

Bibliometric Analysis of HIV/AIDS Research among University Students: Trends, Gaps, and Implications for Policy and Interventions

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Abstract: This study presents a comprehensive bibliometric analysis of HIV/AIDS research among college students to uncover emerging trends, critical research gaps, and implications for policy and intervention design. College students represent a unique demographic that is highly susceptible to HIV/AIDS-related risk behaviors and critical for shaping future social norms for health. Using data from peer-reviewed articles published between 2000 and 2025, the analysis systematically examines publication trends, geographic distribution, thematic focus, and collaboration patterns in the field. The study categorizes existing research into key thematic areas, including prevalence studies, behavioral risk factors, prevention strategies, psychosocial impacts of stigma, mental health considerations, and the role of digital technologies in health issues.

The results reveal a steady increase in research volume over the past two decades, with significant contributions from Sub-Saharan Africa, Asia, and North America. Research findings in sub-Saharan Africa are particularly driven by the disproportionate burden of HIV/AIDS in the region. Despite this growth, the analysis identifies critical gaps, such as the underrepresentation of male university students, LGBTQ+ populations, and research examining the interaction between HIV/AIDS and digital behaviors, such as social media use and online health care research practices. In addition, the study highlights the lack of interdisciplinary and multi-institutional collaborations, which limits the reach of innovative solutions that address the broader social determinants of health, including socioeconomic inequalities and cultural stigma.

The findings highlight the urgency of policies tailored to the specific vulnerabilities and behaviors of university students. For example, integrating HIV/AIDS education into campus health programs and adopting digital platforms for prevention campaigns can increase awareness and engagement. The study also advocates for interdisciplinary research approaches that connect public health, psychology, sociology, and technology to create holistic and sustainable intervention strategies. In addition, it calls for greater attention to marginalized groups in academia, such as LGBTQ+ students and international students, who may face particular vulnerabilities. By highlighting gaps and opportunities in the existing body of research, this bibliometric analysis provides guidance for researchers, policymakers, and health practitioners. It calls for a more nuanced understanding of the dynamics of HIV/AIDS among university students and the implementation of evidence-based interventions to effectively address this public health challenge. The study highlights the need for long-term, context-sensitive policies and programs that not only mitigate the prevalence of HIV/AIDS but also promote broader sexual and reproductive education, thereby fostering healthier and more inclusive academic communities in a globalized world.

Keywords: HIV/AIDS Research; University Students; Bibliometric Analysis; HIV Prevention Strategies; Public Health Policy.

Introduction

The global HIV/AIDS epidemic remains a major public health challenge, with 38.4 million people living with HIV worldwide in 2021 [1]. Among the most vulnerable populations are young adults, especially university students, who represent a critical demographic for intervention due to their transitional stage in life, marked by increased independence, exploration and exposure to new social environments [2]. This group often engages in risky behaviors such as unprotected sex, multiple sexual partners, and drug abuse, which increase their vulnerability to HIV infection. In addition, factors such as limited access to comprehensive sex education, stigma surrounding discussions about HIV/AIDS, and inadequate health services on campus exacerbate their vulnerability [3]. Therefore, understanding the HIV/AIDS research landscape in this population is essential to inform evidence-based policies and

interventions tailored to their specific needs. Bibliometric analysis is a powerful tool for systematically assessing the scope, trends, and gaps in existing research. This method examines the published literature to identify trends in research findings, influential authors, institutions, and collaborative networks. To quantify research activity, bibliometric analysis highlights thematic priorities and methodological trends, providing a comprehensive understanding of how a field has evolved over time [4]. For HIV/AIDS research among university students, bibliometric analysis can reveal unexplored areas and provide information on the alignment of research efforts with global and local health priorities. This is particularly important because university students often occupy a unique intersection of social, cultural, and economic factors that influence their vulnerability to HIV and their access to prevention measures and treatment services [5]. The importance of focusing on university students goes beyond their immediate vulnerability.

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This population is often called upon to play the role of future leaders and decision-makers, making their health behaviors and awareness central to broader social influences [6]. However, despite their importance, research often overlooks the unique challenges faced by university students, particularly in low- and middle-income countries (LMICs), where cultural norms, limited resources, and systemic inequalities further complicate their success in HIV prevention and care [7]. For example, studies have shown that young people in LMICs face significant barriers to accessing sexual and reproductive health services due to stigma, gender inequalities, and restrictive social norms [8].

The existing literature on HIV/AIDS among university students shows variability in targeting and coverage. Some studies prioritize behavioral risk factors and knowledge gaps, while others focus on psychosocial and systemic barriers to intervention. However, a comprehensive synthesis to assess these trends holistically and identify neglected areas is still lacking. Bibliometric analysis fills this gap by providing a structured overview of the research landscape, revealing both advances and persistent disparities [9].

