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**Reproductive Desires and Intentions among HIV-infected Individuals in
Chennai, India**

A Thesis Submitted to the
Yale University School of Medicine
in Partial Fulfillment of the Requirements for the
Degree of Doctor of Medicine

by

Elizabeth Houle

2008

ABSTRACT

Despite the personal and cultural importance of childbearing in India, limited information exists on the extent of childbearing desires and intentions among HIV-infected individuals in this setting. The purpose of this study was to measure the extent of childbearing desires among HIV-infected individuals in Chennai, India, thereby testing the hypothesis that HIV significantly influences the desire to have children. Three hundred HIV-infected individuals were interviewed about childbearing desires and intentions during routine visits for HIV care at an HIV specialty care clinic in Chennai, South India. Sixteen percent of participants expressed desire for childbearing, and 9% expressed intention to have children in the future. Desire for children was associated with childlessness (OR 7.38, 95% CI 3.18-17.15), longer time since diagnosis with HIV (OR 2.187, 95% CI 1.511-5.511), and absence of financial concerns about bearing children (OR 3.81, 95% CI 1.77-8.21). Childbearing desires decreased with increasing age (OR 0.922, 95% CI 0.87-0.98). Childbearing desires were not associated with measures of disease progression. The most frequently cited concerns about childbearing among participants were the potential of infecting the infant (71%) followed by the burden of the participant's own illness (49%). Thirty-five percent of participants reported lack of knowledge about reducing transmission of HIV for couples trying to conceive. Although 84% of the cohort expressed no desire for childbearing, nearly half (48%) of those without desire stated that in the absence of HIV infection they would desire and or intend to have children. When compared with individuals who desired children regardless of HIV infection, these individuals were more inclined to have at least one child already, resided in the state of Andhra Pradesh, had known their diagnosis for a

shorter time, and had more childbearing concerns related to HIV infection. Although the prevalence of childbearing desire and intent are lower among this population than in HIV-infected populations studied in other settings, it is likely that childbearing among HIV-infected individuals in India will become increasingly important as HIV-infected patients live longer and healthier lives through increasing access Highly Active Antiretroviral Therapy (HAART) in India.

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INTRODUCTION

According to UNAIDS there are an estimated 2.5 million people, or 0.36% of the general population, living with HIV in India, with the majority of known cases in males. In the southeastern state of Tamil Nadu the prevalence is estimated to be as high as 0.65% among women presenting to antenatal clinics. More than 80% of reported AIDS cases are due to heterosexual transmission (1). One retrospective study demonstrated that marriage, monogamy, and heterosexual intercourse were the only identifiable risk factors among HIV-infected women presenting to an HIV tertiary care center in south India, illustrating that for many, HIV-infection occurs within the context of marriage (2). Individuals infected with HIV in the context of marriage, as well as unmarried individuals considering marriage, face decisions about reproduction since bearing and raising children are integral to married life in India.

Broadly speaking, the interplay of complex biological, psychological, and social factors—including personality, value systems, beliefs about pregnancy, birth and parenthood, influence of spouse, parents and community, major life events, social support, and barriers or facilitators—all inform the decision and motivation to bear children for any individual (3). HIV infection adds layers of complexity to decision-making around childbearing, and its influence on these desires and intentions differ depending on the personal, social, and biomedical context (4). For example, in one scenario family members or one's partner might pressure an HIV-infected individual to have children because of cultural norms, or in an alternative scenario they might discourage childbearing because of disapproval associated with HIV infection (5).

In India, where the number of children per couple in 2005 was 2.9, the cultural and societal pressure to bear children is widespread and pervasive (6). Little social science research has explored the direct consequences of being childless in India. However, it is broadly known that a woman's place and security in her husband's family depends upon her ability to produce offspring. Failure to conceive or successfully bear children is commonly blamed on the wife, and can lead to divorce, abandonment and abuse (7). Studies examining factors associated with domestic violence have demonstrated that childlessness is associated with significantly higher risk of recent domestic violence (8).

In this cultural context, the expectation that women will bear children is so profoundly culturally embedded that the stigma and psychological burden associated with failure to do so may be greater for some than the burden associated with HIV. Pregnancy requires unprotected sexual intercourse, which in the case of discordant couples—couples where one partner is infected with HIV and the other is not—means risking transmission from one partner to the other (9). Pregnancy, childbirth and breast-feeding all involve risk of vertical transmission from mother to infant. In addition to the risk of transmission, living with HIV places additional health, social and financial burdens on both parents and children. Despite these risks, many HIV-infected individuals continue to have children, and those who do not may still be grappling with the decision and its consequences.

Much emphasis in resource-limited settings has been placed on limiting unplanned pregnancies, particularly in the context of HIV, given the risks of vertical and horizontal transmission of the virus (4, 10). In some settings, HIV-infected individuals report that they have not discussed reproduction with healthcare providers because of

perceived negative reactions (5). However, if policy and counseling efforts focus solely on discouragement of reproduction while ignoring the complexity of peoples' true desires and intentions or education, they may actually fuel sexual and mother to child transmission of HIV rather than addressing the factors that inform these decisions (9). Understanding how HIV-infected individuals reconcile their illness with the desire to bear children is essential in counseling appropriately about reducing risks of transmission and addressing individuals' family planning needs and reproductive desires.

Historically, before the advent of Highly Active Antiretroviral Therapy (HAART) when risk of mother to child transmission was high, pregnancy was strongly discouraged among HIV-infected individuals in high-income settings, such as the United States (11). In 1985, the CDC advised against pregnancy for HIV-infected women citing poor prognosis, possible complications and risk of vertical transmission (12, 13). These recommendations were echoed by the American College of Obstetrics and Gynecology, which also advised against pregnancy for HIV-infected women in 1987 (14, 15).

