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Causes and Effects of Drug Abuse Among Primary School Learners in Senanga District, Zambia: Digital Health Interventions and AI-Driven Prevention Strategies

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Abstract — Drug abuse among primary school learners represents a growing public health and educational challenge in sub-Saharan Africa, with documented consequences for cognitive development, academic performance, social behaviour, and long-term health outcomes. In Senanga District, Western Province, Zambia, primary school teachers and administrators report increasing encounters with substance use among learners as young as ten years old. This article investigates the causes and effects of drug abuse among primary school learners in Senanga District, situating local findings within global scholarship on adolescent substance use prevention, AI-powered health promotion, and community-based intervention models. Drawing on a descriptive survey employing qualitative and quantitative methods, the study identifies peer influence, family dysfunction, poverty, emotional distress, and community drug availability as primary causal factors. Academic underperformance, absenteeism, behavioural difficulties, health deterioration, and school dropout are documented as key effects. The article argues that AI-driven health literacy platforms, digital peer education tools, and community-based digital support networks offer promising complementary interventions for drug abuse prevention in primary school contexts. Policy recommendations are presented.

Keywords *— Drug Abuse; Primary School Learners; Senanga District; Zambia; Prevention; AI Health Promotion; Substance Use; Digital Intervention.*

1. Introduction

Substance abuse among school-age children and adolescents is a globally recognised public health crisis with profound educational, social, and developmental consequences (Ashifa, 2020a; Zahoor et al., 2025). In Zambia, evidence of drug and alcohol use among primary school-aged children — including the use of cannabis, alcohol, glue sniffing, and pharmaceutical drug misuse — has been documented in multiple districts, with rural Western Province communities including Senanga District among the affected areas (Ashifa, 2021a; Vettriselvan et al., 2025a). The consequences for academic performance, school attendance, behavioural regulation, and physical and mental health are severe and multidimensional, generating cascading disadvantages that extend well beyond the school years into adult life (Ashifa, 2020b; Ranganathan et al., 2024). Global advances in AI-powered health promotion, digital peer education, and data-driven substance use prevention offer new possibilities for early identification and intervention with at-risk primary school learners possibilities that have yet to be systematically explored in Zambian rural primary school contexts (Venice et al., 2025a; Vasantha et al., 2025). This article addresses this gap by examining drug abuse causes and effects in Senanga District primary schools and identifying evidence-based prevention and intervention strategies that can be contextually adapted for rural Zambian implementation.

2. Literature Review

2.1 Causes of Drug Abuse Among Primary Learners

The causal pathways to drug abuse among primary school-age children are multifactorial, operating across individual, family, peer, school, and community levels (Ashifa, 2020a; Vettriselvan et al., 2025a). At the individual level, emotional dysregulation, anxiety, depression, trauma history, and low self-esteem are established risk factors for early substance initiation (Zahoor et al., 2025; Elkin et al., 2025; Ranganathan et al., 2024). Peer influence is consistently identified as one of the most powerful proximal drivers of substance initiation among school-age children with exposure to drug-using peers substantially increasing individual risk regardless of other protective factors (Ashifa, 2020b; Venice et al., 2025e). Family-level risk factors include parental substance abuse, family dysfunction, domestic violence, neglect, and poverty conditions that increase child vulnerability to substance use through both modelling effects and the creation of emotional pain that children may seek to alleviate through substance use (Ashifa, 2021a; Ranganathan et al., 2024). Community-level factors including drug market proximity, community norms tolerating substance use, absence of structured recreational opportunities, and limited law enforcement create the enabling environments within which individual and family

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risk factors translate into actual drug abuse among primary learners (Kariveliparambil et al., 2026b; Vettriselvan & Anto, 2018).

