

# Factors Associated With Pregnancy Occurrence Among Known HIV Positive Women In Rangwe Sub-County, Homa Bay County, Kenya

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**Abstract**— Globally, the proportions of women of reproductive age living with HIV vary between regions, with significantly higher proportions in sub-Saharan Africa. The scale-up of multiple-drug antiretroviral therapy in Africa has changed childbearing dynamics for HIV-positive women, with an impact on pregnancy incidence, although there is little understanding of the factors associated with pregnancy incidence among these women. This descriptive cross-sectional study investigated the incidence of pregnancy among HIV positive women in Rangwe Sub-County, and identified the associated personal, medical and community factors, using semi-structured questionnaires administered to 244 women on antiretroviral therapy. Quantitative data was analyzed using descriptive statistics and logistic regression using SPSS v.23 ( $\alpha=0.05$ ), while qualitative data was subjected to thematic analysis. Over 95% of the women had conceived after being diagnosed HIV positive. Age, marital status and CD4 cell count were significantly associated with pregnancy incidence ( $p<0.05$ ). Partner consent ( $p=0.034$ ), and partner HIV serostatus ( $p=0.005$ ) were significantly associated with pregnancy, unlike partner support, partner awareness of participant's status, defaulting from ARVs, and community or family acceptance of childbearing ( $p>0.05$ ). Women with undetectable viral load (HIV RNA  $<50$  copies/mL) were 2.7 times more likely to get pregnant compared to women with detectable viral load (OR=2.71; 95%CI=1.8-3.22;  $p=0.028$ ). The Ministry of Health and relevant stakeholders should improve on the strategies to enhance viral load and CD4 cell count monitoring, HIV status disclosure between sexual partners, and adoption of strategies that promote male partner support to women to get pregnant, and to use family planning methods of choice.

**Index Terms**— HIV, RNA .

## I. INTRODUCTION

Globally, there are regional variations in the proportions of women of reproductive age living with HIV, significantly higher proportions being in sub-Saharan Africa [1]. It is known that HIV/AIDS impacts significantly on pregnant women [2, 3], with varying effects between different settings [4]. Increased availability and coverage of antiretroviral (ARV) in sub-Saharan Africa has prolonged the lives of people living with HIV, and enabled those who wish to have

children to do so, yet, reproductive health services and discourse in the context of HIV have centered almost exclusively on pregnancy prevention [5, 6]. In Nigeria, a study found that up to 55% of women receiving ARV therapy had future fertility intentions, those with regular partners (married or cohabiting) showing a significantly higher rate of unintended pregnancy than those with unstable partners [7].

Women living with HIV are potentially at increased risk of adverse pregnancy outcomes, possibly due to different factors, notably immunosuppression and use of combination antiretroviral therapy [8, 9]. A study in Northern Vietnam showed that once pregnant, the decision by HIV positive women to either continue or terminate their pregnancies is equally guided by everyday social relations, especially engagements with spouses, parents, siblings, and in-laws [10].

Many factors have been attributed to pregnancy incidence among HIV infected women in western Kenya, including living together with a husband, age, discussing family planning (FP) with a partner, and prior use of FP [6, 11]. The desire to have a desired number of children, religious leaders, family and the broader community have been seen as reinforcing cultural expectations for married women to have children. This study investigated the factors that drive the incidence of pregnancy among women already diagnosed with HIV in Homa Bay County.

## II. METHODS

### A. Study design

This study adopted a mixed-methods approach, using both qualitative and quantitative methods, as well as retrospective patient data retrieval.

### A. Study area

Rangwe is one of the 8 sub counties of Homa Bay County, with a population of 121,041 people (female = 62,284; 51%) spread across 28 community units, 359 villages and 24,452 households, linked by 280 CHVs to the 28 health facilities in the sub-county: 18 GoK, 5 FBO, 5 private. The 5 with high-volume CCCs were Rangwe Sub-County Hospital, Ndiru Health Center (HC), Nyagoro HC, Ngegu Dispensary and Asumbi Mission Hospital. Homa Bay County HIV prevalence (20.7%) is nearly 4.5 times higher than the national prevalence (4.9%), and about 17.5% of pregnant women are HIV positive. Rangwe contributes about 11% of

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the total population of people living with HIV in Homa Bay County. Women of reproductive age in Rangwe Sub County is 29840 while elimination of MTCT (eMTCT) need for the sub-county is 943 with an e-MTCT rate of 1.7%. New HIV positive were 649 while known HIV positive at first ANC visit were 550 (DHIS and NASCOP dashboard, 2019).

## B. Target population

All women (1200) of reproductive age enrolled on ART and care within Rangwe Sub-County.