However, the advent of HAART, which dramatically increased quality of life and longevity and significantly reduced rates of mother to child transmission, in conjunction with assisted reproductive options, caused shifts in policy and recommendations in high-income settings (12). In 1994 the 076 trial of the Pediatric AIDS Clinical Trial Group (PACTG) demonstrated that treatment with zidovudine (AZT) reduced the rate of mother to child transmission to 8% among those treated compared with a 25% transmission rate in the untreated group (16). Administration of AZT and scheduled cesarean section before rupture of membranes, in conjunction with avoidance of breastfeeding, was found to further reduce mother to child transmission to 2% (17, 18). Suppression of HIV RNA

viral load to less than 1000 copies/mL through administration of HAART can also reduce vertical transmission to 1% to 2% regardless of mode of delivery (18). Consequently in 2001, the CDC changed its recommendations, no longer advising against pregnancy among HIV-infected women, but rather stating that HIV-infected pregnant women should receive counseling and information about reproductive options. Current guidelines by the Public Health Service Task Force at the CDC provide detailed recommendations for preconceptual and prenatal counseling, about use of antiretrovirals during pregnancy and use of elective cesarian section so that women can make informed decisions (19). ACOG also revised recommendations indicating that HIV-infected individuals should have the same access to assisted reproductive technologies as their uninfected counterparts. (12)

Research from high-income settings exploring childbearing desires, intentions, and decision-making has demonstrated that HIV-infected individuals desire children (20, 21, 22, 23, 15, 24). Even before HAART for prevention of mother to child transmission (PMTCT), HIV-infected individuals continued to desire and bear children despite the high risk of transmission and recommendations against pregnancy and childbearing (25). A later study examining fertility desires and intentions among a nationally representative sample of HIV-infected men and women receiving treatment in the U.S. demonstrated that 28-29% of them desired children, which was lower than the proportion of women in the US who desire children. Of those desiring children, 31-41% expected or intended to have them in the future. In this study, younger individuals with fewer children who reported higher overall health status were more likely to desire children as were women whose partner's HIV status was unknown. However, childbearing desires were not related to disease progression. (20)

Access to HAART allows individuals infected with HIV to live longer with improved quality of life and decreases risk of mother to child transmission of HIV, which influences reproductive decision-making in resource plentiful settings. A U.S. study suggested that implementation of the Pediatric AIDS Clinical Trial Group Protocol 076 resulted in fewer HIV-infected women choosing postpartum sterilization and maintaining options for future fertility (26). These results imply that in addition to increased longevity for those living with HIV, the reduced risks of vertical transmission may influence reproductive decision-making. A more recent study finding that the HAART-era birth rate among HIV-infected women was 150% higher than the pre-HAART era birthrate as opposed to 5% higher in uninfected counterparts, provides further compelling evidence that HAART has had a profound impact on child-bearing in this setting (24). This study, however, did not specify whether the increased birth rate was due to increased decisions to bear children or a result of improved health and consequent increased fertility.

In addition to administration of HAART for PMTCT, other assisted reproductive technologies exist, which are limited to high-income settings because of high costs (15). Among sero-discordant couples, in addition to the risk mother to child transmission, there is risk of horizontal transmission—from the HIV-infected partner to the uninfected partner. Even among sero-concordant couples, meaning couples where both partners are HIV-infected, unprotected sexual contact introduces the risk of transmission of drug-resistant strains of the virus from one partner to the other (27). Studies have shown that consistent use of condoms among sero-discordant couples, where the male partner is infected and the female partner uninfected is 69%-94% effective at preventing transmission (28, 29). Obviously, however, for couples that wish to conceive, condoms

also prevent the desired pregnancy. In such couples, assisted reproductive technologies, which reduce risk of transmission without preventing pregnancy, are available. Sperm washing isolates spermatozoal cells from nonspermatozoal and seminal cells, which are the reservoirs for HIV (30, 31). A retrospective multi-center study examining the safety and efficacy of sperm washing in 1036 HIV-1 sero-discordant couples in Europe demonstrated that sperm washing significantly reduced the risk of transmission to the female partner (32). Another perhaps less expensive, but riskier option for sero-discordant couples wishing to conceive involves suppressing the male partner's viral load through antiretroviral treatment and then limiting unprotected sexual contact to the most fertile period of the female partner's menstrual cycle. HIV sero-concordant couples can also use this method of timed intercourse to reduce risk of transmission of drug resistant virus. (28) However, the technique requires education and financial and technological resources to monitor viral load and ovulation. In sero-discordant couples where the female partner is infected, the obvious choice is artificial insemination, where women can inseminate themselves at very low costs, as opposed to in vitro fertilization, which is a more costly option (33). The success of minimizing risk of transmission under these circumstances would then be contingent upon access to PMTCT. These techniques, while innovative and viable options in resource-plentiful settings are expensive and largely unavailable in resource-limited settings, where basic access to PMTCT is still limited.

As access to HAART improves in resource-limited settings, it is possible that it will influence reproductive decision-making in these settings, given its profound impact on childbearing among HIV infected individuals in high-income settings (24). Access to

HAART in India has increased significantly over the past seven years. According to UNAIDS/WHO, 785,000 of the 5.7 million people living with HIV in India need antiretroviral therapy. Generic antiretroviral therapy became available in India in the year 2000, which meant that first-line therapy was then available for US \$1 per day. Cost of first-line combination therapy of stavudine, lamivudine and nevirapine has further declined to US \$146 per person per year (34). The government of India has committed to providing ART free of cost at government ART Centers (127 of them as of June 2007) as part of its National AIDS Control Program (35). By December 2005, 60,000 people requiring ART were receiving it, 24,000 receiving it free through the government program, another 10,000 receiving it free through intersectoral partners, and 10,000-20,000 were receiving it from other sources (34).

A study investigating the impact of the introduction of generic HAART at the large HIV clinic where this study was conducted found a dramatic increase in the number of people seeking treatment for HIV between 1996 and 2003 and a 20% increase in the number of people who could afford therapy after the introduction of generics in the year 2000, most probably because patients are more likely to seek care if they believe that they will have access to affordable therapy (36). After the year 2000 and availability of generic HAART, Kumarasamy et al also observed a dramatic change in the natural history of the disease at this center. The number of individuals seeking treatment for infections decreased by 20-fold, and the death rate decreased from 25 to 5 per 100 person years between 1997 and 2003 (36).

In resource-limited settings, risk of mother to child transmission is estimated to be 15%-25% among non-breastfeeding infants of HIV-infected mothers and 25%-45%

among breastfeeding infants (11). PMTCT programs are available in resource-limited settings including India. A review of national programs in 71 countries for 2004-2005 indicated that PMTCT increased from 7% in 2004 to 11% in 2005, with 8% of infants born to HIV-infected mothers receiving antiretroviral prophylaxis (37). However, in 2006 less than 10% of estimated HIV-infected women actually received antiretrovirals for PMTCT worldwide (38).

