

*Full Length Research Paper*

# A cohort study on obstetric care for HIV positive women in Addis Ababa: Intrapartum transfers and associated delays

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**Despite the importance of safe obstetric practice in reducing mother-to-child HIV transmission and adverse perinatal outcomes, little is known about access to intrapartum obstetric care for HIV positive women. A cohort of HIV positive women were followed to assess the rate of intrapartum transfers and associated adverse outcomes in Addis Ababa. Overall, 282 HIV positive pregnant women were followed, 75% gave birth at Emergency Obstetric and Neonatal Care facilities, 42% of them transferred between health facilities during the intrapartum period and 36% were transferred two or more times. Sixty four percent of the first time transfers were due to obstetric complications, while all subsequent transfers were due to practical constraints. Women in their second pregnancy were less likely (OR 0.3 95% CI 0.2-0.6) to be transferred than women in their first pregnancy. Transferred women experienced more stillbirths than women who were not transferred. The rate of stillbirths was not significantly associated with the syphilis test result, the CD<sub>4</sub> count and initiating antiretroviral therapy. There appeared to be serious challenges within the health care system compromising the intrapartum care for our participants and increasing the risk of stillbirth and MTCT. Undue transfers during the intrapartum period should be addressed at all levels of the health care system.**

**Key words:** Delay, EmONC, Ethiopia, intrapartum, MTCT, stillbirth, transfer, PMTCT

## INTRODUCTION

Safe obstetric practice is one of the components of the prevention of mother-to-child HIV transmission (PMTCT) programme (Read and Newell, 2005). The rate of MTCT

during pregnancy is about 10% while it reaches 20% during the intrapartum period (De Cock et al., 2000). The intrapartum HIV transmission is responsible for about 75% of the HIV infection in non-breast feeding infants and 50% among infants receiving breast feeding for 18 to 24 months (De Cock et al., 2000; Gaillard et al., 2000; Read and Newell, 2005). Certain obstetric procedures during the intrapartum period such as episiotomy and artificial rupture of membrane can increase the risk of mother-to-child HIV transmission (MTCT). The rate of MTCT also increases with increasing duration of labour especially after membrane rupture, indicating the need for prompt attention during the intrapartum period. In obstetric literature, the “three delays” model is often used

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**ART**, Antiretroviral therapy; **CI**, confidence interval; **DHS**, demographic and health survey; **EmONC**, emergency obstetric and neonatal care; **IQR**, inter quartile range; **MTCT**, mother-to-child HIV transmission; **OR**, odds ratio; **PMTCT**, prevention of mother-to-child HIV transmission.

to explain the non-obstetric causes for poor maternal and perinatal outcomes (Barnes-Josiah et al., 1998; WHO et al., 2009; Waiswa et al., 2010). The “first delay” refers to delay in making decision to seek care, the “second delay” refers to delay in reaching health care facilities and the “third delay” refers to delay in receiving appropriate care after reaching health facility. Studies from resource poor settings show that women often encounter considerable delay in receiving appropriate obstetric care even after reaching a health facility (Coley et al., 2001; WHO et al., 2009). The Interval between admission and treatment often determines the pregnancy outcomes: The shorter the interval the better the outcome and vice versa (WHO et al., 2009). In particular referrals between facilities increase delays that women in labour may not have time for (Ramanathan, 2009; WHO et al., 2009). In resource poor settings, 25% of the stillbirths are caused by prolonged labour and asphyxia, largely a result of lack of prompt attention and poor intrapartum obstetric management (McClure et al., 2009).

In PMTCT programmes, a lot of attention and debate has surrounded medication and infant feeding, while safe obstetric practice despite being an important component of a PMTCT programme has been given less attention. Reviews and Meta analyses have shown that the risk of MTCT is higher in vaginal deliveries compared to elective caesarean deliveries (The International Perinatal HIV Group, 1999; Read and Newell, 2005). Nevertheless, for practical and technical reasons safe vaginal delivery remains the standard of care in many resource poor setting. In these settings including Ethiopia, HIV positive women’s access to safe obstetric care and the actual care these women receive have not been well documented. There is also scarcity of evidence showing the relationship between access to intrapartum obstetric care and prenatal outcomes among HIV positive women. Focusing on a cohort of HIV positive women in Addis Ababa, we assessed the rate of institutional delivery, the rate of transfers between health facilities during the intrapartum period and the occurrence of stillbirths.

