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The Effect of the Pre-Exposure Prophylaxis (PrEP) Program on Adolescents' Girls: A Case of Kawama, Mufulira District

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Abstract: ***HIV/AIDS remains a major health challenge for adolescent girls, particularly in sub-Saharan Africa. This study aimed*** **to assess the impact of the PrEP program on HIV prevention among adolescent girls in Kawama Compound, Mufulira. A cross-sectional survey was conducted among 50 girls aged 15–19 years, using structured questionnaires and face-to-face interviews, with stratified random sampling to ensure representation across age, education, and geographic zones. The results showed that while 88% were aware of PrEP, only 25% had comprehensive knowledge, and among those eligible (84%), just 50% initiated PrEP older adolescents being more likely to start. Adherence was problematic, as 38% discontinued and only 54% of users maintained high adherence, with 72% reporting community-level stigma as a barrier. Ultimately, only 14% achieved effective protection through sustained, high-adherence use. The study thus, concluded that, despite high awareness, the program faced significant challenges in knowledge, uptake, and adherence, highlighting the need for interventions targeting stigma reduction, better education, youth-friendly services, and adherence support to improve PrEP outcomes for adolescent girls.**

Keywords: *Pre-Exposure Prophylaxis, Adolescent Girls, HIV Prevention, Stigma, Adherence.*

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I. INTRODUCTION

➢ *Background*

HIV/AIDS remains a major worldwide health issue that disproportionately affects adolescent girls and young women (AGYW), particularly in Sub-Saharan Africa. Every week, around 4,000 AGYW (aged 15-24) are infected with HIV worldwide, with Sub-Saharan Africa accounting for over 78% of all new infections (Ziba et al., 2024). Despite making up just around 10% of the sub-Saharan African population, AGYW account for over 25% of new HIV infections due to variables such as biological susceptibility, economic dependency, gender inequality, limited access to education, and early marriage. In Eastern and Southern Africa, HIV prevalence among AGYW is more than double that of their male counterparts (Meek et al., 2022), and Zambia follows suit: HIV incidence among AGYW is approximately twice that of young men, with 4-5% of girls aged 15-19 already HIV-positive and prevalence increasing with age (Wong et al., 2024; Ziba et al., 2024). Despite continuous preventative efforts, Zambia recorded 23,000 new HIV infections in 2024, with adolescents and young people accounting for more than one-third of the total.

In recent decades, HIV prevention techniques have shifted from predominantly behavioural approaches such as abstinence, faithfulness, and condom use to biological interventions such as Pre-Exposure Prophylaxis (PrEP) (McLeroy et al., 1988). PrEP is an antiretroviral medicine used by HIV-negative people that provides more than 90% protection against sexual HIV transmission when used regularly (Ziba et al., 2024; CDC, 2022). Crucially, it offers security independent of partner cooperation, which is especially significant for AGYW with minimal relationship power. Initiatives such as DREAMS (Determined, Resilient, Empowered, AIDS-free, Mentored, and Safe) and PEPFAR support have prioritised PrEP access for AGYW in Zambia, with over 3,200 AGYW at high risk initiating PrEP between 2020 and 2022 in four districts, and an uptake rate of more than 99% among those eligible (Chanda et al., 2023).

However, despite the countrywide integration of PrEP within Zambia's HIV prevention framework since 2017, the effectiveness of PrEP programs for adolescent females in certain communities, such as Kawama Compound in Mufulira, remains unknown. The effectiveness of such treatments is determined by more than just medicinal efficacy; social and behavioural elements like stigma,

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awareness, knowledge, and continuous adherence all have a substantial impact on outcomes. Local issues in Kawama include HIV and PrEP stigma, adolescent sexuality norms, clinic access barriers, transportation costs, school conflicts, and the availability of youth-friendly services, all of which may have an impact on PrEP uptake and sustained use. This study consequently investigates the effect of the PrEP program on adolescent females in Kawama Compound, Mufulira, by examining both biological outcomes and the social-behavioral aspects that function as barriers or facilitators to effective PrEP utilisation. Understanding these contextual factors is critical for improving program tactics and, ultimately, lowering HIV infections in this susceptible community.

- *Statement of Problem*

Despite the introduction of PrEP as an HIV prevention strategy in Zambia, adolescent girls in Kawama Compound, Mufulira, remain highly vulnerable to HIV, with local data showing early sexual debut and high-risk behaviors (Mayimbo et al., 2019). Notably, 70% of young women aged 15-24 have engaged in sexual intercourse, primarily between ages 15 and 19, and there is no clear link between HIV knowledge and safer sexual behavior, highlighting the need for interventions like PrEP that go beyond awareness alone (Mayimbo et al., 2019).

The effectiveness of PrEP in this context is uncertain due to limited data on awareness, uptake, and adherence among adolescent girls (Ramadhani et al., 2021; Chanda et al., 2023; Wong et al., 2024). Compounding these challenges, the recent closure of the DREAMS centre in Kawama and documented healthcare worker stigma may further restrict PrEP access and awareness (United States Department of State, 2025; Meek et al., 2022).

Only 50 adolescents at Kawama clinic have adhered to PrEP as of 2024, with just 10 girls currently using it as of June 2025, illustrating suboptimal uptake. These gaps in data and understanding threaten the effectiveness of the PrEP program and leave adolescent girls at continued risk of HIV (Ziba et al., 2024). This research, therefore, seeks to clarify the impact of PrEP in Kawama, focusing on barriers such as awareness, stigma, adherence, and accessibility.

- *Aim of the Study*

To assess the impact of the PrEP program on HIV prevention and related behaviours among adolescent girls in Kawama Compound, Mufulira.

- *Specific Objectives*

To determine the level of awareness and knowledge of PrEP among adolescent girls (15-19 years old) in Kawama Compound.

To assess the extent of PrEP uptake and utilization patterns among eligible adolescent girls in this population.

To evaluate adherence to PrEP and continuation rates over time among adolescent girls who have initiated PrEP, including identifying common reasons for discontinuation or irregular use.

II. LITERATURE REVIEW

- *PrEP Awareness and Knowledge*

Awareness and accurate information of PrEP are critical to its success as an HIV prevention approach among adolescents. However, research from many worldwide contexts repeatedly show that many teenagers, even those at high risk for HIV, are either ignorant of PrEP or have substantial misconceptions regarding its usage. For example, just 38% of Black and Latinx teenagers in high-prevalence US settings had ever heard of PrEP, indicating a significant educational gap even in well-resourced situations (Nunn et al., 2019). In Sub-Saharan Africa, where HIV incidence is highest and PrEP distribution has been most active, awareness is unequal. According to Tanzania's 2022 Demographic and Health Survey, just 6.9% of teenagers and young adults (ages 15-24) are aware of PrEP, indicating that awareness gaps exist despite focused efforts (Tanzania Commission for AIDS et al., 2022). Where comprehensive demonstration projects and community education initiatives are performed, awareness levels can skyrocket. Kenya's early introduction of PrEP, combined with mass media and youth-friendly promotion, increased awareness among young women to 84% in some locations (Minnis et al., 2019). Even in these success stories, only a small percentage of people informed could appropriately characterise PrEP's aim, emphasising the difficulty of not only boosting awareness but also assuring right comprehension. Misconceptions about PrEP as an HIV therapy rather than a preventive measure, misunderstanding about who is qualified, and concerns about high costs are prevalent. Furthermore, insufficient information from impersonal advertising or quick professional visits may fail to resonate with young people, whereas peer-led education and real-life testimonials from other young women are very effective in making PrEP relatable and trustworthy (Minnis et al., 2019).

