

Incidence of Home Delivery Among Women Living With HIV in Lira, Northern Uganda: A Prospective Cohort Study

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Abstract

Introduction

Facility delivery is one of the interventions recommended in the context of HIV to reduce on the risk of mother-to-child transmission of HIV. Home delivery has been associated with mother-to-child transmission of HIV and remains high among HIV-infected women. Predictors for home delivery in the context of HIV have not been fully studied and understood in Northern Uganda. We therefore aimed to find out the incidence and risk factors for home delivery among women living with HIV in Lira, Northern Uganda.

Methods

This prospective cohort study was conducted between August 2018 and January 2020 in Lira district, Northern Uganda. A total of 505 HIV infected women were enrolled and followed up at delivery. We used a structured questionnaire to obtain data on socio-demographic, reproductive-related and HIV-related characteristics. Data was analysed using Stata version 14.0 (StataCorp, College Station, Texas, U.S.A.). We estimated adjusted risk ratios using Poisson regression models to ascertain risk factors for home delivery.

Results

The incidence of home delivery among women living with HIV was 6.9% (95%CI: 4.9% - 9.5%). Women who were most likely to deliver at home were single mothers (adjusted risk ratio = 4.39, 95%CI: 1.68 – 11.42). Women who experienced night time onset of labour (adjusted risk ratio =0.4, 95%CI: 0.18 – 0.87) and women who were adherent to their ART were more likely to deliver in the hospital (adjusted risk ratio=0.33, 95%CI: 0.13 – 0.86).

Conclusion

HIV infected women most likely to deliver at home were single mothers. Women whose labour started at night and those who were adherent to their ART were more likely to deliver in the hospital. We recommend intensified counselling on birth planning and preparedness in the context of HIV and PMTCT especially for single women and those not adherent to their ART.

Introduction

Facility delivery is one of the interventions recommended in the context of HIV to reduce on the risk of mother to child transmission of HIV (MTCT) (1,2). Home delivery has been associated with MTCT of HIV (3,4) because the risk of transmission is reduced when deliveries are attended to by skilled birth attendants in health institutions. Furthermore, delivering from home deprives an HIV infected woman of PMTCT interventions during and immediately after labour and delivery which include receiving ARV prophylaxis for the baby, emergency caesarean section when required, safe delivery practices and use of

standard infection prevention practices. HIV infected women who deliver outside health facilities are therefore likely to suffer complications resulting into vertical HIV transmission, maternal and (or) infant death.

Studies have been done on predictors for both maternal and neonatal mortality. Home delivery ranks high among them (4–6). Skilled care and attendance in a hospital during the antenatal period and child birth is critical as it facilitates an optimum referral system in case of obstetric complications that can potentially lead to maternal or neonatal mortality. The maternal mortality rate in Uganda is 345 per 100,000 live births. In 2017 alone 6000 maternal deaths occurred and of these, 110 were HIV-related (7). The neonatal mortality rate in Uganda is 19 deaths per 1000 live births (8).

Other risk factors that have been associated with home delivery among HIV infected women include non-attendance of antenatal care, cost of delivery, low perceived quality of care, fear of discrimination during facility-based delivery, poor adherence to ART, lack of maternal education and history of previous home delivery (9–17). Interventions like male involvement in maternal and child health services for HIV infected women has been shown to improve utilisation of these services like facility delivery (18).

Since evidence demonstrates a heightened risk of mother-to-child transmission in the presence of home delivery (3,4), facility delivery is essentially critical for HIV-infected women and healthcare workers must accentuate its importance during antenatal care.

Predictors for home delivery among HIV infected and HIV uninfected women may be comparable (10), however some factors are unique to only HIV infected women like poor ART adherence for mother (14) (15) and poor ART adherence to infant nevirapine prophylaxis (13). These predictors have not been fully studied and understood in Northern Uganda. Furthermore, findings from different study contexts cannot be generalised to other study settings. We therefore aimed to find out the incidence and risk factors for home delivery among women living with HIV in Lira, Northern Uganda. These findings will be particularly relevant in identifying HIV infected women most at risk for home delivery so that interventions like intensified counselling on birth planning and preparedness can be targeted to them.

