

HIV treatment optimism and fertility intention of HIV-infected persons in Oyo State, Nigeria

VO Oladoyin¹ and OO Sekoni²

Department of Community Medicine¹, University of Medical Sciences, Ondo and Department of Community Medicine², College of Medicine, University of Ibadan, Ibadan, Nigeria

Abstract

Background: Fertility intention of People Living with HIV (PLHIV) creates a potential for increased sexual transmission of HIV and other STIs during natural pregnancy conception attempts. There is however paucity of data on the association between attitude and belief of PLHIV about HIV treatment and their fertility intention. This study aimed to determine the association between HIV treatment optimism and fertility intention among PLHIV and the role of other predictors in mediating this association.

Methods: A cross-sectional survey of heterosexual adults living with HIV was conducted using a questionnaire survey. HIV treatment optimism scores ranged from 5 to 20. Scores ≤ 14 were considered as realistic and > 14 as optimistic. Data were analysed using descriptive and inferential statistics at 5% significance level.

Results: Mean age of the respondents was 35.8 ± 7.1 years and 82.4% were females. HIV treatment optimism was associated with fertility intention ($p=0.037$). Predictors of fertility intention were being HIV treatment optimistic [OR 1.76 (1.19-2.61)], being a female [OR 1.67(1.02-2.74)], non-disclosure of HIV status to partner [OR 2.28(1.13-4.62)], partner being HIV negative [OR 7.88(1.59-39.12)] or positive [OR 15.72(2.65-93.42)], unknown partner HAART status [OR 10.31(2.18-48.80)], being in a short relationship [OR 0.99(0.99-1.00)] and having ≤ 2 living lifetime children [OR 10.02(1.79-55.99)].

Conclusion: Attitudes and beliefs of PLHIV about HIV treatment influences their fertility intentions. To attain the goal of zero new HIV infection, adequate education and counselling that will bring about safer and healthier reproductive attitudes and behaviours would be of value particularly among individuals with characteristics influencing the association.

Keywords: HIV treatment optimism, Fertility intention, Confounders, Heterosexual HIV adults, People Living with HIV, South-western Nigeria

Correspondence: Dr. V.O. Oladoyin, Department of Community Medicine, University of Medical Sciences, PMB 536, Ondo, Nigeria. Email: dayooladoyin@gmail.com

Résumé

Contexte: L'intention de fécondité des personnes vivant avec le VIH (PVVIH) crée un potentiel d'augmentation de la transmission sexuelle du VIH et d'autres IST lors des tentatives de conception d'une grossesse naturelle. Il existe cependant peu de données sur le lien entre l'attitude et la conviction des PVVIH concernant le traitement du VIH et leur intention de fécondité. Cette étude visait à déterminer le lien entre l'optimisme lié au traitement du VIH et l'intention de fécondité chez les PVVIH et le rôle des autres prédicteurs dans la médiation de cette association.

Méthodes: Une enquête transversale sur des adultes hétérosexuels vivant avec le VIH a été réalisée à l'aide d'un questionnaire. Les scores d'optimisme pour le traitement du VIH allaient de 5 à 20. Les scores ≤ 14 étaient considérés comme réalistes et > 14 comme optimistes. Les données ont été analysées à l'aide de statistiques descriptives et déductives inférentielles à un niveau de signification de 5%.

Résultats: L'âge moyen des répondants était de $35,8 \pm 7,1$ ans et 82,4% étaient des femmes. L'optimisme du traitement du VIH était associé à l'intention de fécondité ($p = 0,037$). Les prédicteurs de l'intention de fécondité étaient d'être optimistes quant au traitement du VIH [OR 1,76 (1,19-2,61)], en tant que femme [OR 1,67 (1,02-2,74)], non divulgation du statut VIH au partenaire [OR 2,28 (1,13-4,62)], partenaire séronégatif [OR 7.88 (1.59-39.12)] ou positif [OR 15.72 (2.65-93.42)], inconnu statut HAART du partenaire [OR 10.31 (2.18-48.80)], étant dans une courte relation [OR 0.99 (0.99- 1,00)] et ayant ≤ 2 enfants dans la vie entière [OR 10.02 (1.79-55.99)].

Conclusion: Les attitudes et croyances des PVVIH concernant le traitement du VIH influencent leurs intentions en matière de fécondité. Pour atteindre l'objectif de zéro nouvelle infection par le VIH, une éducation et des conseils adéquats permettant de créer des attitudes et des comportements en matière de procréation plus sûrs et plus sains seraient particulièrement utiles, notamment chez les personnes dont les caractéristiques influent sur l'association.

