

HIV and Pregnancy: Maternal and Neonatal Outcomes

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Abstract

Background: The HIV/AIDS epidemic is one of the major factors affecting women's health, with 20 million women living with HIV and more than two million pregnancies in HIV-positive women each year. Several studies conducted in SSA have reported that HIV-infected women are at increased risk of maternal adverse pregnancy outcomes such as stillbirth, LBW and preterm new-born. In addition, children born to HIV-infected mothers are at increased risk of mortality regardless of their HIV infectious status. Understanding pregnancy related risks HIV infected women may face is critical to providing appropriate counselling and management of fertility intentions, decisions and unintended pregnancy.

Objectives: To determine the maternal and neonatal outcomes (morbidity and mortality) in pregnant HIV infected women at Masala, Lubuto and Mapalo Clinics of Ndola, Zambia.

Methodology: This is a cross sectional and descriptive study. Data was collected from relevant medical records of HIV-positive pregnant women who delivered using a data abstraction sheet and selected by convenience sampling. The data collected was entered and analysed using IBM SPSS v26.

Results: A total of 360 participants were recruited in the study, 36.7% were aged 25-29 years (majority), 43% attained secondary school as highest level of education, 78.1% were married and 78.2% were self-employed (traders). 91.6% were diagnosed with HIV infection prior to pregnancy, 98.3% and 96.1% received ARV and co-trimoxazole prophylaxis respectively. 60% delivered preterm 96.1% had no maternal morbidities/complications and 0% maternal death, 2.8% had epistomy and 0.61% postpartum haemorrhage. 55% of neonates were females 82.2% had normal birth weight, 41.9% were premature and 2.2% had asphyxia, 12.8% had LBW and 1.1% stillbirths. Statistical significance was established between gestational age at delivery to birth weight and neonatal morbidities ($P=0.001$).

Conclusion: Majority of the maternal and neonatal outcomes were normal with only preterm delivery 60% and prematurity 41.9% the noted significant figures. According to the study, there is an association between gestational age at delivery and birth weight as well as neonatal morbidities in HIV positive pregnant women.

Keywords: Morbidity • Mortality • Pregnancy • Child birth

Abbreviations AIDS: Acquired Immune Deficiency Syndrome; CSO: Central Statistical Office; HIV: Human Immune Virus; MCDMCH: Ministry of Community Development, Mother and Child Health; MoH: Ministry of Health; NDHS: Nepal Demographic Healthy Survey; SAEs: Severe Adverse Effects; PNC: Postnatal Care; ANC: Antenatal Clinic; PLWHIV: People Living with HIV; MCH: Maternal Child Health; LBW: Low Birthweight; SSA: Sub-Saharan Africa; UN: United Nation; UNICEF: United Nations International Children's Fund; UNAIDS: Jointed United Nations Programme on HIV/AIDS UNFPA: United Nation Fund for Population Activities; WHO: World Health Organization; ZDHS: Zambia Demographic Health Survey

Introduction

The HIV/AIDS epidemic is one of the major factors affecting women's health. Almost half of the 37.8 million people living with HIV globally are women and more than two million pregnancies occur in

HIV-positive women each year. The majority of these are in resource constrained settings where the risk of maternal morbidity and mortality is also unacceptably high and where most of the 529,000 deaths from complications of pregnancy, childbirth and abortion occur annually. HIV infection rates in pregnant women vary considerably,

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Received: 04 May, 2021, Manuscript No. JCRE-21-30821; **Editor assigned:** 07 May, 2021, Pre QC No. P-30821; **Reviewed:** 21 May, 2021, QC No. Q-30821; **Revised:** 23 October, 2024, Manuscript No. R-30821; **Published:** 30 October, 2024, DOI: 10.37421/2795-6172.2024.8.178

ranging from below 1% to over 40% across countries. Africa still has the highest rates, although the HIV prevalence in some Asian countries has risen significantly. The woman and the newborn are a dyad, a unit; what affects the woman typically affects the fetus and is manifest in the newborn. Among women of reproductive age, HIV/AIDS is the leading cause of death and women in sub-Saharan region also experience the highest levels of maternal mortality. How HIV interacts with pregnancy is still a matter of debate. Some have argued that pregnancy may accelerate HIV progression or that the risk of obstetric complications may be increased in HIV-infected women, but the available evidence in support of either of these hypotheses is weak. Furthermore, although much is known about the contribution of HIV to adult mortality, remarkably little is known about the mortality attributable to HIV during the pregnancy and postpartum period. Although the burden of HIV-related mortality and morbidity in Africa has been widely reported, there has been little research on the impact of HIV on peoples' everyday lives. Although HIV infection has been reported to have little effect on pregnancy outcome in the developed world, early studies from Sub-Saharan region suggest that infants of HIV-infected mothers may be at increased risk of adverse pregnancy outcomes such as lower birth weight, prematurity and perinatal and neonatal death. Low birth weight has been suggested as a surrogate for prematurity in babies of HIV-infected mothers [1].

The impact of the HIV epidemic on pregnancy related mortality is substantial, with more than half such deaths attributable to HIV in high prevalence settings. This has implications for integrated service delivery as well as for monitoring trends in millennium development goal 5 maternal mortality. Safe motherhood programs should extend their remit beyond the prevention of direct obstetric causes of death and integrate HIV services into their programs in order to reduce the levels of pregnancy-related mortality [2].