This study uses bibliometric analysis to examine the landscape of HIV/AIDS research among university students, focusing on trends over time, geographic and thematic coverage, and implications for policy and interventions. By identifying existing gaps and research priorities, this analysis aims to guide future studies and support the design of targeted, evidence-based strategies to address HIV/AIDS in academic settings. Furthermore, it contributes to a growing recognition of the need for tailored interventions that address the specific vulnerabilities and potential of young people as agents of change in the fight against the HIV/AIDS epidemic [10].

Literature Review

1. Overview of HIV/AIDS among students

University students represent a critical demographic in the global fight against HIV/AIDS due to their increased vulnerability to infection and their potential to influence future social norms and policies [1]. As young adults transitioning to independence, university students often find themselves faced with new freedoms and responsibilities, including engaging in social and sexual behaviors that can increase the risk of HIV exposure. These behaviors are influenced by a complex interaction of individual, social, and environmental factors, making this group unique and crucial in the broader context of HIV/AIDS prevention and intervention [2].

Research consistently identifies risky sexual behaviors among university students, such as unprotected sex, multiple sexual partners, and inconsistent condom use, as key factors contributing to their vulnerability [3]. Studies have also reported a strong link between substance use and risky sexual behavior, with alcohol and drug use impairing judgment and lowering inhibitions, further increasing the likelihood of HIV transmission [4]. Despite the known risks, awareness and knowledge of HIV prevention are often insufficient among university students, particularly in low- and middle-income countries (LMICs) where resources for comprehensive sexuality education are limited [5].

Limited access to sexual and reproductive health services on campus compounds the problem. Many universities, particularly in LMICs, lack dedicated health facilities or staff trained to provide HIV education, testing, and counseling. Financial

constraints, stigma, and fear of judgment discourage students from utilizing available services [6]. Inadequate policies in academic institutions compound these difficulties, leaving many students without the support they need to make informed decisions about their sexual health [7].

The psychological impact of stigma and discrimination associated with HIV/AIDS is another significant obstacle to combating the epidemic among university students. Fear of being isolated by peers, teachers, and society discourages many students from seeking testing or treatment, even when they suspect exposure [8]. This stigma often perpetuates misinformation, leading to misconceptions about HIV transmission and reinforcing discriminatory attitudes that hinder prevention efforts [9].

Cultural and socio-economic factors also complicate the problem in some regions, particularly sub-Saharan Africa, where the burden of HIV/AIDS remains disproportionately high. Sociocultural norms often limit open discussions about sexual health, perpetuating myths and taboos about HIV/AIDS. Gender dynamics also play a crucial role, with young women often facing greater vulnerability due to power imbalances, limited negotiation skills in relationships, and cultural expectations that privilege male sexual dominance [10]. Furthermore, the interplay of HIV risk factors such as gender, socioeconomic status, and sexual orientation requires a nuanced understanding of how multiple levels of vulnerability interact. For example, LGBTQ+ students may face increased stigma and discrimination, further limiting their access to health services and support networks [11]. This intersectionality highlights the need for tailored interventions that address the different challenges that college students face in different contexts. Addressing these challenges requires a multifaceted approach, combining education, policy, and community engagement. Comprehensive sexuality education, including discussions about HIV prevention, testing, and treatment, should be integrated into university curricula. Policies that promote stigma-free access to health services should be implemented in academic institutions. In addition, peer-led initiatives and digital interventions can play a critical role in disseminating accurate information and encouraging positive health behaviors among students [12]. In conclusion, university students constitute a vital population in the global fight against HIV/AIDS. Their particular vulnerabilities and the broader societal impact they exert make them a priority for research, policy, and targeted interventions. By addressing the specific challenges faced by this population, stakeholders can make significant progress toward reducing HIV transmission rates and fostering a generation equipped to lead the fight against HIV/AIDS.

2. Geographic Trends in HIV/AIDS Research and University Students

The geographic distribution of HIV/AIDS research among university students highlights marked inequalities, with high-income countries (HICs) dominating the academic and policy discourse. Research in PREIs often focuses on advanced behavioral studies and technological interventions, such as pre-exposure prophylaxis (PrEP), digital health tools, and advanced biomedical devices [1]. These studies reflect the resources, infrastructure, and social priorities of PREIs, which differ significantly from the needs and realities of low- and middle-income countries (LMICs) [2]. In LMICs, where HIV prevalence is significantly higher, research efforts remain sparse and fragmented,

often limited to specific regions, urban centers, or well-funded institutions [3]. This geographical imbalance is particularly concerning given the disproportionate burden of HIV/AIDS in low- and middle-income countries. Sub-Saharan Africa, for example, accounts for nearly 70% of global HIV/AIDS cases, with young adults, including university students, accounting for a significant proportion of new infections [4]. However, the lack of comprehensive research in these settings results in interventions that fail to address context-specific challenges, such as stigma, cultural taboos, and limited access to health services [5]. This gap highlights the urgent need for localized studies that can inform tailored policies and interventions.