Misinformation and a lack of specialised materials for young people can further reduce motivation to seek PrEP. If females believe PrEP is too expensive or hazardous, or that it may cause infertility (a widespread rumour), they may reject it altogether. Despite global agencies such as UNAIDS, PEPFAR, and WHO endorsing PrEP instruction as part of comprehensive sexuality education, many school curriculum continue to emphasise abstinence or condoms while ignoring newer prevention measures (National AIDS and STI Control Programme, 2018). Community leaders and gatekeepers, who commonly define social norms, are generally unaware about PrEP, restricting its reach in conservative or rural contexts.

In Sub-Saharan Africa, the intensity of national and local programs significantly impacts the level of PrEP awareness among adolescent girls. Early adopting countries, such as Kenya, South Africa, and Uganda, have shown that focused interventions can enhance knowledge, although these gains are frequently concentrated in urban or program-intensive regions. For example, one South African study

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discovered that only 19% of AGYW were aware of PrEP, which was strongly linked to supportive family contexts and open communication regarding HIV prevention (Simbayi et al., 2019). In Uganda, most high-risk AGYW were ignorant of PrEP until they were reached by specific research or intervention efforts, and even as public awareness develops, knowledge gaps exist, particularly among younger and rural adolescents (Nunn et al., 2019).

Practical knowledge is an essential component of effective awareness: understanding not only the existence of PrEP, but also how to obtain it, what eligibility restrictions exist, and what costs may be spent. Many programs have attempted to address this by incorporating PrEP teaching into normal reproductive health treatments and making it accessible in youth-friendly clinics (National AIDS and STI Control Programme, 2018; Minnis et al., 2019). Nonetheless, myths and stigma persist. Fears that taking PrEP would cause others to believe a girl was HIV-positive discouraged uptake and ongoing usage in Eswatini, emphasising the necessity of framing PrEP as a preventive, proactive approach for people who are HIV-negative (Smith & Ndlovu, 2020).

Zambian adolescent girls are becoming more aware about PrEP, because to initiatives like DREAMS that distribute information in schools, community centres, and through peer mentors (Admassu et al., 2024; PEPFAR, 2022). This shows that awareness may be quite high in intervention zones. However, outside of these contexts, many teenagers remain misinformed, which is worsened by cultural taboos surrounding sex and HIV prevention among adults and unmarried youth. Parental and community attitudes can be negative, with some adults concerned that PrEP use promotes premarital sex (Mukaba & Chitundu, 2024). Encouragingly, once parents and teenagers are accurately informed about the preventive benefits of PrEP, both exhibit a readiness to engage and support its usage (Mukaba & Chitundu, 2024).

- *PrEP Uptake and Utilisation Patterns*

Globally, PrEP uptake has progressively increased, but remains below worldwide targets. As of late 2021, an estimated 1.6 million people have started PrEP, compared to a UNAIDS objective of 3 million per year and an aggressive cumulative aim of 21.2 million by 2025 (CDC, 2024). AGYW in Sub-Saharan Africa have been the primary target of scale-up efforts, with programmatic statistics indicating that this group accounted for more than one-third of global PrEP initiations between 2017 and 2023 (CDC, 2024). PrEP is integrated into national HIV prevention efforts in South Africa, Kenya, Uganda, and Zimbabwe, and AGYW in high-incidence areas receive priority outreach and assistance (AVAC, 2022).

Adolescents are more likely to take PrEP when it is offered through complete, supportive programs like DREAMS, which integrate risk screening, counselling, and free medicine. When administered PrEP in a supportive context, 77% of high-risk AGYW in DREAMS-supported Zambian areas took it up (Pettifor et al., 2023). In Kenya, demonstration projects indicated initiation rates of 50–80% among at-risk AGYW, particularly when PrEP was introduced sensitively and with proper support (AVAC, 2022).

Regional and local patterns indicate uneven acceptance, despite previous success. Older teenagers (ages 18-24) initiate PrEP at a higher rate than their younger peers, owing to governmental restrictions and social attitudes that dissuade younger teens from seeking HIV prevention programs (Pettifor et al., 2023). Urban areas often have higher adoption than rural areas, reflecting increased exposure to knowledge and lower stigma. Peer influence can also boost uptake; young women are more likely to begin taking PrEP if they see friends or peers doing so, and if PrEP is administered in youth-friendly, nonjudgmental settings (Hakim et al., 2022).

In Zambia, the DREAMS program has resulted in significant uptake in targeted districts, but PrEP beginning by teenagers is uncommon outside of these areas, most likely because to inadequate awareness, parental consent requirements, and cultural hurdles (Pettifor et al., 2023; Admassu et al., 2024). Peer recommendation has emerged as a major channel, with females frequently recommending their friends to start PrEP, causing a ripple effect in communities.

- *PrEP Adherence and Continuation Patterns*

Global and Regional Trends: Effective HIV prevention among AGYW requires continuous adherence to PrEP after commencement. According to research, young individuals struggle with daily pharmaceutical regimens, and continuation rates drop dramatically after the first few months (CDC, 2024; Admassu et al., 2024). Adherence issues are ascribed to forgetfulness, side effects, stigma, a lack of supporting surroundings, and disruptions caused by life transitions (Amico et al., 2019). Stigma, both HIV-related and linked to views of sexual promiscuity, continues to be a key barrier, driving girls to hide their PrEP use and skip doses when privacy is not available (Admassu et al., 2024). Some AGYW engage in "prevention-effective adherence," taking PrEP only during perceived risk periods and stopping when they feel safe; nevertheless, this approach can result in periods of unprotected risk and complicate public health messaging (Westercamp et al. 2018). Interventions to promote adherence have included behavioural assistance (counselling, peer groups), technological reminders (SMS, smart bottles), and biological breakthroughs (long-acting injectables, vaginal rings). Early results are encouraging: biweekly injectables and discreet delivery mechanisms are particularly popular among adolescents who want to avoid the stigma and inconvenience of daily pills (Admassu et al., 2024).

Adherence patterns in Zambia are consistent with the area. Only 68% of AGYW who started PrEP in DREAMS districts returned for at least one refill after the first month, which is consistent with other African settings (Pettifor et al., 2023). According to qualitative studies, females who are unable to disclose PrEP usage to their parents or who live in stigmatising situations are more likely to cease, but those who have at least one supporting figure been more likely to continue (Mukaba & Chitundu, 2024). Health-care system difficulties such as overcrowded clinics and a lack of active

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follow-up contribute to attrition, particularly in rural and resource-limited settings. Community-based strategies and innovative outreach are being tested to bridge these gaps (PEPFAR, 2022).

➢ *Contextual Factors Influencing PrEP's Effectiveness*

Effective PrEP for adolescent girls requires not only individual understanding and motivation, but also consideration of social, cultural, and institutional contexts. Family attitudes—particularly parental support or opposition are critical. In many countries, parents prefer not to address adolescent sexuality, which can contribute to discouragement or explicit barriers to PrEP availability (Mukaba & Chitundu, 2024). In contrast, in contexts where parental engagement is encouraged, AGYW acceptance and adherence improve.