2.2 Effects of Drug Abuse on Academic Performance and Development

The effects of drug abuse on primary school learners are severe and pervasive. Neurologically, substance use during the critical developmental window of primary school years causes damage to still-developing brain structures governing attention, memory, executive function, and emotional regulation impairments that directly undermine academic learning capacity (Ashifa, 2020a; Ashifa, 2020b). Academic consequences include declining performance, loss of concentration, increased absenteeism, disruptive classroom behaviour, and ultimately school dropout a pathway that research has shown to be particularly swift and irreversible for children who initiate substance use in the primary school years (Vettriselvan et al., 2025a; Vettriselvan & Rajan FSA, 2019).

The social and relational effects of drug abuse among primary learners include deteriorating peer relationships, increased conflict with teachers, social withdrawal or antisocial behaviour, and exposure to criminal networks associated with drug markets (Venice et al., 2025e; Ashifa, 2021b). Physical health consequences including malnutrition, immune suppression, injury from substance-related accidents, and for older primary pupils, exposure to blood-borne infections associated with injecting drug use compound academic and social impacts to create compounded developmental disadvantage (Ashifa, 2020b; Vettriselvan et al., 2025b).

2.3 AI-Driven Prevention and Digital Health Intervention

Artificial intelligence and digital health technologies offer promising tools for drug abuse prevention among school-age populations (Venice et al., 2025a; Arockia et al., 2025). AI-powered early warning systems that analyse patterns of school attendance, academic performance, and behavioural incident data can identify at-risk learners at an early stage enabling targeted preventive intervention before substance use becomes established (Venice et al., 2025b; Akila et al., 2025).

Mobile-based health literacy applications that deliver age-appropriate, culturally relevant information about drug risks in engaging, gamified formats have demonstrated effectiveness in improving substance-related knowledge and attitudes among primary and secondary school populations (Vasantha et al., 2025; Swadhi et al., 2025a). Digital peer education platforms that train and support young peer educators in delivering substance use prevention messages to their classmates leverage the established influence of peer norms on substance use behaviour, while AI-powered content personalisation ensures that prevention messages are calibrated to the specific risk profiles and information needs of individual learners (Venice et al., 2025c; Shanthi et al., 2025). Community-based digital support networks that connect families of at-risk learners with counselling resources, parenting skills programmes, and economic support services address the family-level risk factors that school-based prevention alone cannot reach (Kariveliparambil et al., 2026a; Vettriselvan et al., 2026b).

2.4 Mental Health, Emotional Intelligence, and Resilience

Emotional intelligence and resilience are among the most powerful protective factors against drug abuse initiation among school-age children (Zahoor et al., 2025; Elkin et al., 2025). Children with high emotional intelligence characterised by the ability to recognise and manage their own emotions, empathise with others, and navigate social situations effectively are significantly less likely to initiate drug use than peers with lower emotional intelligence, as they possess more effective non-substance strategies for managing emotional distress and social pressure (Zahoor et al., 2025; Ranganathan et al., 2024).

Social-emotional learning programmes integrated into primary school curricula that explicitly develop emotional intelligence, stress management, peer refusal skills, and self-regulatory capacities represent evidence-based prevention approaches with strong implementation track records across diverse contexts (Vettriselvan et al., 2025e; Meena et al., 2025).

3. Methodology

A descriptive survey design incorporating qualitative and quantitative methods was employed to investigate causes and effects of drug abuse among primary school learners in Senanga District, Western Province, Zambia. Data were collected through structured questionnaires administered to 60 teacher respondents, semi-structured interviews with 10 school counsellors and administrators, and facilitated focus group discussions with 40 senior primary pupils (Kombo & Tromp, 2014; Orodho & Kombo, 2012). Data collection instruments included a teacher questionnaire measuring perceived drug abuse prevalence, causal factors, and educational effects; an administrator interview guide exploring school response strategies; and a pupil focus group protocol exploring peer and community drug use contexts. Thematic analysis was applied to qualitative data; descriptive statistics for quantitative data. All participants provided informed consent and confidentiality was ensured.

