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Research Article

Adverse Pregnancy Outcomes among HIV-Positive Mothers in Dar es Salaam: Progress and Ongoing Challenges

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Abstract

Background: Pregnancy presents unique challenges for HIV-positive women, especially in resource-limited settings. Despite advances in Antiretroviral Therapy (ART), these mothers face increased risks of adverse outcomes, including preterm birth, low birth weight, and perinatal transmission. This study assesses pregnancy outcomes among HIV-positive mothers in Dar es Salaam and compares them to recent findings to evaluate progress and ongoing challenges.

Methods: A descriptive cross-sectional study was conducted in the Ilala and Kinondoni municipalities of Dar es Salaam from March 2015 to May 2016. The study recruited 502 postnatal women attending antenatal clinics, including both HIV-positive and HIV-negative mothers. Data were collected using semi-structured questionnaires and analyzed in SPSS, focusing on socio-demographic characteristics, healthcare access, and neonatal outcomes. Comparative data from recent studies were reviewed.

Results: Of the 502 postnatal women, 9.2% (n=46) were HIV-positive. Most participants were married (78.9%) and had completed primary education (53.4%). Neonatal outcomes included low birth weight (3.4%), preterm delivery (17.5%), low Apgar scores (3.2%), and stillbirths (1.0%), with 25.1% of neonates experiencing adverse outcomes. Socio-demographic disparities were observed, with HIV-positive women reporting different healthcare access levels.

Conclusion: Findings highlight the need for targeted healthcare interventions to address ongoing challenges among HIV-positive mothers. Enhanced access to comprehensive prenatal care and strategies to mitigate self-stigma are essential for improving maternal and child health outcomes in this population.

BACKGROUND

Pregnancy and childbirth present significant challenges for women living with HIV, particularly in resource-limited settings across sub-Saharan Africa, including Tanzania. Dar es Salaam, Tanzania's largest city, is undergoing rapid urbanization and is projected to become a mega-city with over ten million residents by 2030 [1,2]. Currently home to over five million people, the city comprises over 10% of Tanzania's population, with a high annual growth rate of 7%—more than double the national average of 3% [3,4]. Within Dar es Salaam, the proportion of women of reproductive age is 62%, notably higher than the national average of 51% [5]. Health services are accessible through 572 registered facilities, including 42 hospitals and 48 health centers, yet disparities in healthcare access persist, especially for marginalized groups [5].

Despite advancements in Antiretroviral Therapy (ART), HIV-positive mothers continue to face heightened risks of adverse pregnancy outcomes, such as preterm birth, low birth weight, and perinatal transmission. These complications increase morbidity and mortality rates among both mothers and infants [6,7]. Tanzania's HIV prevalence among reproductive-age women stands at 4.8%, with urban areas like Dar es Salaam facing particular challenges due to social and economic barriers to accessing quality care [8,9]. Research from Tanzania and other sub-Saharan African nations shows that while comprehensive prenatal services and ART adherence improve outcomes, accessibility remains inconsistent [10,11]. For example, studies in Kenya and Uganda have documented similar barriers, with stigma and resource limitations hindering timely maternal healthcare access. These findings emphasize the need for targeted interventions that address barriers specific to urban and rural contexts in Africa, which is essential for enhancing maternal health outcomes across the region [12].

HIV-related stigma adds another layer of complexity, particularly in communities where cultural beliefs impact health-seeking behavior. In Dar es Salaam, women with HIV often face discrimination that discourages them from seeking healthcare. This stigma affects access to prenatal and postnatal care, influencing health outcomes for both mothers and infants

[13]. Addressing these socio-cultural challenges through community-based health promotion and stigma reduction is essential for improving maternal and child healthcare access [14]. Health promotion plays a crucial role in empowering HIV-positive mothers by improving health literacy, encouraging ART adherence, and promoting supportive community networks that enable women to access the care they need without fear of discrimination. Strengthening these health promotion strategies aligns with the broader goals of public health in reducing disease burden and improving quality of life.