## C. Sample size determination

Cochran formula was used to calculate the sample size for this study:

$$n = \frac{z^2 (p q)}{e^2}$$

Where: z is the critical value at 95%CI (1.96); e = margin of error; 0.05; p = estimated proportion of the HIV positive women who were pregnant (17.5%); q = 1-p

$$n = (1.96^2 * 0.175 * 0.825) / 0.05^2 = 222$$

Adding 10% (22) to adjust for non-response, **n = 244**

## D. Sampling procedure

Purposive sampling was done following clustering by CCC volume where the top-5 high-volume CCCs were selected. Briefly, on a daily basis, the study team approached each prospective participant, after identifying them from the CCC and ANC registers, sought consent and proceeded to interview them individually concurrently at each of the 5 facilities, to proportionately attain the sample (Table 1).

**Table 1. Sample distribution by facility**

Facility	Capacity (%)	Sample
Rangwe SCH	50	130
Ndiru HC	20	54
Nyagoro HC	10	20
Asumbi MH	10	20
Ngegu Disp	10	20
<b>Total</b>	<b>100</b>	<b>244</b>

**Note: Capacity (%) is based on CCC volume**

## E. Inclusion and exclusion criteria

Included were WRA on ART within Rangwe Sub-County who consented to participate, while the non-consenting WRA on ART, or WRA on ART who were physically too sick to answer the questions, or were mentally challenged, were excluded.

## F. Data collection

Data was collected using a questionnaire and retrieval of patient medication records.

## G. Data analysis

Data focused on the demographic, behavioral, and psychosocial measures. Quantitative data was analyzed using descriptive statistics, and logistic regression, while thematic analysis was done for qualitative data.

## H. Ethical considerations

Approval was obtained from the Board Postgraduate Studies (JOOUST), JOOTRH Research Ethics Committee (Protocol No. IERC/JOOTRH/261/20), and NACOSTI (NACOSTI/P/20/5998). Permission to use anonymized data was got from the Ministry of Health, Homa Bay County. A written informed consent was obtained from each prospective participant prior to enrolment, and confidentiality of all information kept throughout the study.

## III. RESULTS

### A. Respondent characteristics

This cross-sectional study involved 244 women enrolled on treatment and care for HIV within Rangwe Sub-County, in Homa Bay County, western Kenya. The respondents were distributed across 150 villages, in which they had resided for varied durations spanning 3 months to 35 years, with 230 (94.26%) having lived there for at least one year (mean = 11.47 years); 179 (77.83%) had lived there for at least 5 years. The respondents were aged 18-48 (mean=31.12) years, with 198 (80.49%) being aged 18-35 (mean=28.84) years. Only 13 (6.34%) husbands to the married respondents were formally employed; 36 (17.56%) were in informal employment, 106 (51.71%) were self-employed, while 44 (21.46%) were unemployed. The monthly earnings of the households reflected the employment status, with 112 (55.45%) earning below 5,000/, while a huge proportion (30.69%) earned between KSh. 5,000/ - 10,000/; only 2 (0.99%) earned more than KSh. 40,000/.

### B. Person related factors associated with pregnancy status after HIV positive diagnosis

From Table 1, 147 (60.2%) of the 244 women were aged 21-30 years, 189 (77.5%) were married, 174 (71.3%) had reached primary education, 166 (71.6%) had less than two children, and 96 (33.2%) were unemployed. Among the 244 women, 80 (32.8%) had pre-treatment CD4 count <350 cells/mm<sup>3</sup> at enrollment [only 9 (3.69%) had CD4 < 200 cells/mm<sup>3</sup>]. Up to 81(33.9%) respondents had lived more than eight years since HIV diagnosis.

Age, marital status, residence and CD4 cells count were significantly associated with a pregnancy after HIV positive diagnosis ( $p < 0.05$ ). Education level, employment status, period since HIV diagnosis and monthly income were not significantly associated with a pregnancy after HIV positive diagnosis ( $p > 0.05$ ). On the other hand, HIV RNA level (viral load) and timing of ART initiation were independently associated with pregnancy incidence. Failure to achieve viral suppression (HIV RNA <50 copies/mL) was primarily associated with late registration for antenatal care (OR= 1.98; 95% CI =1.2-2.63;  $p = 0.019$ ) and late initiation of ART (OR= 2.56; 95% CI =1.9-3.7;  $p = 0.003$ ). Women with undetectable viral load (HIV RNA < 50 copies/mL) were 2.7 times more likely to get pregnant compared to women with detectable viral load (OR= 2.71; 95% CI =1.8-3.22;  $p = 0.028$ ).