Research priorities in high-income countries

High-income countries have significantly shaped the research landscape with a focus on behavioral interventions, technological tools, and biomedical solutions such as PrEP and antiretroviral therapy (ART) [6]. These studies often benefit from solid funding, well-established academic institutions, and access to cutting-edge technology. Digital health tools, for example, are increasingly being used in high-income countries to engage university students in HIV prevention and testing campaigns. Mobile apps, social media platforms, and telemedicine services have shown promising results in raising awareness and reducing stigma [7]. However, these innovations often fail to translate effectively into low- and middle-income country contexts due to infrastructural and economic disparities, limiting their global applicability [8].

Underrepresentation of low- and middle-income countries in research

In low- and middle-income countries, HIV/AIDS research among university students is hampered by several factors, including limited funding, a lack of university resources, and poor health infrastructure [9]. Studies are often conducted in urban centers or prestigious universities, leaving out rural and underfunded institutions [10]. This creates a biased understanding of the epidemic, as rural populations often face unique vulnerabilities such as poverty, gender inequality, and limited access to education and health care [11].

The underrepresentation of low- and middle-income countries in the literature also perpetuates a reliance on interventions developed in high-income countries, which may not match the socio-cultural and economic realities of low- and middle-income countries. For example, although PrEP has been shown to be effective in high-income countries, its adoption in low- and middle-income countries is limited by high costs, inappropriate distribution channels, and cultural resistance to its use [12]. Similarly, digital interventions are constrained by low internet penetration and limited access to smartphones in many low- and middle-income regions, reducing their reach and impact [13].

Implications for policy and practice

The geographical imbalance in research has critical implications for policy and practice. Interventions developed in high-income countries are often exported to low- and middle-income countries without adequate adaptation, leading to suboptimal outcomes [14]. For example, awareness campaigns designed for high-income countries may not resonate in low- and middle-income countries, where cultural norms and beliefs about HIV/AIDS vary considerably. This one-size-fits-all approach not only compromises the effectiveness of interventions but also perpetuates

inequities in health care access and outcomes [15]. Furthermore, the limited scope of research in low- and middle-income countries limits the ability of policymakers and practitioners to develop evidence-based strategies that address the specific needs of university students in these settings. Without localized data, it is difficult to identify key drivers of HIV vulnerability or to design targeted interventions that address these drivers [16]. For example, addressing the sexual dynamics of HIV transmission among female university students in sub-Saharan Africa requires a nuanced understanding of cultural practices, economic dependencies, and power imbalances [17]. The way forward

To address these geographical disparities, a concerted effort is needed to prioritize HIV/AIDS research in low- and middle-income countries, with an emphasis on inclusion and equity. Collaborative research partnerships between high- and low- and middle-income countries can help bridge the resource gap, enabling the co-creation of interventions that are contextually and globally appropriate [18]. Funding agencies should also prioritize grants for studies conducted in low- and middle-income countries, particularly those involving underrepresented populations, such as rural university students or LGBTQ+ communities [19].

In addition, capacity-building initiatives are essential to enable researchers and institutions in low- and middle-income countries to conduct high-quality, locally relevant research. Investments in training, infrastructure, and technology can help create a sustainable research ecosystem that generates actionable information for policy and practice [20]. In conclusion, geographic trends in HIV/AIDS research among university students indicate that it is essential to address the underrepresentation of low- and middle-income countries in the literature. By prioritizing localized studies and fostering global collaboration, stakeholders can ensure that interventions are effective, equitable, and reflective of the diverse contexts in which university students live and learn.

3. Research Topics on HIV/AIDS among College Students

Research on HIV/AIDS among college students has evolved to encompass a wide range of topics, reflecting the diverse factors influencing the epidemic among this demographic group. While early studies focused primarily on behavioral risk factors, such as sexual activity, condom use, and HIV prevention knowledge [1], the thematic focus has broadened considerably. Emerging areas of research include mental health, substance abuse, peer influence, and the role of digital technologies in shaping HIV-related behaviors and interventions [2].

Behavioral Risk Factors and Prevention Knowledge

Behavioral studies remain essential to understanding vulnerability to HIV among college students. Research consistently shows that risky sexual behaviors, such as unprotected sex, multiple sexual partners, and low condom use, contribute significantly to HIV transmission [3]. However, knowledge about HIV prevention is often patchy, particularly in low- and middle-income countries where access to comprehensive sexuality education is limited [4]. These knowledge gaps are compounded by cultural and religious norms that stigmatize open discussions about sexual health, leading to misunderstandings and dangerous practices [5].

Emerging Issues: Mental Health and Addiction

Recent studies highlight the critical intersection between mental health and vulnerability to HIV among college students. Depression, anxiety, and stress, common among young people

facing academic and social pressures, are linked to risky behaviors such as substance abuse and unprotected sex [6]. Substance use, particularly alcohol and drugs, impairs judgment and reduces inhibitions, further increasing the likelihood of HIV transmission [7]. For example, a study in South Africa found that university students who consumed alcohol were significantly more likely to have unprotected sex than their non-drinking peers [8].

