

Adolescents: Digital Solutions to Co-Occurring Mental Health and Substance Use Disorders

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ABSTRACT

Co-occurring disorders (CODs) refer to the simultaneous presence of a mental health disorder and a substance use disorder, a condition increasingly observed among adolescents. This developmental period involves rapid psychological and social changes, during which experimentation with substances and the onset of psychiatric symptoms often overlap. Depression frequently coexists with alcohol or cannabis use, while ADHD is linked to early substance involvement. Risk factors include genetic vulnerability, adverse childhood experiences, family dysfunction, and peer influence. Adolescents with CODs commonly exhibit overlapping emotional and behavioural symptoms such as irritability, impulsivity, anxiety, or self-harm which obscure diagnosis and delay intervention. These disorders significantly impair functioning, contributing to school failure, delinquency, homelessness, and chronic relapse, often compounded by stigma and limited access to care. Digital innovations have emerged as promising solutions to these challenges. Tools such as mobile applications, teletherapy, AI-powered chatbots, wearable technologies, and online peer networks provide accessible, confidential, and youth-friendly platforms for prevention and treatment. These technologies enable early detection, continuous monitoring, and personalized interventions that align with adolescents' digital fluency. In Nigeria, global platforms like Headspace and indigenous services such as Nguvu Health and Blueroomcare are expanding access to culturally relevant mental health support. Despite their advantages accessibility, privacy, scalability, and engagement, digital approaches face barriers such as limited internet access, privacy concerns, and insufficient regulation. Integrating these innovations within traditional healthcare frameworks offers a transformative opportunity to enhance early intervention, reduce stigma, and strengthen resilience among adolescents with co-occurring mental health and substance use disorders.

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Keywords: Adolescents, Digital Solutions, Mental Health, Substance Use Disorders

INTRODUCTION

Co-occurring disorders (CODs) refer to the simultaneous presence of at least one diagnosable mental health disorder (e.g., depression, anxiety, bipolar disorder, ADHD, PTSD) and one substance use disorder (e.g., alcohol, cannabis, opioids, stimulants) (NIDA, 2020). Among adolescents, these disorders present complex, overlapping symptoms that complicate early detection and treatment (WHO, 2021). Adolescence is a period of rapid physical, emotional, and social change during which experimentation with substances and onset of psychiatric symptoms commonly occur, each often exacerbating the other (SAMHSA, 2022).

High rates of co-occurrence are reported globally; nearly half of adolescents with a substance use disorder also meet criteria for a mental health disorder (WHO, 2021). Depression is often linked with alcohol or cannabis use, while ADHD increases vulnerability to early substance use (SAMHSA, 2022). Cannabis and alcohol are the most commonly misused or abused substances in this population (NIDA, 2020).

Risk Factors

Biological, psychological, and social factors interact in the development of CODs. Genetic vulnerability, abnormal brain function in emotion and impulse control, and family history of mental illness or addiction increase risk (NIDA, 2020; SAMHSA, 2022). Adverse childhood experiences such as abuse, neglect, or exposure to violence are strong predictors (WHO, 2021). Peer pressure, drug availability, poverty, and family dysfunction further contribute. Adolescent brain immaturity heightens susceptibility to both substance effects and psychiatric symptoms (NIDA, 2020).

Clinical Presentation

Adolescents with CODs often exhibit overlapping emotional, behavioral, and cognitive disturbances that obscure diagnosis and delay intervention. Depression manifests as sadness, hopelessness, irritability, and withdrawal; anxiety involves excessive worry, fear, or panic attacks (WHO, 2021). PTSD may follow trauma exposure, causing intrusive memories, avoidance, and hyperarousal. ADHD presents with inattention, hyperactivity, and impulsivity, often leading to substance use for self-medication (SAMHSA, 2022). Conduct Disorder and Oppositional Defiant Disorder involve persistent defiance, aggression, or rule violations that strain family and school relationships (WHO, 2021). Suicidality and self-harm are common, while

psychotic symptoms may appear in severe or substance-induced cases (NIDA, 2020).

