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HIV-associated oral diseases, Oral health-related quality of life (OHRQoL); People living with HIV; Oral manifestations; Research agenda

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HIV-Associated Oral Lesions and Oral Health-Related Quality of Life: The Forgotten Burden and the Need for a Renewed Research Agenda

Abstract

Despite remarkable progress in HIV prevention, diagnosis, and antiretroviral therapy, oral health remains an under-recognized component of comprehensive HIV care. HIV-associated oral diseases continue to affect millions of people living with HIV (PLWH), particularly in low- and middle-income countries where the burden of HIV is highest. Oral manifestations such as oral candidiasis, periodontal diseases, oral hairy leukoplakia, Kaposi sarcoma, salivary gland disorders, and oral ulcerations are associated with immune suppression, disease progression, and treatment outcomes. Beyond their clinical significance, these conditions adversely affect oral health-related quality of life (OHRQoL) by impairing eating, speaking, social interactions, psychological well-being, and overall daily functioning.

This narrative review synthesises current evidence on the prevalence, distribution, and determinants of HIV-associated oral diseases and examines their impact on OHRQoL among PLWH. The review highlights the complex interplay between oral manifestations, immunological markers, viral suppression, socioeconomic factors, and access to oral healthcare services. While substantial progress has been made in understanding the epidemiology of HIV infection, research focusing on oral health outcomes and patient-reported quality-of-life measures remains limited, particularly in sub-Saharan Africa. Existing studies demonstrate a significant association between oral lesions and poorer OHRQoL; however, important knowledge gaps persist regarding the long-term effects of oral diseases, contextual determinants, and effective intervention strategies.

The review argues that oral health should be integrated into HIV care frameworks and public health policies to improve overall health outcomes and well-being. It also calls for a renewed research agenda that prioritizes multidisciplinary investigations, standardized assessment tools, longitudinal studies, and context-specific interventions to reduce the burden of HIV-associated oral diseases and improve the quality of life among PLWH. Addressing these gaps is essential to advancing person-centred HIV care and achieving equitable health outcomes in the era of universal antiretroviral therapy.

BACKGROUND

The world health systems over the past four decades have shown a steady, slow positive response to the Human Immunodeficiency Virus (HIV) infection threat. According to UNAIDS, globally among adults aged 15-49, 40.8 million people had HIV as of 2024, with data indicating an estimated 1.3 million new infections and HIV-related mortality of 630 000 people, despite the widespread implementation of antiretroviral therapy (ART) (WHO/UNAIDS, 2025). South Africa is making history by curbing the HIV infection rate as the 9th African country to introduce and roll out Lenacapavir, which is taken once every six months as long-acting pre - exposure prophylaxis (PrEP) (https://www.npr.org/2026/06/05/nx-s1-5846846/south-africa-hiv-lenacapavir-aid). This will boost HIV infection control in the country, with noted increased access to treatment that has transformed HIV from a fatal disease into a manageable chronic condition, enabling millions of people living with HIV (PLWH) to achieve viral suppression and improved life expectancy (Payagala & Pozniak, 2024). Despite these advances, of the 8 countries already on Lenacapavir, HIV continues to deteriorate health systems, particularly in sub-Saharan Africa, which remains the epicentre of the global epidemic and accounts for the largest proportion of HIV infections and advanced HIV disease (AHD) cases (Justman & Syowai, 2025).

South Africa carries one of the world's largest HIV burdens, with an estimated 7.8 million people living with HIV in 2022 (HSRC, 2024a). Although significant progress has been made towards achieving the UNAIDS 95-95-95 targets, disparities persist across provinces, age groups, and genders. The Free State Province remains among the regions most affected by HIV, with prevalence rates exceeding the national average (HSRC, 2024b). While considerable attention has been directed towards viral suppression, treatment adherence, and prevention strategies, oral health has received comparatively limited consideration within HIV care programmes and research agendas.

Oral manifestations are among the earliest and most common clinical indicators of HIV infection and immune suppression. HIV-associated oral diseases include oral candidiasis, oral hairy leukoplakia, Kaposi sarcoma, periodontal diseases, aphthous ulcerations, salivary gland disorders, oral warts, and melanotic hyperpigmentation (Tappuni, 2020; de Souza Fonseca et al., 2022). These conditions are frequently associated with declining immune status, elevated viral load, reduced CD4+ count, and disease progression (Ottria et al., 2018). Consequently, oral lesions serve not only as important diagnostic and prognostic markers but also as indicators of treatment effectiveness and overall health status among PLWH.

Despite their clinical significance, HIV-associated oral diseases remain under-recognised in contemporary HIV research and healthcare delivery. Existing evidence suggests that oral lesions continue to affect a substantial proportion of PLWH, particularly in resource-constrained settings where access to specialised oral healthcare services is often limited (Tappuni, 2020). Furthermore, the epidemiological profile of HIV-related oral manifestations has evolved following the introduction of ART, necessitating renewed investigation into their prevalence, presentation, and impact on patient well-being (Pamela & Sufiawati, 2024).

Beyond their biological and clinical consequences, oral diseases profoundly affect oral health-related quality of life (OHRQoL). OHRQoL is a multidimensional construct that reflects individuals' perceptions of how oral health influences physical functioning, psychological well-being, social interactions, and overall quality of life (WHO, 2012; Baiju et al., 2017). Oral pain, xerostomia, difficulty chewing, swallowing difficulties, speech impairment, aesthetic concerns, and social stigma associated with oral lesions can significantly compromise daily functioning and psychosocial health among PLWH (Sufiawati et al., 2024; Gaitán-Cepeda et al., 2024). Studies consistently demonstrate that individuals with HIV-associated oral lesions report poorer OHRQoL compared to those without oral manifestations, highlighting the substantial burden imposed by these conditions (Muralidharan et al., 2020; Murererehe et al., 2024).