Methods

Study design and setting

This prospective cohort study was conducted between August 2018 and January 2020 at the Prevention of mother-to-child transmission of HIV (PMTCT) clinic in the Lira Regional Referral Hospital (LRRH). LRRH has an annual antenatal care attendance of about 5,000 patients and conducts approximately 6 – 7,000 deliveries annually. Maternity services are offered freely at LRRH. The PMTCT clinic is an initiative of the Ugandan Ministry of Health where free HIV care and treatment is offered to HIV-infected pregnant women. At the PMTCT clinic, the women receive their antenatal and routine HIV care till they deliver their baby. The mother has a choice of delivering her baby at any health facility or clinic of her choice. The Ugandan healthcare system is subdivided into the national and district levels. These health facilities by

nature are either public health facilities, private-for-profit (PFPs) or private-not-for-profit (PNFPs). PFPs are mainly clinics while PNFPs are religious based. Public health facilities (PHF) offer free services and are ranked as national, district and community based levels. The lowest level for the PHFs is the Village Health Teams (VHTs). VHTs is considered level one and is comprised of community health workers who deliver preventive and curative services as well as health education in the communities. Health centre two (HCII) offers outpatient services and is run by a nurse. Health centre three (HCIII), that is run by a clinical officer offers outpatient, inpatient, simple diagnostic and maternal health services. The Health centre four (HCIV) offers all services offered by HCIII as well as surgical, blood transfusion and emergence obstetric care services. HCIVs are run by medical doctors. National and regional referral hospitals are ranked at national level and offer all services of HCIVs as well as more specialised services (19).

Participants and procedures

HIV infected women with a gestational age of 20 weeks or more and receiving antenatal care at LRRH were consented, consecutively enrolled and interviewed on socio demographic characteristics as well as HIV-related information like antiretroviral regimen, duration and a viral load test done during pregnancy. They were then followed up with a telephone interview around the time of delivery. At this point, women were interviewed on circumstances surrounding labour and delivery like time of onset of labour, type of delivery, place of delivery, person who supervised the delivery, maternal ART adherence. Five hundred and five (505) HIV infected pregnant women were included in the final analysis because they had the completed data required (Figure 1).

Data was collected by trained research assistants that were fluent in Lango and English. Participants were requested to avail their telephone contacts or that of a trusted person to minimize loss to follow-up. The research team also documented detailed mapping for each participant's physical address. In case all the participant's telephone contacts were unavailable, a home visit would be done only if the participant had consented to it at enrolment.

Sample size estimation

A total of 505 HIV infected pregnant women were enrolled in the study. This sample size for detecting a difference between two independent proportions was calculated using STATA version 14.0 (StataCorp; College Station, TX, USA) assuming 80% power, 95% confidence interval (CI) and 5% precision. We also assumed that 51% of HIV infected women delivered in a health facility (14) and that 24.6% of HIV infected women delivered at home (15). The total sample size was then 455 women. After accounting for a non-response of 10% our final sample size was 505 HIV infected women.

Measurement of variables

The interviews were conducted in *Lango* (the language predominantly spoken in the study setting) and English by trained study staff using a structured questionnaire (this has been provided as a supplementary file). The questionnaires were translated into Lango and back translated into English to

ensure consistency in interpretation of information. Marital status was categorised into married and single. Those who were married or cohabiting were combined into one group and labelled “married”. Those who were separated, divorced, widowed or not married were combined into one group and labelled “single”. We created a composite index of wealth (socio-economic status) using principle component analysis (PCA) (20). We used PCA on house ownership, availability of electricity in the house, source of drinking water and fuel used for cooking. Scores were obtained and categorized into five groups (quintiles) ranging from the poorest to the least poor.

