

# Human Immunodeficiency Virus Seroconversion and Associated Risk Factors among Pregnant Women Delivering at Bugando Medical Center in Mwanza, Tanzania

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## Abstract

**Background:** Routine testing for human immunodeficiency virus (HIV) among pregnant women is done early during antenatal care (ANC) in Tanzania, but retesting for the women found negative is rarely done at term or during delivery. **Aim:** This study aimed at determining the magnitude and risk factors associated with HIV seroconversion among pregnant women delivering at Bugando Medical Center (BMC). **Subjects and Methods:** This cross-sectional study was conducted from January to March 2013 involving 400 pregnant women who tested HIV negative during ANC. These were re-tested during delivery, and those found positive (and their babies) were given antiretroviral therapy (ART) prophylaxis. All exposed babies were tested by polymerase chain reactions (DNAPCR) at 1 month of age. Sociodemographic and clinical characteristics were collected using a structured questionnaire and patients' files. Data were analyzed using SPSS version 17.0 software. **Results:** Of 400 pregnant women (mean age 26.4 [5.73] years) enrolled, HIV seroconversion was found in 5.3% (21/400). Upon multivariate logistic regression analysis, polygamous marriage ( $P < 0.001$ ) and history of syphilis during ANC visit ( $P < 0.001$ ) were found to be independent predictors of HIV seroconversion among pregnant women delivering at BMC. One of the 21 babies (4.8%) born of HIV seroconverted women was confirmed to be HIV infected. **Conclusion:** The high rate of HIV seroconversion found in this study implies that HIV re-testing should be an enduring exercise. This will allow timely provision of ART prophylaxis to HIV seroconverted women and their exposed babies and thus, prevent mother to child transmission of HIV.

**Keywords:** Human immunodeficiency virus seroconversion, Pregnant women, Tanzania

## Introduction

Human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS) is one of the most devastating disease posing therapeutic and prevention challenges, especially in developing countries where it accounts for high morbidity and mortality.<sup>[1,2]</sup> HIV infection in pregnancy has become one

of the medical complications of pregnancy in the developing countries where over 70% of the 35 million people living with HIV reside.<sup>[1-4]</sup> In developed countries profoundly low HIV seroprevalence has been reported among pregnant women tested before 34 weeks<sup>[5]</sup> whereas, in developing African countries the rates are high ranging from 5.2% to 11.1%.<sup>[3,4,6-8]</sup> In Tanzania, HIV seroprevalence among adults aged between 15 and 49 years basing on household surveys was found to be 5.7%, with the majority of these being women (56%). Furthermore, the prevalence of HIV among women attending antenatal care (ANC) clinics was 6.8% accounting for approximately 100,000 HIV-exposed infants annually.<sup>[9,10]</sup>

Being sexually active in the midst of undue behavioral drives, physiological and biological changes, pregnant women

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continue to be at risk of getting HIV infection as well as posing a threat of transmitting HIV to the newborn in utero, during delivery or postdelivery through breast feeding.<sup>[11-14]</sup> Limited studies have evaluated HIV seroconversion among pregnant women in developing countries and the rates were shown to vary significantly ranging from 2.6% (53/2035) in Kenya to 17.7% (66/372) in Zimbabwe.<sup>[12,15]</sup> Despite these variations, HIV seroconversion among pregnant women in Tanzania remains to be explored because re-testing for the women found negative early in the ANC is rarely done at term or during delivery. Therefore, this study aimed at determining the prevalence of HIV seroconversion among pregnant women and its associated risk factors as well as assessing the magnitude of mother to child transmission of HIV at Bugando Medical Center (BMC).

