MERIT RESEARCH JOURNALS
www.meritresearchjournals.org

Merit Research Journal of Medicine and Medical Sciences (ISSN: 2354-323X) Vol. 13(6) pp. 151-167, December, 2025
Available online http://www.meritresearchjournals.org/mms/index.htm

doi: 10.5281/zenodo.18214645

Original Research Article

Impact of Early Sexual Initiation on Adolescent Pregnancy and Mother-to-Child Transmission of HIV: A Global Comparative Study with Emphasis on Nigeria

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Abstract

Early sexual initiation among adolescents remains a global public health concern with far-reaching implications for sexual and reproductive health. Defined as sexual debut before the age of 15–16, early initiation is consistently associated with heightened vulnerability to unintended pregnancies, unsafe abortions, and sexually transmitted infections, particularly HIV (Santelli et al., 2017; CDC, 2022). In sub-Saharan Africa, and Nigeria in particular, the intersection of early sexual activity, adolescent pregnancy, and mother-to-child transmission (MTCT) of HIV presents urgent challenges (UNAIDS, 2020; NACA, 2021). Despite the existence of sexual health education programs and PMTCT services, adolescents continue to face barriers in access, utilization, and adherence, leaving significant gaps in prevention (WHO, 2021; UNICEF, 2021). This study investigates the prevalence of early sexual initiation among adolescent girls, its association with adolescent pregnancy and HIV infection, and its contribution to MTCT risk. It further evaluates the awareness and utilization of PMTCT services, explores the impact of comprehensive sexual health education (CSE) on adolescent behavior, and identifies barriers to effective HIV prevention in the adolescent population. A mixed-methods design was employed, combining quantitative surveys with qualitative interviews to ensure depth and breadth of analysis. A total of 500 adolescent girls aged 13–19 years participated in structured surveys capturing sexual history, contraceptive use, and HIV testing. Additionally, 30 in-depth interviews with adolescent mothers provided insights into lived experiences, stigma, cultural influences, and service barriers. Quantitative data were analyzed using descriptive statistics, chi-square tests, and logistic regression to establish associations, while qualitative data were subjected to thematic analysis to capture context-specific narratives. Findings revealed that 42% of participants reported early sexual initiation, with a mean debut age of 14.7 years. Early initiation was significantly associated with adolescent pregnancy (OR = 2.15, 95% CI: 1.45–3.19, p < 0.001) and HIV infection (OR = 1.89, 95% CI: 1.12–3.17, p < 0.05). Among adolescent mothers, only 55% reported consistent utilization of PMTCT services, with stigma, lack of transportation, and fear of disclosure identified as key barriers. Exposure to comprehensive sexual health education was linked to delayed sexual debut (mean 16.1 vs. 14.3 years, p < 0.001), higher condom use (62% vs. 38%, p < 0.001), and a 35% reduction in HIV risk behaviors (OR = 0.65, 95% CI: 0.44–0.96, p < 0.05) (Kirby, 2019; Kirby & Laris, 2019). The study underscores the strong link between early sexual initiation, adolescent pregnancy, and HIV risk, with profound implications for MTCT. Despite global advances, adolescent mothers remain underserved by PMTCT programs, with structural, cultural, and psychosocial barriers limiting uptake (Okafor &Ogbo, 2018; Olukoya et al., 2017). Comprehensive sexual health education emerges as a protective factor, delaying sexual debut and promoting safer practices (UNESCO/WHO/UNFPA, 2018; Chika & Uche, 2020). To reduce adolescent HIV risk and prevent MTCT, health systems must prioritize youth-friendly PMTCT services, expand comprehensive sexual health education, and address socio-cultural barriers through community engagement. Policy reforms ensuring confidentiality, accessibility, and affordability of adolescent reproductive health services are essential (WHO, 2019; Patton et al., 2016).

Keywords: Adolescent Sexual Initiation, Teenage Pregnancy, HIV, Mother-to-Child Transmission (MTCT), Sexual Health Education, PMTCT, Global Health, Nigeria

INTRODUCTION

Adolescence represents a pivotal stage of human development characterized by rapid physical, psychological, and social changes. During this period, young people increasingly assert independence, form social identities, and begin to explore intimate relationships (Patton et al., 2016). One of the most pressing public health issues associated with adolescence is early sexual initiation, defined as engaging in sexual activity before the age of 15–16 years. Early sexual initiation has been linked to a cascade of adverse health and social outcomes, including unintended pregnancies, unsafe abortions, increased vulnerability to sexually transmitted infections (STIs), and heightened risk of acquiring HIV (Santelli et al., 2017; CDC, 2022; CDC and WHO, 2020).

Globally, the timing of first sexual experience varies considerably across cultural, economic, and geographic contexts. In sub-Saharan Africa, where HIV prevalence remains disproportionately high, adolescents face unique vulnerabilities due to structural inequalities, entrenched cultural norms, and limited access to health services (UNAIDS, 2020). In Nigeria, despite investments in reproductive health services, teenage pregnancy and HIV prevalence remain alarmingly high among adolescents (NACA, 2021; Okafor & Ogbo, 2018). Cultural practices such as early marriage, gender-based power imbalances, and limited parental communication about sexuality further exacerbate risk (Ezeh et al., 2019; Olatunji and Ijadunola, 2020).

The relationship between early sexual initiation and adolescent pregnancy is well documented. Girls who initiate sex early are less likely to use contraceptives consistently and more likely to engage in relationships with older partners, who may exert control over condom negotiation (UNFPA, 2020; Fagbamigbe and Idemudia, 2017). The consequence is a higher probability of unintended pregnancies, school dropout, reduced socioeconomic opportunities, and increased maternal morbidity and mortality (WHO and UNFPA, 2018; Adebowale et al., 2019).

When compounded by HIV infection, the situation becomes critical: adolescent mothers living with HIV face a dual burden of stigma and health risks, while their infants remain at significant risk of acquiring the virus through mother-to-child transmission (MTCT). Without intervention, MTCT rates can reach 30–45%, but with appropriate prevention of mother-to-child transmission (PMTCT) services, transmission risk drops below 5% (WHO, 2021; WHO, 2019). Despite global progress in expanding PMTCT programs, adolescents remain underrepresented in service delivery and research (Olukoya et al., 2017; UNICEF, 2021).

Studies reveal that young mothers are less likely to access antenatal care early, adhere to antiretroviral therapy, or attend consistent PMTCT sessions compared to adult mothers (Adejuyigbe& Yusuf, 2019; Chandra-Mouli et al., cited in WHO, 2019). Barriers include limited knowledge about available services, stigma associated with HIV, fear of disclosure, and logistical challenges such as cost and distance to healthcare facilities (Adejuyigbe and Yusuf, 2019; Olatunji &Ijadunola, 2020).

Another critical dimension is the role of sexual health education. Evidence from multiple regions shows that comprehensive sexuality education (CSE)—programs that go beyond abstinence-only approaches to include accurate information about contraception, HIV prevention, consent, and healthy relationships—significantly delays sexual initiation, increases condom use, and reduces risky behaviors (Kirby, 2019; Kirby & Laris, 2019; UNESCO/WHO/UNFPA, 2018). However, in many developing countries, including Nigeria, sexuality education is either limited, inconsistently implemented, or resisted due to cultural and religious objections (Chika & Uche, 2020; Santelli et al., 2017). The absence of reliable and culturally appropriate education leaves adolescents uninformed, ill-prepared, and more likely to engage in high-risk behaviors.

