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CLINICAL ARTICLE

Predictors of unknown HIV serostatus at the time of labor and delivery in Kampala, Uganda

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ABSTRACT

Objective: To determine factors associated with an unknown HIV serostatus among pregnant women admitted in labor to Mulago Hospital, Kampala, Uganda. **Methods:** In total, 665 pregnant women admitted to Mulago Hospital were interviewed about their sociodemographic characteristics, obstetric history, access to prenatal care, fears regarding HIV testing, and knowledge about modes of mother-to-child-transmission (MTCT). Knowledge of the HIV serostatus was assessed by self-report and verified by prenatal card review. **Results:** The prevalence of unknown HIV serostatus at the time of labor was 27.1%. Factors associated with an unknown HIV serostatus included high parity (odds ratio [OR] 1.9; 95% confidence interval [CI], 1.16–3.14), preterm delivery (OR 2.60; 95% CI, 1.06–6.34), prenatal care at a private clinic (OR 12.87; 95% CI, 5.68–29.14), residence more than 5 km from the nearest prenatal clinic (OR 2.86; 95% CI, 1.18–17.9), high knowledge about MTCT (OR 0.25; 95% CI, 0.07–0.86), and fears related to disclosing the test result to the partner (OR 3.60; 95% CI, 1.84–7.06). **Conclusion:** The high prevalence of unknown HIV serostatus among women in labor highlights the need to improve accessibility to HIV testing services early during pregnancy to be able to take advantage of antiretroviral therapy.

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1. Introduction

Globally, 330 000 children acquired an HIV infection in 2011; more than 90% of these children were in Sub-Saharan Africa [1]. One of the key strategies recommended for the prevention of mother-to-child transmission (PMTCT) is the provision of timely HIV testing of pregnant women and antiretroviral therapy for all HIV-positive women [1]. However, interventions for PMTCT can only be initiated when the HIV serostatus of a pregnant woman is known. Testing for HIV during pregnancy is a gateway to care and treatment for HIV-positive pregnant women and their children. Attempts toward increasing the number of women who undergo HIV testing have largely been targeted at women at prenatal care clinics, because the majority of pregnant women (95% in Uganda [2]) attend prenatal care services at least once. However, despite the high attendance of prenatal care services, only 63% of pregnant women in Uganda were tested for HIV during 2009–2010 [1]. The remaining proportion of pregnant women delivered with an unknown HIV serostatus.

Several factors are associated with an unknown HIV serostatus at the time of labor and delivery. These include health system factors (lack of access to prenatal care and HIV testing services), the stigma associated with a positive test result, partner disapproval, and limited knowledge about PMTCT [3–9]. As a result, an unknown maternal HIV serostatus at the time of labor and delivery contributes to the increased number of HIV-exposed newborns who are undiagnosed and consequently not enrolled in available PMTCT services.

Several studies [10–14] have documented an increased acceptability of intrapartum HIV testing for women who present in labor with an unknown HIV serostatus as a last opportunity for PMTCT. However, the longer an HIV-positive pregnant woman receives highly active antiretroviral therapy (HAART), the less likely she is to transmit HIV to her child. Initiation of antiretrovirals (ARVs) less than 4 weeks prior to delivery is associated with a 5-fold increase in the risk of vertical HIV transmission when compared with maternal ARV initiation at 13 weeks prior to delivery [15]. This implies that earlier access to PMTCT services ensures that HIV-positive women receive more-efficacious ARVs for long enough to maximize their protective effect.

Information on barriers to HIV testing during pregnancy is scarce. The present study aimed to determine factors contributing to the presentation of women in labor with unknown HIV serostatus. The findings will inform planners in lower-income countries of areas that need

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strengthening so that women will access PMTCT services earlier during a pregnancy.

2. Materials and methods

The present study had a cross-sectional design and was carried out at Mulago National Referral Hospital, Kampala, Uganda. The hospital has 3 labor suites: 2 are free-of-cost delivery suites and 1 is a for-fee labor suite. One free public labor suite is midwife-led, with 15–20 deliveries conducted per day. The other free labor suite is obstetrician-led, and there are approximately 60–80 deliveries performed each day. The study was conducted in the obstetrician-led labor suite, which receives the majority of self-referred patients from Kampala and the surrounding districts. Permission to carry out the study was obtained from the School of Medicine Research and Ethics Committee at Makerere University, Kampala, Uganda, and the Uganda National Council for Science and Technology. Informed consent was obtained from all study participants prior to data collection.