Women whose labour started between 0600 hours to 1859 hours (Ugandan time) were all categorised and labelled as “day-time onset of labour” and for those whose labour started from 1900 hours to 0559 hours were categorised and labelled “night-time onset of labour”. During the follow-up at the time of delivery, for the measurement of maternal ART adherence, we asked the mother, “In the past week, did you miss taking any dose of your medication?” This was a “yes” or “no” response. If the mother answered “yes” she was considered “non-adherent”.

The outcome of this study was “home delivery”. Women who delivered in any type of health care setting like national referral hospital, regional referral hospital, public health centre or private clinic were all categorised and considered to have delivered in a “hospital setting”. Those that had delivered at the traditional birth attendant, home or on the road side were all categorised and considered to have delivered in a “non-hospital setting” which we refer to as “home delivery” in the rest of the text for comparability purposes.

Data analysis and management

We collected data using pretested, structured questionnaires. Two independent people entered the data into Epi data (www.epidata.dk, version 4.4.3.1). Data was then exported to Stata version 14.0 (StataCorp, College Station, Texas, U.S.A.) for analysis. Continuous data, if normally distributed, was summarised into means and standard deviations and if skewed, was summarised into medians with their corresponding interquartile ranges. For categorical variables, frequencies and proportions we calculated. The incidence of home delivery was estimated and its confidence limits calculated using the exact method. Poisson regression models / analysis were used for bivariate and multivariate analyses (21). All variables that had a p value < 0.25 at bivariate level and those of biological plausibility were collectively put into a multivariable model while controlling for confounding. We estimated unadjusted and adjusted risk ratios with their corresponding 95% confidence intervals.

Results

Socio-demographics

Incidence of home delivery in our cohort was 6.9% (95%CI: 4.9% - 9.5%). The mean age for the women was 30 years (standard deviation (SD) 5.2). About half of these mothers were 30 years or more (49%) and

had attained at least six years of schooling (49.9%). Majority were married (93.5%) and unemployed (60.8%) (Table 1).

Table 1: Socio-demographic characteristics

	Total Deliveries (N=505)	Health facility delivery (N=470)	Home delivery (N=35)
Characteristics of mothers	n (%)	n (%)	n (%)
Socio-demographic			
Age			
≤ 20 years	30 (6.0)	29 (6.2)	1 (2.9)
21 – 29 years	227 (45.0)	215 (45.7)	12 (34.2)
≥30 years	248 (49.0)	226 (48.1)	22 (62.9)
Education			
0 – 6 years	252 (49.9)	229 (48.7)	23 (65.7)
7 – 10 years	174 (34.5)	163 (34.7)	11 (31.4)
11 – 13 years	52 (10.3)	51 (10.9)	1 (2.9)
≥14 years	27 (5.3)	27 (5.7)	0 (0.0)
Marital status			
Married	472 (93.5)	444 (94.5)	28 (80.0)
Single	33 (6.5)	26 (5.5)	7 (20.0)
Employment status			
Employed	198 (39.2)	187 (39.8)	11 (31.4)
Not employed	307 (60.8)	283 (60.2)	24 (68.6)
Religious affiliation			
Christian	487 (96.4)	453 (96.4)	34 (97.1)
Moslem	18 (3.6)	17 (3.6)	1 (2.9)
Ethnic group			
Langi	458 (90.7)	425 (90.4)	33 (94.3)
Other	47 (9.3)	45 (9.6)	2 (5.7)
Socioeconomic index			
Group 1 (poorest)	107 (21.2)	100 (21.3)	7 (20.0)
Group 2	97 (19.2)	83 (17.7)	14 (40.0)
Group 3	130 (25.7)	121 (25.7)	9 (25.7)

Group 4	82 (16.3)	79 (16.8)	3 (8.6)
Group 5 (least poor)	89 (17.6)	87 (18.5)	2 (5.7)

HIV and reproductive-related characteristics

Many of them (97%) had disclosed their HIV status and were taking an efavirenz-based ART regimen (89.7%) which is also a first-line regimen. More than half (55.5%) had a viral load <50 copies/ml during pregnancy. Majority of these mothers (72.9%) had been pregnant at least four times and were between 20 – 27 weeks pregnant (52.1%) at the time of recruitment. A considerable proportion of these women had a night time onset of labour (54.3%) and gave birth by spontaneous vaginal delivery (87.1%) where majority had a live birth (96.6%). More than half were adherent to their ART (69.7%) (Table 2).