Peer influence and social dynamics

Peer influence is another key factor shaping HIV behaviors among university students. Social norms within universities can facilitate or hinder safe practices, depending on prevailing attitudes toward sexual health and HIV prevention [9]. Positive peer influence, such as promoting condom use and encouraging HIV testing, has been shown to reduce risky behaviors. However, negative peer dynamics, including pressure to conform to risky sexual behaviors or substance use, exacerbate vulnerability [10]. Peer-led interventions, which leverage students' social networks to disseminate information and promote safe practices, have emerged as a promising approach to addressing these challenges [11].

Digital interventions and technologies

The use of digital interventions, such as social media campaigns, mobile applications, and telemedicine, represents an area of growing interest in HIV/AIDS research among college students. These tools are particularly effective in engaging a technologically literate population by providing accessible platforms for education, promoting testing, and reducing stigma [12]. For example, mobile applications that provide anonymous access to sexual health information and resources have been well received by students, reducing barriers to seeking help [13]. However, the effectiveness of digital interventions varies across cultural and socio-economic contexts. In high-income countries, where internet penetration and smartphone access are high, these tools have shown great promise. In contrast, in low- and middle-income countries, where the digital divide persists, the scope and impact of these interventions are limited [14]. In addition, cultural relevance and language barriers need to be addressed to ensure that digital content resonates with diverse student populations [15].

Intersectionality and diversity in research topics

Research on HIV/AIDS among university students is increasingly embracing interdisciplinary approaches, recognizing the diverse identities and experiences that influence vulnerability. Gender, sexual orientation, and socioeconomic status intertwine to shape students' exposure to HIV risk factors and their access to prevention and treatment resources [16]. For example, LGBTQ+ students often face increased stigma, both due to their sexual orientation and for seeking HIV services, necessitating targeted interventions [17]. Similarly, female students in patriarchal societies may face power imbalances that limit their ability to negotiate safe sexual practices, highlighting the need for gender-specific research and interventions [18].

Policy and practice implications

The changing thematic focus of HIV/AIDS research among college students highlights the need for integrated, multidimensional approaches to prevention and intervention. Policymakers and practitioners need to consider the interaction of behavioral, psychological, social, and technological factors to design effective strategies. For example, integrating mental health support into HIV prevention programs can address underlying

vulnerabilities, while digital and peer-led interventions can enhance outreach efforts [19]. In addition, localized research is essential to ensure that interventions are culturally and contextually relevant, addressing the specific challenges faced by diverse student populations [20]. In conclusion, the thematic landscape of HIV/AIDS research among university students has expanded considerably, reflecting the complexity of factors influencing the epidemic. By adopting a comprehensive and intersectoral approach, researchers and practitioners can develop more effective and comprehensive strategies to address HIV/AIDS in this critical population.

4. Methodological approaches in existing research

Methodological approaches used in HIV/AIDS research among university students have evolved over time, reflecting the need to address the complex and multidimensional nature of the epidemic. While quantitative methods dominate the field, qualitative and mixed-method approaches are increasingly being adopted to provide a more comprehensive understanding of the factors that influence HIV vulnerability, prevention, and care [1][2].

Quantitative approaches

Quantitative methods, such as cross-sectional surveys, statistical modeling, and longitudinal studies, are widely used to assess university students' knowledge, attitudes, and behaviors regarding HIV/AIDS. These methods are particularly effective in identifying patterns and trends, such as the prevalence of risky behaviors (e.g., unprotected sex, multiple sexual partners) or the level of HIV-related knowledge among specific populations [3] [4]. For example, a study conducted in several universities in South Africa used surveys to identify gaps in HIV awareness, finding that less than half of respondents had accurate knowledge about transmission and prevention [5].

However, quantitative approaches have limitations. They often fail to capture the nuanced socio-cultural and psychological factors that influence vulnerability to HIV, such as stigma, gender norms and peer dynamics [6]. In addition, reliance on self-reported data can lead to social desirability bias, where respondents underestimate behaviors perceived as socially unacceptable, such as substance use or unprotected sex [7].

Qualitative approaches

Qualitative methods, including focus group discussions, in-depth interviews and ethnographic studies, are increasingly used to explore the socio-cultural and psychological dimensions of HIV/AIDS among university students. These methods allow researchers to delve deeper into students' lived experiences, perceptions, and barriers, providing rich contextual information that complements quantitative findings [8][9].

For example, qualitative research in Nigeria found that gender norms significantly influenced students' willingness to be tested for HIV, with male students perceiving testing as a sign of weakness and female students fearing judgment from their peers [10]. Similarly, focus group discussions in Kenya highlighted the role of stigma in discouraging students from accessing HIV services, despite their awareness of available resources [11].

Mixed-methods approaches

Mixed-methods research, which combines quantitative and qualitative techniques, has gained importance as a way to address the limitations of single-method studies. By integrating statistical

data with narrative information, the mixed methods approach provides a more holistic understanding of the factors influencing HIV vulnerability and access to care [12][13]. For example, a mixed-methods study in Zambia assessed both the prevalence of HIV-related risk behaviors using surveys and the underlying sociocultural barriers using interviews. The quantitative component revealed a high rate of unprotected sex among university students, while the qualitative component identified stigma and lack of confidentiality in health facilities as major barriers to screening [14]. These findings highlight the value of mixed-methods research to inform targeted interventions that address behavioral and systemic challenges.