Citation: Adayonfo E, Meniru A, Obah C (2026). Adolescents: Digital Solutions to Co-Occurring Mental Health and Substance Use Disorders. *Nig J Med Dent Educ*; 8(2):154-159.

Consequences

CODs significantly worsen prognosis, leading to chronic symptoms, frequent relapse, and poor treatment response (NIDA, 2020). The interaction between psychiatric instability and substance use accelerates addiction progression and impairs emotional regulation (SAMHSA, 2022). Social outcomes include academic failure, truancy, strained family ties, delinquency, and homelessness (WHO, 2021). Physical health deteriorates due to accidents, infections, poor nutrition, and risky behaviors. Involvement with the justice system is common, often perpetuating a cycle of relapse and marginalization due to inadequate access to integrated care (SAMHSA, 2022).

The Need for Digital Solutions in Addressing Co-Occurring Disorders Among Adolescents

In recent years, **digital platforms** have emerged as transformative tools in the prevention, assessment, and treatment of co-occurring disorders (CODs) among adolescents. Given the barriers many young people face in accessing conventional mental health and substance use services such as stigma, limited availability of adolescent-focused programs, and geographic or financial constraints, digital solutions offer an accessible, scalable, and youth-friendly alternative.

One of the most significant advantages of digital platforms is their **ubiquitous accessibility**. These tools can be accessed at any time and from virtually anywhere, providing continuous support to adolescents who may not have consistent access to traditional, in-person services (Fitzpatrick et al., 2017). This 24-hour availability is particularly valuable in low-resource settings and rural areas, where mental health infrastructure remains limited.

Moreover, **stigma** continues to deter many adolescents from seeking professional help. Digital solutions address this challenge by offering **private and confidential modes of engagement**, allowing users to interact with interventions without fear of judgment or exposure (Headspace, 2003). Anonymity and self-directed participation can increase willingness to seek help, especially among youth who might otherwise remain disengaged from formal care systems.

Importantly, adolescents are **digital natives**, comfortable with technology and naturally drawn to **interactive, gamified platforms** (Digital Therapeutics Alliance, 2019). This familiarity enhances engagement and adherence, as digital interventions can incorporate games, challenges, and feedback systems that make therapeutic content both appealing and effective. Such design features can sustain motivation and promote consistent participation, which are often challenges in traditional care.

Digital interventions also offer remarkable **scalability and cost-effectiveness**. Once developed, digital tools can be widely disseminated to large populations at minimal additional cost, enabling broad public health impact (WHO, 2021). This scalability is particularly beneficial for countries with limited mental health professionals or constrained healthcare budgets, as it allows evidence-based interventions to reach underserved adolescents.

Beyond accessibility and scale, digital platforms are increasingly capable of **early detection** and **personalized intervention**. Through regular user input, digital systems can identify patterns of risky behavior, mood fluctuations, or symptom escalation (Knight et al., 2002). Advances in **artificial intelligence (AI)** and machine learning allow these technologies to adapt dynamically, tailoring interventions to individual needs and preferences (Fitzpatrick et al., 2017). This level of customization enhances treatment precision and responsiveness.

Another vital component of many digital platforms is the integration of **peer support networks**, which foster connectedness and community among adolescents facing similar challenges. Such peer-based interactions help **reduce isolation**, enhance **resilience**, and reinforce positive coping strategies (Adewusi, 2023). For many youths, sharing experiences with peers who understand their struggles provides emotional validation and strengthens engagement with recovery-oriented activities.

In sum, digital platforms represent a promising frontier in adolescent mental health and substance use care. By combining accessibility, confidentiality, engagement, scalability, early detection, personalization, and peer connection, they address many of the barriers that have historically limited adolescent participation in traditional services. As digital technologies continue to evolve, their thoughtful integration into prevention and treatment frameworks could revolutionize the

landscape of care for co-occurring disorders among young people.