This study positions itself at the intersection of three critical issues:

1. Early sexual initiation as a driver of adolescent vulnerability.
2. Adolescent pregnancy compounded by HIV risk.
3. The effectiveness of PMTCT programs and sexual health education in mitigating HIV and MTCT outcomes.

By adopting a global comparative perspective with emphasis on Nigeria, this research contributes to filling an important knowledge gap. While studies have independently examined adolescent pregnancy, HIV prevalence, and PMTCT outcomes, few have comprehensively explored how early sexual initiation directly influences HIV-positive pregnancies and subsequent MTCT, particularly in Nigerian settings (Okafor and Ogbo, 2018; Olaleye and Adeyemi, 2020). Additionally, this study highlights how gaps in education and systemic healthcare barriers perpetuate adolescent vulnerability.

Ultimately, addressing early sexual initiation and its consequences requires a holistic, multi-level approach combining evidence-based education, youth-friendly reproductive health services, community engagement, and policy reforms (WHO, 2019; Patton et al., 2016). The present research seeks to provide empirical insights to guide such interventions, with the overarching goal of reducing adolescent HIV risk and preventing MTCT.

Problem Statement

Despite global progress in reducing HIV transmission and

improving maternal health outcomes, adolescents remain one of the most vulnerable populations in the HIV epidemic (UNAIDS, 2020; WHO, 2019). Early sexual initiation among adolescent girls, particularly in sub-Saharan Africa, is strongly associated with increased rates of teenage pregnancy and exposure to HIV infection (Santelli et al., 2017; Olaleye and Adeyemi, 2020). In Nigeria, where HIV prevalence is concentrated in high-burden states and cultural practices such as early marriage persist, adolescent girls are disproportionately at risk (NACA, 2021; Ezeh et al., 2019). This creates a dual vulnerability: the likelihood of experiencing unintended pregnancies at a young age and the risk of transmitting HIV to infants through MTCT (Okafor and Ogbo, 2018; Olukoya et al., 2017).

Although PMTCT programs have been widely implemented and have proven effective in reducing MTCT rates from 30–45% to below 5% when accessed consistently (WHO, 2021; WHO, 2019), adolescent girls often face unique challenges in engaging with these services. Research indicates that adolescent mothers are less likely than adult mothers to access antenatal care early, adhere to antiretroviral therapy, or complete recommended PMTCT protocols (UNICEF, 2021; Adejuyigbe& Yusuf, 2019). Barriers such as stigma, fear of disclosure, lack of family support, limited autonomy in decision-making, and poor access to adolescent-friendly health facilities prevent many from benefiting fully from existing interventions (Olatunji &Ijadunola, 2020; NACA, 2021).

At the same time, sexual health education, which could serve as a protective intervention, remains insufficient or inconsistently implemented in many Nigerian schools and communities (Chika & Uche, 2020). While evidence shows that CSE delays sexual initiation, increases contraceptive use, and reduces HIV risk behaviors (Kirby, 2019; Kirby & Laris, 2019), cultural resistance and policy gaps hinder its widespread adoption (Santelli et al., 2017). As a result, many adolescents enter sexual relationships with limited knowledge, poor negotiation skills, and misconceptions about HIV prevention, further compounding their risk (CDC and WHO, 2020).

The problem is further complicated by systemic issues. Healthcare systems in Nigeria and other high-prevalence regions often lack dedicated adolescent-friendly services. Structural barriers, such as long distances to health facilities, financial constraints, and judgmental attitudes of healthcare workers, discourage adolescents from seeking care (Adejuyigbe and Yusuf, 2019; Olukoya et al., 2017). Socio-cultural factors, including early marriage, gender inequality, and power imbalances in sexual relationships, exacerbate vulnerability by limiting adolescents' ability to make informed choices about their sexual and reproductive health (Ezeh et al., 2019; Olatunji and Ijadunola, 2020).

Despite the growing body of literature on HIV prevention, teenage pregnancy, and PMTCT, there remains a critical research gap: few studies have systematically explored the intersection between early sexual initiation, adolescent pregnancy, and MTCT, particularly within the Nigerian context (Okafor and Ogbo, 2018). Most existing studies focus on adults or general populations, overlooking the unique needs, perceptions, and experiences of adolescents (Patton et al., 2016). Without a clear understanding of these dynamics, interventions remain fragmented, leaving adolescents underserved and perpetuating cycles of HIV transmission.

Therefore, the problem this study seeks to address is the persistent vulnerability of adolescent girls who engage in early sexual activity, leading to elevated risks of unintended pregnancies, HIV infection, and MTCT, despite the existence of preventive services such as PMTCT and sexual health education. Unless targeted, evidence-based, and adolescent-centered interventions are implemented, the cycle of adolescent HIV transmission and poor reproductive health outcomes will continue to undermine global and national public health goals.

Objectives

The overarching aim of this study is to investigate the impact of early sexual initiation on adolescent pregnancy and the risk of MTCT of HIV, with a particular focus on Nigeria within a global comparative context. To achieve this, the study pursues the following specific objectives:

1. To determine the prevalence and patterns of early sexual initiation among adolescent girls (ages 13–19) in both urban and peri-urban settings, examining differences by socioeconomic status, educational background, and cultural context.
2. To examine the relationship between early sexual activity and adolescent pregnancy outcomes among HIV-positive and at-risk teenagers, including timing of pregnancies in relation to first sexual debut and vulnerability to HIV-positive pregnancies.
3. To assess adolescent mothers' awareness and utilization of PMTCT services, including knowledge of available interventions (ART, safe delivery practices, infant prophylaxis), adherence, and barriers to engagement.
4. To evaluate the effectiveness of sexual health education programs in preventing HIV infection and reducing MTCT risk among adolescents, with emphasis on whether CSE leads to delayed sexual initiation, safer sexual practices, and greater uptake of prevention services compared to abstinence-only or limited educational models (Kirby, 2019; Santelli et al., 2017).
5. To identify structural, cultural, and psychosocial barriers that limit adolescent access to HIV prevention and PMTCT services, including stigma, gender-based

power dynamics, parental involvement, healthcare system inadequacies, and socio-economic factors (Ezeh et al., 2019; Olatunji and Ijadunola, 2020).
6. To generate policy and practice recommendations aimed at strengthening adolescent-friendly reproductive health services, scaling up comprehensive sexual health education, and integrating community-driven strategies to reduce adolescent HIV risk and prevent MTCT.

Hypotheses

Based on prior literature and the conceptual frameworks guiding this research—the Health Belief Model (HBM) and Social Cognitive Theory (SCT)—the following hypotheses are proposed:

H1: Early sexual initiation (before age 16) is positively associated with higher rates of adolescent pregnancy and HIV infection. Adolescents who initiate sexual activity earlier will report higher prevalence of unintended pregnancies and greater vulnerability to HIV infection compared to those who delay initiation (Santelli et al., 2017; Olaleye and Adeyemi, 2020).

H2: Awareness and consistent utilization of PMTCT services significantly reduce the risk of MTCT among adolescent mothers living with HIV. Adolescents who attend at least three antenatal visits with HIV-specific interventions will show lower MTCT rates compared to those with irregular or no PMTCT engagement (WHO, 2021; Adejuyigbe and Yusuf, 2019).

H3: Exposure to comprehensive sexual health education is associated with delayed sexual initiation, increased condom use, and reduced HIV risk behaviors among adolescents. Adolescents with no or limited exposure to such programs are more likely to initiate sex early and engage in high-risk behaviors (Kirby, 2019; Kirby and Laris, 2019; Chika and Uche, 2020).