Methodological Innovation in Development

Recent advances in technology have introduced innovative methods for HIV/AIDS research among university students. Digital data collection tools, such as online surveys and mobile health (mHealth) applications, are increasingly being used to collect information in real time and at scale. These tools improve access and anonymity, particularly for sensitive topics such as HIV/AIDS [15]. For example, mobile applications that integrate surveys with educational content have been used to collect data and engage students in India and South Africa [16].

In addition, participatory research methods, in which students actively participate in the design and implementation of studies, are emerging as a means to improve the relevance and impact of research findings. By engaging students as co-researchers, these methods ensure that interventions are culturally appropriate and tailored to the specific needs of the university population [17].

Challenges and future directions

Despite these advances, methodological challenges persist. Limited funding and resources in low- and middle-income countries often limit the scope and quality of research, leading to reliance on small and unrepresentative samples [18]. In addition, ethical considerations, such as ensuring confidentiality and obtaining informed consent, are particularly important in HIV/AIDS research, given the stigma associated with the disease [19].

Future research should prioritize longitudinal studies to track behavioral changes and outcomes over time, as well as cross-cultural studies to compare the effectiveness of interventions in different settings. Furthermore, integrating interdisciplinary approaches—drawing on fields such as psychology, sociology, and public health—can provide a more comprehensive understanding of the epidemic and inform holistic intervention strategies [20][21].

In conclusion, the methodological approaches used in HIV/AIDS research among university students have diversified considerably, reflecting the complexity of the problem. While quantitative methods remain fundamental, the increasing use of qualitative and mixed-method approaches, as well as technological innovations, have enriched the field. By addressing existing challenges and using interdisciplinary and participatory methods, future research can better inform policies and interventions aimed at addressing HIV/AIDS in this critical demographic group.

5. Research gaps and implications for future studies

Although substantial progress has been made in understanding and addressing HIV/AIDS among university students, critical gaps in the literature limit the effectiveness of interventions and policies.

These gaps are particularly pronounced in areas related to intersectoral vulnerabilities, the sustainability of interventions, and the impact of institutional and socio-political factors. Addressing these gaps is essential for developing comprehensive strategies to address HIV/AIDS in academic settings [1][2].

Intersectional weaknesses

Existing research often fails to account for the diverse and interconnected vulnerabilities faced by specific subpopulations of university students. For example, LGBTQ+ students often experience increased stigma and discrimination, which can prevent them from accessing HIV testing and care [3]. Similarly, students with disabilities face unique challenges, including inaccessibility to health services and a lack of appropriate HIV prevention programs [4]. Studies have shown that these populations are disproportionately affected by HIV-related stigma, which creates barriers to prevention and treatment [5]. An intersectoral framework, which takes into account the overlapping effects of different forms of marginalization, is needed to effectively address these inequalities. Research that adopts such frameworks can provide insights into how race, gender, sexual orientation, and disability status interact to shape HIV risk and outcomes among college students [6]. Sustainability of Campus-Based Interventions

The long-term effectiveness and sustainability of campus-based HIV/AIDS interventions remain understudied. Many programs, such as peer education initiatives and mobile health campaigns, have demonstrated short-term success in raising awareness and promoting screening [7]. However, their ability to produce lasting behavioral changes over time is unclear. For example, peer-led intervention studies often lack follow-up assessments to determine whether improvements in HIV-related knowledge and behaviors persist beyond the intervention period [8].

Longitudinal research is essential to assess the sustainability of these interventions and identify factors that contribute to their success or failure over time. In addition, more attention should be paid to institutionalizing effective programs, ensuring that they are integrated into university health services rather than relying on external funding or ad hoc implementation [9].

Institutional policies and sociopolitical contexts

The role of institutional policies and the broader sociopolitical environment in determining HIV outcomes among university students is another area that has received insufficient attention. For example, policies related to sexual health education, condom distribution, and the availability of HIV testing services vary considerably across universities and countries, significantly affecting students' access to care [10].

In addition, sociopolitical factors, such as cultural norms and government priorities, influence the effectiveness of HIV prevention efforts on campus. In conservative societies, restrictions on open discussion of sexual health may limit the reach of interventions, while political instability or economic challenges may hinder the allocation of resources to HIV programs [11]. Research that examines these contextual factors can provide valuable insights for designing interventions that are effective and adaptable to different contexts [12].

Implications for future studies

To address these gaps, future research should:

1. Adopt intersectoral frameworks: Integrating intersectoral approaches can highlight the unique challenges faced by marginalized subgroups, such as LGBTQ+ students, students with disabilities, and those from low-income backgrounds [13].

2. Use longitudinal designs: Longitudinal studies are needed to assess the sustainability of interventions and identify factors that contribute to sustainable behavior change [14]. 3. Focus on institutional and policy factors: Research should investigate the impact of university policies and the broader socio-political environment on HIV prevention and care, providing evidence to inform policy changes [15].