Types of Digital Solutions

The rapid expansion of digital health technologies has diversified the ways in which prevention, assessment, and treatment of co-occurring disorders (CODs) can be delivered to adolescents. These innovations harness the familiarity of youth with technology while addressing gaps in access, stigma reduction, and continuity of care. The following modalities exemplify key technological advances currently shaping adolescent mental health and substance use intervention frameworks.

Mobile Applications have become one of the most widely utilized digital tools in adolescent mental health promotion and substance use management. Platforms such as *Headspace* and other evidence-based apps developed in partnership with the **Digital Therapeutics Alliance (2019)** provide guided meditation, mood tracking, cognitive-behavioral exercises, and coping skills training. These tools are designed to foster self-awareness, emotional regulation, and stress management in a flexible, user-centered format. Their portability and on-demand accessibility make them particularly appealing to adolescents seeking immediate support without formal clinical engagement.

Teletherapy and Telepsychiatry represent another significant advancement, extending mental health and addiction services to adolescents through secure video or phone consultations (Adewusi, 2023). These modalities bridge geographic and logistical barriers, allowing young people in underserved or rural areas to access qualified professionals. They also promote continuity of care by enabling follow-up sessions, medication management, and crisis intervention in real time. The interactive nature of telehealth fosters therapeutic alliance while maintaining privacy and convenience.

Online Peer Support Communities provide safe digital spaces where adolescents can share experiences, seek encouragement, and receive mutual support (WHO, 2021). Moderated by trained facilitators or peers with lived experience, these communities reduce isolation and foster a sense of belonging which is a key protective factors against relapse and psychological distress. Peer-led support complements professional treatment by normalizing recovery narratives and empowering adolescents to take ownership of their well-being.

Serious Games and Gamified Tools have emerged as innovative ways to engage adolescents in

therapeutic processes. These interactive platforms use elements of play such as rewards, challenges, and storytelling to teach coping skills, improve emotional literacy, and encourage positive behavioral change (Digital Therapeutics Alliance, 2019). Gamified interventions align with adolescents' natural affinity for technology and play, transforming learning and therapy into immersive, motivating experiences that enhance adherence to treatment.

AI-Powered Chatbots are increasingly being integrated into digital health ecosystems as scalable, responsive, and interactive supports. Leveraging artificial intelligence, these chatbots can provide real-time psychoeducation, symptom monitoring, and coping guidance while maintaining user confidentiality (Fitzpatrick et al., 2017). They can screen for risk indicators such as mood instability or substance use patterns, offering timely prompts for self-reflection or referral to professional help when necessary. Their 24/7 availability makes them valuable companions in early intervention and ongoing care.

Wearable Technologies, including smartwatches and biometric sensors, have also gained prominence as tools for continuous monitoring of physiological and behavioral indicators (WHO, 2021). These devices can track sleep patterns, heart rate variability, physical activity, and stress levels; data that can inform personalized interventions and support early identification of relapse or emotional dysregulation. Integration with mobile apps or digital dashboards allows for data-driven feedback to users and clinicians, fostering proactive self-management. Finally, **Digital Psychoeducation Platforms** offer structured online learning environments that provide adolescents, families, and educators with evidence-based information about mental health, substance use, and co-occurring disorders (SAMHSA, 2022). These platforms demystify mental illness, reduce stigma, and enhance health literacy. By increasing awareness and equipping adolescents with accurate knowledge, they empower informed decision-making and promote early help-seeking behavior. In summary, the expanding ecosystem of digital modalities, including mobile apps, telehealth, peer networks, gamified interventions, AI systems, wearables, and online educational tools has transformed the landscape of adolescent mental health and substance use care. When ethically implemented and integrated into broader service frameworks, these technologies offer scalable, engaging, and personalized solutions to the complex

challenges posed by co-occurring disorders among young people.