The World Health Organization (WHO) 2006 guidelines for PMTCT in resource-limited settings outline an approach, which maximizes benefits and minimizes costs through simplified, standardized regimens. These guidelines can be adapted based on the context of the patient and resources available (38, 39). The guidelines describe a tiered approach, which includes a triple drug regimen for women who require HAART for their own health. Women who do not yet need HAART for their own health should take a short course regimen, which includes nevirapine. Infants should receive nevirapine and zidovudine. Although less effective, a nevirapine single dose regimen is recommended where other regimens are not currently feasible. Appropriate intervention among breastfeeding populations is unclear and still under investigation. (38, 39)

As access to HAART improves in India and other resource-limited settings, allowing HIV-infected individuals live longer, healthier lives and reducing rates of mother to child transmission, it is important to assess the extent of fertility desires and intentions and the implications for vertical and heterosexual transmission in these settings. Several studies in resource-limited settings have explored reproductive desires, intentions, and decision-making among HIV-infected individuals and shown that HIV-infected individuals continue to desire and bear children in these contexts (40, 41, 42, 43,

44). One study addressing reproductive decision-making among HIV-infected individuals in Nigeria, found that the reproductive intentions and desires in the region were high. Sixty-three percent of HIV-infected individuals surveyed desired children, and of those desiring children, 71.5%-93.8% intended to have children in the future (44). Another study in Uganda found that 18% of individuals infected with HIV who were surveyed desired more children, with many more than that, 33%, practicing unprotected sex and thus risking pregnancy. In this study men were four times more likely to desire children than women. PMTCT knowledge was high and did not correlate with desire for children, however knowledge did correlate with less unprotected sex and thus less risk of pregnancy (42). A Brazilian study surveying HIV-infected women found that 45% desired children in the future (41). A qualitative study in Capetown, South Africa exploring reproductive decision-making among HIV-infected individuals suggested that fear of transmission, financial concerns, family pressure, disclosure, and community attitudes influence individuals' childbearing decisions (40). To our knowledge no such study examining the reproductive desires and intentions among HIV-infected individuals has previously been conducted in India, where the HIV epidemic and the cultural context affect women uniquely.

The primary aim of this study was to assess the extent of reproductive desires and intentions in HIV-infected individuals in an HIV care center in South India, and to examine socio-demographic and health-related factors associated with the desire and intention to bear children in this population. A secondary aim was to assess HIV-infected individuals' knowledge about reproductive options that would reduce the risks of transmission of HIV.

METHODS

Study Site

This study was conducted at Y.R. Gaitonde Center for AIDS Research and Education (YRG CARE), a non-governmental HIV specialty care center located in Chennai, in the state of Tamil Nadu, South India. Since its inception in 1996, more than 10,000 patients infected with HIV have been in care at the center, with approximately 2000-3000 patients currently receiving ongoing care. YRG CARE provides comprehensive services, including voluntary counseling and testing services, psychosocial counseling, inpatient and outpatient treatment facilities, laboratory monitoring, as well as nutritional support for people living with and affected by HIV.

Data Collection

A semi-structured questionnaire, consisting of 18-23 questions pertaining to the participant's reproductive history, contraceptive practices, reproductive desires and intentions, and knowledge about reproductive options for reduction of horizontal and vertical transmission, was administered in a face-to-face interview in the language best understood by the participant, either Tamil or Telegu. The questionnaires were translated from English to Tamil and Telegu and then back-translated to English for verification prior to the commencement of data collection. The answers to open-ended questions about the reasons for desiring children and concerns about bearing children were coded by the interviewer according to categories established from a review of relevant literature about childbearing decision-making among HIV-infected individuals in other settings. General demographic, medical and socio-economic information was obtained from the

patient's clinic record. The most recent CD4 count and the lowest CD4 count were obtained from a review of each patient's medical record. A history of opportunistic infections and prior hospitalizations was obtained from the YRG CARE HIV Observational Database (45).

This study was approved by the institutional review board at YRG CARE and by the Yale Human Investigations Committee.

Study Sample

The questionnaire was administered to previously diagnosed HIV-infected men and women presenting for routine care between February and April 2007. Patients were eligible to participate if they were female between the ages of 18-40 or male between the ages of 21-50. Females reach age of majority in India at age 18, whereas age of majority for males is 21. Patients were eligible if they had been in treatment at YRG CARE for a minimum of five months, so that they would have had time to develop relationships with their care providers. Patients were eligible if they were either HAART naïve or had undergone no changes in their HAART regimen in the previous 3 months and had not experienced a WHO stage IV AIDS-defining diagnosis within the previous 3 months. These eligibility criteria were established to avoid obtaining responses that would be unduly influenced by an acute disease-related event.

Three hundred eligible participants were recruited to participate in the study by counselors at YRG CARE. The study was explained to participants and informed consent was obtained in the language best understood by each participant.

Data Analysis

All statistical analysis was performed using SPSS software (version 10.0.5, Chicago, USA). Mean plus or minus standard deviation was used for variables which were normally distributed, and median, interquartile range (IQR), and range, if required, were used for variables that were influenced by extreme values.

Chi-square test and t-test were conducted on categorical and continuous variables. Multivariate logistic regression was performed to study the relationship between the various socio-demographic characteristics, health-related characteristics, concerns about childbearing, and knowledge regarding methods to reduce transmission of HIV among respondents who desired children compared to those who did not desire to have children. A p-value of less than 0.05 was considered statistically significant.

RESULTS

Among the 300 study participants, over one quarter were female (n=85, 28%). The mean age of participants was 35(6) years. Most of the participants were married (n=259, 86%), while 8% (n=23) had been previously married, and 6% (n=18) had never been married. Over half of the participants came from the state of Tamil Nadu (n=156, 52%), followed by the state of Andhra Pradesh (n=131, 44%), just to the north of Chennai. The remaining participants came from the neighboring southern states of Pondicherry, Kerala and Maharashtra (n=13, 4%). Close to one-third of participants (n=106, 35%) were sero-discordant with their primary partner, meaning that their partner was not infected with HIV, and over half (n=168, 56%) were in sero-concordant partnerships, meaning that their partner was known by them to be HIV-infected, while few (n=10, 3%) had not had a partner since finding out their status or did not know the status of their partner (n=11, 5%). Among the 265 patients who had a primary partner, almost all (n=265, 93%) had disclosed their HIV status to their partner. Well over half of the respondents (n=164, 55%) had two or more children, just under one-third had one child (n=89, 30%), and less than one-sixth (n=46, 15%) of the respondents were childless. The mean number of children among the participants was 1.3. Among the women surveyed who had previously been pregnant, the mean age of first pregnancy was 21. Table I summarizes the general socio-demographic and health-related characteristics of the participants.