Although growing evidence links oral manifestations to reduced quality of life, the oral health dimension of HIV care remains insufficiently integrated into public health policies, clinical guidelines, and research priorities. Much of the existing literature has focused on prevalence estimates and clinical characteristics. At the same time, comparatively less attention has been devoted to understanding the broader implications of oral diseases on quality of life, healthcare utilisation, treatment outcomes, and long-term well-being. Additionally, evidence from low- and middle-income countries, particularly those with a high HIV burden, remains fragmented and underrepresented.

The evolving epidemiology of HIV, increasing life expectancy among PLWH, and the global emphasis on person-centred healthcare underscore the need to re-evaluate oral health as a critical component of comprehensive HIV management. Understanding the burden of HIV-associated oral diseases and their impact on OHRQoL is essential for informing clinical practice, strengthening health systems, guiding policy development, and improving patient-centred outcomes. Moreover, identifying gaps in the current evidence base can facilitate the development of targeted research agendas and innovative interventions to reduce oral health disparities among PLWH.

Therefore, this review synthesises current evidence on HIV-associated oral manifestations and their impact on oral health-related quality of life. It further examines emerging trends, identifies critical knowledge gaps, and proposes future research priorities to advance oral health within the broader HIV care continuum. By highlighting this often-overlooked dimension of HIV management, the review calls for renewed scientific, clinical, and policy attention to oral health as a fundamental component of holistic HIV care.

METHODOLOGY

Study Design

This study employed a desktop-based narrative literature review approach to synthesise current evidence on HIV-

associated oral diseases, oral health-related quality of life (OHRQoL), and research priorities among people living with HIV (PLWH). The review critically aimed to examine existing literature, identify emerging trends, highlight knowledge gaps, and propose future research directions in oral health and HIV care.

Search Strategy

A comprehensive literature search was conducted between 1 March and 31 May 2025 using electronic databases including PubMed, Scopus, Web of Science, Google Scholar, ScienceDirect, and SpringerLink. Additional grey literature and reports were obtained from international organisations and governmental agencies, including the World Health Organisation (WHO), the Joint United Nations Programme on HIV/AIDS (UNAIDS), and the Human Sciences Research Council (HSRC).

The search strategy utilised combinations of Medical Subject Headings (MeSH) terms and keywords related to HIV and oral health. Search terms included:

- HIV-associated oral manifestations
- oral lesions AND HIV
- oral health-related quality of life
- OHIP-14
- "oral candidiasis AND HIV"
- "periodontal disease AND HIV"
- "oral health AND people living with HIV"
- "quality of life AND HIV oral diseases"
- "CD4 count AND oral manifestations"
- "viral load AND oral lesions"
- "oral health inequalities AND HIV"

Boolean operators (AND, OR) were used to refine the search and maximise the retrieval of relevant publications.

Eligibility Criteria

Studies were considered eligible if they:

1. Examined oral manifestations among people living with HIV/AIDS.
2. Reported oral health-related quality of life outcomes.
3. Investigated associations between oral lesions and HIV clinical markers, including CD4 cell counts and viral load.
4. Were published in peer-reviewed journals.
5. Were published in English.
6. Included quantitative, qualitative, mixed-methods, systematic reviews, scoping reviews, and epidemiological studies.

The review excluded studies that:

1. Focused exclusively on paediatric populations.
2. Did not address oral health outcomes.
3. Were conference abstracts without full-text availability.
4. Contained insufficient methodological information.

Study Selection

Titles and abstracts identified through the database search were screened for relevance to the review objectives. Full-text articles meeting the inclusion criteria were retrieved and assessed for eligibility. Priority was given to recent publications (2015–2025), while seminal and foundational studies relevant to HIV oral lesion classification, oral health measurement instruments, and conceptual frameworks were also included to provide historical context.

Data Extraction and Synthesis

Data were extracted using a standardised review matrix capturing:

- Author(s) and year of publication
- Study location
- Study design
- Study population
- Type and prevalence of oral manifestations
- OHRQoL assessment instruments
- HIV clinical markers (CD4 count and viral load)
- Main findings
- Identified research gaps

A thematic synthesis approach was employed to analyse and organise the evidence. The findings were grouped into four major themes:

1. Epidemiology and burden of HIV-associated oral diseases.
2. Oral manifestations and their relationship with HIV disease progression.
3. Impact of oral diseases on oral health-related quality of life.
4. Emerging research gaps and future priorities for oral health research among PLWH.

Quality Assurance

To enhance the credibility of the review, information was triangulated across multiple sources, including peer-reviewed publications, international HIV reports, oral health guidelines, and epidemiological surveys. Particular attention was given to studies employing validated oral health assessment instruments such as the Oral Health Impact Profile-14 (OHIP-14) and standardised diagnostic criteria developed by the EC-Clearinghouse and the Oral HIV/AIDS Research Alliance (OHARA).

Ethical Considerations

The review utilised publicly available secondary data and published literature; therefore, ethical approval was not required. All sources were appropriately acknowledged and referenced in accordance with academic publishing standards.

Literature data overview

Global estimates show that 39.9 million people were living with HIV in 2023, reflecting a decline of 39% in new HIV infections and 51% in HIV-related mortality compared to 2010 (UNAIDS/WHO, 2024). Data reveal that there were 1.3 million new HIV infections and 630,000 HIV-related deaths in 2023. The report indicated that world leaders can end the AIDS pandemic as a public health threat by 2030 if they fulfil their promises, thereby preventing millions of AIDS-related deaths, reducing millions of new HIV infections, and ensuring that an estimated 40 million people living with HIV (PLWH) lead healthy lives(UNAIDS, 2024; Payagala & Pozniak, 2024). In 2022, 39 million people were living with HIV(PLWH), including 37.5 million adults and 1.5

million children aged 0-14 years, with 53% being women and girls(Payagala & Pozniak, 2024).