This study aims to analyze pregnancy outcomes among HIV-positive mothers in Dar es Salaam, using historical data from eight years ago and comparing it with recent findings to capture changes in maternal and infant health. By examining both historical and current data, the research identifies persistent risk factors associated with adverse pregnancy outcomes and investigates how improvements in healthcare access, health promotion, and socio-economic conditions have influenced these outcomes. The findings will provide insights into gaps in maternal health services and support the development of targeted interventions that enhance maternal and child health outcomes in Tanzania and similar settings across Africa.

METHODS

Study design

This study employed a descriptive and analytical cross-sectional design to investigate pregnancy outcomes among postnatal women. The research was conducted in two district hospitals in the Dar es Salaam Municipality, Tanzania, with data collected from March 2015 to May 2016. To complement the findings from this earlier period, a comprehensive literature review was conducted to assess changes in maternal and child health outcomes from 2016 to the present.

Study setting

The study was carried out in two district hospitals in the Dar es Salaam region, Tanzania. These hospitals serve as main referral centers while also functioning as primary healthcare providers for the respective districts. They offer Voluntary Counselling and Testing (VCT) services, which are provided free of charge to all pregnant women attending antenatal clinics.

Study population

The target population comprised all postnatal women who attended Ilala and Kinondoni district hospitals within the study period, from March 2015 to May 2016. Inclusion criteria included both HIV-positive and HIV-negative postnatal women who met the selection criteria and provided informed consent.

SELECTION CRITERIA

The selection criteria for this study comprised specific inclusion and exclusion criteria to ensure the validity and reliability of the findings. Inclusion criteria encompassed postnatal women attending Ilala and Kinondoni district hospitals from April 2015 to January 2016, irrespective of their HIV status, provided they gave informed consent to participate in the study. In contrast, exclusion criteria applied to participants with incomplete data on critical variables, including birth weight, stillbirth status, live birth status, premature delivery, Apgar score, or HIV status. Additionally, any postnatal women who did not provide informed consent were excluded from the study. This careful delineation of criteria facilitated the collection of a well-defined sample population for the analysis of pregnancy outcomes among HIV-positive and HIV-negative mothers.

Sampling procedure

A random sampling procedure was utilized to select participants who met the inclusion criteria. All postnatal women attending the clinics between March 2015 and May 2016 were considered for inclusion in the study.

Sample size estimation

The minimum sample size was determined using the formula for single proportional estimation:

$$N = \frac{Z^2 \quad P\,(100\text{-}P)}{\varepsilon^2}$$

Where; N = estimated minimum sample size

Z = 1.96 (for a 95% confidence interval, approximated to 2)

P = estimated prevalence of HIV (5.3%)

ε = accepted margin of error (2%)

$$\frac{2^2 x 5.3(100 - 5.3)}{2^2}$$

Thus, the minimum sample size required for the study was 502 individuals.

Measurements

Potential confounding variables included sociodemographic factors such as age, marital status, education level, and income, alongside healthcare service factors like Antenatal Care (ANC) attendance and the quality of care received. The primary outcome variable was adverse neonatal outcomes, which were defined as stillbirth, Low Birth Weight (LBW), preterm delivery, and Apgar score.

DATA COLLECTION, MANAGEMENT, AND ANALYSIS

Data collection

Data collection commenced in March 2015, where the researcher and two trained nurse research assistants enrolled eligible postnatal women at antenatal clinics. Retrospective data were collected from hospital records using semi-structured questionnaires designed in English and translated into Swahili to ensure comprehension. The questionnaires captured key information, including adverse neonatal outcomes such as LBW, preterm delivery, stillbirth, and Apgar scores.

Data management

Daily checks were conducted to ensure data completeness, accuracy, and integrity. Data were entered into SPSS version 17 for analysis, and backups were maintained using flash drives and external hard disks. Completed questionnaires were stored securely.