Materials and Methods

Statement of the problem

The HIV-1 epidemic in sub-Saharan region continues to expand and affect women and children disproportionate. In recent years, with support from a variety of donor organizations, including the global fund on AIDS, tuberculosis and malaria and the President's Emergency Plan For AIDS Relief (PEPFAR), significant progress has been made in increasing the availability of Antiretroviral Therapy (ART) and the number of Prevention of Mother to Child Transmission (PMTCT) [3].

However, for a variety of logistical, financial and socio/cultural reasons, these programs are not covering all in need. In Malawi, for example, there are now more than 100,000 persons who have initiated ART since December 2003. However, it is predicted that 1 million are infected with HIV, 200,000 require ART and each year another 81,000 become infected and will need ART in the coming years. Many HIV-1-infected adults and children in this region of the world still go undiagnosed, or even if diagnosed, are often lost to the health care system and present for care too late even for ART to help. According to a study conducted in London, the effect that a pregnancy may have on a woman's HIV disease state is an important consideration when counselling women infected with HIV about planned or future pregnancies [4]. Although a woman's decision

making process may be concerned with the effect on the baby, the effect a pregnancy may have on her own survival will be an important factor. In addition, in developing countries infant survival has been shown to be adversely effected by maternal death with infants being over three times more likely to die if their mother had died. Early reports of pregnancy in women infected with HIV suggested that pregnancy had a detrimental effect on the mother's immune system, hastening disease progression and shortening the time to death [5].

Zambia's prevalence of HIV/AIDS is at 14.3% inclusive of pregnant women living with HIV/AIDS. Sub-Saharan region contains over 60% of the world's HIV infections and Zambia is among the most severely affected countries in the region. An estimated 1.1 million Zambians are HIV positive and the majority, are women [6].

Justification of the study

Although HIV infection has been reported to have little effect on pregnancy outcome in the developed world, early studies from sub-Saharan region suggest that infants of HIV-infected mothers may be at increased risk of adverse pregnancy outcomes such as lower birth weight, prematurity and perinatal and neonatal death. A cohort study done in London shows that two percent of the HIV-infected women died during the follow-up period that began in their second trimester of pregnancy and continued for 12 months after delivery. There were no deaths among the 367 HIV-negative women and only 3% of these women had a Serious Adverse Event (SAE), illustrating the differences between HIV uninfected and infected women. According to a study done in Cameroun few studies have established the role of maternal HIV infection on neonatal disease and death [7].

Hence this study is designed to determine the maternal and neonatal outcomes (morbidity and mortality) in HIV infected women with non-infected women as controls in Ndola, Zambia using data from three selected clinics-Masala, Lubuto and Mapalo clinic [8].

HIV and AIDS increasingly plague women throughout the world. Female infection and mortality are staggering in parts of Sub-Saharan Africa and rising in the Americas and parts of Western Europe. In the urban centres of these regions, the world health organization estimates AIDS is the leading cause of death for reproductive age women [9].

Several opportunistic infections associated with HIV infection may complicate pregnancy and cause maternal mortality. As such, this literature review is focused on the maternal/neonatal outcomes in HIV-infected women according to the studies that have been carried out.

Global perspective

HIV is the leading cause of death among women of reproductive age. In 2013, 54% of pregnant women in low and middle-income countries did not receive an HIV test, a key step to accessing HIV prevention, treatment and care. Without treatment, about one third of children living with HIV die by their first birthday and half die by their second. For children, the health benefits of HIV treatment are magnified. Beginning antiretroviral therapy before the twelfth week of life reduces HIV-related mortality in children living with HIV by 75% [10].

In 2013, an estimated 1.5 million women living with HIV gave birth, virtually unchanged from 2009. Globally, 3.2 million children under 15 were living with HIV in 2013, comprising 9.1% of all people living with HIV. 240 000 children worldwide acquired HIV in 2013: One new infection every two minutes. Of the 3.2 million children living with HIV, 91% live in Sub-Saharan Africa, 6% live in Asia and the Pacific and the remaining 3% are situated in the rest of the world. Launched in 2011, the global plan towards the elimination of new child HIV infections and keeping their mothers alive has focused efforts on priority countries, 21 of which are in Sub-Saharan region, where 85% of pregnant women living with HIV reside [11].

While progress has been made in these priority countries, much more effort is needed to reach the Global Plan's target of reducing new infections among children by 90% by 2015. In 2013, 1.3 million (1.2 million-1.4 million) women living with HIV gave birth-a figure which is unchanged from 2009. However, the number of children newly infected fell from 350 000 in 2009 to 199 000 (170 000-230 000) in 2013. The rate of mother-to-child transmission also fell-in 2013, 16% (13%-18%) of children born to women living with HIV became infected compared to 25.8% in 2009. HIV testing among pregnant women remains challenging. Globally, about 44% of pregnant women in low and middle-income countries received HIV testing and counselling in 2013, up from 26% in 2009 [12].

Over the past five years, Brazil has registered an annual average of 40.6 thousand cases of AIDS. In pregnant women, from the year 2000 until June 2015, 92, 210 notifications of pregnant women with positive HIV serology occurred. Before the 1990's, scarce therapeutic solutions were available to mitigate the effects of the human immunodeficiency virus. Currently, however, the appearance of superior and more potent medications offers a better quality of life and increases the quality of life and increases the life expectancy of these patients [13].