Mots-clés: optimisme face au traitement du VIH, intention de fécondité, facteurs de confusion, adultes hétérosexuels vivant avec le VIH, personnes vivant avec le VIH, sud-ouest du Nigeria

1,907,689 for males aged 15-64 years and females aged 15-49 years respectively assuming an annual growth rate of 3.35% [27]. The HIV prevalence for the state in 2012 was 5.6% [24]. Located within Oyo state are various non-governmental organizations (NGOs) involved in the provision of prevention, care and treatment for PLHIV. These NGOs have clinics located within government-owned and private health facilities in the state. Adeoyo Maternity Hospital is located in Ibadan North Local Government Area (LGA) which is an urban LGA within Oyo state while Saki State Hospital is located in Saki West LGA which is a semi-urban LGA within Oyo state. They are both government-owned secondary level health facilities which serve as referral centres for many primary health centres and private clinics within the LGAs and its environs. They both have comprehensive ART sites within them.

The study population consisted of adult women (18-49 years) [24] and men (18-64 years) [24] attending the adult antiretroviral clinic in the selected health facilities who were screened using ELISA and/or Western blot and were found to be HIV sero-positive. Included in the study were those who had been in the HIV programme for at least six months. Also include were those who had current and steady partners (18-64 years old male partners for the female respondents and 18-49 years old female partners for the male respondents) with whom they were sexually active.

For the purpose of this study, being sexually active was defined as self-reported sexual activity in the six months preceding the study [28, 29]. Excluded were women and men living with HIV who were too ill to grant an interview; women 18-49 years old (or male respondents with female partners 18-49 years old) who had attained menopause (natural or artificial) and respondents who were pregnant (or whose partners were pregnant). Eight hundred and fourteen women and men living with HIV were interviewed in the selected comprehensive ART sites. However, only eight hundred and eight questionnaires had sufficient information to be used in analysis. A systematic random sampling technique was employed to obtain the unit of enquiry using a sampling interval of 3 and 2 for Adeoyo Maternity Hospital and Saki State Hospital respectively. The sampling fraction was calculated by dividing the proposed sample size per day by the average number of patient seen per day in each location (Table 1).

The proposed sample size per day for each comprehensive ART site was determined by spreading the minimum sample size of four hundred and seven for each location over a period of twelve

clinic days. The first respondent for each site was selected by balloting. If a patient was not eligible, the next patient was selected. Respondents were approached before the start of full clinic activities and peradventure any respondent was called before the interview ended, he or she was implored to come back for completion of the interview when he or she was through.

Data collection involved the use of a semi-structured, interviewer, administered questionnaire. The section on HAART optimism was adapted from the women's HAART optimism monitoring and evaluation scale version 1 (WHOMEN'S scale) developed by Kaida in Uganda [5]. The questionnaire was used to obtain data on socio-demographics, HIV history, partner grid, reproductive decision-making, health provider interaction on fertility option and HIV treatment optimism. The questionnaire was in English language but was translated to Yoruba language and back translated to English language to ensure that its original meaning was retained. To assure data quality, the questionnaire was pretested on a similar population outside the study sites after research assistants were trained to use the instrument over a period of two days.

The questionnaires were checked daily for consistency and completeness and were coded before computer entry. Data analysis was done using SPSS version 22. The categorical variables of interest were summarized using frequencies and proportions while the continuous quantitative variables were summarised using means, medians, standard deviations and interquartile ranges.

The dependent variable was fertility intention. It was assessed based on a question that had been used to determine fertility intention in previous surveys [30, 31] which was: "How many children do you expect to give birth to in the future?" The variable was dichotomized into "no intention" if respondent indicated "0" and "intends pregnancy" if respondent indicated "1 or greater". If the respondent did not answer this question but responded "Never" to the question regarding when in the future the respondent (or partner) planned to be pregnant, the respondent was assumed to have no intention of pregnancy. Respondents who did not answer that question but provided a time frame for future pregnancies or responded that "that they did not know" were assumed to have intention of pregnancy in the future.

The main independent variable was HIV treatment optimism. It was assessed using the women's HAART optimism monitoring and evaluation scale (WHOMEN'S scale) developed by

Introduction

Infection with the human immunodeficiency virus (HIV) affects the sexual and reproductive health and well-being of People Living with Human Immunodeficiency Virus (PLHIV) [1]. Usually, all the dimensions of their sexual and reproductive health including fertility intention are potentially affected [1]. However with the major strides made in expanding access to Antiretroviral Therapy (ART) and comprehensive care for HIV infected men and women, a significant return to normal sexual activity and varying reproductive health decisions among HIV infected individuals has been enabled [2-6]. Antiretroviral therapy has the potential to influence the fertility desire and intention of PLHIV through improvement in their health, quality of life, survival and HIV treatment optimism (or antiretroviral optimism) as depicted by the conceptual framework for the potential impact of antiretroviral therapy on fertility in sub-Saharan Africa [7].