Table 2: Other characteristics

	Total Births	Health Facility Births	Home Births
	(N=505)	(N=470)	(N=35)
Characteristics of mothers	n (%)	n (%)	n (%)
HIV-related			
HIV status disclosure			
Disclosed	490 (97.0)	458 (97.5)	32 (91.4)
Not disclosed	15 (3.0)	12 (2.5)	3 (8.6)
Antiretroviral treatment			
Efavirenz-based	453 (89.7)	423 (90.0)	30 (85.7)
Nevirapine-based	43 (8.5)	38 (8.1)	5 (14.3)
Protease inhibitor-based	9 (1.8)	9 (1.9)	0 (0.0)
Viral load count			
<50 cps/ml	280 (55.5)	259 (55.1)	21 (60.1)
50 – 400 cps/ml	79 (15.6)	73 (15.5)	6 (17.1)
401 – 499 cps/ml	12 (2.4)	12 (2.6)	0 (0)
>1000 cps/ml	32 (6.3)	30 (6.4)	2 (5.7)
Missing Viral load result	102 (20.2)	96 (20.4)	6 (17.1)
Duration of antiretroviral treatment			
≤ 6 months	95 (18.8)	90 (19.2)	5 (14.3)
7 - 30 months	109 (21.5)	104 (22.1)	5 (14.3)
31 – 119 months	267 (52.8)	245 (52.1)	22 (62.8)
≥ 120 months	34 (6.7)	31 (6.6)	3 (8.6)
Reproductive-related			
Baseline			
Parity			
1 – 4	368 (72.9)	349 (74.3)	19 (54.3)
5 – 9	137 (27.1)	121 (25.7)	16 (45.7)
Gestational age (in weeks)			
20 – 27	263 (52.1)	244 (51.9)	19 (54.3)

28 – 35	174 (34.4)	163 (34.7)	11 (31.4)
≥ 36	68 (13.5)	63 (13.4)	5 (14.3)
Accompanied to antenatal care			
Not accompanied	453 (89.7)	423 (90.0)	30 (85.7)
Accompanied	52 (10.3)	47 (10.0)	5 (14.3)
Type of contraceptive used			
None or “safe days”	258 (51.1)	237 (50.4)	21 (60.0)
Effective contraception	247 (48.9)	233 (49.6)	14 (40.0)
Intention to have baby			
No	204 (40.4)	183 (38.9)	21 (60.0)
Yes	301 (59.6)	287 (61.1)	14 (40.0)
At Birth / Delivery			
Type of Delivery			
Spontaneous vaginal delivery	440 (87.1)	405 (86.2)	35 (100.0)
Caesarean Section delivery	65 (12.9)	65 (13.8)	0 (0.0)
Time of onset of labour			
Night time	274 (54.3)	251 (53.4)	23 (65.7)
Day time	231 (45.7)	219 (46.6)	12 (34.3)
Person who supervised the delivery			
Health worker	470 (93.0)	463 (98.5)	7 (20.0)
Non-health worker	35 (7.0)	7 (1.5)	28 (80.0)
Person escorting during delivery			
Mother	93 (18.4)	89 (18.9)	4 (11.4)
Husband	125 (24.7)	111 (23.6)	14 (40.0)
Mother-in-law	78 (15.5)	72 (15.3)	6 (17.1)
Sibling	52 (10.3)	49 (10.4)	3 (8.6)
Other	157 (31.1)	149 (31.7)	8 (22.9)
Status of baby at birth			
Alive	487 (96.6)	454 (96.6)	33 (94.3)