Regional perspective

In 1989 the Global Program on AIDS (GPA) of the World Health Organization (WHO), estimated that there were 2.5 million women and half a million children infected with HIV-1 in Africa. A study carried out in two maternities in Kinshasa, Zaire, in 1988 showed higher mortality rates in previously born children of seropositive mothers compared with children of seronegative mothers (43% vs. 32%, $p=0.01$) [14].

In a case control study done in Nairobi, patients admitted with an acute spontaneous abortion indicated that HIV-1 infection was significantly associated with spontaneous abortion (13.8% vs. 6.2%, $p=0.02$). In another study from Nairobi the mean birth weight of infants born to seropositive mothers was slightly but significantly lower than the birth weight of infants with seronegative mothers (3090 vs. 3220 g, $p=0.005$) [15].

In the Kinshasa study more infants born to HIV-1 seropositive mothers with symptomatic infection were delivered before 38 weeks of gestation compared with neonates of HIV-positive asymptomatic or seronegative women (18%, 12% and 3%, respectively, $p=0.01$). In the Nairobi study abnormalities were noted in 115 stillborn neonates and maternal HIV-1 infection (odds ratio of 2.7) was a contributory factor.

According to a meta-analysis study done in Central Africa, each country where the study was conducted have some of the highest maternal mortality ratios in the world: Malawi 984 per 100,000 live births, (national statistical office (Malawi) and ORC Macro; Calverton, MD: 2005), Tanzania 578 per 100,000 live births (national bureau of statistics and ORC Macro; Dar es Salaam, Tanzania: 2005), Zambia 729 per 100,000 live births (central statistical office (Zambia), central board of health and ORC Macro; Calverton, MD: 2003). However, although the majority of Severe Adverse Effects (SAEs) occurred during labor and delivery for all women, 90% of deaths occurred postnatally and no deaths occurred during labor and delivery. These findings suggest that the high maternal mortality reported in these countries may be more directly influenced by the underlying health status, such as HIV-status and anemia.

Infant mortality, with or without HIV infection, is high in these countries. In contrast to the maternal cohort in which only 25% of SAEs resulted in death, the majority of SAEs (82%) among the infants resulted in death. Mortality was high in this cohort of infants where 86% of the mothers were HIV-infected and 20% of the infants were HIV infected by the end of the 12 month follow-up period. Almost 15% of the infants in the cohort died during this follow-up period (146 per 1000 live births), higher than the all infant mortality in Tanzania (68 per 1000 live births), Zambia (95 per 1000 live births) and Malawi (76 per 1000 live births). Mortality among HIV-1-infected infants was more than 5 times as high as uninfected infants regardless of the timing of infection. By the end of the follow-up period, 42% of infected infants had died, compared with 7.2% of uninfected HIV-exposed infants and 4.8% of HIV unexposed infants. The mortality was the highest among infants infected early (at birth or 4-6 weeks) and confirms other studies of perinatal transmission.

National perspective

In Zambia a report done by UNAIDS revealed that Zambia is one of the countries in Sub Saharan Africa to have one of the world's high HIV/AIDS pandemic. It is estimated to have 14.3% of adults aged 15-49 years to be living with the HIV/AIDS. The number of Zambians living with HIV/AIDS by 2007 was 980,000 and out of these about 575 cases of HIV occurred among women of ages 15-40 years by 2007, which is the population of child bearing age.

Epidemiological data on HIV/AIDS in Zambia has been collected since the early 90's using a Sentinel Surveillance System (SSS) established in 1989. The SSS uses a method of unlinked, anonymous testing on pregnant women attending antenatal clinics, outpatients attending sexually transmitted disease clinics and blood donors. Data from the SSS showed wide variations in HIV infection rates within the country, ranging from 8% to 32% (in the age group 15-39) at different sites. An epidemiological model developed by WHO utilizing data from the SSS projected that in the year 2000 the total number of HIV infected adults in the whole country is between 600,000 and 700,000, *i.e.*, between 14.4% and 16.5% of the adult population.

Objectives

General objective: The aim of the study is to determine the maternal and neonatal outcomes (mortality and morbidity) in HIV infected women at Masala, Lubuto and Mapalo Clinics of Ndola, Zambia.

Specific objective:

- To establish the prevalence of maternal/neonatal mortality in HIV-infected women.
- To evaluate of the efficacy of maternal prophylaxis in HIV infected women.
- To determine the impact of socioeconomic on pregnancy outcomes HIV-positive women.
- To assess the complications associated with HIV/AIDS in pregnant patients.
- To investigate neonatal morbidities in neonates of HIV/AIDS mothers.

Research questions

- In HIV positive pregnant women, is the diagnosis of HIV infection prior to pregnancy or during pregnancy?
- Is the use of ARVs and co-trimoxazole prophylaxis effective in HIV positive pregnant women?
- What are the most experienced maternal/ neonatal morbidities and complications in HIV positive pregnant women?
- Does pregnancy influence progression of HIV disease?