## METHODS

### Study setting

The study was conducted in Addis Ababa, the capital of Ethiopia in 2009. Peripartum care including PMTCT and EmONC services were provided both in public and private health facilities across the city (MOH, 2008). The PMTCT services include HIV counselling and testing, provision of antiretroviral prophylaxis/ treatment to women and their babies, safe obstetrics practices and infant feeding counselling. In 2009 alone 54,698 pregnant women attended antenatal care across the city, 43,128 (78.8%) were tested for HIV in PMTCT programmes and 4.6% were HIV positive (FHAPCO, 2010).

According to a report by the ministry of health, 90% of the pregnant women in Addis Ababa had at least one antenatal visit and 44% gave birth at health facilities (MOH, 2008). Basic EmONC was provided in all the public health centres and hospitals provided comprehensive EmONC (unpublished data, collected by Addis

Ababa Fistula Hospital, Ethiopian Road Authority and the World Bank). The signal functions supposed to be provided in basic EmONC include administration of parenteral antibiotics, parenteral uterotonic drugs, parenteral anticonvulsants, manual removal of the placenta and retained products, assisted vaginal delivery and basic neonatal resuscitation. However, according to a report by the Ministry of Health, all the public EmONC facilities in Addis Ababa were missing one or more signal functions to be offered at their level and were only partially functioning. The signal functions in comprehensive EmONC include all the basic EmONC services plus blood transfusion and caesarean section. Women identified to have serious obstetric complications in the basic EmONC facilities before and after the onset of labour should usually be referred to comprehensive EmONC units. In such cases, the woman should be given a referral slip with information about the reasons for the referral, the treatment given and the HIV status of the woman. These formal procedures for referrals are not always followed. In this study, we use the concept ‘transfers’ to describe situations where the woman is told to seek care at another health facility for obstetric and non-obstetric reasons. Although 33 public and 24 private facilities were providing EmONC services across the city, actual utilization of the services were biased towards public health facilities. Nine out of ten deliveries and 80% of obstetric complications in Addis Ababa were managed in public facilities. The median distance to the nearest referral centre was less than 5 km. Only 47% of the health facilities had ambulance services. The number of skilled staff per 1,000 people is 4.6, compared to the recommended 2.3 staff per 1,000 (WHO, 2005, 2006).

### Study design, data collection and data analysis

The data was obtained from a prospective cohort study conducted primarily to assess HIV positive women’s adherence to PMTCT recommendations from January to December 2009. Study participants were HIV positive women attending 12 public and three private facilities providing PMTCT and EmONC. We used proportionate allocation in selecting public and private facilities. A ratio 4:1 public to private was used by considering the fact that over 80% of the pregnant women in the city received care from public health facilities. Then individual health facilities were selected on the basis of high client flow and to have representation of all the 10 sub-cities. In 2009 alone, 1,976 pregnant women were diagnosed HIV positive in the PMTCT programmes across the city and approximately 25% were diagnosed in the first quarter of 2009 (January to March). Of the 479 women diagnosed from January to March, 282 (59%) women who consented to be followed up were enrolled in our study. At enrolment, women were interviewed by trained PMTCT counsellors at the respective health facilities, using a structured questionnaire. Follow up data were obtained from the women themselves and from log books in the facilities. For women who were transferred to other health facilities and for those who gave birth at home, follow up data about the delivery were collected when they came for six or 42 days postpartum care. Reasons for transferring the women between health facilities both before and after the onset of labour were inquired in an open ended question. Later these responses were coded into three categories: Obstetric complications, practical constraints (including lack of bed and lack of electric power supply) and reason not stated. Reasons for the first transfer were obtained from log books at the health centres. Since the reasons for subsequent transfers were not recorded, the women were asked directly what was said to them. Study endpoints were abortion, delivery or death of a woman. Women were regarded as lost to follow-up when they had not shown up for regular visits and or we failed to trace them.