**Table 2: Person related factors associated with pregnancy status after HIV diagnosis**

	Total (n = 244) n(%)	Pregnant after HIV positive diagnosis; n(%)		P value
		No, n=25(10.2) n(%)	Yes, n= 219(89.8) n(%)	
<b>Age (years)</b>				<b>0.001</b>
15-20	36(14.9)	3(8.3)	33(91.7)	
21-30	147(60.7)	8(5.4)	139(94.6)	
30-39	52(21.5)	12(23.1)	40(76.9)	
40-49	7(2.9)	2(28.6)	5(71.4)	
<b>Marital Status</b>				<b>0.018</b>
Married	189(77.5)	16(8.5)	173(91.5)	
Widowed	38(15.6)	9(23.7)	29(76.3)	
Divorced	4(1.6)	0	4(100)	
Single	13(5.3)	0	13(100)	
<b>Education Level</b>				0.380
Primary	174(71.3)	19(10.9)	155(89.1)	
Secondary	53(21.7)	3(5.7)	50(94.3)	
Post-Secondary	15(6.1)	3(20)	12(8)	
None	2(0.8)	0	2(100)	
<b>Employment Status</b>				0.532
Unemployed	96(40.3)	12(12.5)	84(87.5)	
Self employed	114(47.9)	9(7.9)	105(92.1)	
Informal	18(7.6)	2(11.1)	16(88.9)	
Formal	10(4.2)	2(20.0)	8(80.0)	
<b>Monthly income (KSh)</b>				0.239
<5000	182(80.9)	16(8.8)	166(91.2)	
5000-10000	35(15.6)	6(17.1)	29(82.9)	
10001-20000	4(1.8)	0(0.0)	4(100.0)	
20001-40000	4(1.8)	1(25.0)	3(75.0)	
> 40000	0	0	0	
<b>Time since HIV positive diagnosis (years)</b>				0.891
0-4	80(33.5)	9(11.3)	71(88.8)	
5-8	78(32.6)	7(9)	78(91.0)	
>8	81(33.9)	8(9.9)	73(90.1)	
<b>CD4 (cells/mm<sup>3</sup> blood)</b>				<b>0.044</b>
<350	80(45.7)	15(18.8)	65(81.3)	
>350	95(54.3)	8(8.4)	87(91.6)	
>200	26(10.7)	2(7.7)	24(92.7)	
<b>No of children at HIV+ diagnosis</b>				0.084
0-2 children	166(71.6)	20(12.0)	146(88.0)	
3-5 children	66(28.4)	3(4.5)	63(95.5)	

**C. Community related factors associated with pregnancy among HIV positive women**

Majority of respondents (184; 86.8%) stated that their partners agreed with them becoming pregnant despite their HIV positive status. Partner consent (p=0.034) and community attitude towards HIV positive women who became pregnant (p=0.045) were significantly associated with pregnancy after HIV positive diagnosis, while partner support and community or family acceptance of childbearing were not (p>0.05). Majority of respondents (196; 81%) had not interacted with TBA nor received support (177; 74.1%) from local CBO/CHW towards their pregnancy while HIV positive (Table 2).

**Table 3: Community factors associated with pregnancy after HIV positive diagnosis**

Factor	Total [n=244] n(%)	Pregnant after HIV positive diagnosis; n(%)		P- Value
		No, n=25(10.2) n(%)	Yes, n=219(89.8) n(%)	
<b>Partner agrees with HIV positive respondent becoming pregnant</b>				<b>0.034</b>
No	28(13.2)	4(14.3)	24(85.7)	
Yes	184(86.8)	8(4.3)	176(95.7)	
<b>Partner offers support to HIV positive respondent when pregnant</b>				0.19
No	31(15.4)	3(9.7)	28(90.3)	
Yes	170(84.6)	7(4.1)	163(95.9)	
<b>Community accepts childbearing among HIV positive women</b>				0.209
No	39(16.9)	2(5.1)	37(94.9)	
Yes	192(83.1)	23(12)	169(88)	

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<b>Community offers support to HIV positive women who become pregnant</b>				0.69
No	154(63.6)	15(9.7)	139(90.3)	
Yes	88(36.4)	10(11.4)	78(83.6)	
<b>Attitude of community towards HIV positive women who become pregnant</b>				<b>0.045</b>
Positive	87(36)	14(16.1)	73(83.9)	
Negative	48(19.8)	2(4.2)	46(95.8)	
Can't tell	107(44.2)	8(7.5)	99(92.5)	
<b>Interacted with TBA concerning her pregnancy while HIV positive</b>				0.16
No	196(81)	22(11.2)	174(88.8)	
Yes	46(19)	2(4.3)	44(95.7)	
<b>Has been assisted to deliver a baby by a TBA since testing HIV positive</b>				0.797
No	221(90.6)	23(10.4)	198(89.6)	
Yes	23(9.4)	2(8.7)	21(91.3)	
<b>Has received support from local CBO/CHW towards pregnancy when HIV positive</b>				0.912
No	177(74.1)	18(10.2)	159(89.8)	
Yes	62(25.9)	6(9.7)	56(90.3)	