Conceptual framework

A conceptual framework is an interconnected set of ideas (theories) about how a particular phenomenon functions or is related to its parts. The framework serves as basis for understanding the casual or correctional patterns of interconnections across events, ideas, observations, concepts, knowledge, interpretations and other components of experience. A conceptual framework was designed and one done by Wilson and Cleary, on correlates of quality of life in infected individuals was also adopted (Figures 1 and 2).

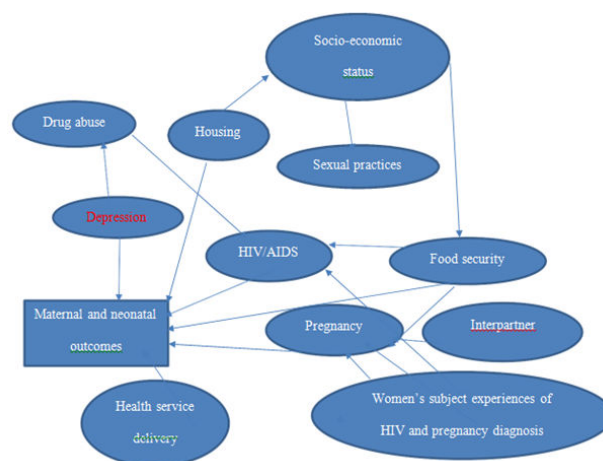


Figure 1. HIV and pregnancy; maternal and neonatal outcomes.

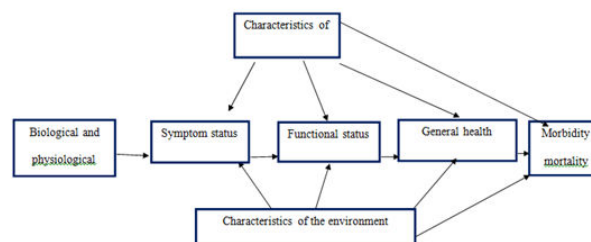


Figure 2. Wilson and Cleary's model of the condoled quality of life.

Measurement

The main dependent variable in this study will be the maternal and neonatal outcomes (morbidity and mortality) (Table 1).

Variable	Indicator	Scale of measurement	Definition
Age	15-25	Independent	This is the age in years of the woman in which your they are reproductive
	26-35		
	36-45		
Apgar score	0	Independent	The APGAR (appearance, pulse, grimace, activity and respiration) score describes the condition of the new born infant immediately after birth
	1		
	2		
ARV, vitamin A and co- trimoxazole prophylaxis	Yes or No	Independent	Prescription of ARVs, vitamin A and co-trimoxazole as
Marital status	Married single divorce	Independent	The state of a mother i.e. if they are in or out of their husband's house. Whether their husband is dead or have never been married
	Widow		
Education	Primary	Independent	The level of education attained
	Secondary Tertiary		
Occupation	Civil servant trader	Independent	The kind of work done in the household that helps the family sustain their basic needs
	Non		

Socio Economical Status (SES)	Low	Independent	The magnitude of the source of income which may vary with households
	Moderate high		
Residence	Low density medium density	Independent	This is the location in which these mothers stay
	High density		
Type of delivery	Vaginal delivery caesarean section instrumental delivery e.g. Forcep	Independent	The procedure used in the process of giving birth
Medical concerns	Yes or No	Independent	Any pre-existing medical conditions other than HIV
Mortality	Yes or No	Dependent	Death of the mother or neonate preterm or postpartum
Morbidity	Yes or No	Dependent	Any adverse maternal or neonatal outcomes i.e. complications or diseases
CD4 count	Low moderate	Independent	The viral load and CD4 count at conception and at time of delivery
	High		
Gestational age at delivery	Preterm	Independent	Preterm (<37 weeks) and term
	Term		(>37 weeks)
Facility type	Community clinic	Independent	Level of health care facility
On cART prior or during pregnancy	Yes No	Independent	Use of antiretroviral medications

Table 1. Definition of variables and scales of measurement.

Study design

A cross sectional and descriptive study was used in this study design was used in this study.

Study setting

The study was conducted in Ndola District, Copperbelt province of Zambia, whose surface area is 688,201 square kilometres and a population projection of 139,509 people in the year 2017. The study was conducted at 3 clinics: Masala clinic, Lubuto and Mapalo clinics of Ndola district of the Copperbelt province, Zambia. Ndola is the third largest city in Zambia, with a population of 451,246. Ndola district has 2 level 3 hospitals, 2 level 2 hospitals, 1 level 1 hospital, 42 urban health centres, 1 rural health centre and no health posts. It is as well the second largest in terms of infrastructure development and it is the centre of industrial and commercial activities of the Copperbelt. It lies just 10 kilometres from the border with DR Congo and it is also the home to Zambia's first modern stadium, the Levy Mwanawasa.

Study population

All pregnant women who are HIV positive ranging from 15 to 45 years and attended antenatal (period between conception and birth) clinic and postnatal (after birth) clinic and gave birth from the named clinics-Masala, Lubuto and Mapalo in Ndola District, Zambia. The medical records subjects were only recruited for the study if they met the inclusion criteria and not considered in the research if they met the exclusion criteria.

Inclusion and exclusion criteria

Inclusion criteria:

- Pregnant women between 15 and 45 year.
- Pregnancy deliveries at the selected clinics.
- HIV infected pregnant women.
- Participant records covering the period under review.