The study was reviewed and approved by the Ethical committee of Addis Ababa City Administration Health Bureau in Ethiopia and the Regional Committee for Medical Research Ethics in Western

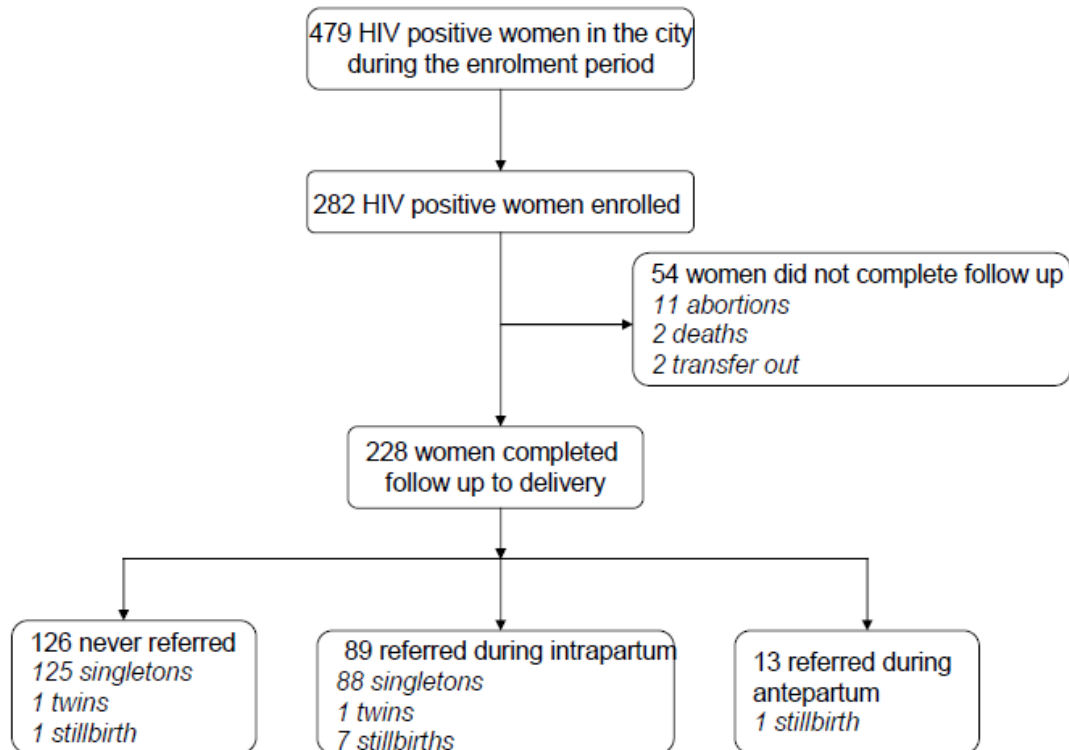


Figure 1. Cohort flow chart.

Norway. Research permits from Addis Ababa City Administration Health Bureau and respective sub cities were obtained. Data were double entered in excel spreadsheet and checked for consistency. Data analyses were done using SPSS version 17. Descriptive statistics and Pearson Chi-Square tests were used to compare baseline characteristics of women who completed their follow up and women who did not. We also used Fisher Exact Test when the expected counts in the cells are less than five. P-values less than 0.05 were considered statistically significant. Odds ratio (OR) with 95% confidence intervals (CI) were used to assess bivariate associations. The rate of institutional delivery was calculated among women enrolled into the study while comparison between transferred and not transferred during the intrapartum period was made only among women who completed the study. The rate of intrapartum transfers was calculated among women who visited health facilities during labour and delivery. The rate of stillbirth was calculated among the total births and stratified by transfer status. Due to the large proportion of women who did not complete their follow up to delivery sensitivity analyses were done to assess potential biases.

## RESULTS

Of a total of 282 HIV positive pregnant women, 228 (81%) completed their follow up to delivery. There were 226 singletons and two twin births. Among the 54 women who did not complete their follow up, 11 (20%) had an abortion, 2 (4%) died while pregnant, 2 (4%) were transferred to other health facilities, whereas about the rest 39 (72%) we have no information (Figure 1). Table 1 presents characteristics of the HIV positive women

stratified by follow up status. The age range was 15 to 38 years. The median educational status of the women were seventh grade (Inter quartile range (IQR) = 3 to 7). One third (33%) of the women were pregnant for the first time. The majority of the women (66%) were enrolled at 28 weeks of gestation or earlier and had a CD<sub>4</sub> count of 350 and above at enrolment. A total of 214 women were tested for Venereal Disease Research Laboratory (VDRL) and six (2.8%) were reactive for syphilis. There was no statistically significant difference between women who completed their follow up and women who did not with respect to their socio-demographic characteristics, obstetric profiles and CD<sub>4</sub> cell count, gestational age at enrolment and the women syphilis test result (Table 1).