Globally, there has been a concerted effort to provide antiretroviral (ARV) treatment to a vast population of people living with HIV. Despite the increase in global coverage of HIV treatment, reductions in AIDS-related mortality have not met expectations, likely due to advanced HIV disease (AHD)(Justman & Syowai, 2025). AHD is defined as a CD4 count of less than 200 cells per mm^3 or a WHO stage of 3 or 4 in individuals living with HIV who are 5 years old or older. According to UNAIDS 2022 HIV data, it was estimated that in 2022, 1.87 million, or 7.7% of all adults living with HIV in the sub-Saharan region, had AHD (Justman & Syowai, 2025). Attention must be given to the affected population to manage and reduce the scourge of the disease.

Progress towards the 2030 project to reach the UNAIDS 95-95-95 targets: To achieve the target, 3.4 million more people living with HIV must know their status. To attain the aimed 95% of people living with HIV on treatment, 9.2 million individuals need to start ARV treatment. Globally, 86% of people living with HIV (PLWH) knew their status, 77% (30.7 million people) accessed treatment, and 72% (65-80%) were virally suppressed (UNAIDS, 2024). The report indicates that the world is not on track to achieve the desired goals and does not adequately address the inequalities driving the AIDS pandemic.

Prevalence of HIV

According to a press release from the Human Sciences Research Council (HSRC) in 2023, the prevalence of people living with HIV (PLWH) decreased from 14% in 2017 to 12.7% in 2022. This translates to approximately 7.8 million individuals living with HIV in South Africa, compared to 7.9 million in 2017. Data indicate that females continue to be more affected by the pandemic, with a prevalence of 16.4%, compared to males at 8.8% across all age groups (HSRC, 2024a). The prevalence peaks at 34.2% for females aged 35–39 years, while it peaks at 27.1% for males aged 45–49 (HSRC, 2024a). The survey indicates that South Africa has made significant progress towards reaching the UNAIDS 95-95-95 targets by 2030.

The HSRC press release in Bloemfontein on Friday, 20 September 2024, indicated that the HIV prevalence in Free State Province in 2022 was 15.6%, compared to 17% in 2017. According to the report, approximately 450,000 people were living with HIV in Free State Province. The HIV prevalence was higher in females than in males across all age categories above 15 years. Of great concern was the significant increase in HIV prevalence among youth aged 15–24 years in 2022 compared to 2017. The prevalence almost doubled in the 15–19-year age category, rising from 3.2% in 2017 to 7.4% in 2022. The report also stated that the prevalence of HIV in Mangaung was estimated at 18.7%, with the highest prevalence among those aged 25-49 years; by gender, females represented 33% compared to males at 14.8% (HSRC, 2024b). The prevalence was 14.8% in urban areas compared to rural and tribal areas.

The introduction of the human immunodeficiency virus into the body of a healthy person begins a cascade of immune system depletion. HIV infection results in progressive depletion of CD4+ lymphocytes and an increase in viral load, leading to immunosuppression in the infected individual (Ottria et al., 2018; de Souza Fonseca et al., 2022). The immunosuppression of the infected person develops multiple signs and symptoms that affect various parts of the body, including the skin, lungs, bones, and oral mucosa, which is the primary and most common site.

The prevalence of oral manifestations among adults living with HIV varies by region and continent. Studies show that the most commonly presenting lesions among people living with HIV include Oral Candidiasis(OC), Oral Hairy Leukoplakia (OHL), Kaposi Sarcoma(KS), Linear Gingival Erythema (LGE), Necrotising Gingivitis (NG), Necrotising Periodontitis (NP), Non-Hodgkin's Lymphoma, Herpes Simplex Virus Infection (HSV), non-specific ulceration, Aphthous Ulcers, Salivary Gland Disease (SGD), Oral Melanotic Hyperpigmentation (MH), and Oral Warts (OW) (Tappuni,2020; Novianti & Sufiawati,2023). Africa (51%) and Asia (39%) had the highest prevalence of Oral Candidiasis, while the average prevalence in Europe and the USA was comparable at 28% and 30%, respectively (Tappuni, 2020).

Oral lesions are classified based on their relationship with HIV infection and are further associated with their etiological factors, such as bacteria, fungi, viruses, and various malignancies. In 1993, the EC-Clearinghouse on Oral Problems Related to HIV Infection and the WHO Collaborating Centre on Oral Manifestations of the Immunodeficiency Virus reached a consensus on a new classification of the oral manifestations of HIV infection (Askinyte et al.,2020; de Souza Fonseca et al., 2022). The classification is as follows: Lesions strongly associated with HIV infection, Lesions less commonly associated with HIV infection, and Lesions seen in HIV infections. (Clearinghouse, 1993; de Souza Fonseca et al., 2022).

Among the oral manifestations strongly associated with HIV infection, the most prevalent are Oral Candidiasis, periodontal diseases, Kaposi Sarcoma, oral hairy leukoplakia, non-Hodgkin lymphoma, and many more. Lesions classified as less commonly associated with HIV infection include human papillomavirus infection, salivary gland diseases, other ulcerations, herpes simplex virus infection, and melanotic hyperpigmentation. The lesions classified as seen in HIV infection include trigeminal neuralgia, facial palsy, and many more.

Oral Health-Related Quality of Life(OHRQoL)

According to WHO (2012), OHRQoL is defined as "an individual's perception of their position in life in the context of the culture and value systems in which they live and with their goals, expectations, standards, and concerns. It is a broad-ranging concept complexly affected by the person's physical health, psychological state, personal beliefs, social relationships, and the individual's relationship to salient features of their environment."