Exclusion criteria:

The study will exclude the following individuals who are

- Not of the reproductive age; below 15 years and above 45 years.
- Women who did not deliver at the selected clinics.
- Patient records not covering the period under review.
- Patient records for other conditions than HIV and pregnancy.

Sample size

In evaluating HIV and pregnancy maternal and neonatal outcomes, 3 clinics were involved in the study. In determining the sample size for each facility, a 12 month coverage of deliveries at the labour ward and MCH was used. The attendance for each clinic was divided by the total attendance for all the clinics and the result was multiplied by the total sample size. The final result after this computation was the sample size for each facility. At a 5% margin of error and a 95% confidence interval, the sample size will be generated using EPI Info statistical programme software. Estimated sample size is 384, however this shall be adjusted according to the data available from medical records (Table 2).

Parameters	Sample size
Level of confidence measure (Z)	1.96 (at 95% confidence level)
Margin of Error (e ²)	0.05
Baseline level of the indications (P)	50% (as no estimates)

Table 2. Information required for computing the sample size.

Sampling procedure

The study settings were selected by convenient sampling. Records was sought for from the existing patient medical records.

Data collection and research tools

A standard data abstraction sheet was used to collect data from all relevant pre-existing medical records from the MCH and labour ward of HIV-infected women. This abstraction sheet was developed from a study conducted in Germany on 'pregnancy complications in HIV-infected women. Information such as the subject's CD4 count and viral load prior to and after delivery were missing in the records at MCH.

Data management, entry and analysis

The data collected from all the relevant medical records *via* data abstraction sheet was checked for completeness and consistency; which was then grouped and coded. IBM SPSS v26 was used for data entry and analysis.

Results

The results have been put in frequency (Table 3). This study involved 360 respondents.

Sr. No.	Particular (n=300)	Frequency	Percent (%)
1	Age group (in years)		
	15-19	5	2.8
	20-24	38	21.1
	25-29	66	36.7
	30-34	40	22.2
	35-45	31	17.2
2	Education level		
	None	60	33.3
	Primary	78	20
	Secondary	36	43.3
	Tertiary	6	3.3
3	Religion		
	Christian	172	95.6
	Moslem	8	4.4
4	Marital status		
	Married	141	78.3
	Single	33	18.3
	Divorce/separated	2	1.1
	Widow	4	2.2
5	Residence		
	Lubuto	54	30
	Kabushi	27	15

6	Masala	51	28.3
	Chipulukusu	48	26.7
	Occupation		
	None	30	16.7
	Self-employment/trader	130	72.2
	Central government	11	6.1
	Local government	9	5

Table 3. Social demographic characteristics.

The Table above shows the social demographic characteristics of the 360 respondents. The table shows that the respondents were from 15 to 45 years of age. The majority of the respondents were from 25-29 years (36.7%). Other respondents were from 30-34 (22.2%), 20-24 (21.1%), 35-45 (17.2%) and the least were 15-19 years (2.8%). The study also found that most of the participants had attained secondary education as their highest level of education (43.3%) and only 3.3% had reached to tertiary education. The study was composed of 95.6% Christians and 4.4% Muslims. Further, 78.3% were married, 18.3% were single, 2.2% were widows and 1.1% had divorced/ on separation. The study was presented by respondents from Lubuto (30.0%), Masala (28.3%), Chipulukusu (26.7%) and Kabushi (15%). Additionally, 72.2% of respondents were not in formal employment and 16.7% were not working at all. However, 6.1% and 5.0% were in central government and local government respectively.

HIV diagnosis

The figure below shows the period when the respondents were diagnosed with HIV/AIDS. The figure shows that most of the respondents were diagnosed prior to pregnancy 96.1% and only 3.9% were diagnosed during pregnancy (Figure 3).

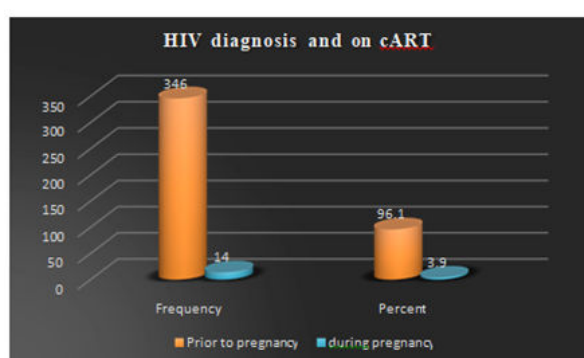


Figure 3. HIV diagnosis.

Mode of delivery

The figure below shows the mode of delivery of undergone by HIV/AIDS patients. The figure shows that 2% of the respondents gave

birth by caesarean section and 98% gave by spontaneous vaginal delivery (Figure 4).

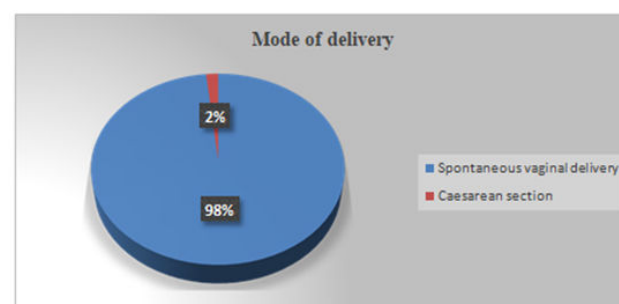


Figure 4. Mode of delivery.

