)	1.26	0.64	2.48	0.501
Implanon	58(21.2)	32(55.2)	26(44.8)	1.68	0.77	3.70	0.194
Injectable	20(7.3)	12(60)	8(40)	2.05	0.70	6.00	0.189
Others	5(1.8)	4(80.0)	1(20.0%)	5.47	0.57	52.97	0.142
None	45(16.4)	19(42.2)	26(57.8)	Ref			

COR=Crude Odds Ratio; CI= Confidence Interval

As indicated in Table 4.4, having intention for children was significantly higher among controls compared to cases [COR=2.70; 95%CI=1.24-5.88; p value =0.013]. However, having condom at home was significantly more among cases than controls [COR=1.94; 95%CI=1.09-3.45; p value= 0.024].

3.5 Multivariate analysis of being in the follow up program and other predisposing factors

Multiple logistic regression analysis was performed in order to identify the independent clinical and health service factors and family planning factors associated with a follow up program. All variables with p value less than 1% during bivariate analysis were considered together in the multivariable logistic regression. Six factors include: (1) have condoms, (2) have intention for children, and (3) use of condoms. (4) Ever had unprotected sex in the last month (5) Ever had Alcohol and (6) Viral Load Results. Upon fitting these factors using binary logistic regression

and specifying 'backward conditional' method with removal at P<0.05, two variables remained significantly associated with being in the follow up program.

Table 4.5: Multivariate analysis of being in the follow up program and other predisposing

Variables	AOR	95%CI		p value
		Lower	Upper	
Full model				
Last Viral Load Results				
<20 (Suppressed)	3.08	0.80	11.92	0.103
>20-100 (Moderate/high)	Ref			
Ever had unprotected sex in the last month				
Yes	Ref			
No	1.11	0.37	3.30	0.849
Have condoms at home				
Yes	2.49	1.45	4.29	**0.001**
No	Ref			
Ever had Alcohol abuse in past 3 months				
Yes	Ref			
No	1.03	0.42	2.53	0.956
Have intension of kids				
Yes	Ref			
No	2.28	0.97	5.35	0.059
Use of condom				
Yes	1.14	0.58	2.28	0.702
No	Ref			
Reduced model				
Have condoms at home				
Yes	2.72	1.62	4.58	**<0.001**
No	Ref			
Have intension of kids				
Yes	Ref			
No	2.42	1.09	5.38	**0.031**

AOR=Adjusted Odds Ratio; CI= Confidence Interval

Having condom at home was about 3 times more likely among study participants enrolled (cases) in the follow up program than controls [AOR=2.72; 95%CI=1.62-4.58; p value <0.001]. However, having intention for children was 2.42 times more likely among controls who were not enrolled in the follow up program compared to cases [COR=2.42; 95%CI=1.09-5.38; p value =0.031].

3.6 Discussion

The current study finds that there are two (2) new HIV infections among controls (non-enrolled) group while there is no new HIV infection among cases (enrolled) group. This explains that being in a follow up program; prevent the new HIV transmission among sero-discordant couples. In line with the study done in Ethiopia, entitled assessment of HIV discordance and associated risk factors among couples receiving HIV test in Dilla, Ethiopia, found that among 152 couples (304 individuals) who received VCT, HIV sero-prevalence in this study was 3.6% (11/304) [6].

The prevalence of HIV infection in females is 5.3%, more than twice than in males 2.0%. Among all participants, 9 (3.0%) were found to be sero-discordant, 2 (0.7%) concordant

positive and 293 (96.4%) concordant negative. Of all couples 9 (5.9%) were found to be sero-discordant, 2 (1.3%) concordant positive and 141 (92.8%) concordant negative. Of the 9 sero-discordant couples, the 4.6% (7/XX) prevalence in females was higher than 1.3% (2/XX) among males. And, among the 9 discordant couples, 5 were premarital sex partner and the remaining 4 were married couples [6].

The present study findings are in line with that of the study done by Yang et al. (2015) in China, entitled Five-year follow-up observation of HIV prevalence in serodiscordant couples, found that at baseline, HIV transmission had occurred in 505 out of 1258 couples and the annual rate of HIV transmission was 6.3% in the absence of an intervention (40.14% after HIV exposure for 6.4 years). Five out of the 753 discordant couples were found to have seroconverted during the 5-year follow-up observation after the implementation of interventions [13].