Data analysis

Univariate analysis was performed to compute descriptive statistics for continuous variables, including means, medians, ranges, and standard deviations. For categorical variables, frequencies and percentages were calculated, and the prevalence of adverse neonatal outcomes was determined. Subsequently, bivariate analyses were conducted to explore the associations between HIV status (the primary predictor) and other independent variables. Chi-square tests or Fisher's exact tests were employed as appropriate, with a significance threshold set at $p < 0.05$. Additionally, Odds Ratios (OR) with 95% Confidence Intervals (CI) were calculated to assess the strength of these associations. To ensure data integrity, several quality control measures were implemented, including training for research assistants, pre-testing of questionnaires to evaluate clarity and completeness, regular meetings to address and resolve challenges in data collection, and secure storage of data and completed questionnaires.

LITERATURE REVIEW

To contextualize the findings of this study, a comprehensive literature review was conducted to gather relevant data on maternal and child health outcomes in Tanzania and similar settings. This review focused on studies published between 2016 and 2024 that examined trends in pregnancy outcomes among postnatal women, the impact of interventions such as Voluntary Counselling and Testing (VCT) services on maternal and neonatal health, and the sociodemographic factors influencing these outcomes. The aim of the literature review was to identify improvements or persistent challenges in pregnancy outcomes over the past eight years, thereby providing a comparative framework for analyzing the results from the original study period against current data.

RESULTS

Description of the study participants

A total of 502 postnatal women were recruited for the study to assess the prevalence of HIV-positive women in Dar es Salaam Municipality hospitals and to establish the association with HIV infection among postnatal women. Of the 502 postnatal women, 46 (9.2%) were HIV-positive, while the remaining 456 (90.8%) tested negative for HIV.

Socio-demographic characteristics of the participants

The age distribution of the participants ranged from 17 to 48 years, exhibiting a normal distribution with a mean age of 29.4 years (SD = 6.3) (Figure 1). Among the participants, a substantial majority were married, constituting 78.9% (n = 396) of the respondents. A notable proportion of the women had attained primary education, accounting for 53.4% (n = 268). Furthermore, a significant number identified as housewives, representing 58.4% (n = 293) of the study participants (Table 1).

P-values denoted with ** are statistically significant at $p < 0.001$, and those marked with * indicate a significant association.

Description of HIV status among the study participants

In this study, 9.2% (n=46) of the postnatal women were HIV positive eight years ago. Of these, 2.6% (n=13) initiated treatment before 14 weeks of pregnancy, while 6.6% (n=33) began treatment after 14 weeks of pregnancy.

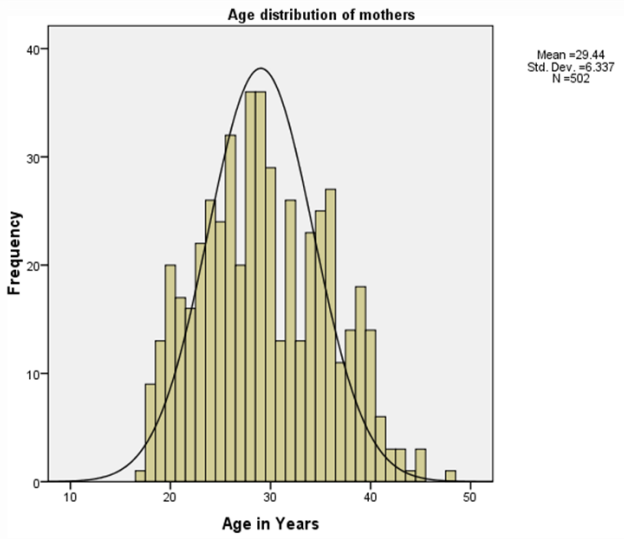

Figure 1 Age distribution of participants.

Table 1: Socio-demographic characteristics comparison of study participants.