According to the hospital's annual records, 40% of the women delivering at Mulago Hospital receive prenatal care services elsewhere. For such women, the history of HIV testing and the serostatus were determined based on their prenatal care card records. On average, two-thirds of obstetric admissions are multiparous, with 35% of these women having an unknown HIV serostatus compared with 24% of the primiparous women. Based on a sample size calculation with a 5% significance level and a power of 80%, 665 women admitted for delivery were enrolled into the present study.

Labouring women presenting at the Mulago Hospital labor ward between January 3 and March 29, 2006, were approached immediately after admission and invited to join the study. Given an estimated 60–80 deliveries per day, the study enrolled every third woman admitted to the hospital to achieve the target sample size. Women were eligible for the study if they were in labor and were expected to deliver by cesarean delivery or scheduled for labor induction. Women were also eligible to participate if they were admitted within 72 hours of the postpartum period. The study excluded pregnant women who were unable or unwilling to give informed consent.

Trained research midwives used a pre-tested questionnaire to establish whether the HIV serostatus was known at the time of labor and delivery (the primary outcome). Women were considered to have an unknown HIV serostatus if they presented with no knowledge of their HIV serostatus at the time of delivery; this was verified using the prenatal care card records. In addition, sociodemographic information such as maternal age, marital status, education level, religious affiliation, and maternal occupation was collected. We also inquired about distance to the nearest prenatal clinic, availability of HIV testing services at the health facility where the woman received prenatal care, type of facility (private or public), and fears regarding HIV testing. Information on obstetric-related factors included parity, prior prenatal care attendance, and pregnancy duration based on the last normal menstrual period or fundal height estimation. Maternal knowledge about mother-to-child-transmission (MTCT) of HIV was assessed based on 3 questions about the timing (prenatal, intrapartum, and breastfeeding) when MTCT of HIV might occur. Correct responses were coded as "1," and incorrect responses including "don't know" were coded as "0." The total MTCT knowledge score comprised the sum of the 3 individual scores, ranging from a minimum score of 0 to a maximum score of 3.

Double data entry was conducted using EpiData 2.1 (EpiData Association, Odense, Denmark). The data were analyzed using Stata version 12 (StataCorp, College Station, TX, USA). Descriptive statistics were used to characterize the study participants and their HIV testing status. Comparisons of the proportions of women with unknown HIV serostatus across categories of each covariate were performed using univariate and multivariate logistic regression models. In addition to parity, variables with $P < 0.2$ in the univariate analyses were retained in the multivariate logistic regression model to determine factors that were independently

associated with an unknown HIV serostatus at the time of labor and delivery. The following variables were included in the multivariate model: age, marital status, education level, parity, type of health facility (private or public), distance to the nearest prenatal clinic, fears regarding the HIV test result, and MTCT knowledge score. For all analyses, $P < 0.05$ was considered statistically significant.

3. Results

In total, 665 women admitted for delivery were enrolled into the study. The participants had a mean age of 22 ± 5.3 years. The majority of the participants (535 [80.5%]) were married and Christian (510 [76.7%]), and approximately half (319 [48.0%]) had not received education beyond the primary level. Of the participants, 312 (46.9%) were primiparous and 652 (98.0%) lived within 5 km of the nearest prenatal

Table 1

Knowledge about mother-to-child transmission and history of HIV testing among the study participants ($n = 665$).^a