What is Available in Nigeria

In Nigeria and other low- and middle-income countries, the integration of digital mental health solutions represents a promising frontier for bridging the longstanding gap between mental health needs and service availability. The scarcity of trained professionals, limited infrastructure, and pervasive stigma surrounding mental illness have made it difficult for many adolescents to access timely, affordable, and youth-friendly care. Digital platforms are beginning to transform this landscape by providing accessible, confidential, and culturally relevant mental health resources.

One of the most prominent global digital tools, **Headspace**, is now **available on the App Store in Nigeria**, providing users with guided meditation, mindfulness training, and stress reduction exercises (Headspace, 2023). Its accessibility on mobile devices allows Nigerian adolescents to engage in evidence-based mental wellness practices at their convenience, without the logistical and social barriers that often accompany in-person therapy. The app's emphasis on self-regulation and mindfulness aligns with preventive and resilience-building strategies that support adolescent emotional health.

In addition to global platforms, **several Nigerian-based digital health companies** have emerged to provide contextually tailored online counseling and therapy services. Notable among these are **Nguvu Health, MyTherapist, and Blueroomcare**, which offer secure, user-friendly interfaces for connecting clients with licensed therapists and psychologists (Adewusi, 2023). These platforms deliver therapy through text, voice, or video sessions, enhancing access for adolescents who might otherwise face stigma, geographical barriers, or financial constraints in seeking traditional care. By leveraging local expertise and culturally sensitive approaches, they contribute to destigmatizing mental health care and normalizing help-seeking behaviors among Nigerian youth.

Collectively, these innovations demonstrate the growing relevance of **digital mental health ecosystems** within Nigeria's healthcare landscape. By expanding accessibility, offering confidentiality, and fostering cultural adaptability, such platforms complement existing health services and align with global best practices for adolescent mental health and substance use care. The emergence of both

international and indigenous digital solutions signals an encouraging shift toward more inclusive, technology-driven models of care for young people with mental health and co-occurring disorders.

Benefits of Digital Solutions

Digital technologies offer multiple advantages in the prevention, early detection, and treatment of co-occurring disorders (CODs) among adolescents. Their integration into mental health and substance use care systems enhances accessibility, engagement, personalization, and cost-efficiency, while overcoming many of the barriers associated with traditional service delivery.

One key advantage is **early identification of symptoms**, made possible through routine self-assessment tools, digital screening questionnaires, and interactive monitoring systems (Knight et al., 2002). These platforms can detect early signs of emotional distress, substance use, or behavioral changes before symptoms escalate into more severe conditions. Such early identification allows for prompt intervention and better prognostic outcomes.

Equally important is the **real-time monitoring of risk behaviors**, which enables continuous tracking of users' mood states, activity patterns, and coping behaviors (Fitzpatrick et al., 2017). Mobile apps and wearable technologies can provide immediate feedback or alert clinicians when concerning trends emerge, facilitating timely support and crisis prevention. For adolescents whose behavioral fluctuations may be rapid and unpredictable such monitoring is particularly valuable.

Digital systems also allow for **tailored interventions using data analytics** and machine learning algorithms (Digital Therapeutics Alliance, 2019). By analyzing user input, engagement patterns, and behavioral data, these systems can personalize therapeutic content, reminders, and motivational feedback. This individualized approach aligns with adolescents' preference for autonomy and interactive learning, increasing the relevance and effectiveness of interventions.

Another critical benefit is the **reduction in treatment dropout**. Many adolescents disengage from conventional therapy due to stigma, scheduling challenges, or perceived lack of connection with providers. Digital interventions, by contrast, offer flexible, user-driven engagement that fits into adolescents' lifestyles, thereby enhancing retention and long-term adherence (WHO, 2021).