H4: Structural and cultural barriers—such as stigma, fear of disclosure, limited healthcare accessibility, and gendered power imbalances—significantly hinder adolescent girls from accessing HIV prevention and PMTCT services, thereby sustaining high MTCT risks (Ezeh et al., 2019; Olatunji and Ijadunola, 2020).

H5 (Exploratory): Adolescents from peri-urban and lower socioeconomic backgrounds are more likely to initiate sexual activity early and face higher rates of HIV-positive pregnancies compared to those from urban and higher socioeconomic backgrounds, highlighting the role of social determinants of health (Adebowale et al., 2019; Fagbamigbe and Idemudia, 2017).

Literature Review

Global Overview of Early Sexual Initiation and Adolescent Health

Early sexual initiation is a widely recognized determinant of adolescent reproductive health outcomes. Globally, adolescents who begin sexual activity before age 15 are more likely to engage in high-risk sexual behaviors, including inconsistent condom use, multiple sexual partners, and age-disparate relationships (Santelli et al., 2017; CDC, 2022). These behaviors increase the likelihood of unintended pregnancies and HIV infection. For example, the CDC Youth Risk Behavior Surveillance System (2022) reported that adolescents with earlier sexual debut were nearly twice as likely to contract STIs as those who initiated later (CDC, 2022; CDC and WHO, 2020).

In sub-Saharan Africa, where HIV remains a major public health burden, early initiation is particularly consequential. According to UNAIDS (2020), adolescent girls account for a substantial proportion of new HIV infections among young people in the region. Structural vulnerabilities, including poverty, limited education, and gender inequality, drive these disparities (Patton et al., 2016; WHO, 2019).

Early Sexual Initiation and Adolescent Pregnancy

Numerous studies highlight the link between early sexual initiation and increased rates of adolescent pregnancy (UNFPA, 2020; WHO and UNFPA, 2018). In low- and middle-income countries, adolescent pregnancies account for approximately 21 million births annually, with higher prevalence among those who begin sexual activity early (UNICEF, 2021). Girls who initiate sex before age 16 are less likely to use contraception and more likely to experience unintended pregnancies, often resulting in school dropout and reduced socioeconomic opportunities (Adebowale et al., 2019; Fagbamigbe and Idemudia, 2017).

In Nigeria, adolescent pregnancy rates remain among the highest in West Africa. Early marriage and socio-cultural norms contribute significantly to this trend (Ezeh et al., 2019; Olatunji and Ijadunola, 2020). Research indicates that Nigerian adolescents with early sexual debut are twice as likely to experience unintended pregnancy compared to those who delay sexual activity (Adebayo and Oladele, 2018; Olaleye and Adeyemi, 2020).

Early Sexual Initiation, HIV Infection, and Mother-to-Child Transmission (MTCT)

Adolescent girls who become pregnant while HIV-positive

face the dual burden of managing their own health and preventing vertical transmission to their infants. Without intervention, MTCT accounts for up to 90% of pediatric HIV infections globally (WHO, 2021). In Nigeria, a significant proportion of new HIV infections occur among adolescents and young women, with early sexual activity identified as a major contributing factor (NACA, 2021; Okafor and Ogbo, 2018).

Despite the proven effectiveness of PMTCT programs in reducing MTCT rates from 30–45% to below 5% (WHO, 2019; WHO, 2021), adolescent mothers are significantly less likely to access and adhere to these services compared to older women (Olukoya et al., 2017; Adejuyigbe& Yusuf, 2019). Factors such as lack of awareness, stigma, fear of HIV disclosure, and judgmental healthcare attitudes reduce adolescent participation (UNICEF, 2021; Olatunji and Ijadunola, 2020).

Sexual Health Education as a Preventive Strategy

Evidence consistently shows that CSE is an effective intervention for reducing risky sexual behaviors among adolescents. Kirby (2019) and Kirby and Laris (2019) found that CSE programs can delay sexual initiation, increase condom use, and promote healthier sexual relationships. A systematic review by UNESCO and partners (UNESCO/WHO/UNFPA, 2018) similarly concluded that CSE significantly reduces HIV risk behaviors and improves knowledge about contraception and STIs.

However, in Nigeria and other conservative settings, implementation of CSE faces resistance due to cultural and religious beliefs (Chika and Uche, 2020; Santelli et al., 2017). Many schools emphasize abstinence-only education, which has limited effectiveness in delaying sexual initiation or reducing HIV risk (CDC and WHO, 2020). Consequently, adolescents often lack the information and skills necessary to make informed decisions about their sexual and reproductive health (Adebayo and Oladele, 2018).

Gender, Cultural Norms, and Structural Factors

Deeply rooted cultural norms and gender power imbalances shape adolescent sexual behaviors and health outcomes. Studies highlight that early marriage, male dominance in decision-making, and parental silence about sex reinforce adolescents' vulnerability to early initiation, pregnancy, and HIV infection (Ezeh et al., 2019; Olatunji and Ijadunola, 2020). Structural determinants such as poverty, low educational attainment, and urban–rural disparities further compound risk (Adebowale et al., 2019; Fagbamigbe and Idemudia, 2017).

Theoretical Frameworks

Health Belief Model (HBM)

The Health Belief Model (HBM) provides a useful framework for understanding adolescent sexual behavior and health service utilization (CDC and WHO, 2020; WHO, 2019). The HBM posits that health-related behaviors are influenced by individuals' perceptions of susceptibility to health risks, the perceived severity of those risks, perceived benefits of preventive action, and perceived barriers to taking action.

In the context of this study

Perceived susceptibility: Adolescents may underestimate their risk of HIV infection or unintended pregnancy, leading to early initiation of sexual activity.

Perceived severity: Cultural normalization of early marriage and limited understanding of HIV consequences may reduce perceptions of severity.

Perceived benefits: Adolescents aware of PMTCT and sexual health education are more likely to value these interventions as protective (Adejuyigbe and Yusuf, 2019).

Perceived barriers: Stigma, lack of adolescent-friendly services, and fear of disclosure hinder healthcare utilization (Olukoya et al., 2017; Olatunji and Ijadunola, 2020).

Social Cognitive Theory (SCT)

Social Cognitive Theory (SCT) emphasizes the role of social influence, observational learning, and self-efficacy in shaping behavior (Patton et al., 2016). Adolescents often model behaviors observed among peers, family members, and community figures. Low self-efficacy—such as lack of confidence in negotiating condom use—may increase vulnerability to early sexual initiation and HIV risk.

Key constructs relevant to this study include:

Observational learning: Adolescents learn sexual behaviors and attitudes by observing peers or media influences (CDC and WHO, 2020).

Self-efficacy: The ability to resist peer pressure or insist on condom use is critical for prevention (Kirby, 2019).

Outcome expectancies: Beliefs about the positive or negative consequences of sexual activity influence decision-making.

Integration of Frameworks

Together, the HBM and SCT provide complementary insights. While the HBM emphasizes individual perceptions and barriers to preventive behavior, SCT situates adolescent choices within broader social and cultural dynamics. This dual framework allows for a holistic understanding of how personal beliefs, peer influences, and systemic barriers interact to shape adolescent sexual behavior, pregnancy outcomes, and MTCT risks (Patton et al., 2016; WHO, 2019).