## Subjects and Methods

### Study design and sampling process

This cross-sectional hospital-based study was conducted from January to March 2013 in the labor ward of BMC. BMC is a consultant, referral, and teaching hospital serving a catchment area of approximately 13 million people with an average of 600 deliveries/month. The study enrolled consecutively 400 pregnant women coming for delivery at BMC who tested HIV negative during ANC visits at least 3 month prior to the study period. Pregnant women with unknown HIV serostatus on ANC card and those with no ANC card on admission as well as those who were in the active phase of labor were excluded from the study.

### Data collection and laboratory procedures

All eligible pregnant women were identified during the admission in the labor ward, the principle investigator explained thoroughly the aim of the study and then a written informed consent was sought from each study participant. Social, demographic, and clinical data were collected using a structured questionnaire, ANC card and patients' files. The syphilis screening among pregnant women in the ANC in Tanzania is based on the Venereal Disease Research Laboratory test whereas the confirmatory test is based on the treponemal pallidum hemagglutination test. Provider initiated counseling and testing for HIV was conducted basing on the new Tanzania algorithm for HIV testing using Determine HIV1/2 (Alere Medical Company, Japan) as first test followed by Unigold (Trinity Biotech. Bray, Ireland).<sup>[9]</sup> All HIV exposed babies were tested for HIV at 1 month of age using DNA-PCR test.<sup>[9,16]</sup>

### Data analysis

Social, demographic, and clinical data were entered into Microsoft excel<sup>®</sup> (Microsoft Corporation, Washington, U.S) for consistent checks and data cleaning and then exported into SPSS version 17.0 software<sup>®</sup> (IBM Corporation, NewYork, U.S) for analysis. Continuous data were described

as mean (standard deviation) or median (interquartile range) depending on the distribution of data. Categorical variables were reported as a proportion and were compared using Chi-squared test or Fischer's exact test where appropriate. At 95% confidence interval,  $P \leq 0.05$  was considered as significant for various predictor variables of HIV seroconversion among pregnant women. All predictor variables with association on bivariate analysis were subjected to multivariate logistic regression analysis.

### Study clearance and ethical considerations

This study got ethical clearance from the Catholic University of Health and Allied Sciences/BMC Research Ethics Committee (CREC/005/001/2013). A written informed consent was sought from every participant. Provider initiated pre- and post-test counseling for HIV was done by the principal investigator and two research assistants (two trained nurses). Unique study identification numbers were used to ensure anonymity of the study participants. HIV infected women and their exposed babies were given antiretroviral prophylaxis as per Tanzanian National AIDS Control Program (NACP) guidelines<sup>[9]</sup> and then referred care and treatment clinic for further management.

## Results

### Social demographic characteristics of the study participants

A total of 2058 pregnant women delivered at BMC during the study period, of these 400 were eligible and thus, recruited. The mean age of the study participants was 26.4 (5.73), minimum 15 and maximum 42 years. More than three quarters of the study participants were from the urban area (87.5% [350/400]) and married (90.7% [363/400]). About half of the study participants were unemployed (49.5% [198/400]) and 42.7% (171/400) booked at 4 months of gestation age [Table 1].

### Human immunodeficiency virus seroconversion and associated risk factors

Human immunodeficiency virus seroconversion was found in about 5.3% (21/400) of pregnant women. Unmarried women ( $P = 0.02$ ), women in a polygamous marriage ( $P < 0.001$ ), women living in a separate house from husbands ( $P = 0.02$ ), women married to frequently traveling (mobile) husbands ( $P < 0.001$ ) and those with a history of syphilis during ANC visit ( $P < 0.001$ ) were significantly associated with HIV seroconversion on bivariate analysis. Upon multivariate logistic regression analysis, polygamous marriage ( $P < 0.001$ ) and history of syphilis at ANC ( $P < 0.001$ ) were found to be independent predictors of HIV seroconversion among pregnant women delivering at BMC. All pregnant women who seroconverted attended their initial ANC outside BMC and self-reported that the HIV serostatus of their husbands was unknown [Table 2].