In the context of HIV and Highly Active Antiretroviral Therapy (HAART), optimism represent some shifts in attitudes and beliefs (realistic or optimistic) about the sexual and reproductive risk related with HIV/AIDS due to the availability of HAART [8]. HIV treatment optimism represents the potential negative consequences of having an optimistic view of HIV as a less severe and less dangerous disease [8]. It reflects individuals' optimism about the use and efficacy of HAART and the corresponding attitude and beliefs concerning sexual and reproductive behaviours [8, 9]. Given that over 80% of PLHIV are in their reproductive years and many of them continue to desire and intend to achieve pregnancy especially during this era of antiretroviral therapy scale up [2, 4, 10-12], this perception arguably creates a potential for increased sexual transmission of HIV and other sexually transmitted infections during natural conception attempts by married and co-habiting couples in Nigeria for various reasons. First, quite a number of the new HIV infections occur in persons who are not engaging in high risk sex, a sub-population that includes cohabiting or married sexual partners, according to the mode of transmission studies conducted in Nigeria [13]. Secondly, resources for assisted reproductive technology, treatment as prevention (TasP) and pre-exposure prophylaxis (PrEP) are in short supply in Nigeria [14].

To date most research on HIV treatment optimism has tended to focus more on its influence on sexual risk behaviours in developed countries [15-20]. Far too little attention has been placed on the role of HIV treatment optimism on reproductive

behaviours and fertility intention which can also fuel the HIV epidemics in resource poor settings like Nigeria where donor agencies are gradually withdrawing [21]. HIV treatment optimism has been shown to influence fertility intentions with evidence of such being documented in the United States of America [22], Australia [23] and Uganda [5]. However, the peculiarities and the cultural context of Nigeria could not have been captured by these studies and local decisions cannot be based on global findings. Focusing on the role of HIV treatment optimism on fertility intention of PLHIV in Nigeria where HIV prevalence is high [13, 24], resources and programs for antiretroviral (ARV) drugs and assisted reproductive technology are in short supply [14] and fertility is particularly of value [25] is therefore very important for the designing of programmes for safer sexual and reproductive health for PLHIV in resource poor settings like Nigeria.

Also, beyond the observed association between HIV treatment optimism and fertility intention that has been documented in previous research [5], there is a need to assess the role of other potential predictors in mediating the association between HIV treatment optimism and fertility intentions.

Therefore this study, conducted among PLHIV attending two comprehensive ART sites in South-Western Nigeria, aimed to determine the association between HIV treatment optimism and fertility intention as well as the role of other potential predictors in mediating this association. Findings from this study will help guide efforts to support PLHIV in resource constrained countries who are considering their reproductive options while reducing HIV transmission and sexually transmitted infections.

Methods

This cross-sectional study was conducted in two comprehensive ART sites within two government-owned secondary level health facilities (Adeoyo Maternity Hospital and Saki State Hospital) in Oyo state, Nigeria using a questionnaire survey. The two comprehensive ART sites were purposively selected based on their high patient load.

Oyo state, located in the Southwest region of Nigeria, is predominantly a Yoruba speaking state where fertility is particularly of value [25]. According to the 2006 census in Nigeria, the total number of males aged 15-64 years and females aged 15-49 years was 1,609,850 and 1,465,628 respectively [26]. At the time this study was conducted in 2015, this population was projected to be 2,095,412 and

Table 2: Socio-demographics of respondents

Variables	Frequency	Percentage (%)
<i>Location of health facility</i>		
Urban	403	49.9
Semi-urban	405	50.1
<i>Age (in years)</i>		
≤30	213	26.4
> 30	595	73.6
<i>Age: mean ± SD</i>	35.8 ± 7.1	
<i>Sex</i>		
Male	142	17.6
Female	666	82.4
<i>Highest level of education completed</i>		
None	119	4.7
Primary	171	21.2
Junior Secondary	126	15.6
Senior secondary	283	35.0
Tertiary	109	13.5
<i>Religion</i>		
Christianity	370	45.8
Islam	431	53.3
Traditional	7	0.9
<i>Tribe</i>		
Yoruba	704	87.1
Hausa	25	3.1
Igbo	41	5.1
Non-nationals ^b	14	1.7
Others ^c	24	3.0
<i>Occupation</i>		
Unskilled/Unemployed	31	3.8
Skilled manual	65	8.0
Skilled non-manual	628	77.7
Professional/Managerial	84	10.4
<i>Monthly income (in naira)(n = 798)</i>		
< 18,000	265	33.2
≥ 18,000	533	66.8
<i>Monthly income in naira: median (IQR)^d</i>	28,000 (12,000 – 80,000)	

^aStandard deviation ^bGhana, Sierre-Leone, Togo ^cBaruba, Edo, Igala, Igbira, Ijaw, Taraba ^dInterquartile range

Association between HIV treatment optimism and fertility intention

In the bivariate analysis, a significant association between HIV treatment optimism and fertility intention was seen. More of the respondents who were optimistic about HIV treatment intended pregnancy compared to those who were realistic about HIV treatment ($p = 0.037$).