Among the 282 HIV positive women enrolled, 211 (75%, 95% confidence interval (CI) 69.4 to 79.5) gave birth at health facilities. One hundred and two (48%, 95% CI 41.7 to 55.0) women were transferred between health facilities before or after the onset of labour, 89 (42%, 95% CI 35.7 to 48.9) being transferred during the intrapartum period. Of the 72 (34%, 95% CI 28.0 to 40.8) women transferred due to obstetric complications, 58 were transferred during the intrapartum period from basic to comprehensive EmONC facilities. Some of the women had multiple intrapartum transfers. The number of transfers for one woman ranged from one to ten, where 57 (64%) were transferred once, 17 (19%) twice and 15 (17%) were transferred three times or more. All first time intrapartum transfers were from basic EmONC facilities.

**Table 1.** Baseline characteristics of 282 HIV positive women in Addis Ababa by follow up status.

Variable	Completed follow up		P-value
	Yes = 228 n (%)	No = 54 n (%)	
<b>Age</b>			
15-24	79 (35.3)	20 (37.0)	0.89
25-29	91 (40.6)	20 (37.0)	
≥30	54 (24.1)	14 (25.9)	
<b>Median (IQR)</b>	25 (23-29)	25 (22-28)	
<b>Education /grades completed</b>			
0 - 4	65 (29.3)	22 (42.3)	0.17
5 - 8	81 (36.5)	17 (32.7)	
≥9	76 (34.2)	13 (25.0)	
<b>Median (IQR)</b>	8 (4-10)	6 (0-9)	
<b>Number of pregnancy</b>			
1	73 (32.4)	19 (35.8)	0.77
2	84 (37.3)	17 (32.1)	
≥3	68 (30.2)	17 (32.1)	
<b>Median (IQR*)</b>	2 (1-3)	2 (1-3)	
<b>CD<sub>4</sub> cell count at enrolment</b>			
<200	42 (26.3)	5 (26.3)	0.80
200-349	48 (30.0)	7 (36.8)	
≥350	70 (43.8)	7 (36.8)	
<b>Median (IQR)</b>	312 (186-450)	306 (197-512)	
<b>Gestational age at enrolment (weeks)</b>			
≤28	128 (65.3)	22 (68.8)	0.84
>28	68 (34.7)	10 (31.3)	
<b>Median (IQR)</b>	22 (18-28)	18 (14-28)	
<b>Syphilis test (VDRL)</b>			
Reactive	4 (2.0)	2 (7.1)	0.15
Non-reactive	184 (92.9)	24 (85.7)	
Test not done	10 (5.1)	2 (7.1)	

\* IQR, Inter quartile range. Due to missing values, the numbers may not add up to the total.

Obstetric complications and practical constraints accounted for 65 and 25% of the reasons for the first time transfers respectively, while all subsequent transfers were due to practical constraints such as lack of bed and lack of electric power supply. Unavailability of bed was the sole reason for transferring labouring women from public comprehensive EmONC facilities to other health facilities. In the case of transfers due to practical constraints, the transfers were made between facilities irrespective of the level of care provided in those facilities and often the women were not given a referral slip but were informed verbally to go to other facilities.

Women in their second pregnancy were less likely to

be transferred during the intrapartum period compared to women who were pregnant for the first time (OR 0.3 95% CI 0.2 to 0.6). There was no significant association between being transferred during the intrapartum period and age, education, CD<sub>4</sub> cell count and gestational age at enrolment (Table 2). To account for the 19% of women who did not complete their follow up, sensitivity analyses were performed in two scenarios, (1) considering all these women as transferred during the intrapartum period, and (2) considering all these as not transferred during the intrapartum period. Both scenarios yield similar result to the main analysis.