**Partner consent to pregnancy after HIV positive diagnosis**

Respondents who acknowledged that their partners agreed with them becoming pregnant after HIV positive diagnosis cited the desire to have more children, HIV concordance, lack of family planning, awareness of measures that prevent vertical transmission, and duration of marriage, as among the major reasons for allowing a pregnancy. Some views were as below:

*"We have agreed to have 5 children and I have not achieved"*

*"We are newly married so he advised me to get pregnant besides my status"*

*"He doesn't want the use of family planning"*

*"Because he is enlightened and he believes that the ARVs are able to protect the baby from vertical transmission"*

*"Because the first baby turned negative therefore, he believes the rest can also turn negative"*

The respondents who reported that their partners did not agree with them becoming pregnant after HIV positive diagnosis mentioned unplanned pregnancies, low socioeconomic status, fear of the child turning HIV positive, as among the major reasons for their lack of agreement as illustrated by their views below:

*"The pregnancies are unplanned, he doesn't like"*

*"He has another family and just inherited me to fulfil culture"*

*"Inability to raise a large number of children due to low socio-economic status"*

*"Fear of children being HIV positive"*

**Community attitude towards HIV positive women who become pregnant**

The respondents viewed the community attitude towards HIV positive women becoming pregnant as positive (88; 36.21%), negative (47; 19.34%), or could not tell (108; 44.44%). Majority of respondents who mentioned positive attitude cited the acceptance of HIV as a normal disease, lack of discrimination, more informed medical care, and most children born to HIV positive mothers being HIV negative, as major reasons, as illustrated by the quotes below:

*"They just take those who have the virus as normal as those who don't"*

*"I have not seen them discriminating positive women as it was there before"*

*"I have been living here and got many children while HIV positive and I have not seen any bad attitude"*

*"Because of available medical facilities and increased knowledge on HIV"*

*"Because most children still turn negative therefore most of them are positive about it"*

The respondents who felt the community had negative attitude towards HIV positive women who become pregnant mentioned discrimination, stigma, belief that the child will turn positive or die of the virus, and linkage to prostitution. Some of the respondents stated:

*"The community always stigmatize people on care"*

*"At times they discriminate me, some talk negatively about my children"*

*"They believe that once you are pregnant and HIV positive you acquired it through prostitution"*

*"They think the child will be born with the virus"*

*"The people in the village back-bite HIV positive people"*

On the other hand, the respondents who were unable to tell the general attitude of the community on women becoming pregnant stated several reasons, but the main one was just because the women had not encountered any reactions, as directly expressed by them:

*"Have not heard anyone talking about it"*

*"Each and everyone has different take on HIV so there are those who can take it positive other negative so its difficult to tell"*

*"They don't always concern about my status because they treat everyone equal despite status"*

*"They don't care"*

*"Many HIV positive don't tell the community; it is only hospital which knows the status"*

The respondents who reported having received TBA assistance in their deliveries since being diagnosed HIV positive provided varying reasons for TBA assistance, including delivery before the expected date of delivery (EDD), distance to the health facility, and logistical challenges involving transportation and time of delivery, like where a delivery happened at night, and a woman found it difficult reaching a health facility, particularly those who lacked someone to accompany them. However, a respondent

reported not going to the hospital after she was advised by a TBA:

*“TBA told me since I got pregnant when taking herbs, I also deliver at her home. She took me to the hospital after one day to collect ARVs”*

The respondents who acknowledged having received support from a local community-based agency or community health worker (CHW) towards her pregnancy while HIV positive reported different forms of support from CHVs, but the predominant were provision of drugs, adherence counselling (87.83%), education on ANC (71.25%) and PMTCT (76.89%). There were also reminders by the CHVs to the respondents to take their drugs, support with NHIF registration, and donation of clothing and foodstuff by CBOs, among others, as illustrated by one respondent’s sentiments:

*“I got health education, and beans and maize seeds for agriculture from One Acre Fund”*

#### D. Medical factors associated with pregnancy after HIV positive diagnosis

While 162 (75.7%) respondents knew their partners were HIV negative, and 38 (17.8%) were HIV positive, a small yet important number of 14(6.5%) did not know their partners’ HIV status. Conversely, 202 (94.4%) respondents stated their partners were aware they were HIV positive, 4 (1.9%) partners were unaware, while 8 (3.7%) did not know.