Variable	Value
Are you aware of your HIV serostatus during the present pregnancy	
Yes	485 (72.9)
No	180 (27.1)
Stage of labor on admission ^b	
First stage	139 (77.2)
Second or third stage	41 (22.8)
Mode of delivery ^b	
Vaginal delivery	141 (78.3)
Cesarean delivery	39 (21.7)
Knowledge about MTCT	
Can a HIV-positive woman deliver a HIV-negative child ^c	
Yes	556 (83.9)
No	61 (9.2)
I don't know	46 (6.9)
Can the HIV virus be transmitted from mother to child during the prenatal period	
Yes	331 (49.8)
No	158 (23.8)
I don't know	176 (26.5)
Can the HIV virus be transmitted from mother to child during labor	
Yes	599 (90.1)
No	25 (3.8)
I don't know	41 (6.2)
Can the HIV virus be transmitted from mother to child during breastfeeding	
Yes	612 (92.0)
No	53 (8.0)
MTCT knowledge score ^d	
0	21 (3.2)
1	45 (6.8)
2	300 (45.1)
3	299 (45.0)
Were you screened for HIV prior to the current pregnancy	
Yes	224 (33.7)
No	441 (66.3)
Are you aware of your partner's HIV serostatus	
Yes	211 (31.7)
No	454 (68.3)
Reason for not knowing the HIV serostatus by the time of delivery ^b	
No HIV testing services available at the health unit	82 (45.6)
Had not started to attend prenatal care services	44 (24.4)
Fear of test results	30 (16.7)
Reported late for prenatal care	5 (2.8)
Waiting for partner's permission	2 (1.1)
Waiting to test as a couple	2 (1.1)
No reason given	15 (8.3)

^a Values are given as number (percentage).

^b $n = 180$ (participants with unknown HIV serostatus only).

^c $n = 633$.

^d The MTCT knowledge score evaluated whether the woman knew that HIV can be transmitted to the child during the prenatal period, during labor, or by breastfeeding, with 0 indicating that the woman did not know about any mode of MTCT, 1 indicating that the woman knew about 1 mode, 2 indicating that the woman knew about 2 modes, and 3 indicating that the woman knew about all 3 modes.

clinic. Approximately half of the respondents (334 [50.2%]) had received prenatal care at Mulago Hospital, whereas 44 (6.6%) women had not attended prenatal care at all. The majority (458 [68.9%]) of the women started attending prenatal care during the second trimester, whereas 94 (14.1%) started prenatal care during the third trimester. A quarter (166 [25.0%]) of the women were interviewed after they had delivered because they were near the second stage of labor or had delivered prior to admission. One of every 5 women (136 [20.5%]) gave birth by emergency cesarean delivery.

Among the 665 women who were interviewed, the prevalence of unknown HIV serostatus was 27.1% (Table 1). The reasons given by the 180 women with unknown HIV serostatus were unavailability of HIV testing services (82 [45.6%]) at the facility where they received prenatal care, failure to attend prenatal care services (44 [24.4%]), and fear of the HIV test result (30 [16.7%]). Some women were waiting to test as a couple or to receive permission from their spouse to undergo the test.

Overall, the women had good knowledge about the different modes of MTCT of HIV. The majority (90.1% and 92.0%, respectively) knew that a mother can pass the HIV virus to the child during delivery and breastfeeding (Table 1). However, fewer than half of the women knew that the HIV virus can be transmitted to the unborn child during the prenatal period. Analysis of the MTCT knowledge scores revealed that 21 (3.2%) women did not know about any mode of MTCT, 45 (6.8%) knew about 1 mode of transmission, 300 (45.1%) knew about 2 modes of transmission, and 299 (45.0%) knew about all 3 modes of transmission.

The prevalence of unknown HIV serostatus did not differ significantly by marital status, education level, or maternal age (Table 2). Factors that were associated with not knowing the HIV serostatus at the time of labor and delivery included: high parity (OR 1.90; 95% CI, 1.16–3.14), preterm

delivery (OR 2.60; 95% CI, 1.06–6.34), prenatal care attendance at a private clinic (OR 12.87; 95% CI, 5.68–29.14), residence more than 5 km away from the nearest prenatal clinic (OR 4.60; 95% CI, 1.18–17.9), and fear of having to disclose the HIV test result to the spouse (OR 3.60; 95% CI, 1.84–7.06). By contrast, a high MTCT knowledge score was associated with knowing the HIV serostatus (OR 0.25; 95% CI, 0.07–0.86).