The concept of OHRQoL has recently gained attention, emphasising the correlation between oral health and overall well-being. OHRQoL employs measurements that assess individuals' perceptions of their health, focusing on physical functioning, psychological well-being, and social interaction. This multifaceted approach is crucial

for understanding patient experiences and guiding clinical practices. It underscores the need for a biopsychosocial model of health, moving beyond traditional medical definitions (Baiju et al., 2017). Various tools have been developed to assess OHRQoL, including the Oral Health Impact Profile (OHIP), Geriatric Oral Health Assessment Index (GOHAI), and Oral Health Impact on Daily Living (OHIDL) (Manfredini et al., 2024). OHIP is the most significant and widely used tool in clinical dentistry to measure quality of life (QoL). These instruments vary in format and context, enabling tailored assessments for different populations (Baiju et al., 2017).

OHRQoL affects dental clinical practice, dental education (for graduates, students, and researchers in oral and health-related fields), and dental research. Research indicates that poor oral health adversely affects daily physiological activities and diminishes quality of life (Lomile Martinez et al., 2022). Patient-reported outcomes are increasingly recognised as critical for evaluating the effectiveness of oral health management, informing policy development and formulation, and guiding the creation of interventions (Noor et al., 2024). OHRQoL is essential for understanding patient experiences, but focusing solely on subjective assessments can overlook objective clinical outcomes. Therefore, it is vital to maintain a balanced approach to dental research and practice.

The current and future conceptual framework focuses

The understanding and use of the Oral Health Impact Profile-14 (OHIP-14) and Oral HIV/AIDS Research Alliance (OHARA).Oral Health Impact Profile-14 shortened version. Instruments used to measure OHRQoL include the Geriatric Oral Health Assessment Index (GOHAI), Oral Impacts on Daily Performances (OIDP), and the Oral Health Impact Profile (OHIP)(Campos et al., 2021). The Oral Health Impact Profile (OHIP) (Slade & Spencer, 1994) is recognised as a significant alternative for identifying dimensions in OHRQoL, given that it is one of the most technically complex measures (Locker, 1995) and the most widely used instrument for measuring OHRQoL. OHRQoL employs validated measures, such as the shortened OHIP-14 (Slade, 1997), to assess the impact of oral health on individuals' quality of life (QoL) related to HIV-related oral health issues (HIV-ROLs). Various dimensions of OHRQoL are evaluated, including functional limitations, physical pain, psychological discomfort, social discomfort, and disability (Gift et al., 1997; Sheiham, 2005; Campos et al.,2021). These instruments, designed to measure the OHRQoL of individuals affected, are crucial for treating dental patients holistically, considering both their physical and psychological well-being.

The quality of life is defined as an individual's perception of their position in life within the context of the culture and value systems in which they live, as well as their personal goals, expectations, standards, and concerns (WHOQoL Group, 1995). This definition broadens the topic to address not only the prevalence of HIV- ROLs, but also their impact on the overall health of affected individuals

Oral HIV/AIDS Research Alliance (OHARA)

The Oral HIV/AIDS Research Alliance (OHARA) is part of the AIDS Clinical Trials Group (ACTG), the largest HIV clinical trials organisation in the world (Shiboski et al., 2009). The trials aimed to train non-oral health professionals in developing skills to identify and diagnose HIV-ROLs in resource-constrained settings. The study presented updated case definitions for standardising HIV-ROLs to determine the final diagnosis of oral lesions when laboratory confirmation is not readily available, utilising clinical presentations and symptoms of lesions (Shiboski et al., 2009). The study updated the Clearinghouse (1993) classification of oral lesions associated with HIV infection. The etiological factors, such as fungi, bacteria, viruses, and tumours, were examined.

Gaps that exist within the OHRQoL

Numerous studies have demonstrated the statistical significance of a correlation between poorer OHRQoL and a higher prevalence of oral lesions (Tappuni, 2020) and have also reported higher OHIP-14 scores. Oral lesions such as angular cheilitis, aphthous ulcers, periodontitis, pseudomembranous candidiasis, and precancerous lesions adversely affect daily physiological activities and overall quality of life. Oral mucosal lesions like candidiasis and herpes infections have shown a significant association with decreased OHRQoL among individuals living with HIV/AIDS (Sufiawati et al., 2024). The correlation between oral mucosal lesions and poorer OHRQoL emphasises the burden of these diseases (Tappuni, 2020; Sufiawati et al., 2024).

Studies indicate that patients with a higher prevalence of multiple types of oral lesions experience poorer overall health-related quality of life (OHRQoL) (Sufiawati et al., 2024; Gaitan-Cepeda et al., 2024), with a higher predilection among females and a self-reported lower health-related quality of life(HRQoL) (Gaitan-Cepeda et al., 2024). Dental caries and periodontal disease have been associated with a poor overall health-related quality of life (OHRQoL) (Muralidharan et al., 2020; Murererehe et al., 2024; Noor, 2024). The various types and classifications of oral lesions have varying levels of poorer OHRQoL.

Patients with a high prevalence of oral manifestations reported significantly lower QoL scores across all domains of OHIP than those without manifestations (Gaita-Cepeda et al., 2024; Moodley & Woods, 2015; Permatasanti & Sufiawati, 2024). The symptoms, such as xerostomia, pain, and difficulty eating and drinking, negatively impact individuals' routines and general well-being. Individuals may develop varying degrees of adaptation and plasticity to manage and potentially mitigate the impact and effects on their daily activities and quality of life.