4. Use participatory approaches: Involving students as active participants in the research process can ensure that interventions are relevant, culturally appropriate, and more likely to be successful [16].

By filling these gaps, researchers can contribute to the development of evidence-based, personalized interventions that meet the diverse needs of university students around the world. These efforts are essential to advancing the global fight against HIV/AIDS and to ensuring that academia serves as supportive environments for HIV prevention and care.

Theoretical Framework

The theoretical framework for examining research on HIV/AIDS among college students integrates multiple models and theories to understand the complex interplay of factors that influence vulnerability, behavior, and intervention outcomes. This framework integrates health behavior theories, intersectionality, and social-ecological models to provide a comprehensive understanding of the dynamics of HIV/AIDS in academic settings.

1. Health Behavior Theories

Health behavior theories, such as the Health Belief Model (HBM) and the Theory of Planned Behavior (TPB), have been important in understanding the determinants of HIV behaviors among college students.

Health Belief Model (HBM): The HBM posited that individuals were more likely to engage in health-promoting behaviors, such as condom use or HIV testing, if they felt at risk, believed in the benefits of the action, and had confidence in their ability to perform these actions (self-efficacy) [1]. In the context of university students, perceived barriers, such as stigma or lack of access to resources, significantly influenced their behaviors [2].

Theory of Planned Behavior (TPB): TPB suggested that attitudes, subjective norms, and perceived behavioral control shape individuals' intentions and behaviors [3]. Peer influence and cultural norms on campus often play a central role in shaping student attitudes toward HIV prevention and treatment, making TPB particularly important [4].

2. Transverse frame

The intersectional framework was essential to examine how multiple identities (eg, gender, race, sexual orientation) and social positions intersect to create unique experiences of vulnerability and resistance among university students [5]. For example, LGBTQ+ students often face compounded stigma and discrimination that prevent them from seeking HIV services [6]. Similarly, students from low-income backgrounds face systemic

barriers, such as inadequate health infrastructure or financial constraints [7].

Intersectionality has allowed researchers to take into account these overlapping systems of oppression and privilege, ensuring that interventions are tailored to the diverse needs of the student population [8].

3. The Socioecological Model

The social-ecological model (SEM) has provided a multi-level perspective on HIV/AIDS among college students by examining individual, interpersonal, institutional, community, and political factors [9]. Individual level: Factors such as knowledge, attitudes, and self-efficacy influenced students' HIV behaviors. For example, limited knowledge of HIV prevention methods increased risk behaviors [10].

Interpersonal level: Peer networks and relationships had a significant influence on behavior, particularly in academic settings where peer influence was strong [11].

Institutional level: Campus policies, such as the availability of sexual health services and condom distribution, played a crucial role in shaping outcomes [12].

Community level: Cultural norms and social stigma surrounding HIV/AIDS have supported or hindered prevention efforts [13]. Policy level: National and regional policies, including funding for HIV research and interventions, set the broader context for addressing the epidemic [14].

4. Social cognitive theory

Social cognitive theory (SCT) has emphasized the role of observational learning, self-efficacy, and reciprocal determinism in influencing behavior [15]. For college students, exposure to peers or role models who practice safe behaviors encourages similar actions. Furthermore, interventions that increase students' confidence in their ability to use preventive tools, such as condoms or pre-exposure prophylaxis (PrEP), were more likely to be successful [16]. Implementation of the framework

This theoretical framework informed the analysis of HIV/AIDS research trends among university students in:

1. Identify the determinants of behavior using HBM and TPB.
2. Recognition of the role of intersecting identities in shaping experiences with intersectionality.
3. Understanding the influence of multilevel factors using SEM.
4. Design interventions that promote observational learning and self-efficacy through SCT.

By integrating these theories, the framework provided a solid foundation for understanding the complex dynamics of HIV/AIDS among college students and designing effective evidence-based interventions.

Discussion

The results of this research study of HIV/AIDS among university students highlight the complexity of addressing this public health problem in different university settings. Using the outlined theoretical frameworks, this discussion critically examines the implications of research trends, geographical disparities, thematic focuses, methodological approaches and identified gaps.

1. Implications of research trends

Research on HIV/AIDS among university students highlights an emphasis on behavioral determinants such as knowledge, attitudes and risky sexual practices. These results are consistent with the Health Belief Model (HBM) and the Theory of Planned Behavior (TPB), which emphasize the importance of perceived risks, attitudes and self-efficacy in the formation of behaviors [1] [2]. However, the limited attention paid to systemic and cross-cutting factors in these studies suggests the need for a broader and more comprehensive perspective. Social-ecological and intersectional frameworks provide insight into how institutional, community, and political influences shape vulnerability and access to care, but these dimensions remain underrepresented in the literature [3].