4. Discussion

In the present study, 27.1% of the women presenting for labor and delivery had an unknown HIV serostatus. This finding is similar to results from other studies conducted in Nigeria [10] and Togo [11]. The observed prevalence of unknown HIV serostatus is very high at a time when Uganda's National Health Policy stipulates that 90% of all pregnant women should be tested for HIV at a prenatal clinic. Besides prenatal HIV testing, no other program of provider-initiated counseling and testing for HIV during pregnancy was available in Uganda at the time of the present study. However, more women with an unknown HIV serostatus are now being tested during the intrapartum period. Although intrapartum HIV testing increases the number of women who know their HIV serostatus, HIV-positive women who are diagnosed during the intrapartum period miss out on the benefits of HAART prophylaxis during pregnancy, which reduces the rate of MTCT to less than 5% if initiated at least 4 weeks prior to delivery [15].

In the present study, the factors associated with an unknown HIV serostatus included individual characteristics and health system factors. Multiparous women were twice as likely to have an unknown HIV serostatus as primiparous women. A possible explanation is that women with a previous uncomplicated pregnancy are less likely to use prenatal services [16], which are a gateway to PMTCT. This is

Table 2

Factors associated with an unknown HIV serostatus among women admitted in labor to Mulago Hospital, Kampala, Uganda (n = 665).

Variable	Serostatus unknown (n = 180) ^a	Serostatus known (n = 485) ^a	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	P value
Age					
≤25 years	140 (77.8)	354 (73.0)	0.77 (0.52–1.16)	0.57 (0.33–0.98)	0.043
>25 years	40 (22.2)	131 (27.0)	1	1	
Marital status					
Married	139 (77.2)	396 (81.6)	0.76 (0.50–1.06)	0.82 (0.46–1.44)	0.48
Single	41 (22.8)	89 (18.4)	1	1	
Education level					
None or primary	105 (58.3)	241 (49.7)	0.71 (0.49–0.99)	0.93 (0.59–1.44)	0.73
Secondary or tertiary	75 (41.7)	244 (50.3)	1	1	
Parity					
Multiparous	73 (40.6)	239 (49.3)	1.4 (1.0–2.0)	1.90 (1.16–3.14)	0.012
Primiparous	107 (59.4)	246 (50.7)	1	1	
Preterm delivery					
Yes	15 (8.3)	16 (3.3)	2.7 (1.3–5.5)	2.60 (1.06–6.34)	0.035
No	165 (81.7)	469 (96.7)	1	1	
Had attended prenatal care at a private clinic					
Yes	28 (20.1)	9 (1.9)	13.3 (6.1–28.9)	12.87 (5.68–29.14)	0.001
No	111 (79.9)	474 (98.1)	1	1	
Distance to the nearest prenatal clinic					
≤2 km	85 (47.5)	203 (41.9)	1	1	
2–5 km	88 (49.2)	276 (57.0)	0.76 (0.53–1.07)	0.72 (0.47–1.12)	0.145
>5 km	6 (3.3)	5 (1.0)	2.86 (0.85–9.64)	4.60 (1.18–17.9)	0.028
MTCT knowledge score ^b					
0	13 (7.2)	8 (1.6)	1	1	
1	22 (12.2)	23 (4.7)	0.59 (0.20–1.69)	0.63 (0.16–2.51)	0.51
2	86 (47.8)	214 (44.1)	0.25 (0.10–0.62)	0.41 (0.12–1.36)	0.14
3	59 (32.8)	240 (49.5)	0.06 (0.06–0.38)	0.25 (0.07–0.86)	0.028
Fears related to disclosure of the HIV test result to the partner					
Yes	28 (15.7)	22 (4.5)	3.92 (2.18–7.06)	3.60 (1.84–7.06)	0.001
No	150 (84.3)	462 (95.5)	1	1	

Abbreviations: CI, confidence interval; MTCT, mother-to-child transmission; OR, odds ratio.

^a Values are given as number (percentage).

^b The MTCT knowledge score evaluated whether the woman knew that HIV can be transmitted to the child during the prenatal period, during labor, or by breastfeeding, with 0 indicating that the woman did not know about any mode of MTCT, 1 indicating that the woman knew about 1 mode, 2 indicating that the woman knew about 2 modes, and 3 indicating that the woman knew about all 3 modes.

supported by evidence [7] that women are increasingly likely not to test for HIV during pregnancy as their parity increases.