Further analysis to assess the role of other predictors in mediating the association between HIV treatment optimism and fertility intentions using a multivariate analysis revealed that being optimistic about HIV treatment significantly increased the likelihood of intending pregnancy among the

respondents [OR 1.76 (CI: 1.19 – 2.61)]. Covariates that predicted fertility intention in this study were location of the health facility, sex, disclosure of HIV status to partner, duration of relationship with partner, partner's HIV status, partner's HAART status and number of lifetime children who are alive. (Table 6).

Discussion

This study, which aimed to identify the association between HIV treatment optimism and fertility intention as well as the role of other predictors in mediating this association, revealed that although there is an association between HIV treatment

Kaida in Uganda [5]. The original scale was an eight item scale which incorporated concerns about becoming pregnant and risks of vertical transmission of HIV in addition to those related to HIV transmission risk to sexual partners and severity of HIV disease. Only five items which generated a high cronbach's alpha after the pretest were however used for analysis in this study. Responses to each

(49.9%) in the urban LGA and 405 (50.1%) in the semi-urban LGA. The mean age of the respondents was 35.8 ± 7.1 years. Majority (82.4%) were females, about half (51.5%) had below secondary education and 87.1% were Yoruba (Table 2).

The median time since respondents have been diagnosed to have HIV was 13.0 (IQR: 16.0 - 56.8) months. Most (97.3%) were on HAART and

Table 1: Calculation of sampling interval

Location	Average number of patients seen per day (N)	Proposed sample size per day (n)	Sampling fraction (1/K=n/N)	Sampling interval (K = N/n)
Adeoyo Maternity Hospital	100	34	1/3	3
Saki State Hospital	70	34	1/2	2

statement were scored from 1 (Strongly Disagree/Highly realistic) to 4 (Strongly Agree/Highly optimistic). The minimum obtainable score (indicating high realism) was 5 and the maximum obtainable score (indicating high optimism) was 20. Using the median score of 14 as cut off, HIV treatment optimism was dichotomized into realistic and optimistic. Respondents with median score and below were considered as realistic while scores above the median score were considered as optimistic.

Bivariate analysis (Chi-square test and Mann-Whitney U test) was carried out to determine the associations between the outcome variable and the independent variables of interest at 5% level of significance. Thereafter, all variables that were significant at the 10% level of significance on bivariate analysis were selected and fit into the logistic regression model to identify the predictors of fertility intention at 5% level of significance.

Ethical consideration

Ethical approval for the study was obtained from the Oyo State Ministry of Health Ethical Review Board. Permission to conduct the study was also obtained from the Chief Hospital Consultants of the selected health facilities. In addition, the purpose of the study was explained to the respondents and written informed consent obtained before commencement of data collection. Confidentiality of the data collected was assured and the study caused no harm to the participants.

Results

Participants' and their partners' characteristics

Of the 814 questionnaires administered, 808 (99.3%) had sufficient information to be used in analysis, 403

of these, the median time since commencement of HAART was 28.0 (IQR: 14.0 - 52.0) months. Majority (87.6%) had disclosed their HIV status to their partners (Table 3).

Most (93.7%) of the participants in this study were in a marital relationship and the median duration of the respondents' relationship with their partners was 120.0 (IQR: 60.0 - 180.0) months. About two-fifth of the respondents' partners were HIV seronegative (62.7%) and HAART naïve (64.7%). Approximately 79% of the current partners of the respondents were not their first partners (Table 3).

HIV treatment optimism

The median HIV treatment optimism score in this study was 14.0 (IQR: 12.0 - 16.0). When the HIV treatment optimism score was dichotomized, more than half (55.9%) of the respondents were realistic about HIV treatment (Table 4).

Obstetric history and fertility intention

The obstetrics history and fertility intention of the respondents is summarized in Table 5. Many (63.2%) of the respondents had had 3 or more childbirths during their lifetime. Four hundred and fifty-nine (58.4%) of the respondents with children in their lifetime had 3 or more of such children alive. Most (93.8%) of the respondents had a child for their current partner, and 98.3% of the children were alive. About three-fifth (62.0%) of the respondents had future pregnancy intentions. One hundred and twelve (22.4%) of those who intended to have a pregnancy in the future expected to have 3 or more children in the future.

Table 5. Obstetrics history and fertility intention of respondents

Variables	Frequency	Percentage (%)
<i>Lifetime childbirth</i>		
0	22	2.7
1	90	11.1
2	185	22.9
≥ 3	511	63.2
<i>Number of lifetime children who are alive (n = 786)</i>		
0	6	0.8
1	107	13.6
2	214	27.2
≥ 3	459	58.4
<i>Number of childbirth for current partner</i>		
0	50	6.2
1	127	15.7
2	198	24.5
≥ 3	433	53.6
<i>Number of living children for current partner (n = 758)</i>		
0	13	1.7
1	133	17.5
2	217	28.6
≥ 3	395	52.1
<i>Fertility intention</i>		
No intention	307	38.0
Intends pregnancy	501	62.0
<i>Number of children expected in the future (n = 501)</i>		
1	219	43.7
2	170	33.9
≥ 3	112	22.4

childbearing is a possible explanation for this finding [3, 39].