Prophylaxis

The figure below clarifies that 98.3% of HIV/AIDS participants were on ARV prophylaxis and 95.6% were on cotrimoxazole prophylaxis (Figure 5).

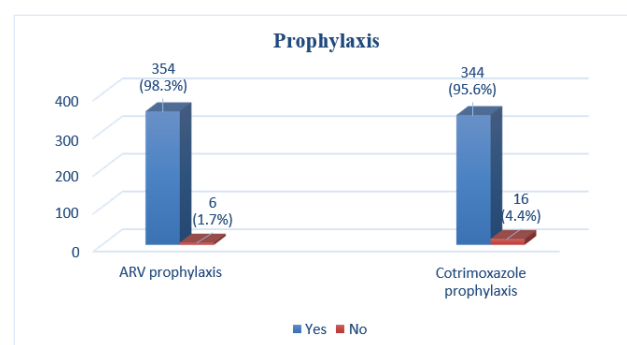


Figure 5. Prophylaxis.

Maternal complications

The table below illustrate some of the complications that were associated with pregnancy in HIV and AIDS patients. The table shows that 0.6% had post-partum haemorrhage and 0.0% was the recorded maternal death during the study period (Table 4).

Sr. No.	Particular (n=300)	Frequency	Percent (%)
1	Postpartum complications		
	None	358	99.4
	Post-partum hemorrhage	2	0.6
2	Mortality (maternal death)		
	No	360	100

Table 4. Maternal complications.

Maternal morbidities

The morbidities that were associated with HIV and AIDS in pregnant women were preterm contractions (1.1%) and a few had to undergo episiotomy (2.8). the majority of the results in this study had non maternal morbidities (96.1%) (Figure 6).

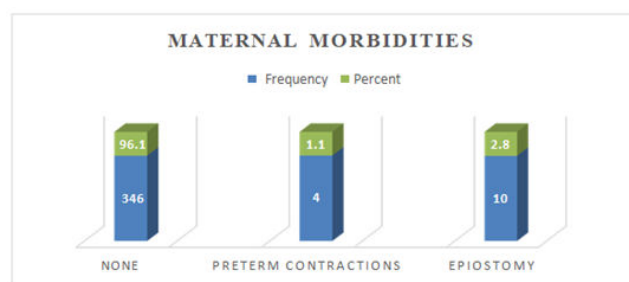


Figure 6. Maternal morbidities.

Gestational age at delivery

Figure 7 below highlights the gestational age of respondents at delivery. The study shows that the majority of the respondents gave birth before term 60% and 40% gave birth at term.

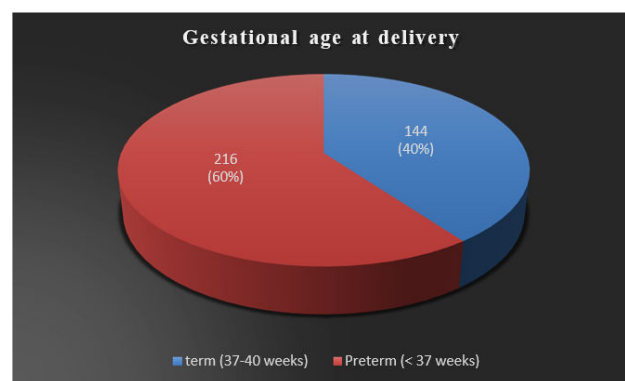


Figure 7. Gestation age at delivery.

Neonatal social demographics

The table below shows the demographic characteristics of the neonates of the respondents. The majority of the neonates were females (55%) and 45% were males. The table further shows that 14.7% neonates had low birth weight. The majority of the neonates had normal birth weight (2.5 KG-3.5 KG) 82.2% and only 3.1% were above the normal birth weight (Table 5).

Sr. No.	Particular (n=300)	Frequency	Percent (%)
1	Gender of neonates		
	Male	162	45
	Female	198	55
2	Birth weight		
	2.5-3.5 kg	296	82.2
	<2.5	53	14.7
	>3.5	11	3.1

Table 5. Social demographics of neonates.

Neonatal morbidities

The figure below shows that 41.9% of neonates were premature, 12.8% had low birth weight and 2.2 % had asphyxia.

The rest of the neonates were normal without any neonatal morbidities (43.1%) (Figure 8).

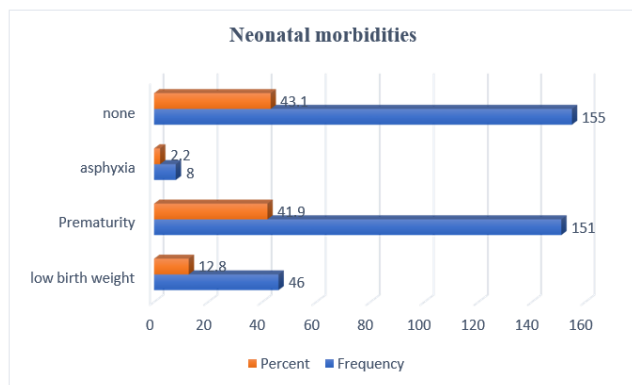


Figure 8. Neonatal morbidities.