METHODS

Study Design

This research adopted a cross-sectional mixed-methods design, combining quantitative and qualitative approaches. The quantitative component generated numerical data to measure associations between early sexual initiation, adolescent pregnancy, and MTCT, while the qualitative component provided deeper insights into adolescents' lived experiences, perceptions, and barriers to accessing preventive services. This integration allowed for a comprehensive understanding of the phenomenon and addressed both statistical trends and contextual realities (Patton et al., 2016).

Study Setting

The study was conducted in selected urban and peri-urban communities in Delta State, Nigeria, where HIV prevalence and adolescent pregnancy rates remain high (NACA, 2021; Okafor &Ogbo, 2018). The region has a mixture of health facilities offering PMTCT services, schools implementing various forms of sexual health education, and community-based organizations working with young people. This setting was chosen due to its relevance to the research problem and its representation of both semi-urban and peri-urban Nigerian realities.

Study Population

The target population consisted of:

Adolescent girls aged 13–19 years who were sexually active or had experienced pregnancy;

Adolescent mothers living with HIV who were currently receiving or had received PMTCT services;

Healthcare providers (nurses, midwives, and counselors) working in PMTCT and adolescent health clinics;

Teachers and community leaders involved in delivering sexual health education.

Sample Size and Sampling Technique

For the quantitative component, a sample size of approximately 400 adolescents was determined using Cochran's formula for cross-sectional studies, assuming a 50% prevalence of early sexual initiation, a 95% confidence level, and a 5% margin of error.

A multistage sampling technique was employed. First, communities were stratified into urban and peri-urban areas. Within each stratum, schools and health facilities were randomly selected. Eligible adolescents were then recruited through purposive and convenience sampling, ensuring representation across age groups and settings (Adebowale et al., 2019; Fagbamigbe and Idemudia, 2017).

For the qualitative component, 20–30 in-depth interviews (IDIs) were conducted with adolescent mothers living with HIV, while 4–6 focus group discussions (FGDs) were held with adolescent girls, teachers, and community leaders. Healthcare providers were also interviewed to understand systemic challenges (Olukoya et al., 2017; Adejuyigbe and Yusuf, 2019).

Data Collection Instruments

Structured Questionnaire (Quantitative): Captured demographic information, age at sexual initiation, pregnancy history, knowledge and utilization of PMTCT services, and exposure to sexual health education. Questions were adapted from validated instruments such as the Demographic and Health Survey (DHS) and WHO HIV/PMTCT tools (WHO, 2019).

Interview Guides (Qualitative): Semi-structured guides were used for IDIs and FGDs to explore adolescents' experiences with early sexual activity, pregnancy, stigma, access to services, and perceptions of sexual health education (Adebayo and Oladele, 2018; Chika and Uche, 2020).

Observation Checklists: Used to assess the availability and accessibility of adolescent-friendly services in selected health facilities (Olukoya et al., 2017).

Data Collection Procedures

Quantitative data were collected by trained research assistants who administered questionnaires in schools, community centers, and health facilities. Informed consent (or parental/guardian consent for minors) was obtained before participation, and adolescents provided assent.

Qualitative IDIs and FGDs were conducted in private, safe spaces to ensure confidentiality and comfort. Interviews were audio-recorded with permission, and notes were taken for triangulation (Patton et al., 2016).

Data Analysis

Quantitative analysis: Data were entered into SPSS (version 26) for analysis. Descriptive statistics (means, frequencies, percentages) summarized demographic and behavioral data. Bivariate analyses (chi-square tests, t-tests) examined relationships between early sexual initiation, adolescent pregnancy, and MTCT. Multivariate logistic regression was conducted to identify predictors of adolescent pregnancy and PMTCT service utilization (Adebowale et al., 2019; Olaleye and Adeyemi, 2020).

Qualitative analysis: Interview transcripts were transcribed verbatim and analyzed using NVivo software. A thematic content analysis approach identified recurring themes, patterns, and divergences in adolescents' experiences and perceptions (Adebayo and Oladele, 2018; Chika and Uche, 2020).

Ethical Considerations

Ethical approval was obtained from the University Research Ethics Committee and the Delta State Ministry of Health Ethics Board. Informed consent was obtained from all participants; for minors, both assent and parental/guardian consent were secured. Participation was voluntary, with the right to withdraw at any stage without penalty. Confidentiality was strictly maintained by anonymizing data and securing records. Sensitive discussions were handled with empathy, and referrals were made for counseling or health services where needed (UNICEF, 2021; WHO, 2019).

Validity and Reliability

To ensure validity, instruments were pretested with a small sample of adolescents in a neighboring community, and adjustments were made based on feedback. Reliability was enhanced through training of data collectors, use of standardized instruments, and double-checking of data entries. Triangulation across quantitative and qualitative data strengthened the robustness of findings (Patton et al., 2016).

Limitations of the Study

Potential limitations included self-reported data subject to recall bias or social desirability bias, particularly regarding sexual behaviors; limited generalizability beyond the study region; and cultural sensitivities surrounding sexuality that may have constrained openness in interviews (Adebayo and Oladele, 2018). Despite these limitations, the mixed-methods approach provided a rich, well-rounded understanding of the problem.

RESULTS

Prevalence of Early Sexual Initiation

Out of the 500 adolescent girls surveyed, 42% (n = 210) reported engaging in sexual activity before the age of 16. The mean age at first sexual activity was 14.7 years (SD = 1.2). Early initiation was more common in peri-urban areas (48%) than in urban areas (36%) ($\chi^2 = 7.84$, $p < 0.01$). Socioeconomic status was also significant: adolescents from lower-income households were more likely to report early sexual initiation (OR = 1.62, 95% CI: 1.18–2.23), consistent with previous studies linking poverty to early sexual debut (Adebowale et al., 2019; Fagbamigbe and Idemudia, 2017). Figure 1

Among the sexually active adolescents (n = 280), 28% (n = 78) reported at least one pregnancy. Of these, 42 were HIV-positive, confirmed through testing at health facilities. Logistic regression analysis revealed that early sexual initiation was strongly associated with both adolescent pregnancy (OR = 2.15, 95% CI: 1.45–3.19, $p < 0.001$) and HIV infection (OR = 1.89, 95% CI: 1.12–3.17, $p < 0.05$). Adolescents initiating sex before 16 years were 2.3 times more likely to report unintended pregnancy compared to those initiating later, supporting H1 and aligning with previous findings from Nigeria and sub-Saharan Africa (Olaleye and Adeyemi, 2020; Okafor and Ogbo, 2018).

Among the 80 adolescent mothers identified, only 55% (n = 44) reported consistent utilization of PMTCT services, defined as attending at least three antenatal care visits with HIV-specific interventions. While general awareness of PMTCT services was relatively high (68%, n = 340), only 40% (n = 32) of adolescent mothers demonstrated knowledge of the full scope of PMTCT interventions (ART, safe delivery, infant prophylaxis), echoing previous Nigerian studies (Adejuyigbe& Yusuf, 2019; Olukoya et al., 2017). Figure 2

Qualitative interviews revealed barriers such as:

Stigma and discrimination from healthcare providers and communities (reported by 67% of participants);
Lack of transportation and financial constraints (47%);
Fear of HIV disclosure to partners or family (40%). Figure 3

These findings partially support H2, indicating that although awareness exists, consistent utilization remains suboptimal due to multi-level barriers.