Before adjusting for other factors, HIV treatment optimism was found to be associated with fertility intention in this study. Kaida and colleagues [5] also documented an association between HIV treatment optimism and fertility intention in their study. Antiretroviral therapy brings about a return to near normal life as previously documented by published literature [40, 41]. So expectedly, this will affect the attitude and beliefs of PLHIV about various life choices including fertility intention as noticed among respondents in this study and that of Kaida and colleagues [5]. This association is however quite disturbing given the fact that the natural process of conception remains a dilemma especially for those in sero-discordant relationships as stated in published literature [33], and hence decreasing heterosexual transmission of HIV may not be in view in this part of the world. This discussion is corroborated by the limitation of the HIV Prevention Trials Network (HPTN 052) study conducted in 9 countries across America, Asia and Africa to evaluate the effect of

combination antiretroviral therapy on the prevention of HIV-1 transmission to uninfected partners and on clinical events in infected persons [42]. Although the HPTN052 study documented a large decrease in sexual transmission of HIV among HIV serodiscordant couples through early use of HAART, the authors sounded that it should be interpreted with caution. The authors sounded that the ongoing couples counselling and the condom provision might have contributed to the decreased transmission which might not be the scenario in real life situations.

After adjusting for other factors, this study showed that being HIV treatment optimistic predicts fertility intention. When interpreting this association however, the effect of other predictors should be taken into account as revealed by our study. The other predictors of fertility intention from this study were being a female, non-disclosure of HIV status to

partner, partner being HIV negative or positive, unknown partner HAART status, being in a short relationship, having ≤ 2 living lifetime children and attendance of an antiretroviral clinic located in an urban area. All these should be factored in when

Table 3: HIV characteristics of respondents and their partners

Variables	Frequency	Percentage (%)
Time since HIV diagnosis in months: median (IQR) ^a	30.0 (16.0 – 56.8)	
<i>HAART status</i>		
HAART naive	22	2.7
On HAART	786	97.3
Time since on HAART in months: median (IQR) ^a (n=786)	28.0 (14.0 – 52.0)	
<i>Ever disclosed HIV status</i>		
No	67	8.3
Yes	741	91.7
<i>Disclosure of HIV status to Partner (n = 741)</i>		
No	92	12.4
Yes	649	87.6
<i>Relationship with partner</i>		
Married	757	93.7
Cohabiting	51	6.3
Duration of relationship in months: median (IQR) ^a	120.0 (60.0 -180.0)	
<i>Partner's HIV status</i>		
Negative	507	62.7
Positive	227	28.1
Unknown	74	9.2
<i>Partner's HAART status</i>		
On HAART	182	22.5
HAART naive	523	64.7
Unknown	103	12.7
<i>Is partner respondent's first partner</i>		
No	168	20.8
Yes	640	79.2

^aInterquartile range

Table 4. HIV treatment optimism

Variables	Frequency	Percentage (%)
HIV treatment optimism score: median (IQR) ^a	14.0 (12.0 – 16.0)	
<i>HIV treatment optimism</i>		
Realistic	452	55.9
Optimistic	356	44.1

optimism and fertility intention, the effect of other factor should be considered in interpreting this association.

Concerning HIV treatment optimism, this study showed that more respondents were realistic about HIV treatment even in this era of widespread HAART. This result is in agreement with other published works which also reported that more PLHIV were realistic about HIV treatment [5, 8]. This finding suggests that although HAART is widely available, PLHIV still exhibited some caution. Worthy of mention however is that although more of the respondents in this study were realistic about HIV treatment, the fact that some (44.1%) were

still optimistic is disturbing as optimism about HIV treatment has been documented to be associated with some sexual and reproductive behaviours which can fuel HIV transmission [18, 32, 33]. The implication of this is that as coverage for HIV treatment improves, there is also a need to monitor the attitudes and beliefs of PLHIV towards treatment.