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4. Findings and Analysis

4.1 Prevalence and Substances Used

Teacher respondents estimated that drug abuse affected between 8–15% of upper primary learners (Grades 5–7) in their schools, with alcohol, cannabis, and glue sniffing identified as the most prevalent substances. Reported substance use was significantly higher among male learners (72% of reported cases) and in schools located in market areas with higher drug market proximity. Teachers reported first encounters with substance use issues among learners as young as nine years old in some cases a finding that underscores the urgency of early primary prevention rather than solely upper primary intervention (Ashifa, 2020a; Vettriselvan et al., 2025a).

4.2 Causes Identified by Teachers and Administrators

Peer influence was identified as the primary causal factor by 88% of teacher respondents, followed by family dysfunction and parental substance abuse (74%), poverty and economic deprivation (68%), emotional distress and unmet mental health needs (55%), and community drug market availability (50%). School counsellors emphasised the interaction among these factors noting that children experiencing family poverty and dysfunction are simultaneously more likely to seek peer acceptance through substance use and less likely to have adequate adult supervision and support (Ashifa, 2021a; Ranganathan et al., 2024; Zahoor et al., 2025).

4.3 Effects on Academic Performance and School Participation

Academic performance effects were documented through teacher observations and available school records. Learners identified as experiencing drug abuse issues showed mean examination performance 22 percentage points lower than school averages, attendance rates 35% lower than peers, and disciplinary incident rates four times higher. School dropout rates among learners with documented substance use issues were estimated at 40% higher than the school average (Ashifa, 2020b; Vettriselvan & Rajan FSA, 2019). Teachers reported significant time diverted from instruction to managing drug-related behavioural incidents an indirect effect on teaching quality with consequences for the entire class (Gayathri et al., 2025b; Vettriselvan et al., 2025c).

4.4 Current School Response Strategies

Current school response strategies were largely reactive and inadequate. Fewer than 30% of schools had a designated counsellor with substance use training. Prevention programmes were rare and where they existed, relied on single-session awareness talks without the sustained curriculum integration associated with effective prevention outcomes. School-community partnerships for substance use prevention were minimal, with most schools reporting no formal linkages with healthcare providers, social welfare services, or community leaders for coordinated drug prevention responses (Kariveliparambil et al., 2026a; Vettriselvan et al., 2026a).

5. Discussion

The findings from Senanga District primary schools present an urgent picture of drug abuse as a significant and growing threat to primary learner well-being, academic performance, and educational completion. The causal complexity of drug abuse involving interacting individual, family, peer, school, and community risk factors demands prevention and intervention approaches that are equally multi-level, sustained, and contextually responsive (Ashifa, 2020a; Zahoor et al., 2025; Ranganathan et al., 2024). The reactive and inadequate current school response documented in this study highlights an urgent need for systematic investment in school counselling capacity, curriculum-integrated social-emotional learning, and community-school partnerships for prevention (Kariveliparambil et al., 2026a; Vettriselvan et al., 2026b). AI-powered early warning systems could enable proactive identification of at-risk learners before drug use becomes entrenched, while digital health literacy platforms could deliver scalable, engaging prevention education to all primary learners regardless of geographic location (Venice et al., 2025a; Vasantha et al., 2025; Arockia et al., 2025).

6. Conclusion and Recommendations

This article has examined the causes and effects of drug abuse among primary school learners in Senanga District, situating local findings within global scholarship on substance use prevention, AI health promotion, and digital intervention. Findings confirm multi-level causal complexity and severe academic, health, and social effects that demand urgent, coordinated policy responses.

Recommendations: (1) train and deploy school counsellors with substance use specialisation in all primary schools (Vettriselvan & Rajan FSA, 2019; Meena et al., 2025); (2) integrate social-emotional learning and drug prevention curricula across all primary grades (Zahoor et al., 2025; Elkin et al., 2025); (3) deploy AI-powered early warning systems for at-risk learner identification (Venice et al., 2025b; Akila et al., 2025); (4) establish community-school drug prevention partnerships linking schools with health and social services (Kariveliparambil et al., 2026a; Vettriselvan et al., 2026b); and (5) implement mobile-based digital health literacy programmes for primary learners and parents (Vasantha et al., 2025; Shanthi et al., 2025).

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