Dead	18 (3.6)	16 (3.4)	2 (5.7)
Mother's adherence to antiretroviral drugs in the past 7 days			
Adhered	352 (69.7)	322 (68.5)	30 (85.7)
Did not adhere	153 (30.3)	148 (31.5)	5 (14.3)

Risk factors for home delivery

Single women were four times (Adjusted Risk Ratio (ARR) = 4.39, 95%CI: 1.68 – 11.42) as likely to deliver at home as their married counterparts. HIV infected pregnant women whose labour started in during the night time were more likely to deliver in a hospital (night time onset of labour ARR=0.4, 95%CI: 0.18 – 0.87) when compared to those whose labour started during the day time. Women who were adherent to their ART were more likely to deliver in the hospital (ARR=0.33, 95%CI: 0.13 – 0.86) than those who did not adhere to their treatment (Table 3).

Table 3: Risk factors for home delivery among women living with HIV.

Variables	Crude IRR	Adjusted IRR
	(95% CI)	(95% CI)
Age		
≤ 20 years	0.73 (0.1 – 5.44)	0.44 (0.14 – 1.4)
21 – 29 years	0.51 (0.23 – 1.17)	0.55 (0.25 – 1.2)
≥30 years	1	1
Marital status		
Married	1	1
Single	2.92 (1.02 – 8.38)	4.39 (1.68 – 11.42)
Socioeconomic index		
Group 1 (poorest)	1	1
Group 2	2.24 (0.83 – 6.07)	2.12 (0.81 – 5.57)
Group 3	1.36 (0.46 – 4.04)	1.23 (0.46 – 3.26)
Group 4	0.49 (0.12 – 1.98)	0.45 (0.11 – 1.89)
Group 5 (least poor)	0.51 (0.1 – 2.52)	0.54 (0.12 – 2.4)
Maternal adherence to ART		
Adhered	0.38 (0.13 – 1.1)	0.33 (0.13 – 0.86)
Did not adhered	1	1
Time of onset of labour		
Night time	0.42 (0.18 – 0.94)	0.4 (0.18 – 0.87)
Day time	1	1
Status of baby at birth		
Alive	1	1
Dead		1.95 (0.5 – 7.56)

Ethical considerations

Approval to conduct the study was granted by the Makerere University School of Medicine Research and Ethics Committee, the Norwegian Regional Committee for Medical and Health Research Ethics in the West, and the Uganda National Council for Science and Technology. Administrative clearance was

granted by the district health office and LRRH management. Nurses / counsellors who work with the PMTCT clinic introduced the study and its procedures to the providers and helped to identify, mobilise and link willing participants with the research team. Participants received verbal and written information detailing the purpose and process of the study. All participants provided written informed consent confirming their voluntary participation in the study. Those that declined participation were not penalised or denied standard health care. Confidentiality and privacy of all data collected was observed during the course of the study through restricted access.

Discussion

We found a high incidence of home delivery in our study. Various studies have found slightly higher rates of home delivery among HIV infected women. Studies done in Kenya (15), Zimbabwe (10), Malawi (14), South Africa (22) and Nigeria (16) all report higher rates of home delivery among HIV infected women than that in our study. All these studies were conducted in different settings like the community (22) and different types of health facilities like religious based hospitals (14) or public health facilities (15). The diversity in the settings among the studies could explain the difference in the rates of home delivery. Furthermore, LRRH and all other Ugandan public health facilities offer free maternity care and delivery services and could explain the low rates of home delivery among HIV infected women in our study setting. One study (23) done in Northern Uganda, a context similar to that in our study found that rates of home delivery in the community or general population are higher than that found in our study among HIV infected women. HIV infected women interface with the health care system much more often than their HIV negative counterparts and therefore understand the benefits of health facility delivery especially for the HIV-free survival of their baby hence are most likely to deliver in the hospital that HIV negative women.