Of the 193 singleton newborns whose birth weight was

**Table 2.** Bivariate association between transfer during the intrapartum period and age, education, number of pregnancy, CD<sub>4</sub> cell count and gestational age among 228 HIV positive pregnant women in Addis Ababa.

Variable	Transferred during the intrapartum period		OR
	Yes =89	No=139	
	n (%)	n (%)	
<b>Age</b>			
15-24	28 (35.4)	51 (64.6)	1
25-29	39 (42.9)	52 (57.1)	1.4 (0.7- 2.5)
≥30	20 (37.0)	34 (63.0)	1.1 (0.5 - 2.2)
<b>Education</b>			
0 – 4	21 (32.3)	44 (67.7)	1
5 – 8	34 (42.0)	47 (58.0)	1.5 (0.8 - 3.0)
≥9	30 (39.5)	46 (60.5)	1.4 (0.7 - 2.7)
<b>Number of pregnancy</b>			
1	39 (53.4)	34 (46.6)	1
2	22 (26.2)	62 (73.8)	0.3 (0.2 - 0.6)
≥3	26 (38.2)	42 (61.8)	0.5 (0.3 - 1.1)
<b>CD<sub>4</sub> cell count</b>			
≥350	29 (41.4)	41 (58.6)	1
200-349	16 (33.3)	32 (66.7)	1.2 (0.5-2.5)
<200	19 (45.2)	23 (54.8)	0.7 (0.3-1.5)
<b>Gestational age (weeks)</b>			
≤28	54 (42.2)	74 (57.8)	1
>28	28 (41.2)	40 (58.8)	1.0 (0.5 - 1.7)

Due to missing values, the numbers may not add up to the total

measured, the median birth weight was 3,000 g (IQR 3,200 to 2,500). No preterm deliveries were reported. Transfer during the intrapartum period was not significantly associated with birth weight. Of the total of nine stillbirths (corresponding to 39 stillbirths per 1,000 births, 95% CI 19.2 to 73.7 per 1,000 births), seven occurred among the women transferred during the intrapartum period, one among the women transferred during the antepartum period and one among the women who were not transferred. Seven stillbirths were among women who were non reactive to VDRL test for syphilis, one among women who did not have VDRL test whereas no still birth among women who were reactive to VDRL test. All the stillbirths were among women who had spontaneous vaginal delivery. Three stillbirths were weighed, and all of them were within the range of 2,500 to 3,900 g. Five stillbirths were registered among women with CD<sub>4</sub> cell count at enrolment of 350 and above and two stillbirths were registered among women with CD<sub>4</sub> cell count at enrolment between 200 and 349. No stillbirth was registered among women with CD<sub>4</sub> cell count less than 200. Two stillbirths were registered among the 73

women who initiated antiretroviral therapy while seven among the 139 women initiated zidovudine prophylaxis (OR = 2.0, 95% CI 0.4 to 5.0).

## DISCUSSION

A cohort of HIV positive women was followed to assess the magnitude of intrapartum transfers and its potential adverse outcomes. We identified serious challenges within the health care system compromising the intrapartum care for HIV positive women and increasing the risk of adverse pregnancy outcomes and risk of MTCT. Even though safe obstetric practice has been one of the components of the PMTCT programme in all the study sites, the risk of MTCT due to delays in receiving obstetric care during labour did not seem to be an issue that received sufficient attention in the health care system. Our findings show that the majority of the HIV positive women visited EmONC facilities for delivery. However, a large proportion of them did not receive appropriate obstetric care due to transfers between

health facilities. While, obstetric complications were the major reason for first time transfer, practical constraints were the sole reason for subsequent transfers. Undue transfers leading to the so called “third delay”, that is, the delay in receiving appropriate care after reaching a health facility and this may have contributed to an increased risk of stillbirth and MTCT. The HIV disease progression, initiating ART and having a positive syphilis test result seemed not to be related to the risk of stillbirth.