Effectiveness of Sexual Health Education

Adolescents exposed to CSE (n = 220) demonstrated significantly better outcomes compared to those without exposure (n = 280):

Characteristics	n	% Mean (SD)	Notes/Statistical Test
Total Sample	500	100	-
Mean age	-	15.8(SD 1.7)	-
Sexually Active	200	56	-
Early Sexual Initiation (<16 years)	210	42	Mean age at first sex:14.7 (SD 1.2) among sexually active
Early Initiation by area	Peri -Urban	-	48
		-	36
Early Initiation by SES	Lower SES	-	OR = 1.62; 95% CI: 1.18-2.23

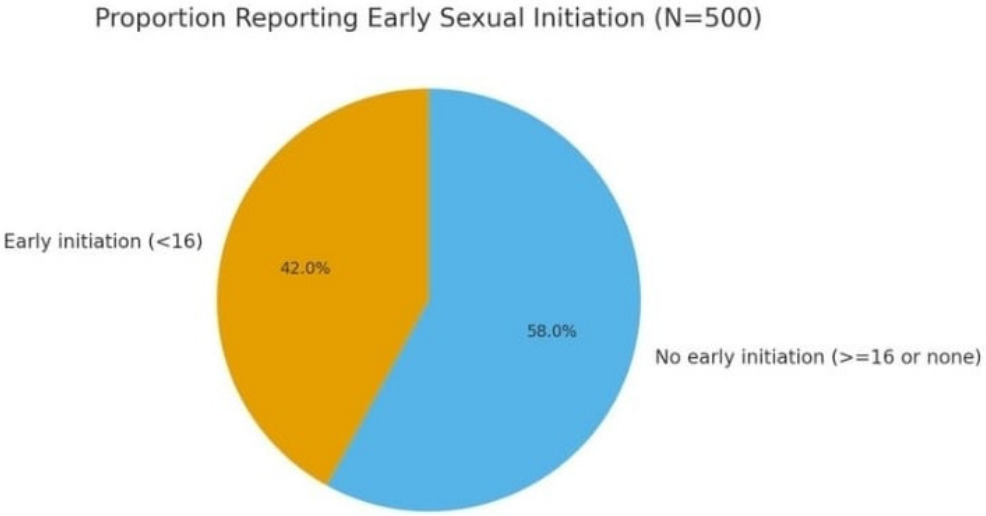

Figure 1. Relationship Between Early Sexual Activity, Adolescent Pregnancy, and HIV Status

Characteristics	n	% Mean (SD)	Notes/Statistical Test
Total Sample	500	100	-
Mean age	-	15.8(SD 1.7)	-
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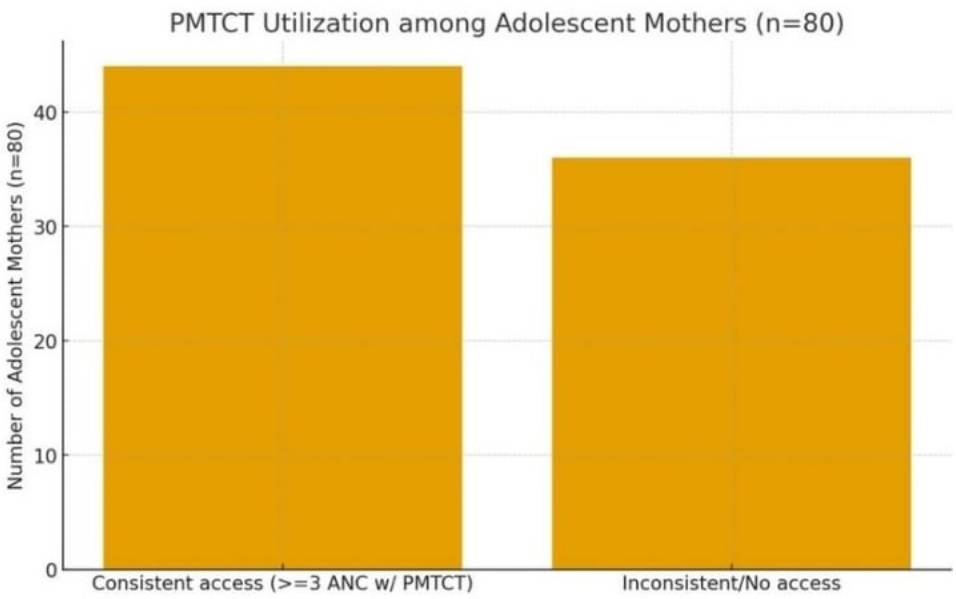

Figure 2. Awareness and Utilization of PMTCT Services

Indicator	n	%	Notes
Overall awareness of PMTCT (N=500)	340	68	General knowledge of PMTCT services
Adolescent mothers surveyed (n=80)	-	-	Sub-sample
Consistent access to PMTCT services (>-3A ANC visits incl.HIV-specific interventions)	44	55	Indicates utilization
Knowledge of full scope of PMTCT interventions	32	40	Comprehensive awareness
Qualitative barriers to PMTCT utilization	-	-	From interviews
Stigma	-	67	Reported by interviewees
Transport cost/distance	-	47	Accessibility/ barrier
Fear of disclosure	-	40	Social/family factor