Data literature overview on Oral lesions associated with HIV

Oral lesions related to HIV infection present as primary signs and symptoms indicating the onset of HIV infection and its progression to acquired immunodeficiency syndrome (de Souza Fonseca et al., 2022). These lesions adversely impact people living with HIV(PLWH) and significantly diminish their Oral Health-Related Quality

of Life (OHRQoL). Research indicates that individuals living with HIV/AIDS are more susceptible to developing a range of oral diseases that can exacerbate poorer overall health. Oral lesions such as candidiasis, periodontitis, and Kaposi Sarcoma, prevalent among PLWH(Vohra et al., 2019; Ezera, 2020; de Souza Fonseca et al.,2022), correlate with poorer OHRQoL outcomes, highlighting the importance of integrated oral health care in HIV management and treatment plans. Regular oral examinations for HIV-positive patients, even those receiving antiretroviral (ARV) treatment, are essential. Oral examinations are a crucial tool for the clinical identification and diagnosis of human immunodeficiency virus-related oral lesions (HIV-ROLS). The necessity for routine oral examinations for HIV-positive individuals, including those on ARV treatment, is vital for detection and management and cannot be overemphasised (Lustosa da Souza et al., 2023).

Oral Lesions and HIV Infection

The oral cavity, as the primary site for signs and symptoms of HIV infection, presents a plethora of oral lesions (de Souza Fonseca et al., 2022). Oral lesions are found in the majority of HIV/AIDS patients and serve as primary indicators of HIV infection (Jana et al., 2022; Cao et al., 2022; de Souza Fonseca et al., 2022), appearing in 50% of HIV-infected patients and up to 80% of patients at the AIDS stage (CD4+ T lymphocytes <200 cells/mm^3) (Akaji et al., 2020; Gopalan & Ahamed, 2020; de Souza Fonseca et al., 2022; Lomeli-Martinez et al., 2022; da Rocha et al., 2022).

The presence of HIV-RoLs serves as a predictor of potential seroconversion of HIV infection in untested and undiagnosed persons, and suggests progression to the AIDS stage and suppression in HIV-infected persons (Bajomo et al., 2013; Indrastiti et al., 2020). Oral lesions in PLWH have a significant, debilitating effect on both the physical and mental health and well-being of those affected. It is, therefore, vital to diagnose HIV infection promptly, predict disease progression, and perform the WHO-staging of AIDS (Permatasanti & Sufiawati, 2024). Oral lesions can arise or manifest in all clinical stages of HIV (Stage 1, 2, 3, 4).

Oral manifestations are essential prognostic and diagnostic measures, especially in clinical settings with inadequate resources. Oral conditions prevalent among people living with HIV/AIDS include oral candidiasis, periodontal diseases, dental caries, oral hairy leukoplakia, and Kaposi sarcoma (Askinyte et al., 2015; Akaji et al., 2020; Lomeli-Martinez et al., 2022). A study conducted among children demonstrated that those with dry mouth and untreated caries reported significantly higher mean global OHRQoL scores than those without the disease (Wang et al., 2023). Oral manifestations cause morbidity and adversely impact patients' health and quality of life (Tappuni, 2020). Other oral manifestations, such as various cancerous lesions, if left unattended, can lead to debilitating effects and mortality for affected individuals.

Prevalence of HIV-related Oral Lesions(HIV-ROLS)

Oral manifestations closely associated with HIV infection have increased due to global concerns about the prevalence of HIV. Access to optimal clinical management and effective treatment in resource-rich countries has dramatically reduced the prevalence of some oral manifestations among the HIV-positive population. However, the situation is different in developing countries, where the majority of HIV-positive patients reside (Tappuni, 2020). These lesions include oral candidiasis (OC), oral hairy leukoplakia (OHL), Kaposi sarcoma (KS), linear gingival erythema (LGE), necrotising gingivitis (NG), necrotising periodontitis (NP), and non-Hodgkin's lymphoma (NHL) (Novianti & Sufiawati, 2023; Wang et al., 2023). Studies have identified the most common oral lesions, which are as follows: oral candidiasis (OC), oral hairy leukoplakia (OHL), herpes simplex virus infection (HSV), Kaposi sarcoma (KS), non-specific ulceration, aphthous ulcers, periodontal disease, salivary gland disease (SGD), oral melanotic hyperpigmentation (MH), and oral warts (OW) (Tappuni, 2020). Africa (51%) and Asia (39%) accounted for the highest prevalence of oral candidiasis, while the average prevalence in Europe and the USA was comparable at 28% and 30%, respectively (Tappuni, 2020).

Studies conducted across various continents and regions reveal different trends and prevalence rates of oral lesions associated with HIV. In the study by da Rocha and colleagues (2022) in Brazil, the prevalence was 28.3%, Oral Candidiasis (OC) presented at 21.8%, Aphthous ulcer, 21.8% and were the most common lesions, with females showing a correlation with the presence of oral lesions. Gopalan and Ahamed (2020) reported a prevalence of oral lesions of 49.0%, with the most common manifestations being Oral Candidiasis (OC) at 28.6%, Aphthous ulcer at 16.14%, Linear Gingival Erythema (LGE) at 13%, and Oral hairy leukoplakia (OHL) at 10.4%. A CD4+ count of less than 200 cells/mm3 was correlated with the prevalence of oral lesions.

Abe et al. conducted a study that indicated an induced reduction of oral lesions among patients on HAART. There was a high prevalence of melanotic hyperpigmentation. Other lesions, such as oral candidiasis, salivary gland enlargement, and dry mouth, presented a pronounced prevalence, which was associated with reduced morbidity and mortality.

Erfaninejad et al. indicated that OC was the most prevalent lesion, at 41%, and the results were similar to those of Aboualigalehdari et al., with a 43.8% OC prevalence. CD4+ count less than 200 cells/mm3 and higher viral loads were associated with lesion presence. Oral thrush, erythematous candidiasis, angular cheilitis, and chronic hyperplastic candidiasis are the most prevalent clinical forms of oral candidiasis in people living with HIV/AIDS (PLWHA) (Ezera, 2020).