Intimate partner interactions play an important influence. Supportive partners can help with uptake, but in some cases, PrEP usage is taken as a sign of mistrust or infidelity, leading to pressure to stop or, in extreme cases, intimate partner violence (Browne et al., 2023; Simoni et al., 2021). Community-level stigma is widespread: HIV-related stigma, sexuality stigma, and gender norms all influence whether girls feel comfortable accessing and using PrEP. Interventions involving community leaders and peer groups have proven beneficial in lowering these obstacles (Chibwana & Banda, 2023).

Accessibility and health system characteristics are also crucial structural factors to consider. Youth-friendly services, provider attitudes, and practical considerations like clinic hours, transportation, and fees can all help or hinder PrEP adoption and adherence (AVAC, 2022; Admassu et al., 2024). Training clinicians to be helpful and nonjudgmental is essential, as is ensuring that health care is accessible and confidential. Legal and policy circumstances are also important; advancing consent legislation, such as those in Zambia, allow more teenagers to acquire PrEP without parental approval (Pettifor et al., 2023). Poverty increases HIV risk and makes it more difficult to sustain preventive health behaviours. Integrated programs like DREAMS, which combine PrEP with empowerment and assistance for girls' education, safety, and economic abilities, have been most effective in magnifying PrEP's favourable effects (Admassu et al., 2024).

➢ *Gaps in the Literature*

Despite tremendous improvement, crucial research gaps remain. Much of the literature on PrEP among AGYW is based on studies from South Africa and Kenya, with little data from Zambia and other locations, limiting the generalisability of results (Admassu et al., 2024; AVAC, 2022). Younger adolescents (under 18) are under-represented due to ethical and legal constraints, and the majority of accessible data focusses on older youth (18-24), implying that the special requirements of mid-adolescents may be overlooked.

Quantitative evidence on intervention efficacy, long-term adherence, and the broader effects of PrEP use (including potential risk compensation) are limited. It is also unclear how new PrEP modalities, like as injectables or vaginal rings, would be welcomed and used by adolescent populations. Finally, the efficacy of multi-component, multi-level interventions has not been rigorously studied, making it difficult to tell which strategies are most beneficial (Admassu et al., 2024; Westercamp et al., 2018). More local research, particularly in Zambia and other under-represented settings, is required to customise interventions effectively and ensure that programs are sensitive to the cultural and social realities faced by adolescent girls at high risk of HIV.

➢ *Theoretical Framework*

This study adopted a multi-theoretical approach to understand PrEP use among adolescent girls, specifically drawing on the socio-ecological model (SEM), the Health Belief Model (HBM), and frameworks addressing gender and power dynamics. These frameworks were used to organize and interpret the determinants of PrEP awareness, uptake, and adherence, highlighting influences at the individual, relational, community, and structural levels.

- *Socio-Ecological Model (SEM)*

The study utilized the socio-ecological model (SEM) to examine how PrEP use was shaped by factors operating across multiple levels of influence, including individual, interpersonal, community, organizational, and societal domains (McLeroy et al., 1988). Within this framework, adolescent girls' decisions about PrEP were understood as being influenced not only by their own knowledge and motivation, but also by their relationships and the broader contexts in which they existed. For example, an individual's perception of HIV risk was shaped by family and peer influences, which themselves were embedded in community norms around adolescent sexuality and institutional factors such as the accessibility of youth-friendly health services (Admassu et al., 2024). By applying the SEM, the study identified opportunities for intervention at various levels such as enhancing personal knowledge, supporting open family communication, addressing community stigma, and improving health service delivery. This comprehensive perspective underlined the need for coordinated, multi-level responses to improve PrEP uptake and adherence among adolescent girls (Baeten et al., 2018).

- *Health Belief Model (HBM)*

At the individual level, the study adopted the Health Belief Model (HBM) to better understand how adolescents' perceptions shaped their engagement with PrEP. The HBM proposed that health behavior was determined by perceived susceptibility to a health threat, perceived severity, perceived benefits of preventive action, perceived barriers, cues to action, and self-efficacy (Glanz et al., 2018). In the context of PrEP, the study considered how adolescent girls' perceived risk of HIV, beliefs about the benefits of PrEP, and concerns about barriers such as side effects or stigma influenced their willingness to use and adhere to PrEP (Amico et al., 2019). Many adolescents underestimated their HIV risk or questioned the effectiveness of PrEP, resulting in low uptake even if they were objectively at risk (Minnis et al., 2019; Nunn et al., 2019). Conversely, those who recognized their vulnerability such as girls involved with older partners or engaged in transactional sex were more inclined to accept

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PrEP when available (Van der Straten et al., 2019). The study also explored how perceived barriers, such as fears about side effects, daily pill-taking, and anticipated stigma, undermined PrEP adherence (Admassu et al., 2024). Education and counseling interventions were identified as important for correcting misconceptions and increasing both risk awareness and self-efficacy. Additionally, the study noted the role of cues to action—such as HIV-negative test results or provider recommendations in triggering consideration and uptake of PrEP (Admassu et al., 2024).

- *Gender and Power Dynamics*

The study used gender and power dynamics frameworks to examine how social and structural factors affect PrEP use among adolescent girls. It found that gender inequalities in relationships often limit girls' control over their sexual health, making it difficult for them to negotiate condom use or openly use PrEP, especially if their partners disapprove. Cultural taboos and stigma around adolescent sexuality further discourage PrEP use and can lead to secrecy or discontinuation. Economic and social dependence on male partners or families also reinforces these power imbalances. Despite these challenges, involving male partners, parents, and community leaders and fostering open communication and support can help improve PrEP uptake and adherence. The study concludes that multi-level interventions are needed, addressing both individual beliefs and the broader social and structural environment influencing girls' decisions about HIV prevention.

➢ *Conceptual Framework*

This study's conceptual framework combines the socio-ecological model, the Health Belief Model, and gender and power dynamics to visually map out how various factors influence PrEP effectiveness among adolescent girls in Kawama Compound. The framework distinguishes between independent variables (predictors) at four socio-ecological levels—individual, interpersonal, community, and structural and dependent variables that represent the stages of the PrEP cascade: awareness and knowledge, uptake, and adherence. It illustrates the hypothesized relationships between these variables, showing that each stage in the PrEP cascade is influenced by multi-level factors and that awareness is a prerequisite for uptake, which in turn precedes adherence. The figure referenced in the text depicts these relationships and the stepwise progression through the cascade.