Table I. Characteristics of participants

Sociodemographic characteristics		
Total participants		300
Gender	Male	215(72%)
	Female	85(28%)
Mean Age (SD), years		35(6)
Age group	18-24	13(4%)
	25-30	58(19%)
	31-40	183(61%)
	41-50	46(20%)
Education	None	32(11%)
	Primary	28(9%)
	Middle	65(22%)
	Secondary	121(40%)
	Graduate	46(15%)
	Unknown	7(2%)
Occupation	Unskilled	52(17%)
	Skilled	110(37%)
	Professional	26(9%)
	Housewife	77(26%)
	Truck Driver	24(8%)
	Unemployed	5(2%)
	Unknown	6(2%)
State	Tamil Nadu	156(52%)
	Andhra Pradesh	131(44%)
	Pondicherry	4(1%)
	Karnataka	6(2%)
	Maharashtra	1(0%)
	Kerala	2(1%)
Marital Status	Never married	17(6%)
	Married	261(87%)
	Separated	4(1%)
	Divorced	5(2%)
	Widow/widower	13(4%)
Mean (SD) age of first pregnancy among women, years		21(3)
Number of Children	0	46(15%)
	1	89(30%)
	2	137(46%)
	3	22(7%)
	4 or more	5(2%)

Health-Related Characteristics		
Total participants		300
Mean (SD) time since diagnosis, months		48 (30)
Time since diagnosis	5 months-1 year	27(9%)
	1 year-2 years	61(20%)
	2 years-3 years	42(14%)
	3 years-4 years	44(15%)
	4 years-5 years	27(9%)
	>5 years	99(33%)
Median (IQR) most recent CD4 count, cells/mL		370(241-538)
Most recent CD4 count, cells/mL	<50	2(1%)
	50-199	44(15%)
	200-499	165(55%)
	≥500	88(29%)
	unknown	1(0%)
Median (IQR) lowest CD4 count, cells/mL		161(91-281)
Lowest CD4 count, cells/mL	<50	47(16%)
	50-199	128(43%)
	200-499	97(32%)
	≥500	27(9%)
	unknown	1(0%)
Number of prior hospitalizations	0	214(71%)
	1	22(7%)
	2	34(11%)
	≥3	30(10%)
History of AIDS-defining Opportunistic Infection	Yes	99(33%)
	No	201(67%)
Currently on HAART	Yes	211(70%)
	No	89(30%)
Mean (SD) duration on HAART, months		26(21)
Duration on HAART	4 months-1 year	63 (30%)
	1 year-2 years	55(26%)
	2 years-4 years	59(28%)
	>4 years	34(16%)
Mean (SD) time in care at YRG CARE		40(27)
Time in care at YRG CARE	5 months-1 year	44(15%)
	1 year-2 years	63(21%)
	2 years-3 years	57(19%)
	3 years-6 years	90(30%)
	>6 years	46(15%)
Disclosure to primary partner	Yes	265(88%)
	No	14(5%)
	No partner	21(7%)

HIV status of primary partner	Negative	106(35%)
	Positive	168(56%)
	Unknown	9(3%)
	No partner	17(6%)
Belief in effectiveness of HAART	Yes	284(95%)
	No	11(4%)
	Do not know	5(2%)

In terms of health status, on average the patients had been aware of their diagnosis for 4 years (mean: 48±30 months). The median (IQR) most recent CD4 count was 370(241-538), and the median (IQR) lowest CD4 count recorded 161(91-281). One-third (n=99, 33%) of the participants had previously been diagnosed with an AIDS-defining opportunistic infection (OI), and just under one-third (n=86, 29%) had been hospitalized at least once during the history of their infection. Over two-thirds (70%) of the participants were taking highly active antiretroviral treatment (HAART) at the time of the interview, and the mean duration on HAART was 26 (SD:21) months. Ninety-five percent of the participants believed that HAART was effective at slowing the course of HIV infection regardless of whether or not they were taking HAART. The participants had been receiving care at YRG CARE for a mean duration of 40 (SD:27) months.

Among the 300 HIV-infected individuals interviewed, 16%(n=47) expressed desire to have at least one more child, whereas 9% (n=28), or 60% of those who desired a child, expressed the intention to actually bear more children. So few participants expressed intention for childbearing that we were unable to compare them to those who did not intend to have children.

Eighty-one percent of people surveyed were greater than 30 years of age, which suggests that older individuals may have been over-represented in this cohort. However a separate analysis was done among individuals less than age 35, which showed that the

prevalence of childbearing desires among the younger group was similar, 19% as opposed to 16% in the entire cohort, and the associated factors among the younger participants were similar as well.

Table II shows the percentage distribution of the study participants and the mean values by selected characteristics according to the desire for children. Of those who desired children 74% were male and 26% were female which is similar to the sex distribution among those who did not desire children. Men and women who desired children were younger than those who did not desire children (mean (SD) age 32(6) and 35(6) respectively, $p=0.005$) and were more likely to have never married than those who did not desire to have a child (17% vs 4%; $p<0.001$). The participants desiring children were more likely to be childless, and childbearing desires decreased with increasing number of children. The participants who desired children were more likely to have been pregnant or had a partner who had been pregnant since finding out that they were HIV-infected than those who did not desire children. The participants who desired children had been aware of their HIV diagnosis for longer time than those who did not desire children (41 months vs. 46 months; $p=0.002$). However the desire for children was not significantly related to the level of disease severity in terms of the lowest CD4 count, a history of opportunistic infection or hospitalizations. Desire for children was not significantly associated with whether or not the participants were taking HAART or with the duration on HAART among those who were taking it.

The most frequently cited reason for desiring children was personal fulfillment (32%), followed by family pressure to bear children (28%), community pressure (13%), and a partner's desire for a child (13%). Fewer respondents cited desire for a child of a

specific sex as a reason for desiring another child. Few people recognized the impact of treatment as a reason for desiring children, whether it was the impact of treatment on their own health or treatment as a means of reducing vertical transmission. The reasons for desiring children among participants who desired them are summarized in Table IV.

The most commonly expressed concern about childbearing was possible transmission of HIV to the offspring, which was cited by 213 (71%) of the respondents, regardless of whether or not they wanted to have children. That predominating concern was followed by the burden of the respondent's own illness. Seventy-three of the 132 participants who did not have a partner infected with HIV stated they would be concerned about transmitting HIV to a partner in the attempt to conceive. Financial concern associated with bearing another child was expressed significantly more often among individuals who did not desire children (n=120, 47%) compared with those who desired children (n=9, 19 %, $p<0.001$). Fifteen percent (n=7) of individuals desiring children versus 0% (n=1) of individuals not desiring children stated that they had no concerns about childbearing ($p<0.001$).

Knowledge about reproductive options for reducing risks of transmission was not significantly associated with the desire for children. However, among the entire cohort, 35% reported no knowledge about methods of reducing vertical and horizontal transmission while trying to conceive, illustrated in Figure 1. Fifty-four percent cited HAART for PMTCT as a means of reducing vertical transmission, with only 31% reporting knowledge about c-section as part of PMTCT, and 29% recognizing that formula-feeding played a part in PMTCT.