The **enhanced anonymity and privacy** provided by digital platforms further encourage participation (Headspace, 2023). Adolescents often fear being judged or stigmatized when seeking help for mental health or substance use issues. Digital spaces allow them to explore support options and express distress in a confidential environment, fostering openness and self-reflection.

In resource-limited settings, digital technologies significantly **improve access to care in underserved areas** (Adewusi, 2023). Mobile connectivity and telehealth systems bridge the gap between adolescents and qualified mental health professionals, overcoming barriers related to distance, shortage of specialists, and limited infrastructure. This democratization of care is especially vital in low- and middle-income countries. Many digital interventions also promote **family and peer involvement**, facilitating collaborative care and strengthening social support networks (SAMHSA, 2022). Family engagement improves monitoring, adherence, and understanding of the adolescent's condition, while peer support enhances motivation, belonging, and resilience. Integrating these social dimensions into digital care models amplifies their therapeutic impact.

Finally, digital health solutions demonstrate substantial **cost-effectiveness and scalability** (WHO, 2021). Once developed, platforms can be deployed widely at minimal marginal cost, reaching large populations of adolescents across diverse geographic and socioeconomic contexts. This scalability supports public health goals by extending evidence-based interventions beyond traditional clinical settings.

In summary, digital approaches provide a powerful complement to traditional models of adolescent mental health and substance use care. Through early detection, continuous monitoring, personalization, privacy, social inclusion, and scalability, they offer an innovative pathway toward more accessible, efficient, and effective management of co-occurring disorders among young people.

Challenges

Despite their promise, digital interventions for adolescent mental health and substance use disorders face several challenges that limit their reach, reliability, and impact.

A major concern is the **unequal access to devices and internet connectivity**, which reinforces existing health inequities (WHO, 2021). In many low- and middle-income countries, including Nigeria, limited

broadband coverage, high data costs, and inadequate access to smartphones or computers prevent many adolescents especially those from rural or low-income backgrounds from benefiting fully from digital health innovations. This “digital divide” perpetuates disparities in service delivery and must be explicitly addressed in implementation plans.

Another significant limitation involves **privacy and data security concerns** (Fitzpatrick et al., 2017). Adolescents may be reluctant to engage with digital mental health tools if they fear their sensitive information could be accessed, misused, or disclosed without consent. Ensuring robust encryption, transparent data policies, and compliance with ethical and legal standards is therefore essential to building trust and safeguarding users.

The **lack of evidence-based validation for some apps** is also a growing issue (Digital Therapeutics Alliance, 2019). While thousands of mental health-related applications are available commercially, many lack scientific grounding, regulatory oversight, or independent evaluation of their efficacy. This variability in quality can lead to misinformation, poor outcomes, or even harm if users rely on unverified tools in lieu of professional treatment.

Moreover, there is the risk of **over-reliance on digital tools without professional care**, where adolescents may substitute self-guided apps for the comprehensive assessment and therapy that only trained clinicians can provide (SAMHSA, 2022). Such over-dependence can delay necessary clinical intervention, particularly in severe cases that require medication, psychotherapy, or crisis management. Thus, digital interventions should complement not replace traditional mental health services.

CONCLUSION

Adolescents with co-occurring mental health and substance use disorders face complex challenges that demand innovative, accessible, and effective responses. Traditional care remains vital but limited by stigma, scarcity of resources, and systemic fragmentation (WHO, 2021). Digital solutions, ranging from mobile apps and teletherapy to AI-powered chatbots and wearable technologies, offer transformative opportunities to bridge gaps. They enhance early detection, real-time monitoring, tailored interventions, and engagement in ways that

resonate with digital-native adolescents (Fitzpatrick et al., 2017; Headspace, 2003). Successful implementation requires cultural sensitivity, integration with face-to-face care, strong privacy safeguards, and rigorous quality control (Digital Therapeutics Alliance, 2019). By combining evidence-based practice with digital innovation, access can be expanded, outcomes improved, and adolescents empowered toward recovery and resilience (SAMHSA, 2022).

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