Up to 214 (91.45%) of 234 respondents (who reacted) stated they had become pregnant since being diagnosed HIV positive, of which only 66.97% had been planned. For those who planned to have the children, the condom, injection (*Depo provera*®), pills, implants, tubal ligation and safe days, were all variably used, with many expressing concomitant use of more than one, notably the combination of condom and implants, or condoms and injection (*Depo provera*®). This was also done to prevent HIV transmission, as reflected in the sentiments by different respondents, as below:

*“Since my husband is not on drugs he uses prep, and whenever we want to have a child, we usually go to the hospital for measures to take to protect him”*

*“We make sure that we are virally suppressed is when we go ahead and look for the child”*

Only 168 (68.85%) respondents declared whether their partners knew they were using a family planning method; 124 (73.81%) were aware, 24 (14.29%) were not, while the remaining 20 (11.90%) did not know whether or not the partners were aware. Only 130 (77.38%) of the 168 reacted to whether the partners approved of their use of the methods; 116 (89.23%) were supported, 13 (10.0%) were not, while 1 (0.77%) could not tell whether the partners approved their use of the methods or not. The reasons given by those whose partners did not support their use of FP methods ranged from medical, to personal to social factors, some of which were as stated below:

*“He wants me to have more children so he doesn't want me to use family planning”*

*“He is very arrogant and doesn't like the idea of using family planning”*

*“He just wants us to have many children since he is the only child in his family”*

*“He might quarrel because he says family planning destroys women’s womb”*

*“He says family planning spoils sex enjoyment and makes me bleed a lot”*

Male partner’s HIV serostatus was significantly associated with pregnancy after HIV positive diagnosis ( $p=0.005$ ). However, male partner’s awareness of study participant’s HIV serostatus and defaulting from ARVS were not significantly associated with pregnancy after HIV positive diagnosis ( $p>0.05$ ). Up to 175 (72.26%) of responding 242 respondents said they had never defaulted. Only 23 (34.85%) of the 66 who reported having defaulted had done so while pregnant (Table 4).

**Table 4: Medical factors associated with pregnancy after HIV positive diagnosis**

	Total n=244(%)	Pregnant after HIV positive diagnosis		P- value
		No, n=25 (10.2%)	Yes, n=219(89.8%)	
<b>If partner is HIV positive</b>	<b>n(%)</b>	<b>n(%)</b>	<b>n(%)</b>	<b>0.005</b>
Yes	162(76.1)	5(3.1)	157(96.9)	
No	38(17.8)	2(5.3)	36(94.7)	
Didn't know	14(6.5)	3(23.1)	10(76.9)	
<b>Partner aware she is HIV positive</b>				0.532
Yes	202(94.8)	9(4.5)	193(95.5)	
No	3(1.4)	0(0.0)	3(100)	
I don't know	8(3.8)	1(12.5)	7(87.5)	
<b>Has ever defaulted on ARV medication</b>				0.186
Never	175(72.6)	22(12.6)	153(87.4)	
Rarely	64(26.6)	3(4.7)	61(95.3)	
Often	2(0.8)	0(0.0)	2(100)	
<b>Has ever defaulted during pregnancy</b>				0.162
No	88(79.3)	7(8.0)	81(92.0)	
Yes	23(20.7)	0(0.0)	23(100)	

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The reasons for defaulting on medication ranged from side effects, forgetting, stigma, and other related reasons, as illustrated by respondents' sentiments below:

“Due to feeling dizzy and not keeping time”  
 “Forgetting, feeling tired of taking the drug”  
 “Forgot to carry my pills when travelling”  
 “If time of taking the drugs has reached and I'm with others, I feel shy and stigmatized, so I prefer to leave. Also, drug burden, side effects, plus pregnancy are difficult to bear”  
 “When my husband died and I was hiding from my new partner, I was already pregnant but did not know that”  
 “When my medicines were over during health workers' strike and I had a funeral of my child”

Up to 86.27% of the respondents reported having received similar quality of services before and after being diagnosed HIV positive. However, the respondents identified certain differences in the way they were handled, most of which were intended to ensure the safety of the mother and baby, upon being diagnosed HIV positive. Some of the most mentioned differences are as captured in the statements that follow:

“After being HIV positive I was taught very many ways which can make my child to be safe but before I wasn't cared for too much”  
 “Clinic dates were close and when negative I was told to come only 4 times”  
 “I have been getting more appointment when I am positive than when I was negative”  
 “I visited the hospital immediately I got pregnant which I didn't do when I was HIV negative”

“I was closely monitored by doctors and sometimes called on phone for some services which has never happen while HIV negative”

“Number of visits to clinic are more, nurses take long time talking to you and advising you more when HIV positive”

All (100%) respondents agreed that as a pregnant HIV positive woman, it was easy to access the MHC services at the hospital, and 95.3% concurred that ARV use made their pregnancy safe, the predominant justification offered being that most children were protected from HIV infection when the mothers used ARVs during pregnancy. Of 227 respondents, 105 (46.26%) said their religions supported FP use, 81(36.68%) said it did not, while the remaining 41 (18.06%) did not know.