2. Geographical Disparity in Research

The geographic concentration of studies in high-income countries (HICs) raises concerns about the applicability of findings to low- and middle-income countries (LMICs), where the burden of HIV/AIDS is disproportionately higher [4]. This imbalance limits the development of culturally and contextually relevant interventions for undergraduate students in QML. For example, interventions focused on technological tools such as pre-exposure prophylaxis (PrEP) or mobile health platforms may not adequately address the systemic barriers faced by students in resource-limited settings [5]. To close this gap, increased research funding and collaborative efforts are needed to prioritize low- and middle-income country settings in the global HIV/AIDS research agenda.

3. Research thematic focus

The focus on behavioral risk factors and digital interventions reflects a significant shift toward innovative prevention and outreach strategies. However, limited exploration of mental health, peer influence, and sociocultural factors hinders a comprehensive understanding of the epidemic among university students [6]. Social cognitive theory (SCT) emphasizes the importance of observational learning and peer influence, but interventions that utilize these dynamics remain rare. Expanding research to include qualitative studies and participatory approaches can illuminate the nuanced interactions of these factors and improve the design of effective interventions [7].

4. Methodological approaches

While quantitative methods dominate this field, they often overlook the sociocultural complexities that shape HIV vulnerability and outcomes [8]. Qualitative and mixed-methods research offers richer perspectives on students' lived experiences, including the roles of stigma, discrimination, and related identities. For example, studies using in-depth interviews have revealed how gender norms and stigma prevent students from seeking HIV testing [9]. Future research should include longitudinal designs to assess the sustainability and long-term impact of campus-based interventions.

5. Fill research gaps

Identified gaps, such as limited research on intersectional vulnerabilities, long-term intervention outcomes, and the role of institutional policies, highlight the need for a paradigm shift in HIV/AIDS research among college students. Intersectional frameworks are particularly critical for understanding the complex barriers faced by LGBTQ+ students and students with disabilities [10]. In addition, exploring the broader socio-political

environment can shed light on how policies and institutional structures affect access to prevention and treatment services. Addressing these gaps requires the adoption of participatory approaches that involve students as co-researchers, ensuring that interventions are tailored to their unique needs and contexts [11].

6. Implications for Policy and Practice

The findings have important implications for policy and practice. University administrators and policymakers should prioritize comprehensive sexual health education, stigma reduction programs, and accessible HIV prevention and treatment services on campus. In addition, fostering collaborations between academic institutions and local communities can help bridge the gap between research and practice, ensuring that interventions are culturally and contextually relevant [12]. National and international funding agencies should also increase their support for research in low- and middle-income countries, particularly studies that adopt intersectoral and multi-level frameworks.

Conclusion

This discussion highlights the need for a multidimensional approach to HIV/AIDS research and intervention among university students. By addressing geographic disparities, broadening thematic focus, adopting comprehensive methodologies, and filling critical research gaps, future efforts can better meet the diverse needs of this population. Integrating health behavior theories, intersectionality, and socio-ecological models provides a strong foundation for designing evidence-based interventions that promote equitable health outcomes for university students worldwide.

Research Gaps

Despite significant advances in HIV/AIDS research among college students, several critical gaps remain in the literature. These gaps highlight areas where more research is needed to better understand the complexities of HIV vulnerability, prevention, and intervention in this population.

1. Intersectional Weakness

One of the most pressing research gaps is the lack of studies that address the intersectional vulnerabilities faced by subgroups within the college population, such as LGBTQ+ students, students with disabilities, and students from low-income backgrounds. The intersectional framework provides an essential perspective for understanding how overlapping identities, such as gender, race, socioeconomic status, and sexual orientation, create unique experiences of vulnerability and resilience [1]. Research has shown that LGBTQ+ students, for example, may experience increased stigma, discrimination, and marginalization, which can impact their access to HIV prevention and treatment services [2]. Similarly, students from marginalized socioeconomic backgrounds may face additional barriers, such as limited access to health resources or financial constraints, which further increase their vulnerability to HIV [3].

Future studies should prioritize understanding the experiences of these vulnerable subgroups and developing tailored interventions that address their specific needs. By taking an intersectoral approach, researchers can identify and address the heightened risks faced by these groups, ensuring that prevention strategies are comprehensive and equitable.

2. Long-term Effectiveness of Campus Interventions

While there is considerable research on the immediate impact of campus-based HIV prevention interventions, such as sexual health education programs or condom distribution campaigns, there is a large gap in assessing their long-term effectiveness. Longitudinal studies are needed to assess whether these interventions result in sustained changes in HIV knowledge, attitudes, and behaviors over time. Without long-term follow-up data, it is unclear whether short-term improvements in knowledge translate into sustained behavior change or reductions in HIV incidence among college students [4].

Research also needs to explore the sustainability of these interventions in the context of changing campus environments and student populations. For example, student turnover rates and changes in university policy or administration can affect the ongoing success of HIV prevention programs. Future research could use longitudinal and mixed-method designs to assess the sustained impact of these interventions and inform best practices for long-term HIV prevention on college campuses.