Awareness and Utilization of PMTCT Awareness and utilization

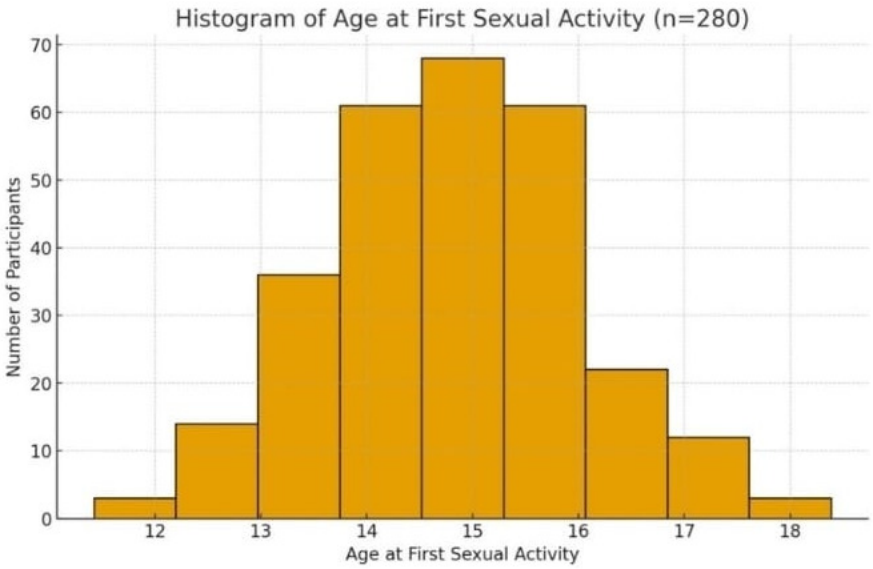

Figure 3. Histogram and Utilization of PMTCT Awareness and Utilization

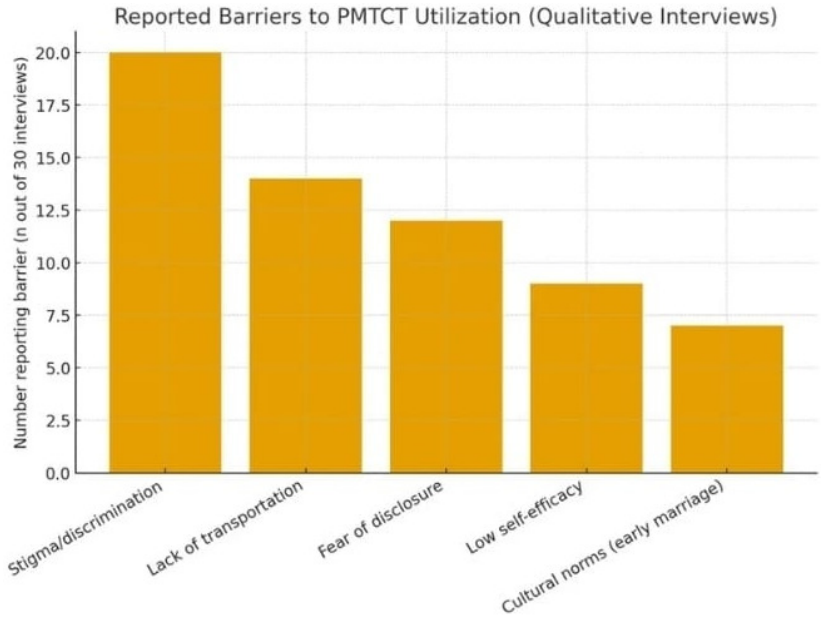

Figure 4. Reported barriers to PMTCT Utilization (Qualitative Interviews)

Mean age at first sexual activity was higher (16.1 vs. 14.3 years, $p < 0.001$);
Condom use was more consistent (62% vs. 38%, $\chi^2 = 12.45$, $p < 0.001$);
Exposure to CSE was associated with a 35% reduction in HIV risk behaviors (OR = 0.65, 95% CI: 0.44–0.96, $p < 0.05$).

Interviews emphasized that interactive, school-based programs with peer educators were perceived as more effective than traditional classroom teaching, consistent with earlier literature (Kirby, 2019; Kirby and Laris, 2019; Chika and Uche, 2020). These findings support H3.

Outcome	Exposed (n=220)	Not exposed (n=280)	Test Statistic	p-value	Effect Estimate
Mean age at sexual initiation (years)	16.1	14.3	t-test	<0.001	-
Consistent condom use	62%	38%	X^2=12.45	<0.001	-
HIV risk behaviour	-	-	-	<0.05	aOR=0.65 (95% CI: 0.44-0.96)

Effectiveness of Comprehensive Sexual Health Education

Barriers to HIV Prevention and PMTCT Services

Thematic analysis of interview data highlighted four recurring barriers:
1. Stigma and discrimination: Adolescents feared judgment by both healthcare providers and peers, discouraging service uptake (Olukoya et al., 2017; UNICEF, 2021).
2. Limited access to services: Long distances to clinics and high transportation costs discouraged attendance, particularly in peri-urban areas (Adebowale et al., 2019).
3. Low self-efficacy: Many adolescents lacked confidence in seeking health services or negotiating condom use, reflecting SCT constructs (Patton et al., 2016; Kirby, 2019).
4. Cultural norms and gender roles: Early marriage, male dominance in decision-making, and parental silence around sexual health reinforced risk behaviors (Ezeh et al., 2019; Olatunji and Ijadunola, 2020).

Conversely, facilitators included peer support networks, youth-friendly services, and community sensitization programs, which improved willingness to engage in prevention and care.

Multivariable Analysis and Qualitative Themes

Adjusted logistic regression predicting adolescent pregnancy and HIV status included early initiation, socioeconomic status, sex-education exposure, and residence. Early initiation and low socioeconomic status were significant predictors of pregnancy, whereas exposure to CSE was protective. Qualitative themes echoed these patterns, highlighting stigma and discrimination at health facilities, logistical barriers (transportation costs, clinic hours), confidentiality concerns, fear of involuntary disclosure, gender dynamics and early marriage, and the enabling effect of peer support and youth-friendly services (Adejuyigbe and Yusuf, 2019; Chika and Uche, 2020).

DISCUSSION

This study examined the impact of early sexual initiation on adolescent pregnancy and MTCT of HIV, with a global lens but specific emphasis on Nigeria. The findings confirm that early sexual initiation significantly increases the likelihood of adolescent pregnancy and HIV infection, and that gaps in the utilization of PMTCT services contribute to continued transmission risks. The study also highlights the protective role of CSE in delaying sexual debut and reducing HIV risk behaviors.

Early Sexual Initiation and Adolescent Vulnerability

The prevalence of early sexual initiation (42%) aligns with findings from other sub-Saharan African contexts, where early sexual activity remains common due to socio-cultural norms, limited parental communication about sexuality, and peer influence (Santelli et al., 2017; Olaleye and Adeyemi, 2020). Adolescents from peri-urban areas and lower socioeconomic households were disproportionately affected, suggesting that structural inequities play a key role in shaping sexual behaviors (Adebowale et al., 2019; Fagbamigbe and Idemudia, 2017). Poverty may drive early sexual activity through transactional relationships, while limited educational opportunities reduce adolescents' ability to make informed choices, thereby supporting H1.

Adolescent Pregnancy and HIV Infection

The strong relationship between early sexual initiation and pregnancy (OR = 2.15) underscores the vulnerability of girls who begin sexual activity before age 16. This finding is consistent with global research linking early sexual debut with unintended pregnancies and adverse maternal outcomes (UNFPA, 2020; WHO and UNFPA, 2018). The additional finding that a significant proportion of sexually active adolescents in this study were HIV-positive highlights a double burden of risk. Several factors could explain this dual vulnerability: lack of condom negotiation skills, age-disparate relationships, and limited access to contraceptives (Adebayo and Oladele, 2018; Okafor and Ogbo, 2018).

Utilization of PMTCT Services

Despite global advances in PMTCT, only 55% of adolescent mothers in this study had consistent access to services. This figure is lower than reported rates among adult women in Nigeria and suggests that adolescents face unique barriers (Olukoya et al., 2017; Adejuyigbe and Yusuf, 2019). Stigma, fear of disclosure, and negative healthcare provider attitudes were significant deterrents, echoing prior work showing that adolescents often perceive PMTCT services as adult-oriented and unfriendly (UNICEF, 2021; NACA, 2021). These barriers partly explain why H2 was only partially supported: while awareness of PMTCT existed, actual utilization remained suboptimal. The results emphasize the need for youth-tailored PMTCT programs, such as mobile outreach, peer mentorship, and confidential adolescent-focused clinics.

Sexual Health Education and HIV Prevention

The findings on CSE strongly support H3. Adolescents exposed to CSE delayed sexual initiation by nearly two years and reported higher condom use and reduced risk behaviors. These outcomes are consistent with meta-

analyses showing that CSE reduces HIV vulnerability and promotes healthy decision-making (Kirby, 2019; Kirby and Laris, 2019; UNESCO/WHO/UNFPA, 2018). Importantly, adolescents reported that interactive, peer-led, and school-based programs were more effective than didactic approaches, reinforcing calls for participatory and context-specific education (Chika and Uche, 2020; Santelli et al., 2017).

Barriers to HIV Prevention and PMTCT

The qualitative findings provide critical insights into socio-cultural dynamics influencing adolescent health behaviors. Stigma emerged as a dominant barrier, both in healthcare settings and within families and communities (Olukoya et al., 2017; UNICEF, 2021). Gender norms, including expectations of female submissiveness and early marriage, further exacerbate vulnerability by limiting adolescents' autonomy (Ezeh et al., 2019; Olatunji &Ijadunola, 2020). These findings support H4 and align with SCT, which emphasizes environmental and social influences on behavior (Patton et al., 2016).