Oral Lesions, CD4+ T Lymphocyte count, and Plasma viral load

The decrease in CD4+ count is associated with various oral and systemic manifestations that can serve as prognostic markers for immune suppression in AIDS patients (Vohra et al., 2019; de Souza Fonseca et al., 2022). There is a statistically significant relationship between the prevalence of oral lesions in HIV-

seropositive patients and both CD4+ T-cell count and plasma viral load (Moodley & Wood, 2015; Shu et al., 2020). Reduced CD4+ T lymphocyte counts and high levels of viral loads correlate with the prevalence of oral lesions, with Kaposi sarcoma, oral candidiasis (OC), periodontitis, and oral hairy leukoplakia being the most common, in that order (Indrastiti et al., 2020). A study conducted among children in Nigeria found a significant association between oral lesions and a lower CD4 count ($p = 0.004$). In contrast, no significant correlation was observed compared with plasma viral load ($p = 0.256$) (Oladokun et al., 2013).

These studies collectively affirm the relationship between the prevalence of oral manifestations and risk factors such as CD4+ T lymphocyte count and viral load. The relationship between the presence of oral lesions and CD4+ count is inversely proportional, whilst viral load is directly proportional. Higher viral loads are associated with a greater likelihood of developing oral lesions, whereas higher CD4+ counts tend to be associated with a reduced prevalence of lesions.

Oral Lesions and Antiretroviral Treatment(ART)

The advent of ART has significantly reduced the proliferation of oral lesions related to HIV (Lomeli-Martinez et al., 2022) and improved the OHRQoL among PLWH, as well as the overall quality of life (QoL) within this group. The treatment of HIV-ROLS among individuals in resource-limited countries, where access to health care and antiretroviral therapy (ART) is restricted, highlights the need for a biopsychosocial model of health that moves beyond traditional medical definitions(Baiju et al., 2017). The prevalence of oral lesions and their impact on quality of life (QoL) continue to impose a substantial burden on the resources and health systems of these countries (Challacombe, 2020). Patient adherence, compliance with ART, and improved oral health hygiene behaviour are crucial for reducing oral lesions and enhancing health outcomes(Malele-Kolisa et al., 2022).

Oral Lesions and Oral Health-Related Quality of Life(OHRQoL)

The presence of oral lesions in individuals living with HIV/AIDS adversely impacts both oral and overall health. Oral health is linked to the physical and mental well-being of affected individuals; thus, the presence of certain oral and peri-oral lesions can compromise dental aesthetics and alter physiological factors such as speech, chewing, and swallowing, ultimately affecting the health and quality of life of patients (Lomeli-Martinez et al., 2022). Therefore, it is imperative to integrate the medical treatment of HIV-positive patients with the prevention, diagnosis, and management of their oral health. Health professionals possess the skills to identify, diagnose, and treat oral pathologies based on clinical characteristics, etiological agents, and local and systemic risk factors (Lomeli-Martinez et al., 2022).

Impact of Oral Lesions on OHRQoL

Prevalence of Oral Lesions

Studies demonstrate that a high percentage of HIV-positive individuals experience oral lesions, with conditions like candidiasis being the most common (Velásquez et al., 2024). Studies indicate that 50% of people with HIV infection present with one or more manifestations, whereas for those with AIDS, 80% present with manifestations (Askinyte et al., 2015; Heron & Elahi, 2017; Gopalan et al., 2020; Lomile-Martinez et al., 2022; Pamela & Sufiawati, 2024). The diverse nature of oral manifestations in HIV-positive persons heightens the complexity of the interaction between immunosuppression, antiretroviral therapy, and other risk factors (Velásquez et al., 2024). Early clinical findings indicate that oral lesions, primarily oral candidiasis and hairy leukoplakia, are closely associated with HIV infection among patients (Gaitan-Cepeda et al., 2024). The presence of various oral lesions, with candidiasis being the most prevalent among others, such as herpes viral infections, Kaposi sarcoma, periodontal diseases, dental caries, and more, reveals the relationship between oral health and the immune status of individuals. These oral lesions pose challenges to health, public health, and impact quality of life (Bajomo et al., 2013).

Risk factors such as gender, age, viral loads, CD4+ count, ARV treatment compliance, level of education, oral hygiene practices, alcohol consumption, use of tobacco products, frequency of oral consultations, and access to oral health services affect the prevalence of oral lesions. Depending on geographic location or continent, some oral lesions are more prevalent than others. Candidiasis is the most common oral manifestation in Africa and Asia, whereas in America and Europe, the prevalence is almost similar (Tappuni, 2020). In studies conducted in Brazil, Gonzalez et al. (2024) and Souza et al. (2023) reported that necrotising periodontitis and advanced gingivitis were the most prevalent oral lesions.

Comprehensive management and treatment of oral manifestations in individuals living with HIV requires a proactive, preventive, and collaborative approach aimed at improving quality of life. It is essential to consider the patient profile holistically and broadly to avoid a fragmented approach to treatment and management for affected populations.

Disparities in the prevalence of HIV-related oral lesions are influenced by various factors, including lifestyle, access to healthcare facilities and their proximity, sociodemographic aspects, the condition of the oral cavity of affected individuals prior to HIV infection, the clinical experience of oral healthcare professionals, and the use of different diagnostic modalities (Gopalan & Ahamed, 2020; de Souza Fonseca et al., 2022). The prevalence of oral lesions among populations in developed countries is lower than in resource-limited countries.

Gender differences indicate that female patients often report poorer OHRQoL across various dimensions than their male counterparts, which may be linked to multiple factors (Indrastiti et al., 2020; Gaitan-Cepeda et al., 2024). Sociocultural and demographic factors may play a role. Females seek help and consult oral and general healthcare providers earlier than their male counterparts.