**Table 1: Social, demographic, and obstetric characteristics of study participants**

Variable	Number (n)	Percentage
Age		
<25	174	43.5
25-30	139	34.8
>30	87	21.7
Residence		
Urban	350	87.5
Rural	50	12.5
Education level		
Primary	222	55.5
Secondary	94	23.5
Higher education	84	21.0
Parity		
0	141	35.2
1	115	28.8
>2	144	36.0
Gravidity (G)		
G1	128	32.0
G2	114	28.5
>G3	158	39.5
Gestational age (weeks)		
<38	47	11.8
39	100	25.0
40	163	40.7
>40	90	22.5
*ANC booking (months)		
2-3	113	28.3
4	171	42.7
5-6	116	29.0

\*ANC: Antenatal care

## Mother to child transmission of human immunodeficiency virus

One of the 21 babies (4.8%) born of HIV seroconverted women was confirmed to be HIV infected.

## Discussion

Human immunodeficiency virus seroconversion among pregnant women in this study (5.3%) is higher than 1.02% reported in Namibia<sup>[8]</sup> and 2.6% in Kenya,<sup>[12]</sup> but lower than 17.7% reported in Zimbabwe.<sup>[15]</sup> indicating that HIV is still a public health problem among pregnant women in both countries, but the magnitude of problem varies from country to country reflecting different interventional policies to combat HIV infection in these countries. However, basing on the HIV detection methods (i.e. rapid HIV serological methods) used in the present study, the magnitude could have been higher if the ultra-sensitive methods (i.e. HIV DNA/RNA methods) were to be employed. This emphasizes the need to introduce the later methods to timely uncover the incident HIV infections antenatally as shown in developed countries though cost remains a challenge.<sup>[5]</sup>

This study showed that pregnant women who are unmarried, women in a polygamous marriage, women living in a separate house from husbands and women married to frequently traveling husbands were more likely to seroconvert. Other similar studies have also shown that single mothers,<sup>[7]</sup> polygamous relationship and multiple sexual partners.<sup>[6,12,17]</sup> are potential risk factors for HIV seroconversion among pregnant women. Polygamy reduces family cohesion thus increasing the possibility of women to have other partners and infection of any of the partners in the network puts everyone else at risk of acquiring HIV.<sup>[6,12]</sup> Pregnant women at the peak of reproductive age (25–30 years) in the present study were more likely to seroconvert (7.2%), although the difference was not statistically significant ( $P = 0.09$ ), other similar study showed the difference to be statistical significant (15–34 years,  $P < 0.005$ ).<sup>[7]</sup> Suggesting that this age range may be associated with higher sexual activities. Similar to other studies,<sup>[6,15]</sup> high seroconversion rate was shown among pregnant women married to mobile husbands. This can be explained by the fact that women married to mobile husbands can engage in casual partnerships because they are either free, lonely or experience economic hardship.<sup>[6,15]</sup> It is well-known that ulcerative sexual transmitted infections facilitates HIV transmission.<sup>[18]</sup> and similar to other studies,<sup>[4,6]</sup> the present study has also shown that pregnant women with a history of syphilis were significantly prone to seroconvert ( $P < 0.001$ ). This study found that all HIV seroconverted pregnant women reported that the HIV serostatus of their husbands was unknown. This can be explained by the fact that in Tanzania the policy on HIV screening among pregnant women's partners is not stringently implemented and as a matter of fact no commitment of these partners to attend ANC clinics. A study conducted in Iringa, Tanzania has shown that HIV testing aimed at prevention of horizontal and vertical transmission of HIV during pregnancy require communication and support within the couple.<sup>[19]</sup> Furthermore, involvement of the local community can increase the number of male partners tested annually from 7% to 50%.<sup>[19]</sup> and thus, uncovering male partners HIV serostatus in the context of prevention of maternal to child transmission of HIV.