### E. Logistic regression analysis of factors associated with pregnancy after HIV diagnosis

Knowledge of partner's HIV status was identified as an independent predictor of pregnancy after HIV positive diagnosis among the women (Table 5). The odds of pregnancy after HIV-positive diagnosis decreased 90%-98% among women who did not know their partner's HIV status (univariate; OR 0.10, 95% CI 0.02–0.50; multivariate; OR 0.02, 95% CI 0.001–0.35). In univariate analysis, the odds of pregnancy after HIV-positive diagnosis decreased 71% among widowed women. (OR 0.29, 95% CI 0.12–0.73) compared to married women. However, women with a higher CD4 count (>350) were 2.5 times more likely to have had a pregnancy after HIV-positive diagnosis (univariate; OR 2.5, 95% CI 1.0–6.27) compared to those with a lower CD4 count.

**Table 5: Logistic regression of predictors of pregnancy after HIV positive diagnosis**

	Univariate		Multivariate	
	OR (95%CI)	P value	OR (95%CI)	P value
<b>Marital status</b>				
Married	Ref			
Widowed	0.29(0.12-0.73)	<b>0.009</b>	3.42(0.20-58.21)	0.85
Divorced	1 (empty)		1 (empty)	
Single	1(empty)		1(empty)	
<b>Pre -treatment CD4</b>				
CD4 <350	Ref			
CD4 >350	2.5(1.0-6.27)	<b>0.049</b>	2.3(0.46-11.3)	0.304
<b>Knowledge of partner's HIV status</b>				
Yes	Ref			
No	0.57(0.1-3.07)	0.516	0.61(0.06-5.84)	0.67
Didn't know	0.10(0.02-0.50)	<b>0.005</b>	0.02(0.001-0.35)	<b>0.006</b>

#### IV. DISCUSSION

This study involved 244 women living with HIV and enrolled on care within Rangwe Sub-county, located within the vast Homa Bay County, which is among the HIV high-burden areas in Kenya [12]. The respondents had resided for varied durations spanning between 3 months to 35 years, and majority had resided in the area for at least one year. They thus adequately represented the general population in terms of spatial distribution and duration lived in the area. That majority of the respondents were aged below 35 years reflected a huge proportion of sexually active and reproductive age, also identified as where HIV has significant effect [8, 13]. In a similar fashion, a study among HIV positive men in Uganda reported that younger men had higher probability of partner pregnancy [14].

The study community generally had a weak economic power, with both respondents and their partners exhibiting just about 15% formal employment, and more than 50% earning less than KSh. 5,000/ monthly. This was generally consistent with the low literacy among the respondents, as close to 75% had only attained primary education. This therefore is a key factor in this study, since economic power has been demonstrated to influence health seeking behaviour, including the choices made in reproductive health [4, 8, 15-17].

Over 75% of the respondents were married, tying in well with the age range of the participants, with majority having two or less children at the time HIV diagnosis. This, however, changed with time, and the respondents had had more children by the time of this study, the numbers influenced by various factors as have been reported from different study settings [2, 7, 18]. Nearly a half of the respondents had low pre-treatment CD4 count ( $< 350$  cells/mm<sup>3</sup>) at enrollment, and at least 30% had lived for more than eight years since they were diagnosed with HIV. These two attributes have previously been reported to individually or collectively affect the management of HIV, including adherence, and consequent viral load [2, 19]. Logistic analysis in this study further revealed that women with a higher CD4 count ( $>350$  cells/mm<sup>3</sup>) were 2.5 times more likely to have had a pregnancy after HIV-positive diagnosis compared to those with a lower CD4 count. This study may not conclusively explain this, but the observation may be attributed to the general feeling of well-being by the women. This could however be due to individual behaviour, intertwining efforts at HIV viral load management through ART, the use of protection for infection prevention, and deliberate efforts to have children. The role of the partner, his HIV status, views on contraception, and need to have children may also be at play. This, obviously, needs further scientific scrutiny.