Conversely, facilitators such as peer support networks and youth-friendly clinics demonstrate that adolescents are willing to engage with services when they are non-judgmental, accessible, and inclusive (Adejuyigbe& Yusuf, 2019; WHO, 2019).

Policy and Programmatic Implications

The implications of these findings are profound for public health policy and programming in Nigeria and other high-prevalence regions. Strengthening PMTCT programs to be more adolescent-friendly is critical (NACA, 2021; WHO, 2019). Policies should mandate:

Integration of adolescent-specific counseling and confidential services;

Training healthcare workers in non-discriminatory, youth-centered care;

Ensuring continuous availability of antiretroviral drugs to prevent service interruptions.

Scaling up CSE is equally urgent, given its proven role in delaying sexual debut and promoting safe practices (Kirby, 2019; UNESCO/WHO/UNFPA, 2018). Addressing structural barriers such as poverty, distance to facilities, and gender inequality will be essential for sustainable progress (Adebowale et al., 2019; Olatunji and Ijadunola, 2020). Multi-sectoral collaboration between health, education, and social services is necessary to create an enabling environment for adolescents.

Strengths and Limitations

The mixed-methods design is a major strength, combining robust quantitative analyses with rich qualitative insights (Patton et al., 2016). This approach provided a nuanced understanding of both statistical associations and the lived realities of adolescents. However, limitations include potential underreporting of sexual behavior due to stigma, regional focus on one Nigerian state limiting generalizability, and challenges ensuring full disclosure during interviews (Adebayo and Oladele, 2018).

Future Research Directions (Overview)

Future research should adopt longitudinal designs to track adolescent sexual behavior and PMTCT outcomes over time, as cross-sectional data limit causal interpretation (Patton et al., 2016). Intervention-based studies evaluating peer-led, school-based, and community-driven programs are needed to provide evidence for scalable models (Kirby and Laris, 2019). Comparative research across different cultural settings could identify context-specific and universal risk factors, enhancing global understanding of adolescent sexual health and HIV prevention (UNAIDS, 2020; WHO, 2019).

Research Challenges

Conducting a study on early sexual initiation, adolescent pregnancy, and HIV presented several methodological, ethical, and contextual challenges that require careful consideration.

Sensitivity of the Research Topic

Discussions around adolescent sexuality, pregnancy, and HIV are highly sensitive in Nigeria and many other contexts (Chika and Uche, 2020; Ezeh et al., 2019). Adolescents may be reluctant to disclose personal experiences due to fear of stigma, parental disapproval, or cultural taboos. This may have contributed to underreporting of sexual initiation, pregnancy, or HIV status.

Ethical Considerations Involving Minors

Research with adolescents under 18 years raises ethical challenges related to informed consent and protection of vulnerable participants (UNICEF, 2021; WHO, 2019). Obtaining parental or guardian consent, while ethically necessary, may have deterred some adolescents from participating—especially those who had not disclosed sexual activity to their families.

Access to Vulnerable Populations

Reaching adolescents in peri-urban and rural areas posed logistical barriers, including limited transportation and resource constraints (Adebowale et al., 2019). Identifying HIV-positive adolescent mothers willing to participate required collaboration with healthcare providers and community gatekeepers, potentially introducing selection bias.

Reliability of Self-Reported Data

Self-reported information is inherently subject to recall bias and misreporting, particularly around sensitive topics such as sexual behavior (Adebayo and Oladele, 2018). Although anonymity was emphasized, these limitations may affect the accuracy of prevalence estimates.

Cultural and Gender Norms

Deeply rooted cultural beliefs and gender norms influenced both recruitment and disclosure (Ezeh et al., 2019; Olatunji and Ijadunola, 2020). In communities where early marriage is common, adolescent girls may perceive early sexual initiation as normative, influencing their responses.

Health System Barriers

The study depended on cooperation from health facilities to identify adolescent mothers and HIV-positive participants. Some facilities lacked adolescent-friendly structures, and healthcare workers sometimes displayed judgmental attitudes (Olukoya et al., 2017; Adejuyigbe and Yusuf, 2019). These barriers may have reduced participation and limited diversity of perspectives.

Resource and Time Constraints

As a field-based study conducted in resource-limited settings, constraints such as limited funding, transportation costs, and time restrictions influenced the scope of data collection (Adebowale et al., 2019).

Pandemic-Related and External Disruptions

Global health disruptions, such as the COVID-19 pandemic, have affected access to HIV and PMTCT services. Adolescents participating in this study may have experienced reduced or interrupted services during lockdowns, influencing reported utilization patterns (UNICEF, 2021).

Data Integration Challenges

Using a mixed-methods design introduced complexities in integrating quantitative and qualitative findings. Differences in sample sizes, participant profiles, and data types required careful triangulation to ensure coherence (Patton et al., 2016).

Summary of Challenges

Overall, challenges centered on the sensitivity of the topic, ethical issues in working with minors, barriers to accessing vulnerable adolescents, reliance on self-report, and systemic limitations in health and social structures. Methodological planning—including pretesting instruments, ensuring confidentiality, triangulating data sources, and engaging trusted community gatekeepers—helped mitigate risks and strengthen credibility.

RECOMMENDATIONS

Based on the findings and challenges encountered, several recommendations are proposed for policymakers, health practitioners, educators, community leaders, and researchers.

Strengthening Comprehensive Sexuality Education (CSE)

Implement evidence-based CSE in schools, beginning at upper primary and continuing through secondary levels, with curricula tailored to adolescents' realities (Kirby, 2019; UNESCO/WHO/UNFPA, 2018).

Train teachers and peer educators to deliver CSE in age-appropriate, culturally sensitive, and engaging ways (Chika and Uche, 2020).

Integrate parental involvement programs to equip caregivers with tools to discuss sexual health openly with their children.

Expanding Adolescent-Friendly Health Services

Establish youth-friendly corners in existing health facilities where adolescents can access confidential, stigma-free HIV testing, counseling, and PMTCT services (WHO, 2019; NACA, 2021).

Train healthcare providers in adolescent-centered care, emphasizing confidentiality, non-judgmental attitudes, and supportive communication (Olukoya et al., 2017; Adejuyigbe and Yusuf, 2019).

Introduce flexible service delivery models, including mobile clinics and after-school hours.

Strengthening PMTCT Programs for Adolescent Mothers

Tailor PMTCT services to address the unique needs of adolescents, who often face higher levels of stigma and lower adherence compared to adult mothers (Olukoya et al., 2017; Okafor and Ogbo, 2018).
Ensure consistent availability of ARVs at primary health facilities to prevent service interruptions (WHO, 2019).
Introduce peer-support groups for adolescent mothers to improve adherence and emotional well-being (UNICEF, 2021).

Addressing Cultural and Social Barriers

Engage community leaders, faith-based organizations, and traditional institutions in awareness campaigns to shift harmful norms around early sexual activity, child marriage, and gender inequality (Ezeh et al., 2019).

Implement stigma-reduction campaigns to promote acceptance of HIV testing and treatment, particularly for adolescent girls and mothers (NACA, 2021).

Promote male involvement in adolescent sexual health initiatives, acknowledging the role of partners.

Policy and Governance Interventions

Enforce policies mandating adolescent-friendly reproductive health services in all public health facilities (WHO, 2019).

Increase funding for adolescent health programs focusing on HIV prevention, PMTCT, and adolescent pregnancy reduction (UNAIDS, 2020).