We also found in our study that single women (separated, divorced, widowed or never married) were more likely to deliver at home. Similar evidence has been found in studies done in South Africa (22), Zambia (24), and Nigeria (25). Male involvement in maternal and child health care services for HIV infected women improves utilization of these services (8,9,18). Single women lack the social support of a spouse, partner or extended family (in-laws). Social support during pregnancy plays a role in reducing stigma as well emotional and physical stress resulting from pregnancy. Partner support also helps the mother in making the decision to deliver at a health facility. Single women are therefore more likely not to deliver at the hospital because of lack of this social or partner support.

It is surprising to note that night-time onset of labour was found to be protective of home delivery. One study done in Malawi (26) found the contrary. In our study context, culturally, pregnant women approaching the end of the gestational period have to stay with their in-laws (mother-in-law, sister-in-law, grandmother etc). HIV infected women understand the risks associated with night-time onset of labour especially delivering while at home and because of the extensive support they get from the family while pregnant, they are able to make it to the health facility to deliver even if the labour starts at night. More qualitative studies can be done to gain an in-depth understanding of this finding.

This study also demonstrated that being adherent to ART by the mother was protective against home delivery. A number of studies have shown similar evidence. Studies done in Malawi (14), Zambia (13), Kenya (15,27) found that poor ART adherence was associated with home delivery. Being adherent to ART is a result achieved from regular interaction with the health care system. These women are able to have regular clinic appointments for their HIV care and other integrated HIV services like counselling on birth planning and preparedness. Women adherent to their ART therefore do understand the importance of health facility delivery in PMTCT and are therefore most likely to deliver in the hospital and not at home.

Strengths And Limitations

This study did have some limitations. Our study was done in a hospital setting therefore findings of this study may only be generalizable to our study context and those similar to it. However, this being a prospective cohort study is a strength because it establishes causality between the covariates and outcome of home delivery. Most of the studies done in this area of inquiry have been cross-sectional in nature and establish only associations.

Conclusion

HIV infected women most likely to deliver at home were single mothers. Women whose labour started at night and those who were adherent to their ART were more likely to deliver in the hospital. We recommend intensified counselling on birth planning and preparedness in the context of HIV and PMTCT especially for single women and those not adherent to their ART.

List Of Abbreviations

HIV: Human Immunodeficiency Virus

ART: Antiretroviral therapy

PMTCT: Prevention of mother-to-child transmission of HIV

LRRH: Lira regional referral hospital

CI: confidence interval

ARR: Adjusted risk ration

Declarations

Ethical considerations

Approval to conduct the study was granted by the Makerere University School of Medicine Research and Ethics Committee SOMREC: Ethical approval number: REC REF No. 2017-004; Date of approval: 10th

January 2018; the Uganda National Council for Science and Technology: Ethical approval number: HS222ES; Date of approval: 24th September 2018; and the Norwegian Regional Committee for Medical and Health Research Ethics in the West (Ethical approval number: 2017/2489/REK vest; Date of approval: 26th January 2018) Administrative clearance was granted by the Lira district health office and LRRH. Service providers/counselors at the PMTCT clinic were introduced to the study and its procedures and were requested to identify, mobilize and link willing participants with the research team. Participants received verbal and written information detailing the purpose and process of the study. All participants provided written informed consent confirming their voluntary participation in the study. Those that declined participation were not penalized or denied standard health care. Confidentiality and privacy of all data collected was observed during the course of the study through restricted access. All methods in this study were carried out in accordance with relevant guidelines and regulations

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests

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Authors' contributions

Conceptualization by A.N., T.T., G.N., J.K.T., P.W.; Data curation by A.N.; Formal analysis by A.N., D.M., T.T. and J.K.T.; Funding acquisition by J.K.T., T.T., G.N. and P.W.; Methodology by AN, TT, JKT and DM; Project administration by G.N., J.K.T., T.T. and P.W.; Resources by J.K.T., G.N., P.W. and T.T.; Supervision by T.T., J.K.T., T.T. and P.W.; Writing of original draft by A.N.; Review and editing by A.N., D.M., J.T., A.A.O.A., J.K.T., P.W., T.T. and G.N.