Table II. Percentage distribution of study participants and mean values by socio-demographic characteristics according to desire for children

Characteristic	Desire children	Do not desire children	p
N(%)	47(16%)	253(84%)	
Gender			0.643
Female	12(26%)	73(29%)	
Male	35(74%)	180(71%)	
Mean (SD) Age, years	32(6)	35(6)	0.005
Age group			0.033
18-24 years	4(9%)	9(4%)	
25-30 years	13(28%)	45(18%)	
31-40 years	28(60%)	155(61%)	
41-50 years	2(4%)	44(17%)	
Marital Status			<0.001
Never married	8(17%)	9(4%)	
Married	39(83%)	222(88%)	
Separated/divorced/widowed	0(0%)	22(7%)	
Has at least one child			<0.001
Yes	22(47%)	231(91%)	
No	25(53%)	22(47%)	
Number of Children			<0.001
0	25(53%)	22(8%)	
1	20(43%)	69(27%)	
2	2(1%)	135(53%)	
≥3	0(0%)	27(11%)	
Occupation			0.453
Unskilled	4(9%)	48(19%)	
Skilled	21(44%)	89(35%)	
Professional	5(11%)	21(8%)	
Housewife	10(21%)	67(26%)	
Truckdriver	5(11%)	19(8%)	
Unemployed	1(2%)	4(2%)	
Unknown	1(2%)	5(2%)	
Education level			0.476
None	2(4%)	30(12%)	
Primary	5(11%)	23(9%)	
Middle	8(17%)	57(23%)	
Secondary	21(45%)	100(39%)	
Graduate	10(21%)	36(14%)	
Unknown	1(2%)	6(2%)	
State			0.119
Tamil Nadu	33(70%)	123(49%)	
Andhra Pradesh	13(28%)	118(47%)	
Other	1(2%)	12(4%)	

Table III. Percentage distribution of study participants by HIV-related characteristics according to desire for children

Characteristic	Desire children	Do not desire children	p
N(%)	47(16%)	253(84%)	
Disclosure to primary partner*			0.449
Yes	38(97%)	227(95%)	
No	1(3%)	13(5%)	
HIV status of primary partner*			0.764
Positive	25(66%)	143(61%)	
Negative	13(34%)	93(39%)	
HIV-infected child			0.946
Yes	3(6%)	18(7%)	
No	44(94%)	235(93%)	
Pregnancy since HIV status known in patients			0.004
Yes	14(36%)	40(16%)	
No	25(64%)	205(84%)	

*only asked of participants with a partner

Table III. Percentage distribution of study participants and mean values by health-related characteristics according to desire for children

Characteristic	Desire children	Do not desire children	p
N(%)	47(16%)	253(84%)	
Mean (SD) duration since diagnosis, months	41(30)	46(29)	0.002
Duration since diagnosis of HIV			0.011
5 months-1 year	2(4%)	25(10%)	
1 year-2 years	3(6%)	58(23%)	
2 years-3 years	8(17%)	34(13%)	
3 years-4 years	4(9%)	40(16%)	
4 years-5 years	6(13%)	21(8%)	
>5 years	24(51%)	75(30%)	
Mean (SD) duration of attendance at YRG, months	49(28)	39(27)	0.011
Duration of attendance at YRG			0.074
5 months-1 year	4(9%)	40(16%)	
1 year-2 years	5(11%)	58(23%)	
2 years-3 years	10(21%)	47(19%)	
3 years-6 years	16(34%)	74(29%)	
>6 years	12(25%)	34(13%)	
Median (IQR) recent CD4, cells/mL	396(261-593)	370(240-535)	0.347

Most recent CD4 count, cells/mL			0.889
<50	0(0%)	2(1%)	
50-199	6(13%)	38(15%)	
200-499	26(55%)	139(55%)	
≥500	15(32%)	73(29%)	
unavailable	0(0%)	1(0%)	
Median (IQR) lowest CD4, cells/mL	181(96-320)	160(82-271)	0.317
Lowest CD4 count, cells/mL			0.226
<50	7(15%)	40(16%)	
50-199	18(38%)	110(43%)	
200-499	14(30%)	83(33%)	
≥500	8(17%)	19(8%)	
unavailable	0(0%)	1(0%)	
History of AIDS-defining OI			0.863
Yes	15(32%)	84(33%)	
No	32(68%)	169(67%)	
Prior hospitalization			0.385
No	36(77%)	178(70%)	
Yes	11(23%)	75(30%)	
Receiving HAART			0.079
Yes	28(60%)	183(72%)	
No	19(40%)	70(28%)	
Mean (SD) duration on HAART, months	34(23)	28(21)	0.122
Duration on HAART among patients receiving HAART			0.044
4 months-1 year	8(29%)	55(30%)	
1 year-2 years	3(11%)	52(28%)	
2 years-4 years	8(29%)	51(28%)	
>4 years	9(32%)	25(10%)	
Belief in effectiveness of HAART			0.535
Yes	43(92%)	241(95%)	
No	3(6%)	8(3%)	
Do Not Know	1(2%)	4(2%)	

Table IV. Reasons for desiring children

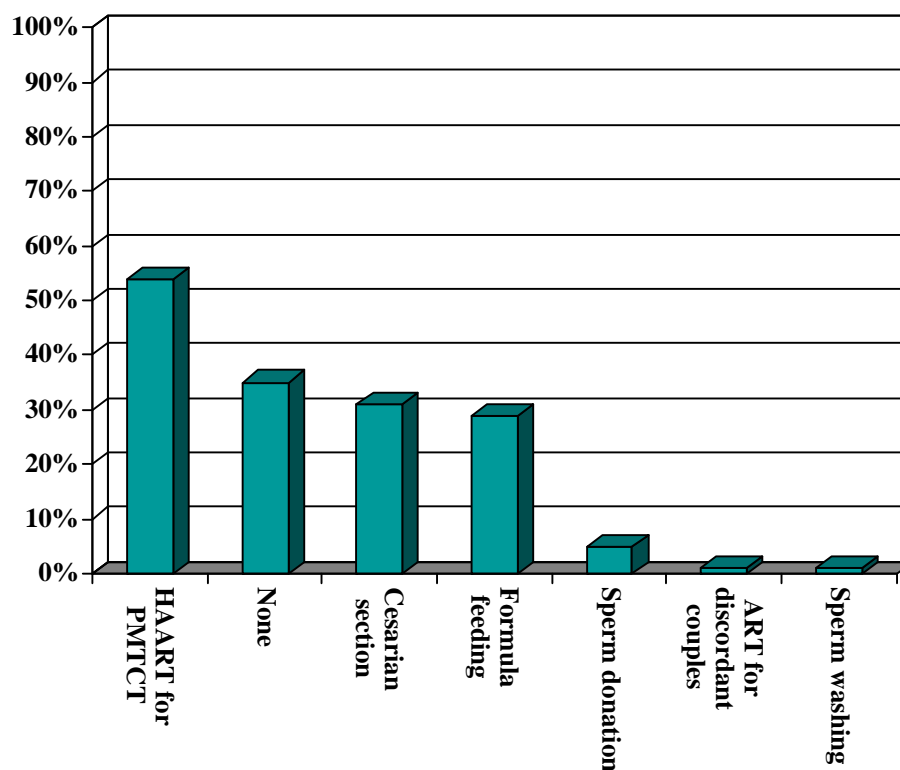
Number of participants desiring children	47(100%)
Reasons	
Personal fulfillment	32(74%)
Family pressure	12(28%)
Community Pressure	6(13%)
Partner desires a child	6(13%)
Desire to have a male child	3(7%)
Desire to have a female child	2(5%)
Treatment working, patient feels healthy	3(7%)
Access to medications to reduce transmission	3(7%)
Religious reasons	2(5%)
Other	10(23%)