Characteristics	HIV-Positive n (%)	HIV-Negative n (%)	*p* value
Marital Status			
Married	42(8.4)	354(70.5)	0.015*
Single	4(0.8)	75(14.9)	0.001**
Separated	-	26(5.2)	0.234
Widow	-	1(0.2)	0.870
Age Group			
17-20	2(0.4)	41(8.2)	0.421
21-34	32(6.4)	301(60.0)	0.001**
35-48	12(2.4)	114(22.7)	0.760
Occupation			
Employed	4(0.8)	114(22.7)	0.240
Not employed	23(4.6)	270(53.8)	0.001**
Peasant	19(3.8)	72(14.3)	0.455
Education of Mother			
Not attended school	1(0.2)	24(4.8)	0.033*
Primary	30(6.0)	238(47.4)	0.001**
Secondary	9(1.8)	108(21.5)	0.670
Tertiary	0(0.0)	58(11.6)	0.215
Madrasa	6(1.2)	28(5.6)	0.212

Prevalence of neonatal outcomes

The prevalence of neonatal outcomes was assessed based on four key indicators: stillbirth, low birth weight, Apgar score, and preterm delivery. The findings revealed that 3.4% (17/502) of neonates had low birth weight, and 17.5% (88/502) were born preterm. Additionally, 3.2% (16/502) of neonates had a low Apgar score, while stillbirths accounted for 1.0% (5/502) of the total. Overall, the prevalence of adverse neonatal outcomes, including stillbirth, low birth weight, preterm delivery, and low Apgar score, was 25.1% (126/502) with a 95% confidence interval.

Contribution of various factors to neonatal outcome prevalence

Preterm delivery was the most common adverse neonatal outcome, affecting 17.5% (88/502) of the study population, followed by low birth weight at 3.4% (17/502). The least frequent outcome was stillbirth, occurring in 1.0% (5/502) of cases.

The prevalence of adverse neonatal outcomes among housewives was higher at 16.3% (82/502) compared to other postnatal women with different occupations. Women aged 22-34 years had the highest prevalence at 19.3% (97/502) compared to other age groups. Additionally, married women had a higher prevalence of adverse neonatal outcomes at 15.7% (79/502) compared to single women (Table 2).

Association between HIV status and neonatal outcomes

Bivariate analysis was conducted to assess the association between HIV status and neonatal outcomes, including stillbirth, preterm birth, low birth weight, and low Apgar score. Results indicate that HIV-positive mothers experienced no stillbirths, whereas 2.2% (n=11) of their infants were born preterm, 0.2% (n=1) had low birth weight, and 9.0% (n=45) had low Apgar scores. In comparison, HIV-negative mothers exhibited higher rates of adverse neonatal outcomes, with 1.0% (n=5) stillbirths, 24.8% (n=124) preterm births, 5.0% (n=25) low birth weight, and 79.6% (n=399) low Apgar scores (Table 3).

Table 2: Prevalence of adverse neonatal outcomes by various demographic characteristics.

Characteristic	Low Birth Weight n (%)	Preterm n (%)	Still Birth n (%)	Apgar Score n (%)
Occupation of Mother				
Employed	4(0.8)	18(3.6)	1(0.2)	3(0.6)
Not employed	9(1.8)	58(11.6)	4(0.4)	11(2.2)
Peasant	4(0.8)	12(2.4)	0(0.0)	2(0.4)
Age				
17-20	2(04)	9(1.8)	0(0.0)	4(0.8)
22-34	13(2.6)	69(13.7)	5(1.0)	10(2.0)
35-48	2(0.4)	10(2.0)	0(0.0)	2(0.4)
Education				
Not attended school	0(0.0)	3(0.6)	0(0.0)	3(0.6)
Primary	10(2.0)	55(11.0)	4(0.8)	8(1.6)
Secondary	5(1.0)	21(4.2)	0(0.0)	3(0.6)
Tertiary	1(0.2)	4(0.8)	1(0.2)	1(0.2)
Madrasa	1(0.2)	5(1.0)	0(0.0)	1(0.2)
Marital Status				
Married	12(2.4)	54(11.6)	4(0.8)	9(1.8)
Single	5(1.0)	20(4.0)	1(0.2)	6(1.2)
Separated	0(0.0)	9(1.8)	0(0.0)	1(0.2)
Widow	0(0.0)	1(0,2)	0(0.0)	0(0.0)

Association between timing of ARV initiation and neonatal outcomes

Mothers who initiated ART before 14 weeks of pregnancy showed no cases of stillbirth, low birth weight, or low Apgar scores, though 4.5% (n=4) of their infants were born preterm. Conversely, among mothers who began ART after 14 weeks, 8.0% (n=7) of infants were preterm, and 5.0% (n=1) were of low birth weight.