During this study, age, marital status, residence and CD4 cell count were significantly associated with pregnancy after HIV positive diagnosis, as earlier reported by other studies [7, 8, 11, 20]. Notably, the probability of pregnancy after HIV-positive diagnosis decreased drastically among widowed women. In comparison, Ezugwu, Iyoke [7] found that over 50% of a cohort of women receiving antiretroviral therapy in Nigeria had future fertility intentions, with those having regular partners (married or cohabiting) exhibiting a

significantly higher tendency to unintended pregnancy than those with none or unstable partners. Furthermore, Akelo, McLellan-Lemal [21] demonstrated that living in the same compound with a husband was associated with increased chances of repeat pregnancy among Kenyan women. On the other hand, this study found that the respondents' level of education, employment status, monthly income and period since HIV diagnosis were each not associated with pregnancy after HIV positive diagnosis. There are however disparities in the role of these socioeconomic and demographic attributes, as have further been demonstrated by Zegeye, Mbonigaba [4], and these factors are related and contribute to the general well-being of a person living with HIV, which may influence their decisions on sexual interactions, including the intention to have children. Age is particularly linked to marital status, and likely to the number of children, or previous pregnancies, which again, may drive a woman's desire to have children.

While this study found partner consent was significantly associated with pregnancy, partner support and community (or family) acceptance of childbearing were not significantly associated with pregnancy after HIV positive diagnosis. These agree to a large extent with the findings from Malawi [1], in which participants reported that they conceived due to the desire to please their husbands, and the fear of losing their husbands to others if they did not bear children. Recently, the role of men has equally been echoed in Zambia by Hampanda, Mweemba [22], who reported a rather thin balance between benefit and harm resulting from male partner support of pregnancy, especially when he is serodiscordant. In addition to the desire to have more children by both respondents and their partners, HIV seroconcordance, non-use of family planning, low acceptance of HIV serostatus, and being newly married were advanced as key reasons for carrying a pregnancy in this study.

The attitude of the community towards HIV positive women who become pregnant was significantly associated with pregnancy incidence, in line with earlier reports [22-24] that collectively reported that the perceptions and resultant treatment given to HIV positive women, both by the local and health provider communities, influences a lot the intention and willingness to conceive, sometimes even if there are high risks [25]. Such perceptions and treatments vary between positive and negative, and may change with contexts, notably geography and time. In agreement with other reports, some partners did not agree to the respondents becoming pregnant after HIV positive diagnosis, being opposed to unplanned pregnancies [7, 26, 27], inability to raise children due to low socioeconomic status [1, 11], and the fear of the child turning HIV positive [28].

Slightly more than 30% of the respondents viewed the attitude of community towards HIV positive women becoming pregnant as positive, as most reported acceptance of HIV infection as any other common diseases, and they did not experience discrimination. They also cited having received more informed medical care, with most children being born HIV negative. These observations potentially have an effect on improving sexual and reproductive health, raising the chances of subsequent pregnancy [29]. On the other hand, the small proportion of respondents who felt the

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community had a negative attitude towards HIV positive women who become pregnant mentioned discrimination, stigmatization of people on HIV care, the belief that the child will turn positive or die of HIV infection, and linkage between promiscuity and one being pregnant and HIV positive. Such has been previously reported, like in Mozambique where many providers believed that women living with HIV should not have children [30].

Majority of respondents had not interacted with a TBA or received support from local CBO/CHW towards their pregnancy while HIV positive, but nearly all that did so were advised to promptly visit a health facility, with a further emphasis on the need for delivery at a health facility. Still, only about 10% of those reported having received TBA assistance, the main reasons being when a woman delivered before the expected delivery date (EDD). Distance to the health facility, and lack of transport fee to get to the hospital or pay for the services were also cited as factors that promoted the use of TBA services. Furthermore, whenever a delivery happened at night, some women found it difficult reaching a health facility, especially if one lacked someone to accompany them. These findings compare well with others that showed that differences in sociodemographic characteristics between HIV-infected and -noninfected pregnant women influence their health-seeking character [8, 9].

Just about 25% respondents received support from a local community-based agency/community health worker (CHV) towards her pregnancy while HIV positive, which predominantly involved provision of drugs and adherence counselling, education on ANC and PMTCT by CHVs. There were also reminders by the CHVs to the respondents to take their drugs, support with health insurance registration, and donation of clothing and foodstuff by CBOs. There is still need to dig deeper into the role of CHVs in different contexts, since they are often inclined to work in areas where they are trained, or in diseases that are deemed more prominent in particular region.