Table V. Percentage distribution of study participants and mean values by concerns and knowledge regarding reproductive options according to desire for children

Characteristic	Desire children	Do not desire children	p
N(%)	47(16%)	253(84%)	
Concerns about bearing children			
Infecting infant	30(64%)	183(81%)	0.238
Burden of own illness	18(38%)	129(80%)	0.110
Infecting partner	10(21%)	63(25%)	0.595
Financial burden	9(19%)	120(47%)	<0.001
No concerns	7(15%)	1(0%)	<0.001
Stigma associated with illness	5(11%)	12(5%)	0.108
Family already complete	0(0%)	26(10%)	0.021
Other	3(6%)	9(4%)	
Knowledge about reproductive options			
None ¹	12(26%)	92(36%)	0.152
ART for mother and infant	27(57%)	136(54%)	0.606
Cesarian section	33(70%)	59(23%)	0.895
Formula feeding	15(32%)	71(28%)	0.955
Adoption	9(19%)	49(19%)	0.972
Treatment with ART in discordant couples	2(4%)	2(1%)	0.057
Sperm donation	4(9%)	10(4%)	0.174
Sperm washing	0(0%)	3(1%)	0.453
Desire for childbearing in absence of HIV			
Yes	*	121(48%)	
No		130(51%)	
Do not know		2(1%)	

¹Subjects did not report known means of reducing transmission for HIV-infected couples wishing to conceive

Figure 1. Knowledge about reproductive options that reduce vertical and horizontal transmission in HIV-infected couples wishing to conceive



The results of univariate analysis, comparing those who expressed desire for children to those who did not desire children, summarized in Table VI, demonstrate that desire for childbearing was associated with younger age (odds ratio, 0.922; 95% CI=0.87-0.98), being childless (odds ratio, 7.38; 95% CI=3.18-17.15), and being unmarried (odds ratio, 5.193; 95% CI=1.89-14.30). Increasing number of children was associated with decreased childbearing desires (odds ratio, 0.051; 95% CI=0.012-0.221). Absence of financial concern about having another child was also associated with desire for children (odds ratio, 3.81; 95% CI=1.77-8.21). Greater than four years since the diagnosis of HIV was associated with the desire for children (odds ratio, 2.187; 95% CI=1.511-5.511). In the multivariate model, desire for children was significantly associated with being

childless (odds ratio, 8.992; 95% CI= 4.368-19.742) and with greater time since diagnosis (odds ratio, 3.024; 95% CI= 1.419-6.445).

Table VI. Univariate and multivariate analysis of characteristics associated with desire for childbearing in entire cohort

Characteristic	Desire children N=47	Do not desire children N=253	Univariate		Multivariate regression	
			OR	95% CI	OR	95% CI
Mean (SD) age, years	32(6)	35(6)	0.922	0.87-0.98	0.945	0.882-1.01
Marital Status						
Married	38(81%)	222(88%)	-	-	-	-
Never married	8(17%)	9(4%)	5.19	1.89-14.3		
Other	1(2%)	21(9%)	0.266	0.04-2.03		
Childless						
Yes	25(53%)	22(9%)	7.38	3.18-17.2	8.99	4.37-19.7
Mean number of children*	1.09	1.86	0.051	0.012-0.221	-	-
Time since diagnosis						
4 years or more	30(64%)	96(38%)	2.19	1.51-5.51	3.02	1.42-6.45
Concern about financial burden of another child						
No	38(81%)	133(53%)	3.81	1.77-8.21	1.86	0.788-4.37

*among participants with children

Although 84% of the cohort expressed no desire for childbearing, nearly half (48%) of those without desire stated that in the absence of HIV infection they would desire and or intend to have children. In order to assess the effect of HIV infection on the desire for children, we compared the group who openly expressed desire for children despite HIV infection, to those who stated that they did not currently desire children but would desire them in the absence of HIV. These results are summarized in Tables VII-XVI. When compared with the 47 who expressed desire for children, the 121 who stated that they would desire children in the absence of HIV were not significantly older (mean age 32 vs. 35) and did not differ significantly according to gender. Study participants who would have desired children in the absence of HIV infection are more likely to have

at least one child already (87% vs 47%, $p < 0.0001$), tended to have a shorter duration since diagnosis and were more likely to live in the neighboring state of Andhra Pradesh (56% vs 28%, $p = 0.002$) compared to participants who expressed desire for children regardless of HIV status (Table VII, Table IX). However, desire for more children in the absence of HIV was not significantly associated with any measures of disease progression such as most recent or lowest CD4 count, history of opportunistic infections or history of hospitalizations (Table IX). Individuals who expressed that they would desire children if they were HIV-negative were significantly more likely to express concern about vertical transmission, concern about the burden of their own illness and financial burden when compared with the participants who expressed desire for children regardless of HIV status (Table X). Their knowledge about methods for reducing transmission among couples wishing to conceive was not significantly different than the participants who desired children regardless of their HIV status (Table X).

The results of univariate and multivariate analysis, comparing those who would have desired children if they were HIV-negative to those who desired children regardless of their HIV status are summarized in Table XVI. These results demonstrate that state of residence, already having a child, time since diagnosis, and concern about transmission of HIV infection to the infant were all related to the influence of HIV on reproductive desire. Multivariate analysis demonstrates that participants who already had at least one child (odds ratio, 5.617; 95% CI=2.174-14.515) and resided in the state Andhra Pradesh (odds ratio, 3.560; 95% CI=0.012-0.221) were more likely to have had HIV status significantly influence their desire for another child.