Impact of sociodemographic factors on adverse neonatal outcomes

Lower educational levels were associated with higher prevalence rates of adverse neonatal outcomes. Mothers with no schooling or primary education exhibited a prevalence of 15.4% (n=77) and 5.8% (n=29) adverse outcomes, respectively, whereas only 1.8% (n=6) of mothers with tertiary education

Table 3: Bivariate analysis of HIV infection and adverse neonatal outcome (N=502).

	Neonatal Outcome			
HIV-status	**Still birth** n (%)	**Preterm** n (%)	**Low birth weight** n (%)	**Apgar Score** n (%)
HIV positive	0 (0.0)	11 (2.2)	1 (0.2)	45 (9.0)
HIV negative	5 (1.0)	124 (24.8)	25 (5.0)	399 (79.6)

Table 4: Bivariate analysis of sociodemographic characteristics and neonatal outcomes (N=502).

Variable	Still Birth n (%)	Preterm n (%)	Low Birth Weight n (%)	Apgar Score n (%)
Education of Mother				
Not attended school	0 (0.0)	3 (1.2)	0 (0.0)	3 (0.6)
Primary	4 (0.8)	55 (11.0)	10 (2.0)	8 (1.6)
Secondary	0 (0.0)	21 (4.2)	5 (1.0)	3 (0.6)
Tertiary	1 (0.2)	4 (0.8)	1 (0.2)	1 (0.2)
Madrasa	0 (0.0)	5 (1.0)	1 (0.2)	1 (0.2)
Occupation of Mother				
Not employed	4 (0.8)	58 (11.6)	9 (1.8)	11 (2.2)
Employed	1 (0.2)	18 (3.6)	4 (0.8)	3 (0.6)
Peasant	0 (0.0)	12 (2.4)	4 (0.8)	2 (0.4)
Age Group				
17-20	0 (0.0)	9 (1.8)	2 (0.4)	4 (0.8)
21-34	5(1.0)	69 (13.7)	13(2.6)	10 (2.0)
35-50	0 (0.0)	10 (2.0)	2 (0.4)	2 (0.4)
Marital Status				
Married	4 (0.8)	58 (11.6)	12(2.4)	9 (1.8)
Single	1(0.2)	20 (4.0)	5(1,0)	6 (1.2)
Separated	0 (0.0)	9 (1.8)	0 (0.0)	1 (0.2)
Widow	0 (0.0)	1(0.2)	0(0.0)	0 (0.0)

had adverse outcomes. Maternal age and marital status also influenced neonatal outcomes, with married women exhibiting slightly higher rates of adverse outcomes (15.7%, n=79) than single women (5.2%, n=26). However, none of these associations reached statistical significance (Table 4).

DISCUSSION

This cross-sectional study examined pregnancy outcomes among HIV-positive mothers in Dar es Salaam's Ilala and Kinondoni districts, providing valuable insights into maternal HIV and neonatal health in a rapidly growing urban center in Tanzania. Tanzania continues to face substantial neonatal health challenges, with HIV contributing to neonatal morbidity and mortality [13]. Our study found a higher prevalence of HIV among postnatal women compared to recent Tanzanian studies, suggesting a potential decline in HIV prevalence over time [14]. This decline is likely due to increased HIV awareness, educational efforts, and improved access to healthcare services, which reflect the success of national and local HIV prevention strategies [15,16]. Similar declines in HIV prevalence have been observed in other African countries with robust ART and prevention programs, underscoring the effectiveness of sustained public health efforts across the region.

Interestingly, our study did not reveal a statistically significant association between maternal HIV status and adverse neonatal outcomes, which aligns with some studies that found no significant differences in pregnancy outcomes between HIV-positive and HIV-negative mothers [17]. However, this finding diverges from meta-analyses and studies in other settings where maternal HIV infection was linked to outcomes like low birth weight and preterm delivery [18]. The discrepancies between studies may arise from differences in healthcare access, sample populations, socioeconomic factors, and the quality or timing of interventions. Such variability highlights the complexity of HIV's impact on maternal and neonatal health and suggests that localized factors and resources can significantly influence outcomes. For instance, disparities in healthcare infrastructure and ART coverage across urban and rural settings may contribute to different outcomes, as observed in similar studies across sub-Saharan Africa [19].