Our findings suggest that delays in receiving appropriate care after arrival at health facility is a common experience among HIV positive women seeking birth care in Addis Ababa. This seems to a considerable extent related to transfers between health facilities during established labour. Overall, 48% of the pregnant women were transferred to other health facilities either before or after the onset of labour, 42% were transferred during the intrapartum period, and 34% were transferred due to obstetric complications. In general, compared to the 19% referrals for complications related to pregnancy and labour reported from a multi country survey across nine Asian countries and the 15% obstetric complications expected to happen during pregnancy, labour, delivery and during the postnatal period, the rate of transfer in our study is high (WHO et al., 2009; Lumbiganon et al., 2010). The risk of intrapartum transfer was lower among women in their second pregnancy than among women who were pregnant for the first time, and this corresponds to a higher risk of obstetric complications such as pre-eclampsia and dystocia among primigravidae (Duckitt and Harrington, 2005).

The high rate of transfer in this study seems to be related to deficiencies within the health care system. In Addis Ababa city where the study was conducted, availability and accessibility of EmONC facilities was not an issue, but access to care and the quality of care provided in those facilities (unpublished data, collected by Addis Ababa Fistula Hospital, Ethiopian Road Authority and the World Bank). Efficient functioning of a health system can be affected by shortage of supplies, shortage of trained staff, poor competence among available staff and poor staff motivation as well as lack of accountability. Studies from Ethiopia and Tanzania reported that most of the basic EmONC facilities were functioning poorly in terms of the quality of the services they were expected to provide (unpublished data, collected by Addis Ababa Fistula Hospital, Ethiopian Road Authority and the World Bank). Poor competence among health care providers in basic EmONC facilities may lead to over-diagnosis and failure to handle obstetric complications that could be managed at their level. This argument is supported by the fact that nationally, only 3.3% of the health care workers assisting women in labour had received training in EmONC (unpublished data, collected by Addis Ababa Fistula Hospital, Ethiopian Road Authority and the World Bank). In their study from Tanzania, Olsen et al. (2004) observed that over-diagnosis was one of the possible

reasons for the excess obstetric complications seen in Tanzanian health care facilities. Transfers often cause overburden and fatigue in the already constrained comprehensive EmONC facilities. This in turn affects the quality and quantity of care provided in those facilities and may further increase transfers from comprehensive EmONC facilities. Hence a vicious circle is created. Lack of bed came out as the sole reason for transferring the HIV positive women during the intrapartum period from hospitals. In these comprehensive EmONC facilities, a minimum of 30 to 32 beds including delivery couches are recommended for 1,000 deliveries per year (WHO, 1991), yet the available beds including delivery couches for 1,000 deliveries per year in Addis Ababa were 22, much lower than the minimum requirement (unpublished data, collected by Addis Ababa Fistula Hospital, Ethiopian Road Authority and the World Bank; WHO et al., 2009). Therefore, reducing the work load at comprehensive EmONC facilities by limiting unnecessary transfers from basic EmONC facilities and having a functioning referral system with reliable ambulance services are some of the fundamental prerequisites for improved maternal and perinatal outcomes in Addis Ababa.

One can also associate the high rate of transfer to the HIV disease progression of the women. According to studies, asymptomatic HIV-positive women do not have a higher risk of obstetric complications than HIV-negative women and they do not require special obstetric interventions (Bucceri et al., 1997; Coley et al., 2001; Onah et al., 2007). Our finding showed that about 75% of the women had a CD<sub>4</sub> cell count over 200 and they were asymptomatic. It is therefore difficult to attribute the high rate of intrapartum transfer to the HIV disease progression of the women. Furthermore, in a case control study from Nigeria, the rate of caesarean section was not significantly different among HIV positive cases and HIV negative controls, 8.3 vs 11.0% (Onah et al., 2007).

Whatever the reasons for the transfers, they cause delays in receiving appropriate obstetric care. Of the women transferred during the intrapartum period, 36% were actually transferred more than once while in labour. Multiple transfers of a woman will delay provision of the care needed and may be detrimental to maternal and perinatal survival, as some obstetric complications can claim the lives of the women or their babies within a very short time (Ramanathan, 2009; WHO et al., 2009). According to studies from resource poor settings, the “third delay” significantly contributes to maternal morbidity and mortality (Ramanathan, 2009; Samuel, 2009). Maternal disabilities such as obstetric fistula and incontinence are common consequences of delays in receiving appropriate intrapartum obstetric care for obstructed labour (Ekanem et al., 2010). Although there was no maternal death related to intrapartum transfers in our study, the many transferred women may have suffered consequences of the transfers. In a study from Sweden, women who were transferred after the onset of