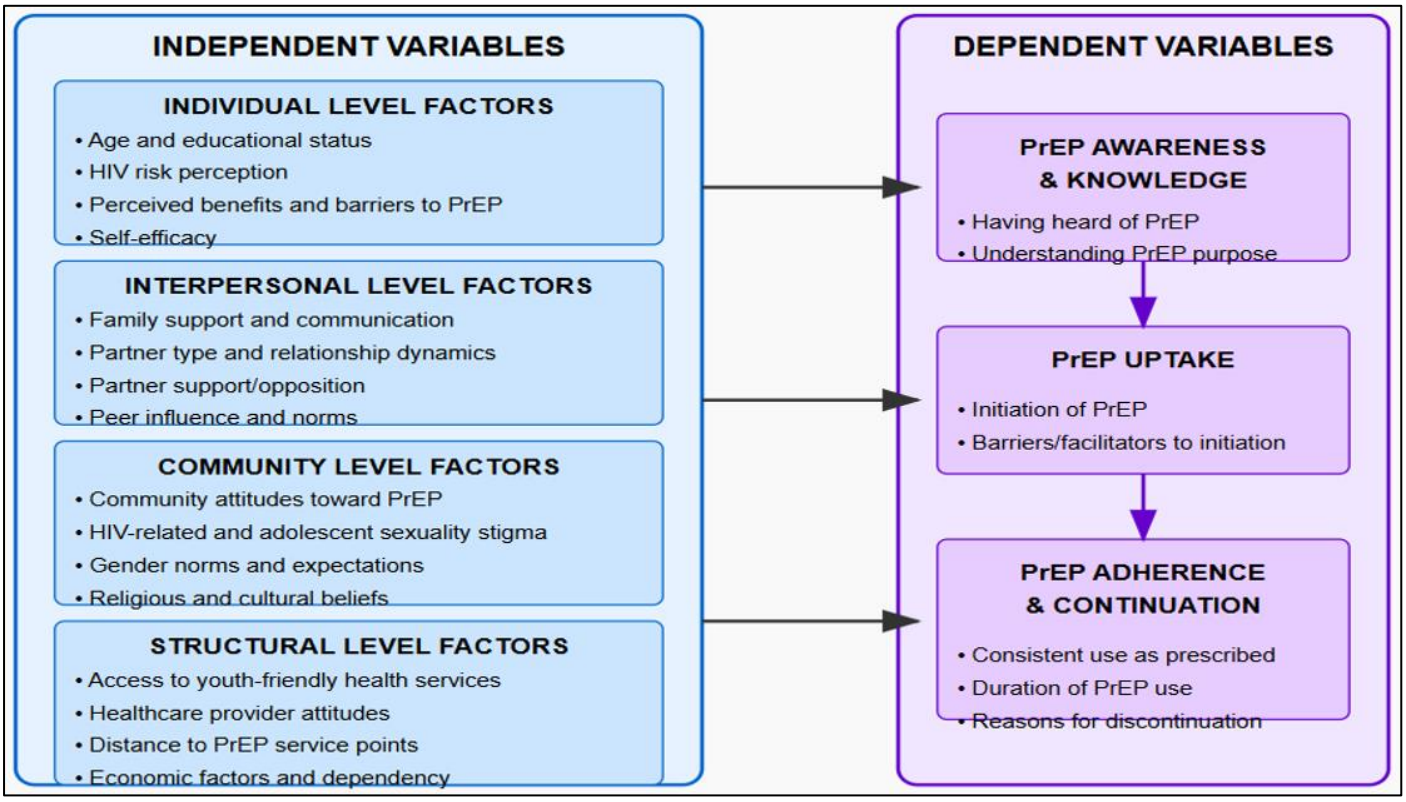

Fig 1 Conceptual Framework
Source: Author Own Design (2025)

III. METHODOLOGY AND DESIGN

➢ *Research Approach*

The study adopted a deductive research approach, progressing from established theoretical frameworks to the collection and analysis of empirical data. This approach was suitable for testing the applicability of the socio-ecological model, Health Belief Model, and gender power dynamics to PrEP use in the target population. The deductive methodology facilitated the formulation of hypotheses about factors affecting PrEP awareness, uptake, and adherence, which were then empirically tested. This approach ensured systematic variable measurement and allowed for comparison with similar studies, contributing to the broader understanding of adolescent HIV prevention.

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➢ *Research Strategy*

A cross-sectional survey strategy was selected to capture a snapshot of PrEP awareness, uptake, and adherence among adolescent girls in Kawama Compound at a single point in time. This strategy allowed for systematic and standardized data collection from a relatively large sample, enhanced the generalizability of findings, and enabled quantification of key variables and relationships. The cross-sectional survey was also cost-effective and time-efficient—qualities essential for the study's resource constraints—and was consistent with survey methodologies used in similar research contexts.

➢ *Sampling Frame*

The sampling frame consisted of all adolescent girls aged 15-19 years residing in Kawama Compound, estimated at 1,200 individuals. Multiple data sources were used to construct a comprehensive sampling frame, including community health registers, school enrolment lists, and records from community-based organizations and youth health programs. To minimize coverage error, these lists were cross-referenced, and community health workers were consulted to identify overlooked segments of the population. This multi-source approach ensured representation of both in-school and out-of-school adolescents, as well as those connected and not connected to health services.

➢ *Sample Size and Sampling Techniques*

The original calculated sample size, based on Cochran's formula and the finite population correction, was 291. However, due to time and financial constraints, the study targeted 50 adolescent girls. Stratified random sampling was employed to ensure representation across age groups (15–16 and 17–19 years), educational status (in-school and out-of-school), and four geographical zones within Kawama. This created 16 strata, with proportional allocation and random selection within each stratum using a computer-generated sequence. This sampling technique strengthened the study's external validity and enabled meaningful statistical inference about the broader adolescent girl population in Kawama.

➢ *Operationalization of Research Variables*

Key research variables were carefully operationalized for quantitative measurement. PrEP awareness was measured by whether respondents had heard of PrEP and their level of knowledge. Uptake and utilization were assessed through eligibility, initiation, duration of use, access points, and barriers and facilitators. Adherence was measured by current status, consistency, duration, discontinuation reasons, and associated challenges and supports. The study also included contextual and socio-demographic variables such as age, education, sexual activity, relationship status, family context, economic factors, stigma, healthcare access, social support, and gender-power dynamics. The operationalization framework was based on validated tools adapted to the local context.

➢ *Data Collection Techniques*

Data were collected via structured questionnaires administered through face-to-face interviews. This method accommodated varying literacy levels and allowed clarification of questions, enhancing rapport and data quality. The questionnaire included mostly closed-ended items, with some open-ended questions for qualitative insights. It was organized into sections on demographics, PrEP knowledge and experiences, HIV risk, and factors influencing uptake and adherence. The instrument was translated into Bemba and Nyanja, back-translated, reviewed by experts, and pre-tested with a similar group outside the study site. Female research assistants with adolescent health experience conducted the interviews in private to ensure confidentiality and comfort.

➢ *Data Analysis Methods*

Quantitative data analysis was planned using SPSS version 26. Data preparation included checking for completeness, coding, and cleaning for logical consistency. Descriptive statistics summarized sample characteristics and key variables. Bivariate analyses (e.g., chi-square, t-tests, ANOVA) explored relationships between variables. Multivariate analyses, including logistic and linear regression, identified factors associated with awareness, uptake, and adherence, controlling for confounders. Scale validation and reliability analysis (Cronbach's alpha, factor analysis) were conducted for multi-item measures. All statistical tests were set at a significance level of 0.05, with model assumptions and goodness-of-fit evaluated. Results were interpreted in light of the theoretical frameworks guiding the study.

➢ *Ethical Considerations*

Ethical approval was obtained from relevant Zambian authorities. The study implemented a tiered consent process: adolescents aged 18–19 provided informed consent, while those 15–17 gave assent with parental or guardian permission, unless a waiver was justified to protect participants. Confidentiality was safeguarded through unique ID codes, private interviews, and secure data storage. The research team was trained to monitor for distress and follow referral protocols if needed. Participants received information on HIV prevention and youth-friendly services. Community engagement was prioritized, with findings disseminated to support local HIV prevention efforts.

IV. RESULTS

➢ *Introduction*

This section presents the key findings from the assessment of PrEP awareness, uptake, adherence, and the contextual factors influencing PrEP utilization among adolescent girls in Kawama Compound, Mufulira. Results are organized according to the main research objectives and cover participants' demographic characteristics, levels of PrEP awareness and knowledge, patterns of PrEP uptake and adherence, as well as the social, cultural, and healthcare system factors affecting these outcomes. The findings provide important insights into the challenges and facilitators of PrEP use in this high-risk population, informing recommendations for improving HIV prevention efforts among adolescent girls in similar settings.