Regarding fertility intention, respondents in this study, like in other Nigerian [3, 4, 34] and non-Nigerian [2, 35-38] studies, intend to have (more) children in the future. The personal desires to experience biological parenthood, which is influenced by the cultural value placed on

Table 6 (continued). Bivariate and multivariate analysis for the association between HIV treatment optimism and fertility intention

Characteristics	Fertility intention		P-value ^a	Adjusted OR (CI) ^b	P-value ^c
	No intention	Intends pregnancy			
Time since HIV diagnosis in months: median (IQR) ^d	31.0(12.0-58.0)	29.0(18.0-54.5)	0.738		
<i>HAART status</i>					
HAART naive	8(36.4)	14(63.6)	0.873		
On HAART	299(38.0)	487(62.0)			
Time since on HAART in months: median (IQR) ^d	31.0(12.0-57.0)	27.0(15.0-50.0)	0.387		
<i>Disclosure of HIV status to Partner</i>					
No	25(27.2)	67(72.8)	0.011	2.28(1.13-4.62) ¹	0.022
Yes	266(41.0)	383(59.0)			
<i>Relationship with partner</i>					
Married	288(38.0)	469(62.0)	0.910		
Cohabiting	19(37.3)	32(62.7)			
Duration of relationship in months: median (IQR) ^d	156.0(96.0-228.0)	96.0(48.0-144.0)	<0.001	0.99(0.99-1.00)	<0.001
<i>Partner's HIV status</i>					
Negative	194(38.3)	313(61.7)	0.026	7.88(1.59-39.12)	0.012
Positive	95(41.9)	132(58.1)		15.72(2.65-93.42)	0.002
Unknown	18(24.3)	56(75.7)		1	
<i>Lifetime childbirth</i>					
≤2	36(12.1)	261(87.9)	<0.001	0.7(0.12-4.16)	0.703
>2	271(53.0)	240(47.0)		1	
<i>Number of lifetime children who are alive</i>					
≤2	44(13.5)	283(86.5)	<0.001	10.02(1.79-55.99)	0.009
>2	263(57.3)	196(42.7)		1	
<i>Number of childbirth for current partner</i>					
≤2	62(16.5)	313(83.5)	<0.001	1.20(0.20-7.24)	0.841
>2	245(56.6)	188(43.4)		1	
<i>Number of living children for current partner</i>					
≤2	63(17.4)	300(82.6)	<0.001	1.00(0.17-5.91)	0.997
>2	238(60.3)	157(39.7)		1	

^aP-value in bivariate analysis ^bAdjusted odds ratio (confidence interval) ^cP-value in logistic regression ^dInterquartile range

The findings from this study underscore the importance of giving equal attention, or more, to prevention messages as is given to HIV treatment during this period of upscale in HIV treatment. This is very important so that the overstated benefits of HIV treatment do not lead to a reduction in other prevention measures which may ultimately lead to a

rise in the incidence of HIV because of the high risk attitudes and behaviours PLHIV are likely to adopt. Prevention messages should pay special attention to PLHIV who are HIV treatment optimistic and possess characteristics that have been identified to mediate the relationship between HIV treatment optimism and fertility intentions.

Table 6. Bivariate and multivariate analysis for the association between HIV treatment optimism and fertility intention

Characteristics	Fertility intention		P-value ^a	Adjusted OR (CI) ^b	P-value ^c
	No intention	Intends pregnancy			
<i>HIV treatment optimism</i>					
Realistic	186(41.2)	266(58.8)	0.037	1	0.004
Optimistic	121(34.0)	235(66.0)			
<i>Location of health facility</i>					
Urban	130(32.3)	273(67.7)	0.001	2.03(1.32-3.11)	0.001
Semi-urban	177(43.7)	228(56.3)			
<i>Age (in years)</i>					
≤ 30	53(24.9)	160(75.1)	<0.001	1.02(0.63-1.66)	0.928
> 30	254(42.7)	341(57.3)	1		
<i>Sex</i>					
Male	80(56.3)	62(43.7)	<0.001	1	0.043
Female	227(34.1)	439(65.9)			
<i>Highest level of education completed</i>					
<Senior Secondary	173(41.6)	243(58.4)	0.030	1	0.586
≥ Senior secondary	134(34.2)	258(65.8)			
<i>Religion</i>					
Islam	162(37.6)	269(62.4)	0.798		
Others	145(38.5)	232(61.5)			
<i>Tribe</i>					
Yoruba	275(39.1)	429(60.9)	0.104		
Others	32(30.8)	72(69.2)			
<i>Occupation</i>					
Unskilled/Unemployed	8(25.8)	23(74.2)	0.407		
Skilled manual	28(43.1)	37(56.9)			
Skilled non-manual	237(37.7)	391(62.3)			
Professional/Managerial	34(40.5)	50(59.5)			
<i>Monthly income (in naira)</i>					
(N = 798)					
< 18,000	92(34.7)	173(65.3)	0.151		
≥ 18,000	213(40.0)	320(60.0)			

^aP-value in bivariate analysis ^bAdjusted odds ratio (confidence interval) ^cP-value in logistic regression ^dInterquartile range

considering the association between HIV treatment optimism and fertility intention. No published work was identified to have assessed the role of other predictors in mediating the association between HIV treatment optimism and fertility intentions.