The higher frequency of unknown HIV serostatus among women with preterm labor raises issues related to delayed seeking of prenatal care. In a study from Vietnam [17], late prenatal care attendance was associated with no HIV testing in pregnancy. Other studies [18,19] have shown that if there are no complications during early pregnancy, the majority of women wait until the third trimester before they start prenatal care in order to obtain a prenatal care card as required for hospital admission for labor and delivery. Communities perceive the requirement for a prenatal care card as a means to ensure a “smooth” admission to a health unit. However, lack of education on the benefits of early initiation of prenatal care creates a situation where women seek prenatal care late during their pregnancy to obtain a prenatal care card, rather than receiving critical care services—including HIV testing—early during pregnancy.

In the present study, women were more likely to have an unknown HIV serostatus if they received prenatal care at a private clinic as opposed to a public health facility. This raises questions regarding the availability and affordability of HIV testing services to pregnant women with a lower income, given that private facilities often require payment for services, which some women cannot afford. In addition, many midwife-led maternity centers do not have HIV testing services available. Findings [6] from Wakiso, a rural district in central Uganda, showed that pregnant women often visit both private midwives and public health facilities, with the latter providing free HIV testing services. This highlights the need for governments to partner with the private sector to increase coverage of PMTCT services, including affordable HIV testing. Governments should register private health facilities that offer prenatal care services and provide them with free HIV test kits and ARVs. It is also plausible that public health facilities may lack qualified personnel, and the staff at these facilities may not have the time required to offer HIV counseling and testing.

Pregnant women who feared disclosure of their serostatus to their spouses were 4 times more likely to have an unknown HIV serostatus. Fear of the repercussions of testing has a strong influence on a woman's decisions to test for HIV. Pregnant women were concerned that disclosure of a positive test result might lead to physical or emotional abuse, including abandonment by their male partners. In addition, the stigma associated with HIV and AIDS increases women's fears regarding HIV testing. The relationship between stigma and HIV testing uptake has been well documented in the existing literature [20–22].

Women residing more than 5 km from the prenatal care site were more likely to have an unknown HIV serostatus than women who lived within 5 km. Even though Uganda's National Health Policy recommends that all households should be located within 5 km of the nearest health clinic, several households are outside the recommended distance.

A low level of MTCT knowledge was identified as another predictor of unknown HIV serostatus among women admitted in labor at Mulago Hospital. Fewer than 50% of the women knew that an HIV-positive woman can transmit the HIV virus to the unborn child during the prenatal period. This lack of knowledge may explain why early initiation of prenatal care and subsequent PMTCT are less valued among some women.

The present study had the following limitations. The study was hospital-based and the possibility of selection bias cannot be excluded. However, the majority of the women in labor who obtained services from the hospital came from Kampala and the surrounding districts. The study minimized measurement bias by clearly defining unknown HIV serostatus and using 2 sources of information: self-report and confirmation using the prenatal care card. Where the woman presented without a record of HIV testing on the card, she was categorized as having an unknown HIV status. In addition, our model suggested that unavailability of HIV testing at the prenatal care facility was associated with an unknown HIV status, but the data were inconclusive and lacked

sufficient reliability to be included in the analysis. Nonetheless, the present results highlight the potential to scale-up HIV testing by making its inclusion in routine prenatal care services a health system priority. The cross-sectional nature of the present study precludes any causal inferences with regard to the measured associations.

In summary, the present results revealed that the prevalence of unknown HIV serostatus among women at the time of labor and delivery is high. One in every 4 women admitted in labor had an unknown HIV serostatus. Greater efforts are needed to increase the rate of HIV testing early during pregnancy as part of the national PMTCT program in Uganda. This is particularly crucial in order to ensure that HIV-positive pregnant women benefit from HAART during pregnancy, delivery, and the postpartum period. Strategies to integrate public and private sector HIV testing services may also improve access to HIV testing among women with a lower income.

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Conflict of interest

The authors have no conflicts of interest.

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