Risk factors correlated with oral lesions and the importance of oral healthcare

Comprehensive management and treatment of oral manifestations in individuals living with HIV requires a proactive, preventive, and collaborative approach aimed

at improving quality of life. In the study by Cao et al., the data highlighted that age, gender, and marital status were associated with several periodontal health indicators; however, no statistical relationship was found between marital status and periodontal health status. Disparities in the prevalence of HIV-related oral lesions are influenced by various factors such as lifestyle, access to healthcare facilities and their proximity, sociodemographic characteristics of patients, conditions of the oral cavity prior to HIV infection, the clinical experience of oral healthcare professionals, and the use of different diagnostic modalities (Gopalan & Ahamed, 2020; de Souza Fonseca et al., 2022). The prevalence of oral lesions among populations in developed countries is lower than in resource-limited countries, due to access to and the availability of facilities, leading to an improved quality of life.

Quality of Life Correlation

The odds ratio for patients presenting with HIV-related oral lesions is higher(three times more: p=0.03; OR 3.1), making them more likely to report poorer oral health-related quality of life (OHRQoL) compared to those without lesions (Sufiawati et al.,2024; Gaitan-Cepeda et al.,2024). Patients with dental caries and periodontal diseases, where pain is the primary symptom, report a poorer quality of life (QoL) (Murererehe et al., 2024). Candidiasis is also associated with a decline in OHRQoL among the affected population(Aitken-Saavedra et al., 2021), particularly symptoms such as pain and reduced self-esteem. These findings underscore the importance of focusing on the affected population to improve quality of life (QoL). Risk factors correlated with oral lesions and the importance of oral healthcare are discussed, including the prevalence of lesions.

Preventive Measures

Periodic dental check-ups and preventive care, such as prophylactic treatment and other treatment modalities, are vital and can mitigate the impact of oral diseases on quality of life (Novianti & Sufiawati, 2023). These measures reduce prevalence, lessen the disease burden, and minimise the social and psychological effects on patients.

Comprehensive Treatment

Integrating oral health care for people living with HIV (PLWH) into HIV healthcare is crucial for enhancing the overall quality of life (Murererehe et al., 2024). It is essential to modify the standard operating procedures (SOPS) to improve the management of oral lesions among people living with HIV/AIDS. Several studies suggest that although oral health issues are common among HIV patients, many individuals can maintain a satisfactory OHRQoL with effective antiretroviral therapy, which highlights the importance of ongoing treatment and support (Sufiawati et al., 2024). The integrative approach to HIV management and HIV-ROLS enhances health and quality of life.

Classification and types of Oral lesions

The oral lesions associated with HIV infection are classified according to their causative agents, such as bacteria, fungi, viruses, and various neoplastic forms. These OLs are further classified as OLs strongly associated with HIV/AIDS, OLs less commonly associated with HIV/AIDS, and manifestations/oral lesions seen in HIV infection (Clearinghouse, 1993; Askinyte et al., 2015; de Souza Fonseca et al., 2022; Lomile-Martinez et al., 2022). Various oral manifestations categorised according to the aforementioned classifications will not be discussed in this chapter. However, those lesions that were commonly present during the study and are of importance will be discussed and described in the literature review.

Oral lesions that are strongly associated with HIV/AIDS.

There are several oral lesions strongly associated with HIV, and among them, the following are important to mention due to their prevalence in the oral cavity.

- Oral candidiasis consists of pseudomembranous candidiasis, angular cheilitis, and erythematous candidiasis.
- Periodontal diseases include, among other conditions, gingivitis, necrotising periodontitis, necrotising gingivitis, and linear gingival erythema.
- Oral hairy leukoplakia is also a typical oral lesion strongly associated with HIV/AIDS, and OHL is a precursor of malignancies.

The most common malignancies prevalent among PLWH are Kaposi sarcoma and non-Hodgkin lymphoma, and both manifestations are strongly associated with HIV/AIDS (de Souza Fonseca et al., 2022; Pamela & Sufiawati, 2024; Dhlodhlo et al., 2024).

Oral lesions that are less commonly associated with HIV/AIDS

There are several oral and perioral lesions of interest among the oral lesions classified as less commonly associated with HIV/AIDS, namely, Salivary gland diseases, which include xerostomia and salivary gland swelling (Askinyte et al., 2015; Mary et al., 2018; de Souza Fonseca et al., 2022; Pamela & Sufiawati, 2024). Xerostomia occurs due to the prolonged use of certain drugs, which reduces saliva flow in the oral cavity, leading to a dry mouth and an increased risk of dental caries (Askinyte et al., 2015; de Souza Fonseca et al., 2022; Pamela & Sufiawati, 2024).

Herpes simplex virus and human papillomavirus infections are among the prevalent viral oral manifestations less commonly associated with HIV/AIDS (Clearinghouse, 1993; Askinyte et al., 2015; Mary et al., 2018; de Souza Fonseca et al., 2022).

Melanotic hyperpigmentation (MH) of the oral cavity affects the buccal mucosa, gums, tongue, and palate. MH is classified as a lesion less commonly associated with HIV/AIDS (Clearinghouse, 1993; Mary et al., 2018; Askinyte et al., 2015; de Souza Fonseca et al., 2022). MH is common among individuals who are on prolonged antiretroviral therapy (ART).

How to address these research gaps

The need for localised studies that assess and examine the impact of HIV-ROLs on the quality of life of people living with HIV underscores the necessity for research on oral lesions and their impact on oral health-related quality of

life in Mangaung Metro, Free State Province. Despite the available research in this field, targeted studies are scarce in this geographic area, which could inform public health strategies, the development of standard operating procedures (SOPS), and improved clinical practices.