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Figures

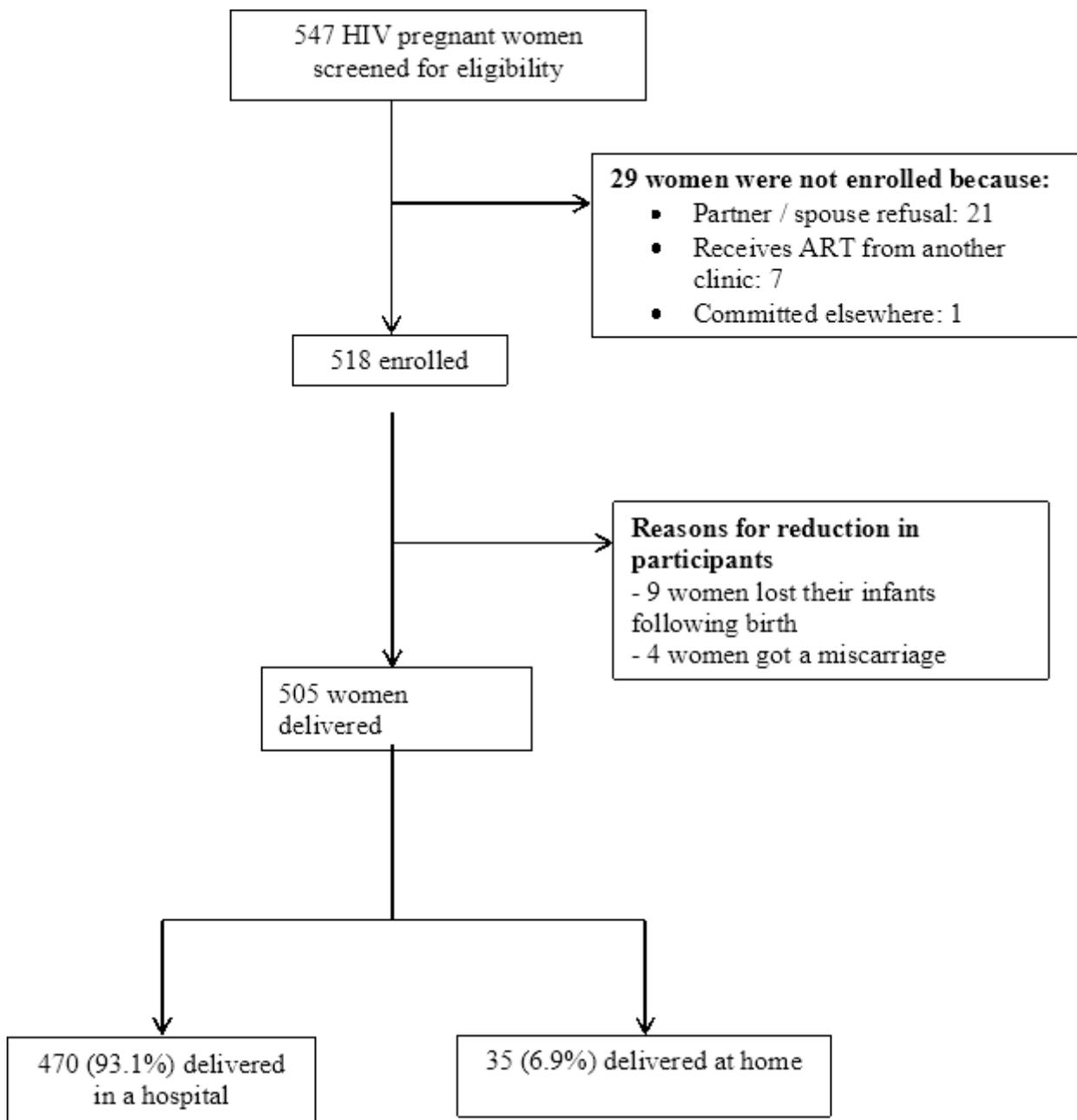


Figure 1

Study flow chart

Supplementary Files

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