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➢ *Demographic Characteristics of Study Participants*

The study involved 50 adolescent girls aged 15 to 19 years, with an average age of 17.2 years (SD = 1.4). The majority (68%) were in the 17–19 age group, while 32% were aged 15–16 years. Most participants (76%) were currently enrolled in school, and 24% were out of school. In terms of living arrangements, 82% lived with their parents, 14% resided with other relatives, and 4% lived independently or with friends. Access to health facilities varied, with 54% living within 3 kilometers of a PrEP-providing facility, and 46% residing further away. Most of the participants (90%) reported being sexually active; among them, 67% were in a relationship and 33% were single. These demographic features underline that the sample consisted predominantly of girls at high risk of HIV, which supports their eligibility for PrEP services.

Table 1 Demographic Characteristics of Study Participants (N=50)

Characteristic	Category	Frequency (n)	Percentage (%)
Age Group	15-16 years	16	32.0
	17-19 years	34	68.0
Educational Status	In school	38	76.0
	Out of school	12	24.0
Living Arrangements	With parents	41	82.0
	With other relatives	7	14.0
	Independent/with friends	2	4.0
Distance to Health Facility	< 3 kilometers	27	54.0
	≥ 3 kilometers	23	46.0
Sexual Activity	Sexually active	45	90.0
	Not sexually active	5	10.0
Relationship Status	In relationship	30	60.0
	Single	15	30.0
	Not applicable	5	10.0

Source: Primary Data Survey May, (2025)

➢ *PrEP Awareness and Knowledge Among Adolescent Girls*

- *General Awareness of PrEP*

The study found that 88% of adolescent girls had heard of PrEP for HIV prevention, indicating a high level of general awareness. Awareness was significantly greater among older participants (94.1% among those aged 17–19) compared to younger ones (75.0% among those aged 15–16), with a statistically significant difference (p = 0.032). Sexually active participants were also much more likely to be aware of PrEP (93.3%) than those not sexually active (40.0%), a difference that was also statistically significant (p = 0.019). While PrEP awareness was higher among in-school participants (92.1%) compared to out-of-school participants (75.0%), this difference did not reach statistical significance.

Table 2 PrEP Awareness by Demographic Characteristics (N=50)

Characteristic	Aware of PrEP	Not Aware of PrEP	Total	P-value
Overall	44 (88.0%)	6 (12.0%)	50	-
Age Group				0.032*
15-16 years	12 (75.0%)	4 (25.0%)	16	
17-19 years	32 (94.1%)	2 (5.9%)	34	
Educational Status				0.156
In school	35 (92.1%)	3 (7.9%)	38	
Out of school	9 (75.0%)	3 (25.0%)	12	
Sexual Activity				0.019*
Sexually active	42 (93.3%)	3 (6.7%)	45	
Not sexually active	2 (40.0%)	3 (60.0%)	5	

*Statistically Significant at P < 0.05

Source: Primary Data Survey May, (2025)

- *Knowledge Levels and Understanding*

Although awareness of PrEP was high among participants, there were notable gaps in their understanding. The mean knowledge score among those aware of PrEP was 5.8 out of 10 (SD = 2.1), with only 25% scoring in the high knowledge range (8–10 points) and an equal proportion showing low knowledge (0–3 points). Half of the participants demonstrated moderate knowledge. Specific knowledge gaps were evident, particularly regarding daily adherence requirements (only 54.5% answered correctly) and the ability to stop and restart PrEP safely (47.7% correct). Other areas, such as understanding that PrEP does not cause HIV and does not affect fertility, were better understood but still not universal.

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Table 3 PrEP Knowledge Assessment Among Aware Participants

Knowledge Area	Correct Response	Incorrect/Uncertain
Overall Knowledge Score	Mean: 5.8 (SD = 2.1), Range: 2-9	-
Knowledge Level Distribution		
Low (0-3 points)	11 (25.0%)	-
Moderate (4-7 points)	22 (50.0%)	-
High (8-10 points)	11 (25.0%)	-
Specific Knowledge Areas		
PrEP prevents HIV in HIV-negative people	36 (81.8%)	8 (18.2%)
Daily adherence required for effectiveness	24 (54.5%)	20 (45.5%)
PrEP does not cause HIV infection	35 (79.5%)	9 (20.5%)
Side effects are generally mild and temporary	28 (63.6%)	16 (36.4%)
PrEP does not affect fertility	32 (72.7%)	12 (27.3%)
Regular HIV testing required during PrEP use	26 (59.1%)	18 (40.9%)
PrEP can be stopped and restarted safely	21 (47.7%)	23 (52.3%)
PrEP should be used with other prevention methods	29 (65.9%)	15 (34.1%)

Source: Primary Data Survey May, (2025)

- *Misconceptions and Barriers to Accurate Understanding*

Despite general awareness, misconceptions about PrEP were common. The most prevalent misconception was the belief that PrEP use indicates promiscuity (27.3%), followed by concerns that PrEP might cause HIV infection (22.7%). Some participants mistakenly believed PrEP provides immediate protection or that it is only for high-risk groups. Barriers to accessing accurate information were also significant, with the most common being limited detailed counseling (68.2%) and the lack of youth-friendly information formats (34.1%).

Table 4 PrEP Misconceptions and Information Barriers

Misconceptions/Barriers	Frequency	Percentage (%)
Misconceptions		
PrEP use indicates promiscuity	12	27.3
PrEP might cause HIV infection	10	22.7
PrEP provides immediate protection	8	18.2
PrEP is only for high-risk groups	7	15.9
PrEP affects fertility negatively	6	13.6
Information Access Barriers		
Limited detailed counseling during exposure	30	68.2
Conflicting information from sources	14	31.8
Stigma concerns about seeking clarification	11	25.0
Language barriers in materials	8	18.2
Lack of youth-friendly information formats	15	34.1

Source: Primary Data Survey May, (2025)

➢ *PrEP Uptake and Utilization Patterns*

- *Eligibility and Risk Assessment*

Most participants were considered eligible for PrEP according to national guidelines, with 84% meeting eligibility criteria. The predominant risk factors included being sexually active (90%), unprotected sex (74%), and inconsistent condom use (62%). Many participants reported multiple risk factors, with 64% having three or more, highlighting a high vulnerability to HIV.

Table 5 PrEP Eligibility and HIV Risk Factors

Risk Factor/Eligibility Criteria	Frequency	Percentage (%)
Overall PrEP Eligibility	42	84.0
Specific Risk Factors:		
Sexually active	45	90.0
Unprotected sexual intercourse	37	74.0
Multiple sexual partners (past 6 months)	13	26.0
Age-disparate relationships (>5 years older)	19	38.0
Transactional sex experiences	7	14.0
Partner with unknown HIV status	28	56.0
History of sexually transmitted infections	9	18.0
Inconsistent condom use	31	62.0

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Number of Risk Factors per Participant:		
1-2 risk factors	18	36.0
3-4 risk factors	20	40.0
5+ risk factors	12	24.0

Source: Primary Data Survey May, (2025)

- *PrEP Initiation Rates and Patterns*

Among eligible girls, the overall PrEP initiation rate was 50%. Initiation was significantly higher among older adolescents (58.1% in ages 17–19) than younger ones (27.3%, p = 0.048). Girls in relationships had higher initiation rates (59.3%) compared to those who were single (33.3%), although this difference was not statistically significant. Similarly, those in school had a higher initiation rate (56.3%) compared to out-of-school girls (30.0%).