The present study shows bivariate analysis of service delivery among sero-discordant couples's enrolled (cases) and non-enrolled (control) in a follow up program. Out of 137 cases, 104(59.1%) have condoms compared to 72(40.9%) of controls; out of 137 cases, 10(29.4%) have pregnancy intention compared to 24(70.6%) of controls; out of 113(53.8%) used condoms compared to 97(46.2%) of controls.

The study participants enrolled (cases) in the follow up program were about three times more likely to have condoms at home (AOR=2.72; 95%CI: 1.62-4.58; P=<0.001) compared to those non-enrolled (controls). Serodiscordant couples who are enrolled (cases) in the follow up program intended to have pregnancy 0.4 times less likely (AOR=0.41; 95%CI: 0.19-0.92; P=<0.031) compared to those who are not enrolled (controls).

In contrast with the study done in Ethiopia entitled assessment of HIV discordance and associated risk factors among couples receiving HIV test in Dilla, Ethiopia found that premarital couples were significantly more likely to be discordant than married couples, AOR = 1.68; 95%CI (1.36- 5.40). HIV discordance was also significantly associated with having two or more sexual partners, as compared to just one (AOR = 4.06; 95%; CI:2.41-10.13) [6].

The present study is in line with that conducted by Kumarasamy et al. (2010) entitled exploring risk factors for HIV transmission among heterosexual discordant couples in South India and finds that patients in seroconverting relationships were less likely to use condoms with their primary partners than patients in discordant relationships (P < 0.05). Patients in relationships that seroconverted between 6 and 12 months were diagnosed more often with genital Herpes simplex than patients in discordant relationships (P50.001) [14].

In the univariate and multivariate logistic regression, the following variables were associated with seroconversion: PVL 4100 000 [odds ratio (OR): 1.82; 95% confidence interval (CI): 1.1–2.8], non-disclosure of HIV status (OR: 5.5; 95% CI: 4.3–6.2) and not using condoms (OR: 2.8; 95% CI: 2.4–3.6) [14].

In line also with the study done in China entitled five-year follow-up observation of HIV prevalence in serodiscordant couples found that factors independently associated with HIV seroconversion included an HIV viral load > 1000 copies/ml (odds ratio (OR) 18.706, 95% confidence interval (CI) 1.577– 221.926), the index partner being on antiretroviral therapy (OR

0.019, 95% CI 0.002–0.180), and condom use in the past 6 months (OR 0.194, 95% CI 0.021–0.795) [13].

In line with the study done in Uganda entitled effect of couples counseling on reported HIV risk behavior among HIV Serodiscordant Couples by ART Use, HIV Status and Gender in Rural Uganda found the reported condom use at last sex with spouse increased over time ($p<0.001$) with the largest increases found among couples where the positive participant never received ART during the study (an increase from 68.8% at enrollment to 97.1% at 24 months). Male participants reported reductions in the number of concurrent sexual partners ($p<0.001$), increase in the knowledge of the HIV serostatus of these partners ($p = 0.001$) and a trend towards improved condom-use among non-primary partners ($p = 0.070$). Reported reduced risky behaviors did not wane over the study period [15].

6. Conclusion and recommendations

After analyzing and interpreting the results from this study, the researcher would like to conclude that the main objectives of this study were achieved in terms of comparing HIV infection among serodiscordant couples enrolled in a follow-up program (cases) and non-enrolled (controls) and establish factors associated with HIV infection among serodiscodant couples. Although this study shows that there is an increased effect of being in follow up program for HIV prevention among sero-discordant couples. The study however highlights the need for the Ministry of Health and other concerned stakeholders to promote discordant couples to be enrolled in the follow up program by having condoms, not having pregnancy intention and use condoms while having sex with their partner.

Based on findings of the study, the following recommendations were suggested: The Government has a critical role in ensuring the provision of condoms to all serodiscordent couples to increase the HIV prevention to those who are HIV negative. There is a need of ongoing health education to reduce pregnancy intention to HIV discordant couples. Government of Rwanda through Rwanda Biomedical Centre should promote condom use among serodicordant couples in order to reduce level of HIV infection among sero-discordant couples. Serodiscordant couples need to be enrolled in the follow up program as this should give them access to have condoms, reduce pregnancy intention and through health education conducted at the site of follow up, they could gain the benefits of using condoms. Serodiscordant couples should be educated on the appropriate use of condoms as this will reduce HIV infection to those who will not be HIV positive.

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