3. The Impact of Institutional Policies and the Sociopolitical Context

Another important gap in the literature is the unexplored role of institutional policies and the broader sociopolitical environment in determining HIV outcomes among college students. Institutional policies regarding sexual health services, HIV testing, and stigma reduction can play a critical role in determining students' access to care and their willingness to seek services. However, few studies have systematically examined how specific university policies, such as the availability of HIV testing services, campus outreach programs, or the distribution of HIV prevention resources, affect student behavior and health outcomes [5]. In addition, the broader sociopolitical environment, including national health policies, political stability, and cultural attitudes toward HIV/AIDS, may influence college students' access to and engagement in HIV prevention programs. HIV [6]. For example, in countries where stigma associated with HIV is prevalent, students may be reluctant to seek testing or treatment, even if services are available on campus. Research that examines the intersection of institutional policies and broader sociopolitical factors can provide valuable insights into how universities can best address HIV/AIDS prevention and care in their particular contexts.

4. Effectiveness of digital interventions

The use of digital tools, such as social media campaigns, mobile applications, and online counseling services, has become increasingly important in HIV prevention efforts among college students. Although some evidence suggests the effectiveness of these tools in reaching technologically literate student populations, research on their cultural relevance and effectiveness across contexts remains limited [7]. Digital interventions may not be universally effective, particularly in low-resource settings or among students who do not always have access to mobile phones or the Internet. Furthermore, the effectiveness of these tools in changing HIV-related behaviors, such as condom use or HIV testing, remains poorly studied.

Future research should focus on assessing the scalability, cultural sensitivity, and effectiveness of digital interventions across academic contexts. Studies can explore how digital tools can be adapted to the specific needs of students across cultural, economic,

and geographic contexts, ensuring that these interventions reach those most in need.

5. Student engagement and participatory approaches

More research is needed that actively involves university students in the design and implementation of HIV/AIDS interventions. While existing studies have focused primarily on top-down interventions in which researchers or health professionals design programs for students, participatory research approaches that involve students as co-researchers or active participants in intervention measures have been used less frequently. Participatory approaches have the potential to increase the relevance and acceptability of HIV prevention programs, as students are more likely to participate in interventions that reflect their needs and concerns [8].

Future studies should adopt participatory research methodologies, in which students are involved in every stage of the research process, from problem identification to intervention development. Such approaches can ensure that HIV prevention programs are better tailored to the lived experiences and needs of college students, resulting in more effective and sustainable interventions.

6. The role of mental health in HIV vulnerability

Finally, the role of mental health in HIV vulnerability among college students remains an unexplored area. Mental health problems, such as depression, anxiety, and substance abuse, can have a significant impact on HIV behaviors. For example, students with mental health problems may engage in riskier sexual behaviors, such as unprotected sex, as a coping mechanism [9]. Additionally, the stigma associated with HIV and mental health can prevent students from seeking needed care or disclosing their HIV status.

Research that explores the intersection between mental health and vulnerability to HIV can provide critical insights into how mental health support services can be integrated into campus HIV prevention programs. This approach addresses the holistic needs of students, promotes mental and sexual health, and reduces overall HIV risk.

Conclusion

This study provides a comprehensive bibliometric analysis of HIV/AIDS research among university students, with a focus on trends, gaps, and implications for policy and interventions. University students represent a crucial demographic group in the global fight against HIV/AIDS due to their increased vulnerability, driven by risk behaviors, stigma, limited access to health services, and sociocultural factors. However, research addressing the unique challenges faced by this group remains fragmented and unevenly distributed across geographic and thematic areas.

The analysis identifies major geographic disparities in HIV/AIDS research. Studies from high-income countries (HICs) dominate the literature, often focusing on technological and behavioral interventions, such as pre-exposure prophylaxis (PrEP) and digital health tools. In contrast, low- and middle-income countries (LMICs), where HIV prevalence is higher, are underrepresented, limiting the development of culturally relevant and localized interventions. Furthermore, the thematic focus of existing research is primarily on risk behaviors, such as sexual practices and HIV prevention knowledge, with increasing attention to mental health, substance abuse, and digital interventions. However, the

effectiveness and scalability of these interventions remain unexplored. Methodological approaches in the literature show a reliance on quantitative models, such as cross-sectional surveys, which often fail to capture the socio-cultural complexity of HIV vulnerability among university students. While qualitative and mixed-methods studies are gaining ground, they remain underutilized. Additionally, significant research gaps continue to exist, including insufficient attention to intersectional vulnerabilities (e.g., LGBTQ+ students, students with disabilities), the long-term sustainability of interventions, and the impact of institutional policies and sociopolitical contexts on HIV outcomes.

To address these gaps, the study recommends that future research adopt intersectional and participatory frameworks, utilize longitudinal designs, and explore the integration of mental health and HIV prevention strategies. The findings highlight the need for evidence-based, context-specific interventions tailored to the diverse needs of college students. Policymakers and academic institutions should prioritize holistic approaches that address behavioral, institutional, and systemic barriers to improving HIV outcomes in academic settings.

By synthesizing existing knowledge and highlighting critical gaps, this study provides a solid foundation for advancing HIV/AIDS research and interventions targeting university students, thereby contributing to global efforts to reduce HIV incidence and improve health equity.

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