Table 6 PrEP Initiation Among Eligible Participants (n=42)

Characteristic	Initiated PrEP	Never Initiated	Total	P-value
Overall	21 (50.0%)	21 (50.0%)	42	-
By Age Group				0.048*
15-16 years (n=11)	3 (27.3%)	8 (72.7%)	11	
17-19 years (n=31)	18 (58.1%)	13 (41.9%)	31	
Educational Status				0.234
In school (n=32)	18 (56.3%)	14 (43.7%)	32	
Out of school (n=10)	3 (30.0%)	7 (70.0%)	10	
Relationship Status				0.156
In relationship (n=27)	16 (59.3%)	11 (40.7%)	27	
Single (n=15)	5 (33.3%)	10 (66.7%)	15	

*Statistically Significant at $p < 0.05$

Source: Primary Data Survey May, (2025)

- *PrEP Access Points and Barriers to Uptake*

The study examined where adolescent girls accessed PrEP and the barriers they faced in starting PrEP. Most participants who initiated PrEP (61.9%) accessed it at health facilities, while others used community outreach programs (28.6%) or youth centers (9.5%). The most common barriers to PrEP uptake among eligible but non-initiating participants included fear of side effects (57.1%), stigma from peers or family (47.6%), and lack of detailed information (38.1%). Some girls also reported concerns about daily pill-taking and doubts about PrEP effectiveness.

Table 7 PrEP Access Points and Barriers to Uptake (n=42)

Access Point/Barrier	Frequency	Percentage (%)
Access Points		
Health facility	13	61.9
Community outreach program	6	28.6
Youth center	2	9.5
Barriers to Uptake (among non-initiators)		
Fear of side effects	12	57.1
Stigma from peers/family	10	47.6
Lack of detailed information	8	38.1
Concerns about daily pill-taking	7	33.3
Doubts about PrEP effectiveness	6	28.6
Cost/transportation issues	3	14.3

Source: Primary Data Survey May, (2025)

- *Facilitators of Uptake*

The most important facilitators for PrEP uptake among those who initiated included recommendations from healthcare providers (66.7%), peer support (38.1%), and access to youth-friendly services (28.6%). These factors highlight the role of trusted sources and supportive environments in promoting PrEP use among adolescent girls.

Table 8 Facilitators of PrEP Uptake Among Initiators (n=21)

Facilitator	Frequency	Percentage (%)
Recommendation by healthcare provider	14	66.7
Peer support	8	38.1
Youth-friendly services	6	28.6

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Family encouragement	4	19.0
PrEP education sessions	3	14.3

➢ *PrEP Adherence and Continuation*

Among those who initiated PrEP, 61.9% were still taking it at the time of the study. The main reasons for discontinuation were side effects (38.1%), stigma (23.8%), and forgetting doses (19.0%). Adherence was highest among those who received continuous support from healthcare providers and peers.

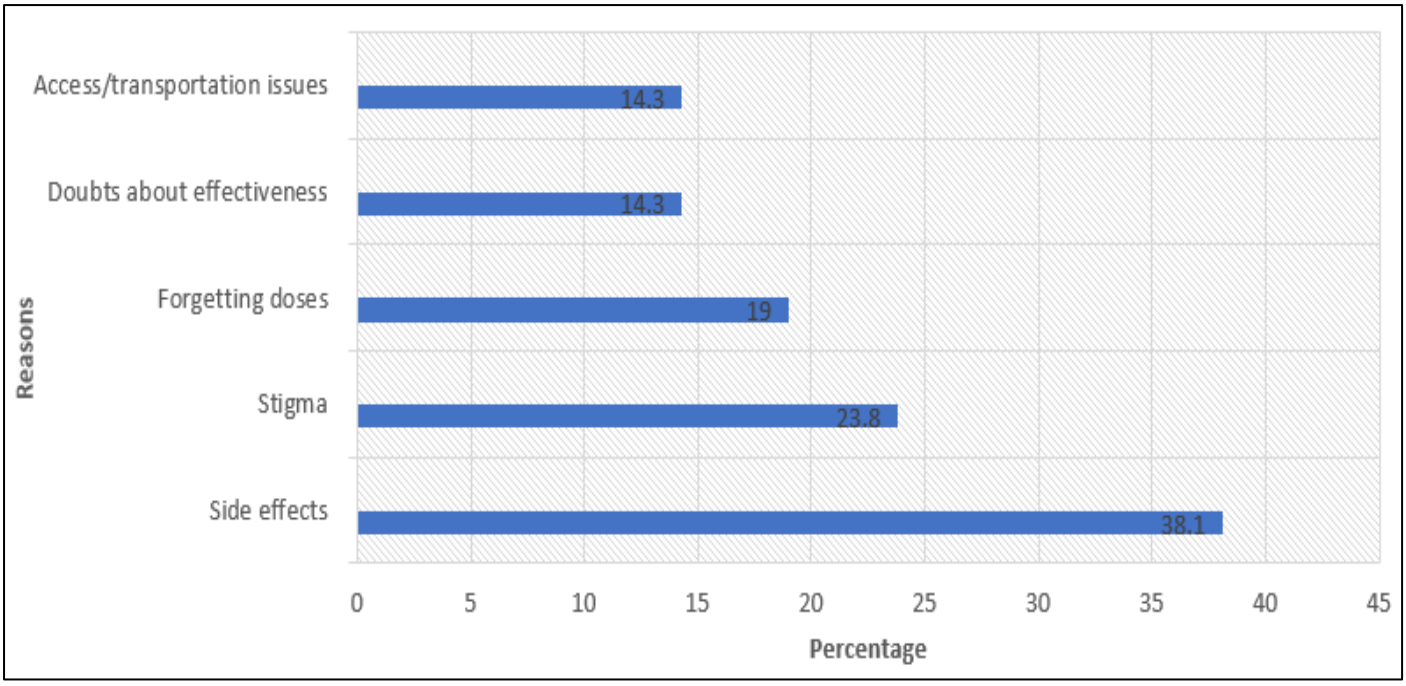

Fig 2 Primary Reasons for Prep Discontinuation
Source: Primary Data Survey May, (2025)

- *Adherence Challenges Among Current users*

Current PrEP users reported a range of challenges affecting their adherence. The most common challenge was the need to conceal medication use from family (76.9%), which had a high impact on adherence. Forgetting doses was also frequent (69.2%), as were difficulties in scheduling around family routines and fear of being questioned about medication. Side effects such as nausea (46.2%) and menstrual changes (38.5%) were notable, with menstrual changes having a particularly high impact, often resulting in temporary discontinuation.