A small yet important number of 6.5% did not know their partners' HIV status. In a similar trend, about 95% of the respondents confirmed that their partners were aware they were HIV positive, and, again a small but important 3.7% did not know. This study found that knowledge of partner's HIV status as an independent predictor of pregnancy after HIV-positive diagnosis among the women. The knowledge of the partners' HIV status was crucial in this study, as previous reports show that knowledge of HIV status is associated with lower childbearing desire [31, 32]. This is likely because there will be intentions to plan the family, as well as prevent partner infection.

Over 95% of the respondents reported having become pregnant after being diagnosed HIV positive, an observation previously made by authors [33-35]. Only about 34% of the pregnancies were unplanned, reflecting the findings from southeast Nigeria, where 37.2% incidence of unintended pregnancy was previously reported [7], and leaves a question on the future fertility intentions of women diagnosed with HIV. This is especially important given the high number of

children reportedly delivered after the women in this study had been diagnosed HIV positive. Again, factors like community desires come into play [11], and may push a woman into pregnancy, intended or not. In addition, the perceived assured safety of the child from HIV among women on ART was reported by Biseck, Kumwenda [1] to promote the incidence of pregnancy among HIV positive women in Malawi. This could easily have been true for this study population, given the study was conducted when ART was adequately in use, having been generally accepted in the region.

This study recorded an overall high level of use of contraceptives, compared to reports from elsewhere, including Ethiopia and Tanzania, but where there was concurrence on the male condom and injectables as being the preferred and most commonly used contraceptive methods [36, 37]. Generally, the condom was prominently identified as a means to prevent HIV transmission, alongside its contraceptive role. Part of the explanation for low or non-use of contraceptives could mainly be related to a perceived low risk of pregnancy [38].

Majority of the respondents reported that their partners knew they were using a family planning method, nearly all of whom supported the same. This is important for proper planning, choice and use, and in the event switching from one to another method may be necessary [39]. For those partners who did not support family planning methods being used by the respondents, the reasons offered were reflective of mere lack of willingness to do so. For example, where a respondent reported a husband wanting more children as the only reason was a weak argument, as there would be periods when a woman may not biologically be able to conceive. Arguments like the methods destroying a woman's womb were either ill-informed, or stemmed from other experiences, but which were poorly contextualized.

Further analysis revealed that the partner's HIV serostatus was significantly associated with pregnancy after HIV positive diagnosis, while the partner's awareness of study participant's HIV serostatus was not significantly associated with pregnancy after HIV positive diagnosis. This may point to the critical role played by the male partners in the occurrence of these pregnancies, where the positive partners may more likely use protection [2, 34]. The observation could also be simply the result of the fact that participants were all HIV positive, and most of them had reported the partners were aware of their status, reducing variance between the two groups; partner aware versus partner not aware.

Defaulting on ART was not significantly associated with pregnancy after HIV positive diagnosis. While there is not a very strong basis, the fact that majority had never defaulted implies making a comparison between the groups would be difficult. Still, some would argue that increased use of ART improves the quality of life, and may enhance reproductive health [7]. This, however, cannot be conclusively decided from this study.

There was a high approval of the MHC services offered at the health facilities, with all the respondents agreeing that the



services were easy for them to access as pregnant HIV positive women, and further, they were certain that ART made their pregnancy safe, as most children were protected from HIV infection on delivery. Such trends have been reported elsewhere, notably from South Africa [40], Zambia [41] and Uganda [42].

## V. CONCLUSION

Nearly all respondents had become pregnant after being diagnosed HIV positive, about one-third being unplanned. Age, marital status and CD4 cell count were associated with pregnancy among HIV positive women. Most respondents knew their partners' HIV status, and this knowledge was a strong predictor of pregnancy incidence. Women with higher CD4 counts were more likely to become pregnant. Partner's HIV serostatus was significantly associated with pregnancy among HIV positive women while the partner's awareness of a woman's HIV serostatus was not. Majority of the women planned their pregnancies, with the condom being a prominently used method of contraception, and often used alongside other common methods.

The overall positive attitude of the community towards HIV positive women who become pregnant was associated with pregnancy incidence. As a community, majority of males agreed to HIV positive female partners becoming pregnant despite their status. While partner consent was significantly associated with pregnancy partner support and community or family acceptance of childbearing were not significantly associated with pregnancy incidence among HIV positive women.

## VI. RECOMMENDATION

The Ministry of Health, working with relevant stakeholders, should improve on the strategies to enhance family planning among HIV-infected women, putting focus on the younger and married women, while improving CD4 cell count monitoring among the women. It should also ensure an enhanced HIV status disclosure between sexual partners, and provision of various family planning methods at the nearest health facility to the women, with adequate information on them.

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