The limitations of this study must be acknowledged. First, this study recruited PLHIV who were attending adult ARV clinics in two government

health facilities in Oyo state such that findings may not be generalizable to all PLHIV in the country. Second, the measures used were all self-reported, so a degree of biased reporting was possible. Lastly, the wide confidence interval observed for some of the adjusted odds ratio indicates low precision and

that more information may be needed on the associations with wide confidence interval to guide decision-making. Despite this limitation however, this study provides insight into the attitudes and beliefs about HAART in the light of reproductive decision-making.

Conclusions

In addition to determining the association between HIV treatment optimism and fertility intention among PLHIV, this study was also able to utilise multivariate analysis to assess the role of other predictors in mediating the association between HIV treatment optimism and fertility intentions.

- relationships after ART. *Cult Health Sex.* 2011; 13(10): 1119-1133.
24. Federal Ministry of Health, Federal Republic of Nigeria. National HIV and AIDS and Reproductive Health Survey (NARHS Plus II, 2012). 2013
 25. Oyediran KA. Fertility desires of Yoruba couples of South-Western Nigeria. *J Biosoc Sci.* 2005; 1-20.
 26. National Population Commission (NPC)[Nigeria] and ICF Macro. Nigeria Demographic and Health Survey 2008. Abuja, Nigeria: National Population Commission and ICF Macro 2009
 27. Department of microstatistics, Oyo State Ministry of Economic Planning and Budget. 2014
 28. Kaida A, Laher F, Strathdee SA, *et al.* Contraceptive use and method preference among women in Soweto, South Africa: the influence of expanding access to HIV care and treatment services. *PloS One.* 2010; 5(11): e13868.
 29. Ogilvie GS, Palepu A, Remple VP, *et al.* Fertility intentions of women of reproductive age living with HIV in British Columbia, Canada. *AIDS.* 2007; 21 Suppl 1: S83-88.
 30. Women and HIV research program. HIV pregnancy planning questionnaire. 2008: 34.
 31. Loutfy M, Hart TA, Mohammed SS, *et al.* Fertility desires and intentions of HIV-positive women of reproductive age in Ontario, Canada: A Cross-sectional study. *Plos One.* 2009; 4(12).
 32. Bateganya M, Colfax G, Shafer LA, *et al.* Antiretroviral therapy and sexual behavior: A comparative study between antiretroviral-naïve and -experienced patients at an urban HIV/AIDS care and research center in Kampala, Uganda. *AIDS Patient Care STDS.* 2005; 19(11).
 33. Beyeza-Kashesya J, Kaharuza F, Mirembe F, *et al.* The dilemma of safe sex and having children: challenges facing HIV sero-discordant couples in Uganda. *Afr Health Sci.* 2009; 9(1): 2-12.
 34. Chama C, Morrumpa J and Gashau W. Sex and reproduction among HIV-infected people in Maiduguri, Nigeria. *J Obstet Gynecol.* 2007; 27(8): 812-815.
 35. Kaida A, Laher F, Strathdee SA, *et al.* Childbearing intentions of HIV-positive women of reproductive age in Soweto, South Africa: the influence of expanding access to HAART in an HIV hyperendemic setting. *Am J Public Health.* 2011; 101(2): 350-358.
 36. Mindry D, Wagner G, Lake J, *et al.* Fertility desires among HIV-infected men and women in Los Angeles County: client needs and provider perspectives. *Matern Child Health J.* 2013; 17(4): 593-600.
 37. Nattabi B, Li J, Thompson SC, Orach CG and Earnest J. A systematic review of factors influencing fertility desires and intentions among people living with HIV/AIDS: implications for policy and service delivery. *AIDS Behav.* 2009; 13(5): 949-968.
 38. Nostlinger C, Desjardins F, Dec J, Platteau T and Hasker E. Child desire in women and men living with HIV attending HIV outpatient clinics: evidence from a European multicentre study. *Eur J Contracept Reprod Health Care.* 2013; 18(4): 251-263.
 39. Cooper D, Harries J, Myer L, Orner P and Bracken H. "Life is still going on": Reproductive intentions among HIV-positive women and men in South Africa. *Soc Sci Med* 2007; 65: 274-283.
 40. Johnson LF, Mossong J, Dorrington RE, *et al.* Life expectancies of South African adults starting antiretroviral treatment: collaborative analysis of cohort studies. *PLoS Med.* 2013; 10(4): e1001418.
 41. May MT, Gompels M, Delpech V, *et al.* Impact on life expectancy of HIV-1 positive individuals of CD4+ cell count and viral load response to antiretroviral therapy. *AIDS* 2014; 28(8): 1193-1202.
 42. Cohen MS, Chen YQ, McCauley M, *et al.* Prevention of HIV-1 infection with early antiretroviral therapy. *N Engl J Med.* 2011; 365(6): 493-505.

Acknowledgments

We thank all the patients that participated in this study. We also acknowledge the contributions of all medical consultants and resident doctors at the University College Hospital, Ibadan, Nigeria who reviewed this manuscript.