Table 9 Adherence Challenges Among Current Users

Challenge Type	Frequency	Percentage	Impact on Adherence*
Side Effects Experienced			
Nausea	6	46.2%	Moderate
Headaches	4	30.8%	Mild
Fatigue	3	23.1%	Mild
Menstrual changes	5	38.5%	High
Vivid dreams	2	15.4%	Mild
Social and Environmental			
Difficulty hiding pills from family	10	76.9%	High
Fear of questions about medication	8	61.5%	Moderate
Scheduling around family routines	7	53.8%	Moderate
Practical Challenges			
Forgetting doses	9	69.2%	High
Running out of pills	3	23.1%	High
Appointment scheduling conflicts	5	38.5%	Moderate
Transportation to clinic	4	30.8%	Moderate

Impact Rated as: High = Frequently Affects Adherence, Moderate = Sometimes Affects Adherence, Mild = Rarely Affects Adherence
Source: Primary Data Survey May, (2025)

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- *Support Systems and Adherence Facilitators*

Users relied on various support systems to maintain adherence. Technological supports like phone alarms (76.9%) and linking pill-taking to daily routines (92.3%) were most commonly used. While family support was rare due to disclosure barriers, it was rated as highly effective when present. Social support from peers or trusted friends, as well as regular healthcare provider follow-up, were also important facilitators for adherence.

Table 10 Support Systems and Adherence Facilitators Among Current Users

Support System/Facilitator	Utilized	Percentage	Effectiveness Rating*
Technological Supports			
Phone alarm reminders	10	76.9%	High
Calendar reminders	5	38.5%	Moderate
Pill counting/tracking	7	53.8%	High
Social Supports			
Peer support groups	5	38.5%	High
Trusted friend support	6	46.2%	High
Family support (disclosed users)	3	23.1%	Very High
Partner support (disclosed)	4	30.8%	Moderate
Healthcare System Supports			
Regular follow-up appointments	11	84.6%	High
Counselor/provider support	9	69.2%	High
Side effect management support	8	61.5%	Moderate
Personal Strategies			
Linking to daily routine	12	92.3%	Very High
Pill storage strategies	11	84.6%	High
Motivation reminders	8	61.5%	Moderate

Effectiveness Rated by Participants as: Very High, High, Moderate, or Low
Source: Primary Data Survey May, (2025)

➢ *Contextual Factors Influencing PrEP Utilization*

- *Stigma and Social Factors*

Stigma and negative social perceptions were widespread and had a significant impact on PrEP utilization. Cultural taboos about youth sexuality (90%) and the inability to discuss sexual health with family (84%) were the most pervasive barriers. Many participants experienced community-level stigma, with 72% reporting that PrEP use was associated with promiscuity. Disclosure of PrEP use was rare, particularly to family members, due to fear of judgment and gossip.

Table 11 Stigma Experiences and Social Factors

Stigma Type/Social Factor	Frequency	Percentage	Impact on PrEP Use
Community-Level Stigma			
PrEP associated with promiscuity	36	72.0%	High
PrEP confused with HIV treatment	28	56.0%	Moderate
Negative attitudes toward youth sexuality	40	80.0%	High
Gossip about clinic attendance	25	50.0%	Moderate
Family-Level Factors			
Cannot discuss sexual health with family	42	84.0%	High
Fear of family judgment	38	76.0%	High
Lack of family HIV prevention knowledge	35	70.0%	Moderate
Cultural taboos about youth sexuality	45	90.0%	Very High
Peer Influences			
Peer support for HIV prevention	28	56.0%	Positive
Negative peer attitudes toward PrEP	15	30.0%	Moderate
Peer pressure regarding sexual behavior	22	44.0%	Variable
Disclosure Patterns (Among PrEP Users, n=21)			
Disclosed to any family member	5	23.8%	-
Disclosed to partner (if applicable)	6	37.5%	-
Disclosed to close friend	12	57.1%	-
No disclosure to anyone	4	19.0%	-

Source: Primary Data Survey May, (2025)

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- *Healthcare System Factors*

Most participants reported positive experiences with healthcare providers, especially regarding confidentiality (84%) and respectful treatment (76%). However, many cited inadequate provision of comprehensive information (40% negative) and insufficient consultation time (36% negative). While most found the environment youth-friendly and private, waiting times and appointment scheduling also posed challenges for some.

Table 12 Healthcare System Experiences and Provider Interactions

Healthcare Factor	Positive Experience	Negative Experience	No Experience
Provider Attitudes			
Non-judgmental communication	32 (64.0%)	14 (28.0%)	4 (8.0%)
Respectful treatment	38 (76.0%)	8 (16.0%)	4 (8.0%)
Age-appropriate counseling	25 (50.0%)	15 (30.0%)	10 (20.0%)
Confidentiality maintenance	42 (84.0%)	6 (12.0%)	2 (4.0%)
Service Delivery Quality			
Adequate consultation time	28 (56.0%)	18 (36.0%)	4 (8.0%)
Comprehensive information provision	22 (44.0%)	20 (40.0%)	8 (16.0%)
Side effect management support	19 (38.0%)	12 (24.0%)	19 (38.0%)
Follow-up appointment scheduling	35 (70.0%)	10 (20.0%)	5 (10.0%)
Service Accessibility			
Convenient appointment times	30 (60.0%)	15 (30.0%)	5 (10.0%)
Reasonable waiting times	25 (50.0%)	20 (40.0%)	5 (10.0%)
Privacy during consultations	40 (80.0%)	8 (16.0%)	2 (4.0%)
Youth-friendly environment	33 (66.0%)	12 (24.0%)	5 (10.0%)

Source: Primary Data Survey May, (2025).

These results underscore the complex interplay of social, cultural, and healthcare system factors influencing PrEP utilization and adherence among adolescent girls, highlighting areas for targeted intervention and support.

V. DISCUSSION

This chapter critically analyzes the effectiveness of the PrEP program among adolescent girls in Kawama Compound, Mufulira, drawing on the three central pillars of the PrEP cascade: awareness and knowledge, uptake and utilization, and adherence and continuation. The findings are discussed in light of contemporary theoretical frameworks, including the socio-ecological and Health Belief Models, and connected to recent peer-reviewed literature from similar sub-Saharan African contexts to illuminate their broader implications for adolescent HIV prevention.

The study revealed a notably high PrEP awareness rate of 88% among adolescent girls in Kawama, a figure that stands out when compared to much lower rates reported elsewhere in sub-Saharan Africa. For example, Lunkuse et al. (2022) observed low awareness of PrEP among high-risk adolescent girls in Uganda, while only 6.9% of 15-24-year-olds in Tanzania reported any awareness, according to their 2022 Demographic and Health Survey (Ramadhani et al., 2025). This contrast suggests that targeted interventions like the DREAMS program—which was the primary information source for 45% of aware participants—have been highly effective in this community, echoing successes described by Lindsay et al. (2023). However, the reliance on a single program for information dissemination could pose sustainability challenges, underlining the need to diversify channels to maintain high awareness if specific programs face funding or operational changes.

The age disparity in awareness was observed, with 94% of older adolescents (17–19 years) being aware of PrEP compared to 75% of those aged 15–16, a trend consistent with findings from Admassu et al. (2024), who emphasized that younger adolescents are often less exposed due to programmatic and developmental factors. While awareness was high, the study exposed substantial gaps in knowledge: the mean knowledge score was 5.8 out of 10, with only a quarter of participants demonstrating high knowledge. This echoes O'Malley et al. (2021), who found a similar disconnect between awareness and comprehension among Kenyan young women. Specific gaps, such as the requirement of daily adherence—correctly identified by just 54.5%—reflect broader concerns raised by Hartmann et al. (2024) about incomplete understanding of PrEP's effectiveness mechanism. Social misconceptions were also prevalent, with 27.3% of girls believing PrEP use indicates promiscuity, a finding that aligns with the stigma frameworks documented by Rousseau et al. (2021) in conservative African communities.