Associations

The table below shows the association between gestational age at delivery to neonatal morbidities and birth weight. Regarding the

association between gestational ages at delivery to neonatal morbidities, the table shows that 81.5% of preterm babies had a low birth weight whereas 18.5% of term babies had a low birth weight. There were 0 term babies with prematurity morbidity whereas 151 of the preterm babies had prematurity morbidity. The table also shows that 100% of preterm babies had asphyxia and the majority of term babies (132, 89.8%) had no neonatal morbidities. Thus there was a relationship between gestational age and neonatal morbidities ($P \leq 0.001$).

Further, the table illustrates that 56.8% of preterm babies had a normal birth weight (2.5 Kg-3.5 Kg) and 43.2% of term babies also had a normal birth weight. Three percent of term babies had a low birth weight (<2.5) whereas about 94.3% of low birth weight babies were preterm. In addition, 11 (100%) of term babies had a birth weight of above 3.5 and no preterm baby had such a weight. Therefore, there was association between gestational age to birth weight (p value ≤ 0.001) (Table 6).

Variable (380)			Gestational age at delivery		Chi- square test (P-value)
			Term (37-40 weeks)	Preterm (<37 weeks)	
Association between gestational age at delivery to neonatal morbidities					
Neonatal morbidities	Low birth weight	Count	10	44	<0.001
		% within neonatal morbidities	0.185	0.815	
	Prematurity	Count	0	151	
		% within neonatal morbidities	0	1	
	Asphyxia	Count	0	8	
		% within neonatal morbidities	0	1	
	None	Count	132	15	
		% within neonatal morbidities	0.898	0.102	
Association between gestational age at delivery to birth weight					
Birth weight (kg)	2.5 kg-3.5 kg	Count	128	168	<0.001
		% within mean birth weight (kg)	0.432	0.568	
	<2.5	Count	3	50	
		% within mean birth weight (kg)	0.057	0.943	
	<3.5	Count	11	0	
		% within mean birth weight (kg)	1	0	

Table 6. Associations.

Discussion

The introduction of Highly Active Antiretroviral Therapy (HAART) and infant feeding counselling have changed the fate of the unborn

child of HIV positive women especially in developed countries where vertical transmission of HIV Infection has virtually been eliminated. In developing countries where over 70-80% of the affected women reside and comprehensive health care limited, vertical transmission of the virus as well as other adverse pregnancy, obstetric and neonatal outcomes are still very common and often attributed to HIV infection.

In this retrospective cohort study, the risk of vertical transmission, complications associated with HIV/AIDS in pregnant patients and neonatal morbidities in neonates of HIV/AIDS mothers was assessed in HIV-infected women of Masala, Lubuto, Kabushi and Chipulukusu townships (compounds) who delivered from Masala, Lubuto and Mapalo clinics of Ndola. According to this study, the majority of the respondents were from 25-29 years which accounted for 36.7%, this was consistent with the studies done in Mozambique, Nigeria and UK in the 25-29 accounted for 53%, 59.4% and 63.9% respectively.

Majority of women were married (78.3%) while 18.3% were single, this is just as it was observed in the study done in Zimbabwe and Zambia which showed 90.9% and 86% of married women respectively. The study also found that most of the participants had attained secondary education as their highest level of education (43.3%), this is in line with a study done in South Africa, which assessed the prevalence and determinants of unplanned pregnancy in HIV-positive women, were 60% attained secondary school.

Additionally, 72.2% of respondents were self-employed which correlates with the study in Zimbabwe and Mozambique were 71% and 60.7% respectively were self-employed/ traders, this however contradicts the study done in Germany/Austria in which 66% were in formal employment. These studies also showed that 90.6% and 94% of HIV-infected women respectively delivered via spontaneous vaginal delivery, this correlates with this study in which 98% gave birth via spontaneous vaginal delivery. This, however contradicts with a study done in Germany/Austria, which assessed the increased rate of prematurity associated with antenatal ARV therapy in HIV infected women were 66% delivered via elective C-section and only 18% through normal vaginal delivery.

Assessing the timing of pregnancy and HIV diagnosis, 96.1% were HIV-positive prior to pregnancy while only 3.9% were diagnosed with HIV infection during pregnancy, this is consistent with study done in South Africa and Cameroun were HIV diagnosis prior to pregnancy was majority accounting for 90.4% and 84.6% respectively. In terms of gestational age at delivery, majority of women in this study delivered before term (60%), this contradicts with study done in Zambia and Nigeria were preterm delivery (<37 weeks) only accounted for 23.3% and 13.1% respectively.

According to WHO 2013, 2006 guidelines recommend that co-trimoxazole be initiated and maintained regardless of the stage of pregnancy in eligible women living with HIV as a priority intervention. In this study, 98.3% HIV-positive pregnant women received ARV and 95.6% co- trimoxazole prophylaxis, which was observed in a study done in Mozambique in which 91% received ARV prophylaxis. Majority of women in this study had no morbidities (96.1%) and no post-partum complications (99.4%) with only 0.61% postpartum haemorrhage, 2.8% Epiostomy and 1.1% preterm contractions. There was no maternal mortality recorded in this study, which was observed in a study done in mozambique in which 91% received ARV

prophylaxis and recorded only 0.9% maternal death. This showed that maternal complications were minority with only post-partum haemorrhage (3.9%), spontaneous abortion (3.2%) and pregnancy induced hypertension (4.1%).