Table VII. Percentage distribution of study participants and mean values by socio-demographic characteristics according to desire for children regardless of HIV status and desire for children in the absence of HIV infection

Characteristic	Desire Children	Would desire children if HIV negative	p
N(%)	47	121	
Gender			0.848
Female	12(26%)	34(28%)	
Male	35(74%)	87(72%)	
Mean Age (SD)	32(5)	35(6)	0.029
Age			0.287
18 to 25	6(13%)	8(7%)	
26 to 35	28(60%)	68(56%)	
31 to 50	13(28%)	45(37%)	
Marital status			0.046
Never married	8(17%)	8(7%)	
Married or previously married	39(83%)	113(93%)	
Education			0.612
None	2(4%)	13(11%)	
Primary	5(11%)	13(11%)	
Middle	8(17%)	21(18%)	
Secondary/technical	21(46%)	53(45%)	
Graduate	10(22%)	27(15%)	
Employment			0.262
Unskilled or unemployed	5(11%)	27(23%)	
Skilled	21(46%)	47(40%)	
Professional	5(11%)	8(7%)	
Housewife	10(22%)	30(25%)	
Truck Driver	5(11%)	6(5%)	
State of residence			0.002
Tamil Nadu	33(72%)	50(44%)	
Andhra Pradesh	13(28%)	64(56%)	
Number of children			<0.0001
0	25(53%)	15(13%)	
1	20(43%)	55(46%)	
2 or more	2(4%)	50(42%)	
Has at least one child			<0.0001
Yes	22(47%)	104(87%)	
No	25(53%)	16(13%)	

Table VIII. Percentage distribution of study participants and mean values by HIV-related characteristics according to desire for children regardless of HIV status and desire for children in the absence of HIV infection

Characteristic	Desire Children	Would desire children if HIV negative	p
N(%)	47	121	
Disclosure of HIV status to primary partner			0.608
Yes	38(97%)	106	
No	1(3%)	4	
Partner's HIV status			0.447
Positive	25(66%)	65(58%)	
Negative	13(34%)	47(42%)	
Child with HIV			0.033
Yes	8(17%)	7(6%)	
No	39(83%)	114(94%)	
Pregnancy since diagnosis			0.313
Yes	14(30%)	26(21%)	
No	33(70%)	95(79%)	

Table IX. Percentage distribution of study participants and mean values by health-related characteristics according to desire for children regardless of HIV status and desire for children in the absence of HIV infection

Characteristic	Desire Children	Would desire children if HIV negative	p
N(%)	47	121	
Mean (SD) duration since diagnosis, months	57(19)	48(21)	0.011
Duration since diagnosis			0.017
≤48 months	17(36%)	69(57%)	
>48 months	30(64%)	52(43%)	
Median (IQR) most recent CD4, cells/mL	396(261-593)	332(207-506)	0.145
Most recent CD4, cells/mL			0.139
<200	6(13%)	29(24%)	
≥200	41(87%)	91(76%)	
Median (IQR) lowest CD4, cells/mL	181(96-320)	152(70-252)	0.137
Lowest CD4 count, cells/mL			0.291
<200	25(53%)	76(63%)	
≥200	22(47%)	44(37%)	
History of AIDS-defining OI			0.704
Yes	15(32%)	35(29%)	
No	32(68%)	86(71%)	

Taking HAART			0.123
Yes	28(60%)	87(72%)	
No	19(40%)	34(28%)	
Mean (SD) time on HAART, months	34(23)	29(22)	0.239
Belief in effectiveness of HAART			0.468
Yes	43(9%)	115(95%)	
No	4(91%)	6(5%)	

Table X. Percentage distribution of study participants and mean values by concerns and knowledge according to desire for children regardless of HIV status and desire for children in the absence of HIV infection

Characteristic	Desire Children	Would desire children if HIV negative	p
N(%)	47	121	
Concerns about bearing children			
Infecting the partner	10(21%)	40(33%)	0.134
Infecting infant	30(64%)	98(81%)	0.019
Burden of own illness	18(38%)	74(61%)	0.008
Financial burden	9(19%)	48(40%)	0.012
Stigma	5(11%)	10(8%)	0.628
Family complete	0(0%)	0(0%)	-
No concerns	7(15%)	1(1%)	0.001
Knowledge about reproductive options			
Adoption	9(19%)	31(26%)	0.377
Formula feeding	13(28%)	53(44%)	0.054
ART for discordants	2(4%)	2(2%)	0.312
Sperm donation	4(9%)	1(1%)	0.022
Sperm washing	0(0%)	1(1%)	1.0
ART for PMTCT	27(57%)	80(66%)	0.372
C-section	11(23%)	42(35%)	0.196
none	12(26%)	31(26%)	0.991

Table XI. Univariate and multivariate analysis of characteristics associated with desire for childbearing in the absence of HIV infection

Characteristic	Desire children	Would desire children if HIV-negative	Univariate		Multivariate regression	
	N=47	N=121	OR	95% CI	OR	95% CI
Mean age, years	32	35	1.07	1.01-1.14	1.06	0.974-1.14
Marital Status						
Never married	8(17%)	8(7%)				
Currently or previously married	39(83%)	113(93%)	2.90	1.02-8.24	0.402	0.014-11.5
State						
Andhra Pradesh	13(28%)	64(56%)	3.25	1.55-6.82	3.57	1.40-9.10
Tamil Nadu	33(72%)	50(44%)				
Have at least one child						
Yes	22(47%)	105(87%)	5.62	2.17-14.5	4.24	1.36-13.28
Time since diagnosis						
4 years or more	30(64%)	52(43%)	0.765	0.619-0.945	0.459	0.191-1.10
Concern about infecting infant	30(64%)	98(81%)	0.414	0.196-0.875	0.489	0.175-1.37
Concern about burden of own illness	18(38%)	74(61%)	0.394	0.197-0.788	0.479	0.203-1.13
Concern about financial burden of another child	9(19%)	48(40%)	0.360	0.160-0.812	0.786	0.293-2.11
No concerns about bearing another child	7(15%)	1(1%)	21.0	2.51-176	-	-

DISCUSSION

Sixteen percent of HIV-infected individuals expressed desire for children in this sample of mostly married, male subjects, who for the most part already had at least one child, were diagnosed a mean of 4 years prior to the survey, and who had overwhelmingly disclosed their HIV status to their primary partner. Despite pervasive cultural pressure to bear children, desire for children in this setting was less extensive than had been reported among HIV-infected individual in high-income countries (25-45%) and in other resource-limited settings in Africa (18%-63%) (20, 23, 41, 42, 44). Those who desired children in this context tended to be younger, unmarried, and had no children or fewer children than those who did not desire more children. Neither biological markers of disease progression nor exposure to HAART significantly impacted the desire for children. However, HIV infection did play a significant role in the desire and the decision to bear children; nearly half of participants who did not express desire for children said that in the absence of HIV infection they would want more children.