The timing of Antiretroviral Therapy (ART) initiation was also examined, revealing a trend where early ART initiation (before 14 weeks of gestation) correlated with a lower incidence of preterm delivery, although this association was not statistically significant. This trend supports findings from other studies indicating that early ART initiation can lead to better neonatal outcomes by enhancing viral suppression during pregnancy [20]. However, further research is needed to clarify the optimal timing of ART initiation and its impact on neonatal health across diverse African populations [21,22]. Emphasizing early ART uptake as part of routine maternal care could have significant implications for health promotion, reducing the risk of perinatal transmission and improving neonatal health outcomes. The findings of this study emphasize the need for targeted interventions and health promotion strategies aimed at HIV-positive mothers in Dar es Salaam and similar settings. Despite advancements in ART and maternal healthcare, barriers like self-stigma and social discrimination continue to impede optimal health outcomes. Addressing these challenges requires a comprehensive approach that includes community-based programs to reduce stigma, increase ART adherence, and promote early prenatal care. Such programs can enhance health literacy and empower women to seek timely, high-quality care without fear of discrimination. Effective health promotion is also crucial for sustaining HIV prevention gains, as it encourages behavior change and community support for HIV-positive mothers. This study has limitations that should be acknowledged. Data were collected eight years ago, which may result in discrepancies when comparing with current trends; however, several findings align with recent publications, underscoring the study's relevance. Additionally, the cross-sectional design limits causal inference, capturing only a snapshot rather than longitudinal trends. The reliance on self-reported data could introduce biases, particularly regarding ART adherence and health practices. Future research using longitudinal designs and combining quantitative and qualitative methods would provide a more comprehensive view of factors affecting neonatal outcomes among HIV-positive mothers.

CONCLUSION

This study underscores the ongoing need for targeted interventions to address healthcare challenges faced by HIV-positive mothers in Dar es Salaam. Although ART advancements and maternal health services have improved, barriers like self-stigma and uneven healthcare access continue to impact outcomes. Expanding access to comprehensive prenatal care and promoting initiatives to reduce self-stigma are critical to improving health outcomes for this vulnerable population. While HIV prevalence among pregnant women appears to be declining, the absence of significant associations between HIV status and neonatal outcomes highlights the complexity of this issue and the influence of local context on health outcomes. Strengthening healthcare policies, enhancing community-based health promotion, and conducting further research to close knowledge gaps are essential steps. By prioritizing these efforts, stakeholders can make strides in reducing neonatal morbidity and mortality, ultimately contributing to improved health for mothers and infants in Tanzania and similar settings.

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AUTHOR'S CONTRIBUTIONS

L.W.K. conceived the idea and led the manuscript writing. P.K. and E.W.T. actively participated in the study throughout the research process and contributed to the manuscript's development. All authors have reviewed and edited the final manuscript.

DECLARATIONS

Ethics consideration

Ethical considerations for this study were prioritized to ensure the protection of participants' rights and welfare. Ethical clearance was obtained from the HKMU Research Ethical Committee, and permission was secured from local authorities in Ilala and Kinondoni Districts, following the established hierarchy of the Municipal Executive Director, Municipal Medical Officer, and the Medical Officer in Charge. Participants were informed about their willingness to participate and that the information generated from the study would be used solely for academic purposes. The benefits and risks associated with participation were clearly explained, and individuals were assured that their refusal to participate would be accepted without penalty. No significant risks were anticipated from the study, and participants were guaranteed confidentiality through the use of ID codes to conceal their identities. This approach fostered an ethical research environment, emphasizing informed consent and the safeguarding of participant information.

Consent for publication

Not applicable.

Availability of data and materials

The original dataset and consent forms will be made available by the corresponding author upon reasonable request.

COMPETING INTERESTS

The authors declare they have no competing interests.

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