Upon assessment of the possibility of HIV transmission from HIV seroconverted women to their babies, our study revealed unfortunately that one baby was confirmed to be HIV infected despite the antiretroviral therapy (ART) prophylaxis intervention given to all mothers and their babies as per Tanzanian NACP guidelines.<sup>[9]</sup> This finding is low compared to the previous study done in Thailand where 13.3% (2/15) of the infants born to women who seroconverted were infected.<sup>[20]</sup> The low infection rate in Tanzania compared to Thailand could be attributed to the ART prophylaxis intervention given to the mother at the onset of labor and for the baby after deliver, which is routinely done in Tanzania.

**Table 2: Risk factors associated with HIV seroconversion among pregnant women**

Variable	Seroconversion (n (%))		Bivariate		Multivariate	
	Positive	Negative	OR (95% CI)	P	OR (95% CI)	P
Age						
<25	5 (2.9)	169 (97.1)	1			
25-30	10 (7.2)	129 (92.8)	2.6 (0.9-7.8)	0.09	-	-
>30	6 (6.9)	81 (93.1)	2.5 (0.7-8.4)	0.14		
Residence						
Urban	19 (5.4)	331 (94.6)	1			
Rural	2 (4.0)	48 (96.0)	0.7 (0.2-3.2)	0.50	-	-
Marital status						
Married	16 (4.4)	347 (95.6)	1		1	
Unmarried	5 (13.5)	32 (86.5)	3.4 (1.2-9.9)	0.02	0.9 (0.1-8.6)	0.98
Marriage type						
Monogamy	10 (2.8)	345 (97.2)	1		1	
Polygamy	11 (24.4)	34 (75.6)	11.2 (4.4-28.2)	<0.001	31.1 (4.3-226.7)	<0.001
Relationship with husband						
Living together	7 (2.4)	288 (97.6)	1		1	
Separate house	4 (10.3)	35 (89.7)	4.7 (1.3-16.9)	0.02	0.3 (0.0-3.8)	0.37
Mobile husbands	10 (15.2)	56 (84.8)	7.3 (2.7-20.1)	<0.001	2.9 (0.7-12.3)	0.13
Place of ANC						
Bugando	0 (0.0)	8 (100.0)	1	0.65	-	-
Other RCH**	21 (5.4)	371 (94.6)	Omitted <sup>d</sup>			
HIV serostatus of husband						
Negative	0 (0.0)	206 (100.0)	1	<0.001	-	-
Unknown	21 (10.8)	173 (89.2)	Omitted <sup>d</sup>			
History of syphilis at ANC						
Negative	14 (3.6)	376 (96.4)	1		1	0.001
Positive	7 (70.0)	3 (30.0)	62.7 (14.6-268.2)	<0.001	67.2 (10.3-37.3)	

\*\*Reproductive and Child Health, <sup>d</sup>These factors predicted perfectly the outcome. HIV: Human immunodeficiency virus, ANC: Antenatal care, OR: Odds ratio, CI: Confidence interval

## Limitations

This study used rapid HIV serological tests, which could not detect the women who were in the window period. Thus, the later may have been missed and as a result, the actual seroconversion may be higher than what is reported here. Molecular based HIV DNA/RNA detection method would have been of interest to address this limitation. Furthermore, most women delivering at BMC have underlying obstetric risks; thus, information reported here may not be generalized to all women of reproductive age in Tanzania.

## Conclusion

There is a high rate of HIV seroconversion among pregnant women attending BMC for delivery. This missed opportunity may go undetected at delivery if re-testing is not done, thus emphasizing on HIV re-testing near term or during delivery among all pregnancy women who tested negative during ANC. This will allow timely provision of ART prophylaxis to HIV seroconverted women and their exposed babies and thus, prevent mother to child transmission of HIV. Polygamous marriage and history of syphilis during ANC were found to be independent predictors of HIV seroconversion and as a matter of fact couple counseling on safe sexual practices as well as active

screening and treatment of STIs in all pregnant women should be an enduring exercise during ANC visits.

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