In this sample younger age is positively associated with desire for children, which is consistent with similar studies in a wide range of settings (20, 23, 41, 42, 44). Being childless was the strongest predictor of childbearing desire in this cohort, which was also consistent with findings in resource-limited settings in Nigeria and Uganda (21, 44). This may also explain why being unmarried was associated with desire for children, since individuals who were unmarried did not yet have any children. Individuals without children were almost six times more likely to desire children than individuals with one or more children. Likewise, individuals with one child were more inclined to desire another child compared with individuals who already had two or more. These findings support

the possibility that concerns and stigma associated with being childless in this personal and socio-cultural context may outweigh people's concerns about transmission, finances, and the burden of their illness.

A similar study conducted in Nigeria, where desire for children was far more prevalent, noted that desire for childbearing was associated with nondisclosure (44). In our cohort, the overwhelming majority of patients had disclosed at least to his or her primary partner, which may have been protective. In addition to indicating a certain level of personal acceptance of HIV infection, disclosure may discourage people from bearing children because of stigma; once an individual's HIV-status is disclosed, his or her family or community may be concerned about transmission to the child and discourage the individual from having children. However, since respondents in our cohort had overwhelmingly disclosed their HIV status to their primary partner, we are unable to comment on any association between non-disclosure and desire or intention for childbearing in this setting.

Childbearing desires appeared to be independent of health-related factors, such as most recent CD4 count, lowest CD4 count, or history of opportunistic infections, which is consistent with the Nigerian and Ugandan studies. However, the finding that individuals with longer time since diagnosis have greater desire for children may suggest that those desiring children are more inclined to view HIV as a chronic disease rather than an imminently life-threatening illness. Although childbearing desires were not influenced by treatment with HAART, the significant association between the desire to bear children and longer duration since diagnosis, suggests that childbearing desires, and perhaps

intentions, may become increasingly prevalent as longevity improves through better access to treatment and specialized care.

Other studies have suggested that improved availability of HAART, which allows people to live longer, healthier lives and reduces risks of mother to child transmission, has increased childbearing desires and intentions in settings like the U.S. and South Africa (24, 26, 40). In our cohort, childbearing desires were not significantly associated with whether or not a patient was taking HAART or by the duration of treatment with HAART, which may appear to contradict findings that access to HAART increases childbearing among HIV-infected couples. Our finding might be explained by several factors. Nearly all patients interviewed believed in the effectiveness of HAART at slowing the progression of HIV regardless of their childbearing desires or intentions. Furthermore all participants who needed HAART had access to it (although this was not true of all patients with HIV in India), which means that there was no comparison group of individuals who did not have access to HAART in this study. Since all participants believed in the effectiveness of HAART we are unable to comment on any association between participants' belief in the effectiveness of treatment and their desire for additional children.

Despite access to treatment among this study population and their nearly universal belief in the effectiveness of HAART at slowing infection, 46% of respondents did not identify HAART as a means for preventing mother to child transmission. This finding suggests that although patients understood the role of HAART in slowing the progression of their own disease, the majority of them did not fully understand the role of HAART in preventing vertical transmission. This finding might explain why the percentage that

expressed desire was relatively low (16%), similar to a study conducted in Uganda where the population surveyed did not have access to HAART and only 18% expressed desire for children (42). This seeming lack of knowledge, particularly among the individuals desiring children, is surprising in this context of specialized care and ongoing counseling and argues for increased widespread efforts in education and dissemination of information about prevention of vertical transmission of HIV.

Childbearing decisions in India, as elsewhere, are influenced by culture, religion, family structure, and perception of identity (46). This study did not thoroughly qualitatively explore individuals' complex reasons for desiring children, nor their concerns about bearing them. Eighty-four percent of the cohort expressed no desire for childbearing. However, nearly half of those without desire stated that in the absence of HIV infection they would desire and or intend to have children which suggests that being infected with HIV has a powerful influence on the decision of whether or not to bear children. A comparison of the participants who would desire children in the absence of HIV to the group who desired children despite their HIV infection begins to illustrate the impact of HIV on the decision-making. The participants who would have desired more children in the absence of HIV generally already had at least one child, and thus were potentially less susceptible to the cultural stigma or personal sense of loss from being childless. They also tended to live in Andhra Pradesh, which suggests that individuals living in Tamil Nadu, in closer proximity to specialized HIV care, may be more willing to consider childbearing in the face of HIV infection. The participants who would have desired more children in the absence of HIV also more commonly expressed concern about infecting the infant, concern over the financial burden (which may include the

current costs of HAART or the anticipated costs of eventual treatment), and the burden of illness as reasons for not bearing children than the participants who wanted children regardless of their HIV status. This finding suggests that for the majority of individuals who would want children, concerns about the risks of childbearing in the context of HIV outweigh their desire or the personal and cultural importance of bearing more children.

Since this study was conducted in a non-governmental specialized HIV care setting, and the study subjects were mostly male, married, had at least one child and had disclosed their HIV status to their primary partner, these findings may not be generalizable to the entire population of HIV-infected individuals in India. The limitations of this study also include the potential of inter-interviewer inconsistency, as well as the format of face-to-face administration of the questionnaire as opposed to anonymous administration. The reason for face-to-face interviews was the importance of including all participants regardless of whether or not they were literate, as well as the ability of counselors to address questions or concerns that arose after administration of the questionnaire. However, participants may have been hesitant to disclose their true desires and intentions in this setting. Another limitation was that this study did not address the influence of quality of life on the decision of whether or not to bear children, which has been shown to influence reproductive decision-making in other studies. This meant that although we were able to use markers such as CD4 count and history of opportunistic infection as indicators of disease progression, we were not able to account for a patient's more subjective understanding or experience of these factors and its relationship to their childbearing desires.

Future directions of research should include attitudes of health care professionals and policy makers about reproductive decisions among HIV-infected individuals. An exploration of pregnancy risk behavior in this population in light of the stated desires and intentions would also be illuminating as would a comparison to the childbearing desires, intentions and decision-making among an HIV-infected cohort compared to uninfected controls.

In conclusion, this study, which is the first to explore the childbearing desires among HIV-infected individuals in India, illustrates that as people live longer with HIV, they are inclined to consider childbearing. Although HIV influences people's decisions about childbearing, in terms of the potential for infecting the infant, the burden of illness and financial burdens, it is likely that as access to HAART continues to improve, individuals with HIV will live longer lives, and childbearing will become a more pressing concern in this context, particularly among HIV-infected individuals who do not yet have children. It is important that HIV-infected individuals who are considering childbearing have the opportunities to discuss the risks and options, particularly the benefit and importance of HAART for PMTCT, with health-care providers.

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