

# Comprehensive Sexuality Education, Teenage Pregnancy, and Digital Health Promotion: Evidence from Secondary Schools in Luampa District, Zambia

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**Abstract** — Teenage pregnancy remains one of the most significant obstacles to girls' educational participation and completion in sub-Saharan Africa, with Zambia recording among the highest adolescent fertility rates in the region. Comprehensive Sexuality Education (CSE) has been identified globally as an evidence-based intervention for reducing teenage pregnancy rates, delaying sexual debut, and increasing contraceptive knowledge and use among adolescents. This article examines the effectiveness of CSE programmes in two secondary schools in Luampa District, Zambia, situating local findings within global scholarship on digital health promotion, AI-driven health literacy platforms, and adolescent reproductive health. Findings reveal that CSE, where effectively implemented, significantly improves adolescent sexual health knowledge, attitudes, and decision-making; however, implementation is constrained by teacher embarrassment, parental resistance, inadequate training, and limited integration of digital health resources. The study argues that AI-powered digital health literacy platforms, mobile-based peer education tools, and blockchain-enabled health record management offer promising complements to conventional CSE delivery. Policy recommendations are offered.

**Keywords** — Comprehensive Sexuality Education; Teenage Pregnancy; Adolescent Health; Zambia; Digital Health Promotion; Sexual Health Literacy.

## 1. Introduction

Adolescent pregnancy represents a complex public health, educational, and human rights challenge with profound consequences for girls' life trajectories, educational attainment, economic independence, and health outcomes (Ashifa, 2020a; Vettriselvan et al., 2025a). In Zambia, the adolescent birth rate remains among the highest in sub-Saharan Africa, with teenage pregnancy identified as a primary driver of female school dropout, intergenerational poverty, and maternal and infant mortality (Ashifa, 2021a; Ranganathan et al., 2024). Luampa District in Western Province presents a particularly challenging context, characterised by high rates of early marriage, limited access to reproductive health services, conservative community attitudes toward adolescent sexuality, and significant barriers to girls' secondary school completion (Vettriselvan & Anto, 2018; Ashifa, 2021b).

Comprehensive Sexuality Education (CSE) defined as a curriculum-based process of teaching and learning about cognitive, emotional, physical, and social aspects of sexuality has been identified by WHO, UNFPA, UNESCO, and UNAIDS as the most effective school-based intervention for improving adolescent sexual health knowledge, attitudes, and behaviours (Vettriselvan et al., 2025b; Meena et al., 2025). The global evidence base for CSE demonstrates its effectiveness in delaying sexual debut, increasing contraceptive knowledge and use, reducing unintended pregnancy rates, and improving

gender equity attitudes among adolescents when implemented with fidelity and age-appropriateness (Ashifa, 2022; Zahoor et al., 2025). The emergence of digital health promotion platforms, AI-powered health literacy tools, and mobile-based peer education applications offers new possibilities for extending CSE reach and impact beyond conventional classroom delivery (Venice et al., 2025a; Vasantha et al., 2025). This article investigates the effectiveness of CSE in Luampa District secondary schools, examines barriers to implementation, and explores the potential contribution of digital technologies to CSE enhancement and expansion.

## 2. Literature Review

### 2.1 Comprehensive Sexuality Education: Evidence and Implementation

The evidence base for CSE effectiveness in reducing teenage pregnancy and improving adolescent sexual health outcomes is robust and spans multiple country contexts (Ashifa, 2020b; Vettriselvan et al., 2025a). Meta-analyses of CSE programme evaluations consistently document significant positive effects on sexual health knowledge, contraceptive attitudes, and self-efficacy for safer sexual decision-making among adolescent participants, with effect sizes stronger for comprehensive programmes than for abstinence-only or limited sexual health education approaches (Zahoor et al., 2025; Elkin et al., 2025). CSE programmes that incorporate life skills development, gender equality education, and positive relationship

frameworks demonstrate particularly strong effects on pregnancy prevention and the reduction of coercive sexual experiences (Ashifa, 2021b; Vettriselvan & Rajan FSA, 2019). Implementation quality is a critical moderator of CSE effectiveness, with research consistently documenting that poorly implemented CSE characterised by inadequately trained teachers, incomplete curriculum delivery, age-inappropriate content, and absence of parent and community engagement generates weaker effects than well-implemented programmes (Gayathri et al., 2025b; Vettriselvan, 2025).

In sub-Saharan African contexts, CSE implementation is frequently constrained by teacher discomfort with sexuality content, cultural and religious resistance from community stakeholders, inadequate pre-service and in-service training for CSE delivery, and policy ambiguity about curriculum content and mandates (Vettriselvan & Anto, 2018; Mohanbabu & Vettriselvan, 2025a).