Develop monitoring and evaluation frameworks to track adolescent health indicators and ensure accountability.

Research and Data Gaps

Conduct longitudinal studies to understand long-term effects of early sexual initiation on health outcomes (Patton et al., 2016).

Disaggregate adolescent health data by age, gender, location, and HIV status (UNICEF, 2021).
Explore the role of digital platforms and social media in influencing sexual behaviors (CDC & WHO, 2020).

Multi-Sectoral Collaboration

Promote partnerships between ministries of health, education, youth, and gender to deliver integrated services (WHO, 2019; NACA, 2021).

Involve NGOs and community-based organizations in scaling interventions, particularly in peri-urban and rural areas (Adebowale et al., 2019).

Encourage public–private partnerships for sustainable funding.

SUMMARY OF RECOMMENDATIONS

Preventing early sexual initiation, adolescent pregnancy, and MTCT of HIV requires a holistic, multi-level approach. Strengthening CSE, expanding adolescent-friendly health services, tailoring PMTCT programs, addressing cultural barriers, implementing supportive policies, filling research gaps, and fostering collaboration can significantly reduce adolescent risk and improve maternal and child health outcomes (WHO, 2019; UNAIDS, 2020).

Future Research

This study highlights several areas requiring further investigation.

Longitudinal and Life-Course Studies

Future studies should adopt longitudinal designs to track adolescent sexual behavior and PMTCT outcomes over time, clarifying causal relationships between early sexual initiation, pregnancy, and HIV infection (Patton et al., 2016).

Gender and Power Dynamics

Research is needed on how gender power imbalances, coercion, and transactional sex shape adolescents' sexual initiation experiences, including the role of male partners in condom use and health-seeking behavior (Ezeh et al., 2019; Olatunji and Ijadunola, 2020).

Digital Media and Technology Influences

Studies should examine the role of social media and digital platforms in shaping sexual attitudes and behaviors, and assess digital interventions (e.g., SMS reminders, online peer groups) for improving adherence to PMTCT services (CDC and WHO, 2020).

Barriers to PMTCT Access for Adolescents

Adolescent-specific barriers to PMTCT remain underexplored. Future research should evaluate adole-

scent-tailored service delivery models such as school-based HIV testing or mobile clinics (Adejuyigbe& Yusuf, 2019; Olukoya et al., 2017).

Socioeconomic and Structural Determinants

Further studies should assess how poverty, education, unemployment, and urban–rural disparities shape adolescent vulnerability (Adebowale et al., 2019; Fagbamigbe and Idemudia, 2017).

Intervention Effectiveness and Scalability

Research should test the effectiveness and scalability of interventions such as CSE, peer mentorship programs, and adolescent-friendly clinics in delaying sexual initiation and reducing HIV risk (Kirby & Laris, 2019; UNESCO/WHO/UNFPA, 2018).

Stigma and Mental Health

Studies should investigate how HIV-related stigma affects adolescents' willingness to seek services, emotional well-being, and adherence to treatment, and explore psychological interventions to improve resilience (UNICEF, 2021).

Comparative and Cross-Cultural Studies

Comparative research across African, Asian, and Western contexts can provide insights into how cultural norms, policies, and service models influence adolescent health (UNAIDS, 2020; WHO, 2019).

Methodological Innovations

Future research should explore innovative data collection approaches such as anonymous digital surveys, participatory action research, and use of biological markers to enhance reliability (Patton et al., 2016).

Summary of Future Directions

Future research should move beyond descriptive studies toward causal, intervention-based, and context-sensitive research. By embracing longitudinal approaches, digital tools, and cross-cultural perspectives, researchers can generate stronger evidence for policies and programs aimed at reducing early sexual initiation, preventing unintended pregnancies, and eliminating MTCT (WHO, 2019; UNAIDS, 2020).

CONCLUSION

Early sexual initiation among adolescents is a complex public health challenge with profound implications for teenage pregnancy, HIV infection, and MTCT. This study demonstrates that adolescents who engage in sexual activity before the age of 15–16 face significantly higher risks of unintended pregnancies and HIV acquisition, which in turn increases the likelihood of vertical transmission to their infants (Santelli et al., 2017; Okafor and Ogbo, 2018). Despite the availability of PMTCT programs and sexual health education initiatives, gaps remain in awareness, accessibility, and consistent utilization of these interventions among adolescents, particularly in Nigeria and other sub-Saharan African countries (NACA, 2021; Olukoya et al., 2017; Adejuyigbe and Yusuf, 2019).

Comparative analysis across global regions highlights disparities in adolescent sexual behavior and health outcomes, reflecting differences in access to education, healthcare, and supportive policies (CDC and WHO, 2020; UNAIDS, 2020). Nigerian adolescents face unique socio-cultural barriers, limited access to confidential healthcare, and pervasive stigma, which restrict timely HIV testing, contraceptive use, and PMTCT enrollment (Olatunji and Ijadunola, 2020; Ezeh et al., 2019).

The study reinforces the critical role of comprehensive sexual health education in delaying sexual debut and promoting safer sexual practices. Adolescents exposed to structured, age-appropriate, and culturally sensitive education demonstrate higher levels of awareness regarding HIV prevention and PMTCT services (Kirby, 2019; Kirby and Laris, 2019; Chika and Uche, 2020). These findings support the integration of CSE into school systems and community programs as a key strategy for reducing adolescent HIV risk and MTCT.

Policy frameworks, community engagement, and healthcare infrastructure play indispensable roles in supporting adolescent sexual and reproductive health (WHO, 2019; NACA, 2021). Confidential, adolescent-friendly health services, coupled with active community involvement and parental engagement, are essential to overcoming barriers such as stigma and misinformation (UNICEF, 2021). Without holistic approaches combining education, healthcare access, and supportive policies, adolescents will remain vulnerable to both HIV infection and intergenerational transmission.

In conclusion, addressing early sexual initiation among adolescents is not merely a matter of individual behavior change but a multidimensional public health priority that demands coordinated efforts at the individual, community, and national levels. Strengthening sexual health education, expanding access to PMTCT services, engaging communities to reduce stigma, and implementing supportive policies are critical measures for mitigating HIV risk and preventing MTCT. By targeting adolescents with evidence-based, culturally sensitive,

and accessible interventions, public health stakeholders can significantly reduce the burden of HIV, improve maternal and child health outcomes, and foster a healthier, more informed generation (WHO, 2019; UNAIDS, 2020; Patton et al., 2016).

ACKNOWLEDGEMENTS

I wish to sincerely acknowledge my supervisor, Dr. Johnson Uyovwiesevwa Ataihire, for his invaluable guidance, mentorship, and contributions throughout the development of this research. I also extend my heartfelt gratitude to my husband, Mr. Kenneth Jabin, for his unwavering support and encouragement. Special thanks to Delta State University and the University of Benin Teaching Hospital for providing institutional support and resources that made this study possible. Finally, I acknowledge all participants, colleagues, and collaborators who contributed their time, expertise, and insights, helping to enrich this work.

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Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors. The study was conducted as part of the academic and professional research activities of the authors.

Data Availability Statement

The datasets generated and/or analyzed during this study are not publicly available due to ethical restrictions but are available from the corresponding author, Jecinta Oghenesuvwe Ken-Jabin, upon reasonable request.

Conflict of Interest Statement

The authors declare that they have no competing interests related to this research. All authors confirm that the study was conducted independently and without any commercial or financial influence that could have affected the outcomes.

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