labour were more stressed of fear of the unknown and more often had a feeling of rejection than those who were not transferred (Wiklund et al., 2002). Some of the practical challenges experienced by the Swedish women were associated with long distance travel and transportation. This problem is even more important in the Ethiopian context where a major barrier to women's health is their low socio-economic status (CSA, 2006). Over 65% of the women in our study had only 8th grade of schooling or lower. The feeling of being rejected may be a major issue to the women in our study, as HIV/AIDS is still a disease with stigma in Ethiopia. This could affect the trust the women have in the health system and may contribute to disruption in the continuity of care. Transfers during the intrapartum period can also put the women at risk of HIV status disclosure through the information provided in the transfer slips. Furthermore, a serious concern is that the delays caused by the transfers can increase the risk of MTCT both because of delayed labour duration and missing the dose of antiretroviral prophylaxis that should be taken during the intrapartum period.

The delays to receive appropriate care due to intrapartum transfers seem to contribute to adverse prenatal outcomes. The overall rate of stillbirth in our study was 39/1,000 births, where the majority of the stillbirths were among women who were transferred during the intrapartum period. Our finding is consistent with the 31.6 stillbirths per 1,000 births reported in the 2005 Ethiopia demographic and health survey (DHS) for Addis Ababa city but higher than the 21.3 stillbirths per 1,000 births reported for developing countries (CSA, 2006; Goldenberg et al., 2007). This could reflect the sub-optimal intrapartum obstetric care that pregnant women are offered in Addis Ababa despite the city being most privileged in terms of availability and accessibility of skilled attendants at birth as well as EmONC facilities. Report has shown that the "third delay" is common in Addis Ababa and a labouring woman waits on average 1.7 h to receive obstetric care after reaching a health facility (unpublished data, collected by Addis Ababa Fistula Hospital, Ethiopian Road Authority and the World Bank). Similarly, in a health facility based study from Uganda, the "third delay" was responsible for about half of the perinatal deaths (Waiswa et al., 2010).

Although several risk factors are identified for stillbirths, stillbirths occurring during the intrapartum period can largely be attributed to poor quality obstetric care (Mohammad, 2011; Sidra, 2011). Large scale studies reported an inverse correlation between the rate of stillbirth and the quality and quantity of obstetric care provided during pregnancy and delivery (Goldenberg et al., 2007; McClure et al., 2009). For instance, in Nepal, the rate of stillbirth was 54.6/1,000 births with a 9% Skilled attendant at birth, while in Tanzania 29.4/1,000 births with a 35% skilled attendant at birth. Reviews on interventions to improve maternal and newborns outcome

reported that about 25% of intrapartum stillbirths can be reduced by providing skilled attendants at birth (Mohammad, 2011; Sidra, 2011). Nonetheless, this does not seem to be the case in our study, despite 75% of the women being given birth at EmONC facilities in the hands of skilled professionals, the rate of stillbirth was unacceptably high. This could reflect the poor functional status of the EmONC service in the city. In support of this argument, a baseline survey conducted to assess the status of EmONC facilities by the ministry of health of Ethiopia revealed that none of the basic EmONC facilities in the Addis Ababa were fully functional (unpublished data, collected by Addis Ababa Fistula Hospital, Ethiopian Road Authority and the World Bank). Similarly, the 2010 countdown report indicated that maternal mortality and neonatal mortality in Ethiopia have not shown promising decline by the fact that interventions for these problems require properly functioning health care system (Bhutta et al., 2010). Provision of quality basic and comprehensive EmONC can reduce intrapartum stillbirths by about 45 and 75% respectively (Mohammad, 2011; Sidra, 2011).

The stillbirths did not seem to be associated with the HIV disease progression in the women, since no stillbirth was reported among women with CD<sub>4</sub> cell count less than 200, but five among women with CD<sub>4</sub> cell count 350 or more. Similarly, the rate of stillbirth among women initiated antiretroviral therapy was also lower than those initiated zidovudine prophylaxes. A study from Tanzania that followed 1,075 HIV positive and 502 HIV negative pregnant women showed no statistical significant difference between HIV positive and HIV negative women with respect to the rate of stillbirth. By contrast, in a study from South Africa that followed 1,449 HIV infected and 1,401 HIV uninfected women, adverse pregnancy outcomes were in general more prevalent among HIV positive women and in particular among those with lower CD<sub>4</sub> cell count (Rollins et al., 2007). Interestingly, no stillbirth was reported among the four women who had positive test result for syphilis. Although we have limitation to make inference due to small sample size, our finding is in accordance with other studies showing that maternal syphilis as a less likely cause of intrapartum stillbirths (Chalumeau et al., 2002; McClure et al., 2009).