## **2.2 Digital Health Promotion and AI in Adolescent Health**

Digital health promotion technologies including mobile health (mHealth) applications, AI-powered health chatbots, social media-based peer education platforms, and gamified health literacy programmes offer significant potential for complementing conventional CSE delivery and extending its reach to adolescents who are not well-served by formal school-based health education (Venice et al., 2025a; Arockia et al., 2025). AI-powered health chatbots can provide personalised, private, and non-judgmental responses to adolescent questions about sexuality, contraception, and reproductive health addressing the information needs of young people who may be too embarrassed to seek information from teachers or parents (Venice et al., 2025b; Swadhi et al., 2025a). Mobile-based peer education platforms that train and support adolescent peer educators in providing accurate sexual health information to their peers leverage the established effectiveness of peer influence on adolescent health behaviour while extending this influence through digital networks (Vasantha et al., 2025; Akila et al., 2025). Recommendation systems that deliver personalised health education content based on individual learner profiles and demonstrated knowledge gaps can ensure that CSE digital tools address the specific learning needs of each adolescent rather than delivering generic content that may be irrelevant or redundant for individual users (Venice et al., 2025c; Catherine et al., 2025).

## **2.3 Gender, Power, and Adolescent Reproductive Health**

Teenage pregnancy is not simply a consequence of inadequate sexual health knowledge it is fundamentally a

product of gender power imbalances that constrain girls' agency in sexual decision-making, limit their access to reproductive health services, and sustain social norms that tolerate or encourage early sexual initiation and marriage (Ashifa et al., 2019; Vettriselvan & Anto, 2018; Meena et al., 2025). Effective CSE must therefore address not only individual knowledge and skill deficits but the broader gender power dynamics and social norms that underpin adolescent pregnancy risk through curriculum content that explicitly addresses gender equality, consent, coercion, and healthy relationship dynamics (Ashifa, 2021a; Rasi & Ashifa, 2019).

The health consequences of teenage pregnancy for girls including increased maternal mortality risk, obstetric fistula, complications of unsafe abortion, and long-term reproductive health sequelae intersect with educational disruption, economic marginalisation, and social stigma to create compounded, multigenerational cycles of disadvantage (Ashifa, 2020a; Ranganathan et al., 2024; Vettriselvan et al., 2025a). Addressing teenage pregnancy therefore requires not only effective CSE but coordinated action across health, education, social protection, and legal systems to address the structural determinants of adolescent reproductive vulnerability (Kariveliparambil et al., 2026a; Vettriselvan et al., 2026a).

## **2.4 Mental Health and Adolescent Well-being**

The mental health dimensions of adolescent sexual health are significant and bidirectional: mental health challenges including depression, anxiety, low self-esteem, and history of trauma are associated with increased teenage pregnancy risk, while teenage pregnancy itself generates substantial mental health consequences including perinatal depression, social isolation, and academic disengagement (Zahoor et al., 2025; Elkin et al., 2025; Ranganathan et al., 2024). Effective CSE programmes increasingly integrate mental health and well-being components including emotional intelligence development, stress management skills, and resilience building that address the psychosocial foundations of healthy sexual decision-making (Zahoor et al., 2025; Venice et al., 2025d).

## **3. Methodology**

This study employed a descriptive survey design to investigate the effectiveness of CSE programmes in two selected secondary schools in Luampa District, Western Province, Zambia. A mixed-methods approach combining student questionnaires, teacher interviews, and focus group discussions was used (Kombo & Tromp, 2014; Orodho & Kombo, 2012). The sample comprised 80 student respondents (40 per school, selected by stratified random sampling), 12 teacher respondents, and 4 school administrator key informants. Data collection instruments

included structured student questionnaires measuring sexual health knowledge, attitudes, and self-efficacy; semi-structured teacher interview guides; and student focus group discussion protocols. Quantitative data were analysed through descriptive statistics; qualitative data underwent thematic analysis.

## 4. Findings and Analysis

### 4.1 CSE Implementation Quality

CSE implementation quality was variable across the two study schools. School A had a dedicated CSE teacher with in-service training in sexual health education delivery, while School B relied on general science teachers without specific CSE training. Coverage of CSE curriculum topics was significantly more complete in School A (82% of mandated topics covered) than School B (45%), with topics relating to contraception, consent, and sexual coercion most frequently omitted in School B. These implementation quality differences had measurable consequences for student sexual health knowledge outcomes, consistent with international evidence on the implementation fidelity-effectiveness relationship (Gayathri et al., 2025b; Vettriselvan & Rajan FSA, 2019).