In this study majority of neonates were females (55%) and males making up the other 45%, with majority (82.2%) having normal birth weight. Regarding neonatal morbidities and mortality, this study found that 41.9% of neonates were premature, 12.8% had Low Birth Weight (LBW) and 2.2% had asphyxia with majority having none (43.1%). With only 1.1% still births recorded. This almost correlates with study done in Zambia which showed normal birth weight (85.7%), LBW (10.1%) and still birth (2.6%), mozambique had LBW (8.7%) and prematurity (4.9%) which contradicted 41.9% prematurity recorded in our study and South Africa in which showed still births (1.7%).

Statistical significance was established using *chi square* test between gestational ages at delivery to birth weight and neonatal morbidities ($P=0.001$). 81.5% of preterm babies had a low birth weight whereas 18.5% of term babies had a low birth weight. There were 0 term babies with prematurity morbidity whereas 151 of the preterm babies had prematurity morbidity and the majority of term babies (132, 89.8%) had no neonatal morbidities. 56.8% of preterm babies had a normal birth weight (2.5 Kg-3.5 Kg) and 43.2% of term babies also had a normal birth weight. 3% of term babies had a low birth weight (<2.5) whereas about 94.3% of low birth weight babies were preterm. In addition, 11 (100%) of term babies had a birth weight of above 3.5 and no preterm baby had such a weight.

Conclusion

The effects of HIV infection in pregnancy have been mainly studied in high income countries, where both disease burden and health systems are significantly different compared with those in the African region. Establishing the impact of HIV infection on maternal and infant health is particularly challenging in Sub-Saharan Africa (SSA) because of the presence of factors associated with both HIV infection and adverse pregnancy outcomes such as malnutrition, anaemia and other frequent concurrent infections such as syphilis and malaria.

Several studies conducted in SSA have reported that HIV-infected women are at increased risk of maternal anaemia and adverse pregnancy outcomes such as stillbirth, LBW and preterm new-born. However, in this study the most prominent maternal and neonatal outcomes were normal with only preterm delivery (<37 weeks) 60% and prematurity 41.9% the noted significant figures. According to the study, there is an association between gestational ages at delivery and birth weight as well as neonatal morbidities. The effect of low socio-economic status as a potential confounding factor for the observed association between maternal HIV infection and perinatal mortality needs to be further explored.

Recommendations

From the findings from this study, I recommend the following:

- Increasing access to VCT should be a priority, so that HIV diagnosis is made prior to pregnancy which is essential to provide the appropriate care required.

- WHO guidelines on use of ARVs and co-trimoxazole prophylaxis in pregnant HIV- infected women should be upheld. Pregnant women who have reached the stage where antiretroviral treatment and vitamin A supplementation is required should have access to this treatment during pregnancy, with trained providers and referral for ongoing care.
- Male involvement should be emphasized because reduction of adverse maternal/ neonatal outcomes also requires the involvement of men to ensure timely and appropriate care for pregnant HIV-positive women and for the success of PMTCT programs.
- The current study also did not stratify HIV-positive mothers by CD4 count or HIV clinical staging. This needs to be investigated by future research.
- Community education and mobilization on use of ante-natal and post-natal care HIV positive women should be emphasized and strengthened.

Ethical Considerations

Ethical approval was sought from Tropical Disease Research Centre (TDRC) and was granted before the project was carried out. Also, permission was requested and granted from National Health Research Authority (NHRA) and Ndola district health office. Written request was sent to management of Masala, Lubuto and Mapalo and clinics and the management were assured of the confidentiality and that data collected was not used for other purposes apart from those specified in the protocol. The information and records collected was locked with a password on my laptop and no one was allowed to access the information except the supervisor of the study. No identifying information such as name of patient was captured from the records. Data collected was solely for research purposes.

Study Limitations

This study could have been done on a large scale, but due to limited time and resources, was only limited to three clinics, this limits the external validity of the study to nonusers of the selected health facilities and the study was limited to government clinics exclusive of private clinics. Additionally, since an abstraction sheet was used for data collection, results of the study are dependent upon the availability and accuracy of the data in the medical records, information such as viral load and CD4+ count prior to and after delivery was missing in the records at MCH office.

Declaration

I Richard Khondowe of SIN 15005805, hereby declare that this work is my original work and has not been presented for any other awards at the Copperbelt university or any other university.

Acknowledgement

I wish to acknowledge with sincere gratitude all those who contributed to the production of this proposal. First and foremost, I would like to acknowledge the almighty god for giving me strength and good healthy throughout the period of my project proposal

development. For I believe that it was not out of my own capabilities but through his guidance academically and morally. Extremely special thanks also go to my supervisors, Ms Charity Kapenda. and Dr C. Banda for creating a fresh and unstressful academic atmosphere through the regular supervisions and guidance made during the development period of this research project. Their efforts and dedication to this piece of work will always be appreciated. Finally, I would like to thank all my friends, the lecturers from Public health unit, Prof. Siziya, Mr Syapiila P and Mr T. Nyirenda, at the Copperbelt university, school of medicine and the community at large who were interested in the research for their guidance, great support and efficiency in providing vital information.

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How to cite this article: Khondowe, Richard. "HIV and Pregnancy: Maternal and Neonatal Outcomes." *J Clin Res* 8 (2024): 178.