The last, but not least important finding of our study was the high rate of institutional deliveries among HIV positive women. In contrast with the low rate of institutional delivery (43.5%) reported among the general female population in the city (MOH, 2008), 75% of the HIV positive women in our study gave birth at health facilities. Various factors could have influenced the HIV positive women's decision to deliver at health facility. Safe obstetric practice has been promoted for the reduction of MTCT since 2004 (Olsen et al., 2005).

The public health message has been that safe delivery among HIV positive women is delivery in health facilities. The high rate of institutional delivery for HIV positive

women in our study reflects that this message has reached out to the target groups. It may also be an indication of women's high motivation to adhere to health workers' advice to secure an HIV negative status of their baby. Moreover, the high rate of institutional delivery may be partly attributed to the study project activities (Hawthorne effect), with improved communication between the women and their PMTCT counsellors and incentives and more focus on the outcome than in routine care.

One of the limitations of the study is that 19% of the women did not complete their follow up. This might threaten the external validity of the study. The fact that HIV/AIDS is still a disease with stigma, the possibility of abortion among women enrolled in early pregnancy, the low rate of institutional delivery in the city (43.5%) (MOH, 2008) and the high reported dropout rate in a national PMTCT programme (Mirkuzie et al., 2010) were taken into account while considering the sample size. During the follow up, substantial effort were made to trace the lost to follow up through telephone, house to house search using existing tracing mechanisms, visiting different hospitals for transferred women, checking ART clinics and the under five clinics. In the analysis, there were no statistical significant differences in the baseline characteristics between women who completed the study and those who did not. Besides, the losses to follow up were not related to the intrapartum transfers and hence less likely to bias our findings. Moreover, the study covered about 60% of the eligible women and we used proportionate allocation to population size when selecting public and private facilities. Hence, we believe that the findings of this study could still be generalized to HIV positive women who attend antenatal care in Addis Ababa. Yet, there could be a Hawthorne effect that increased the rate of institutional delivery. There is no doubt that the study would be stronger if there was an HIV negative comparison, especially to unveil the role of stigma and discrimination in caring for HIV positive women. The reason for not including a comparison group was that the data were drawn from a cohort study set out to assess HIV positive women's adherence to PMTCT recommendations. The possibility of having a historic cohort for comparison was not feasible as the routine information in the delivery logbooks at the facilities do not indicate the women's HIV status for confidentiality reasons.

In conclusion, this study has drawn attention to the problems of safe delivery practices in a PMTCT programme that seem not to attract the attention it deserves from the health care system and health care workers unlike some of the other PMTCT programme components. The study revealed a high rate of institutional delivery among the HIV positive women that may indicate the women's awareness of the importance of institutional delivery to lower the risk of HIV transmission to their babies. However, despite the expressed goal of

reducing maternal and perinatal mortality, the health system appeared unable to take advantage of the HIV positive women's motivation for 'safe delivery'. Meanwhile, due to deficiencies within the health care system, the women's right to appropriate care seem to be violated. Over one third of the HIV positive women were transferred during the intrapartum period, and this could partly be due to over-diagnosis of obstetric complications and practical constraints within the health facilities. This delayed the women from receiving timely obstetric care and may have contributed to adverse pregnancy outcomes and increased MTCT. Especially the basic EmONC facilities that the majority of the women relied on, appeared not to be functioning properly, and may have subjected the pregnant women to unnecessary transfers. Improvement in the quality of obstetric care services in Addis Ababa is imperative for the health system to succeed in reducing the rate of stillbirth and the rate of MTCT. The PMTCT training for health workers should also address the issue of intrapartum transfers and the "third delay" so that HIV positive women's access to appropriate and timely intrapartum obstetric care can be ensured.

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