Barriers to accurate knowledge were systemic, with 68.2% reporting limited detailed counseling and 31.8% encountering conflicting information, consistent with implementation challenges identified by Obiezu-Umeh et al. (2021). Notably, only 5% cited health facilities as their main source of PrEP information, highlighting a missed opportunity for the healthcare sector to deliver comprehensive, accurate, and consistent education (Lanham et al., 2021). In terms of uptake, the study's 50% initiation rate among eligible adolescent girls represents moderate program success compared to higher rates observed in structured programs elsewhere, such as the 77% reported in the DREAMS evaluation in Zambia (Lindsay et al., 2023). Lower uptake in this setting may reflect differences in

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program scale, intensity, or community readiness. Uptake was higher among older adolescents (58.1% vs. 27.3% for younger girls), which is consistent with findings by Admassu et al. (2024) and likely reflects greater autonomy, more accurate risk perception, and fewer structural barriers among older youth. Notably, 67% of initiations took place within the past year, consistent with the expanding reach and maturing delivery of PrEP programs across the region (Muhumuza et al., 2021).

DREAMS program sites were the main access points for PrEP initiation (57.1% of users), a testament to the effectiveness of youth-friendly service models (Medina-Marino et al., 2021; Rousseau et al., 2022). Public health facilities were less frequently used, likely due to barriers such as negative provider attitudes and lack of privacy, as documented by Nyblade et al. (2022). This underscores the importance of specialized adolescent services alongside efforts to improve the inclusiveness and quality of mainstream health systems. Stigma emerged as the leading barrier to PrEP uptake, reported by 66.7% of non-users, in line with Hartmann et al. (2024), who found that stigma is the single greatest impediment to PrEP expansion among adolescents across Africa. Concerns about side effects were also common (47.6%), reflecting findings by de Vos et al. (2023) that even mild or transient side effects can have a disproportionate impact on adolescent users. Family-related barriers, especially fear of discovery by parents (42.9%), further complicated uptake, echoing the cultural taboos and disclosure challenges found by Mukaba and Chitundu (2024).

Adherence and continuation analysis revealed high rates of discontinuation, with 38.1% of initiators stopping PrEP by the time of data collection—a trend observed in other sub-Saharan studies (de Vos et al., 2023). The median duration of continuous use was six months, and persistence declined over time, as seen by Celum et al. (2021) who noted that adherence among young women often fluctuates in line with perceived risk and changing life circumstances. Only 54% of current users maintained high adherence, with better adherence on school days, suggesting the importance of routine and structure (Shapley-Quinn et al., 2024). The widespread use of technological reminders (76.9%) points to the promise of digital health interventions, but their effectiveness appears maximized when supplemented by human support (Haberer et al., 2021). Discontinuation was most often due to side effects (50%) and stigma (37.5%), reaffirming the importance of robust pre-initiation counseling, follow-up, and community-based stigma reduction (Velloza et al., 2020; Hartmann et al., 2024). Stigma was multi-layered: 56% confused PrEP with HIV treatment, 72% associated it with promiscuity, and 90% cited cultural taboos about youth sexuality, reflecting patterns seen by Hartmann et al. (2024), Admassu et al. (2024), and Roberts et al. (2023). Addressing such stigma requires not only individual-level interventions but also community engagement with influential leaders and family systems.

Healthcare experiences were mixed, with 28% reporting negative provider attitudes and a strong emphasis on privacy and confidentiality, valued by 92% of participants. Integration of PrEP with other reproductive health services and improved provider training are critical solutions, as highlighted by Geary et al. (2014) and Lanham et al. (2021). Family and relationship dynamics further influenced outcomes; most girls did not disclose PrEP use to partners or family, but those who did generally experienced better adherence, supporting findings by Roberts et al. (2023) and Mukaba & Chitundu (2024) that culturally sensitive family engagement can be beneficial. The results validate both the socio-ecological and Health Belief Models, as individual, relational, and community-level factors shaped PrEP outcomes and perceived barriers such as stigma and side effects influenced decisions throughout the cascade (Muhumuza et al., 2021; Rousseau et al., 2021; Obiezu-Umeh et al., 2021). In practical terms, the study underscores the need for more intensive, developmentally tailored education and counseling, expanded youth-friendly and integrated services, robust provider training, and the use of digital and social support systems to improve both uptake and adherence.

VI. CONCLUSIONS

This study examined the effectiveness of PrEP program implementation among adolescent girls in Kawama Compound, Mufulira, focusing on awareness and knowledge, uptake and utilization, and adherence and continuation. Quantitative analysis revealed that while PrEP awareness was notably high—largely due to targeted initiatives such as the DREAMS program critical gaps in comprehensive knowledge and persistent misconceptions remain. Program reach was uneven, with younger adolescents and those less connected to structured interventions demonstrating lower levels of awareness and engagement. Uptake rates among eligible participants were moderate, influenced by age, stigma, side effect concerns, and challenges in family and community disclosure. Adherence patterns highlighted the ongoing difficulties of sustained use, with side effects, social stigma, and lack of continuous support contributing to discontinuation. Findings validate the socio-ecological and Health Belief Models, underscoring the interplay between individual, interpersonal, community, and structural factors in shaping PrEP outcomes. Barriers such as stigma, cultural taboos, and negative provider attitudes continue to limit the effectiveness of PrEP interventions, while youth-friendly service delivery, social support, and digital reminders were found to facilitate both uptake and adherence. The study emphasizes the urgent need for integrated, multi-level strategies to address systemic and contextual barriers, optimize service delivery, and enhance information quality. Ultimately, strengthening community engagement, provider training, and support systems is essential for maximizing the public health impact of PrEP among adolescent girls in high-risk settings.

RECOMMENDATIONS

To improve PrEP program outcomes in urban, high-risk settings, the study recommends strengthening community and school education to provide comprehensive, age-appropriate PrEP information; investing in youth-friendly and integrated health services; and prioritizing strategies to

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reduce stigma at both community and family levels. Additional recommendations include enhancing pre-initiation counseling and ongoing support, promoting collaboration among key stakeholders, and implementing robust, digital monitoring and evaluation systems to support real-time, data-driven program improvements..

FURTHER STUDIES

Future research should explore the effectiveness of integrated stigma-reduction interventions targeting both family and community levels, as well as the impact of digital adherence support tools in adolescent populations. In addition, studies examining the long-term outcomes of youth-friendly, integrated PrEP service models and their scalability in resource-constrained urban settings are warranted. Research should also consider the intersection of relationship dynamics, gender norms, and PrEP outcomes to inform the development of contextually tailored interventions that address the unique needs of adolescent girls.

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Conceptualization, methodology writing review and editing and analysis (D.M). The author has decided to publish this version of the review article, Editing the article (Mr. T. S).

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- *Institutional Review Board Statement:*

This study was approved by the Cavendish University Zambia Ethics Committee.

- *Informed Consent Statement: Not applicable.*

- *Data Availability Statement:*

The datasets used during the current study are available from the corresponding author on rational request.

- *Dedication:*

I dedicate this work to my beloved late brother, my mother and my father Mr and Mrs Mufalali, whose brief yet profound presence continues to shape my life. May this achievement honor your memory and reflect the inspiration, laughter, and love you shared. Your legacy lives on through every step I take, and I will carry your spirit with me, always.

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- *Conflicts of Interest:*

The authors declare no conflict of interest.

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