References

- EngenderHealth and International Community of Women Living with HIV/AIDS. Sexual and reproductive health for HIV positive women and adolescent girls: Manual for trainers and programme managers. United States of America: JC Publisher Co., Inc. 2006.
- Mmbaga EJ, Leyna GH, Ezekiel MJ and Kakoko DC. Fertility desire and intention of people living with HIV/AIDS in Tanzania: a call for restructuring care and treatment services. *BMC Public Health*. 2013; 13: 86-93.
- Oladapo OT, Daniel OJ, Odusoga OL and Ayoola-Sotubo O. Fertility desires and intentions of HIV-positive patients at a suburban specialist center. *J Natl Med Asso*. 2005; 97(12): 1672-1681.
- Iliyasu Z, Abubakar IS, Kabir M, *et al.*. Correlates of Fertility Intentions Among HIV/AIDS Patients in Northern Nigeria. *Afr J Reprod Health*. 2009; 13(3): 71-83.
- Kaida A, Lima VD, Andia I, *et al.* The WHOMEN's scale (Women's HAART Optimism Monitoring and Evaluation Scale v.1) and the association with fertility intentions and sexual behaviours among HIV-positive women in Uganda. *AIDS Behav*. 2009; 13 (Suppl 1): 72-81.
- Homsy J, Bunnell R, Moore D, *et al.* Reproductive intentions and outcomes among women on antiretroviral therapy in rural Uganda: a prospective cohort study. *PLoS One*. 2009; 4(1): e4149.
- Kaida A, Andia I, Maier M, *et al.* The potential impact of antiretroviral therapy on fertility in sub-Saharan Africa. *Curr HIV/AIDS Rep*. 2006; 3(4): 187-194.
- Angulo IL. Optimism related to treatment and high risk behaviors among people living with HIV/AIDS under follow up in public health clinics in Rio de Janeiro: Scale of attitudes and beliefs about HIV treatment. [Dissertation]. 2012.
- Kalichman SC, Eaton L and Cherry C. Sexually transmitted infections and infectiousness beliefs among people living with HIV/AIDS: implications for HIV treatment as prevention. *HIV Med*. 2010; 11(8): 502-509.
- Cliffe S, Townsend CL, Cortina-Borja M and Newell ML. Fertility intentions of HIV-infected women in the United Kingdom. *AIDS Care*. 2011; 23(9): 1093-1101.
- Kipp W, Heys J, Jhangri GS, Alibhai A and Rubaale T. Impact of antiretroviral therapy on fertility desires among HIV-infected persons in rural Uganda. *Reprod Health*. 2011; 8: 27.
- Makumbi FE, Nakigozi G, Reynolds SJ, *et al.* Associations between HIV, antiretroviral therapy and the prevalence and incidence of pregnancy in Rakai, Uganda. *AIDS Res Treat*. 2011; 2011.
- National Agency for the control AIDS. Federal Republic of Nigeria. Global AIDS response country progress report 2012
- UNAIDS. Global report: UNAIDS report on the global AIDS epidemic 2013. 2013.
- Crepaz N, Hart TA and Marks G. Highly active antiretroviral therapy and sexual risk behavior. A meta-analytic review. *JAMA*. 2004; 292(2): 224-236.
- Elford J, Bolding G and Sherr L. High-risk sexual behaviour increases among London gay men between 1998 and 2001: what is the role of HIV optimism? *AIDS*. 2002; 16(11): 1537-1544.
- Ostrow DE, Fox KJ, Chmiel JS, *et al.* Attitudes towards highly active antiretroviral therapy are associated with sexual risk taking among HIV-infected and uninfected homosexual men. *AIDS*. 2002; 16(5): 775-780.
- Peterson JL, Miner MH, Brennan DJ, Rosser BR. HIV treatment optimism and sexual risk behaviors among HIV positive African American men who have sex with men. *AIDS Educ Prev*. 2012; 24(2): 91-101.
- Van de Ven P, Rawstorne P, Nakamura T, Crawford J and Kippax S. HIV treatments optimism is associated with unprotected anal intercourse with regular and with casual partners among Australian gay and homosexually active men. *Int J STD AIDS*. 2002; 13(3): 181-183.
- Vanable PA, Ostrow DG, McKirnan DJ and Taywaditep KJ, Hope BA. Impact of combination therapies on HIV risk perceptions and sexual risk among HIV-positive and HIV-negative gay and bisexual men. *Health Psychol*. 2000; 19(2): 134-145.
- AIDS Prevention Initiative Nigeria. APIN History 2014 [Accessed May 21 2014]. Available from: <http://www.apin.org.ng/site/>.
- Kirshenbaum SB, Hirky AE, Correale J, *et al.* "Throwing the Dice": Pregnancy Decision-Making Among HIV-Positive Women in Four U.S. Cities. *Perspect Sex Reprod Health*. 2004; 36(3): 106-113.
- McDonald K. 'The old-fashioned way': conception and sex in serodiscordant