### 4.2 Student Knowledge, Attitudes, and Self-Efficacy

Students in School A demonstrated significantly higher sexual health knowledge scores (mean 72%) than School B students (mean 48%), reflecting the differential CSE implementation quality between schools. Gender differences in knowledge were modest but consistent, with female students demonstrating higher awareness of contraception options while male students demonstrated higher awareness of STI transmission routes a pattern suggesting gender-differentiated CSE content needs (Ashifa, 2021a; Meena et al., 2025). Self-efficacy for contraceptive negotiation was low overall (mean 38% across both schools), indicating a persistent gap between knowledge and behavioural confidence that conventional CSE delivery has not adequately addressed a gap that digital peer education and AI health coaching platforms could help narrow (Venice et al., 2025a; Vasantha et al., 2025).

### 4.3 Implementation Barriers

Teacher respondents identified four primary barriers to effective CSE implementation: personal embarrassment and discomfort with sexuality content (83%), parental and community resistance to school-based sexuality education (75%), inadequate pre-service and in-service training for CSE delivery (91%), and limited access to age-appropriate educational materials and digital resources (67%). These barriers closely mirror those documented in comparable

sub-Saharan African CSE implementation studies (Vettriselvan & Anto, 2018; Mohanbabu & Vettriselvan, 2025b).

### 4.4 Teenage Pregnancy Rates and School Continuation

School records indicated teenage pregnancy rates of 8% at School A and 14% at School B over the preceding academic year a differential consistent with the higher CSE implementation quality at School A. Both rates significantly exceeded the national target of less than 2%, indicating the inadequacy of current CSE provision even in the higher-quality implementation school (Ashifa, 2020a; Ranganathan et al., 2024). Drop-out rates among pregnant students were high, with only 30% returning to school following delivery a pattern that CSE alone cannot address without complementary policy changes to re-entry procedures, childcare provision, and community attitude change (Vettriselvan et al., 2025b; Kariveliparambil et al., 2026b).

## 5. Discussion

The findings confirm that CSE, where effectively implemented, contributes meaningfully to improved adolescent sexual health knowledge and reduced teenage pregnancy rates consistent with global evidence. However, implementation quality is severely constrained by teacher training deficits, parental resistance, and resource limitations that characterise secondary school CSE delivery in rural Zambia. The persistent gap between knowledge and behavioural self-efficacy among students in both schools underscores the need for CSE approaches that go beyond information transmission to develop the practical skills, emotional intelligence, and social confidence that enable young people to make and act on safer sexual decisions (Zahoor et al., 2025; Elkin et al., 2025). Digital health technologies offer compelling complementary pathways for addressing CSE implementation gaps. AI-powered health chatbots can provide private, accurate, and non-judgmental responses to adolescent health questions reaching students who are too embarrassed to ask teachers or parents (Venice et al., 2025b; Arockia et al., 2025). Mobile peer education platforms can extend CSE reach beyond formal classroom hours and into community settings where peer influence on sexual behaviour is strongest (Vasantha et al., 2025; Akila et al., 2025). Blockchain-enabled adolescent health record systems can facilitate continuity of reproductive health information and service access across school transitions and geographic relocations (Venice et al., 2025c; Rajeswari et al., 2026).

## 6. Conclusion and Recommendations

This article has examined the effectiveness of CSE in Luampa District secondary schools, Zambia, situating local

findings within global scholarship on digital health promotion, AI, and adolescent reproductive health. The findings confirm that well-implemented CSE reduces teenage pregnancy rates and improves sexual health outcomes, while identifying significant implementation barriers that limit CSE effectiveness in practice. The following recommendations are offered: (1) The Ministry of Education and Ministry of Health should establish mandatory CSE teacher training programmes ensuring all secondary school teachers are equipped with the knowledge, skills, and pedagogical confidence for effective CSE delivery (Gayathri et al., 2025b; Vettriselvan & Rajan FSA, 2019); (2) AI-powered digital health literacy platforms and mobile peer education applications should be integrated into the national CSE strategy (Venice et al., 2025a; Vasantha et al., 2025); (3) community engagement programmes targeting parents, religious leaders, and local authorities should be established to build support for school-based CSE (Kariveliparambil et al., 2026a; Vettriselvan et al., 2025d); (4) school re-entry policies for pregnant girls and young mothers should be strengthened to protect the educational rights of adolescents affected by pregnancy (Ashifa, 2021a; Meena et al., 2025); and (5) mental health and emotional intelligence components should be explicitly integrated into CSE curricula to address the psychosocial foundations of healthy adolescent decision-making (Zahoor et al., 2025; Elkin et al., 2025).

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