Some oral lesions present with pain symptoms and discomfort that negatively impact OHRQoL. Several studies indicate that oral mucosal lesions among people living with HIV/AIDS correlate with lower OHRQoL scores, emphasising the need for targeted interventions (Sufiawati et al., 2024). Localised data are essential to enhance the understanding of how cultural, socioeconomic, and health system factors could influence OHRQoL in the region. The unique oral health challenges facing the affected populations in Mangaung due to the impact of oral manifestations on quality of life will be broadly explored, and an attempt will be made to develop interventions specific to the region.

Health authorities could use the study results to develop oral health intervention strategies specific to the geographic area. The study can also be utilised to determine the optimal budget allocation for capital and human resources.

Why are such studies important?

At the operational level of rolling out Lenacapavir, a research study on oral lesions associated with HIV/AIDS and their effects on OHRQoL is essential for understanding the implications of oral health on an individual's well-being. Even though Lenacapavir will have a long-term protective effect if one is exposed to HIV, oral lesion research findings will provide critical data that can aid in developing public health strategies and be utilised effectively in clinical practice to improve health outcomes at the roll-out critical point of modern HIV therapy.

Studies indicate that patients with a high prevalence of oral lesions report poor overall health-related quality of life (OHRQoL). Research shows a 50% prevalence of oral manifestations in HIV-infected patients and an 80% prevalence in AIDS patients (Pamela & Sufiawati, 2024). In the study by Gaita-Cepeda and colleagues (2024), a prevalence of oral lesions was reported at 44.1%, with 48.8% reporting poor oral health; an odds ratio indicates that patients with HIV-RoLs are three times more likely to experience this compared to those without. Other studies indicate an oral candidiasis prevalence of 68%, with 7% of oral lesions strongly associated with HIV infection. The prevalence of oral lesions correlates with lower CD4+ T-lymphocyte counts, high viral loads, and the type of antiretroviral treatment used (Moodley & Wood, 2015).

Ethical clearance

No ethics clearance required as the study involves no human samples nor identifiable data

Conflict of interest:

No conflict of interest from the authors

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REFERENCES

1. Abe, O.E., Fagbule, O.F., Olaniyi, O.O., Adisa, A.O. and Gbolahan, O.O., 2021. Orofacial lesions associated with long-term highly active antiretroviral therapy among HIV-seropositive adults in Ibadan, Nigeria. The Pan African Medical Journal, 38.
2. Aboualigalehdari E., Tahmasebi Birgani M., Fatahinia M., Hosseinzadeh M. (2020). Oral colonization by Candida species and associated factors in HIV-infected patients in Ahvaz, 10.4178/epih.e2020033, southwest Iran. Epidemiology. Health. 42:e2020033.
3. Aitken-Saavedra, J., da Silva, A.F., Moreira, A.G., Maturana-Ramirez, A. and Vasconcellos, A.C.U., 2021. Salivary characteristics may be associated with burning mouth syndrome? Journal of Clinical and Experimental Dentistry, 13(6), p.e542.
4. Akaji, E., Nwankwo, O. and Nwadije, J., 2020. HIV-related oral lesions in patients on HAART: A preliminary study in Enugu, Southeast Nigeria. International Journal of Medicine and Health Development, 25(2), pp.70-70.
5. Aškinytė, D, Matulionytė, R. and Rimkevičius, A., 2015. Oral manifestations of HIV disease: A review. Stomatologija, 17(1), pp.21-8.
6. Aškinytė, D, Matulionytė, R. and Rimkevičius, A., 2015. Oral manifestations of HIV disease: A review. Stomatologija, 17(1), pp.21-8.
7. Baiju, R.M., Peter, E.L.B.E., Varghese, N.O. and Sivaram, R., (2017). Oral health and quality of life: current concepts. Journal of clinical and diagnostic research: JCDR, 11(6), p.ZE21.
8. Bajomo, A.S., Ayo-Yusuf, O.A., Rudolph, M.J. and Tsotsi, N.M., 2013. Impact of oral lesions among South African adults with HIV/AIDS on oral health-related quality of life. Journal of Dental Sciences, 8(4), pp.412-417.
9. Campos, L.A., Peltomäki, T., Marôco, J. and Campos, J.A.D.B., 2021. Use of oral health impact profile-14 (OHIP-14) in different contexts. What is being measured? International Journal of Environmental Research and Public Health, 18(24), p.13412.
10. Cao, P., Zhang, Y., Dong, G., Wu, H., Yang, Y., and Liu, Y., 2022. Clinical oral condition analysis and the influence of highly active antiretroviral therapy on human salivary microbial community diversity in HIV-infected/AIDS patients. Frontiers in Cellular and Infection Microbiology, 12, p.937039.
11. Challacombe, S.J. (2020). Global inequalities in HIV infection. Oral diseases, 26, pp.16–21.
12. Clearinghouse, E.C. (1993). EC Clearinghouse on oral problems related to HIV infection and WHO collaborating centre on oral manifestations of the Human Immunodeficiency Virus. Classification and diagnostic criteria for oral lesions in HIV infection. J Oral Pathology Med, 22, pp.289–291.

13. da Rocha, G. C. T., Fonseca, R. R. S., Oliveira-Filho, A. B., Ribeiro, A. L. R et al. (2022). Evaluation of Sociodemographic Factors and Prevalence of Oral Lesions in People Living with HIV from Cacoal, Rondônia, Amazon Region of Brazil. International journal of environmental research and public health, 19(5), 2614. https://doi.org/10.3390/ijerph19052614
14. de Souza Fonseca, R.R., Laurentino, R.V., Machado, L.F.A., da Silva Gomes, C.E.V., de Alencar Menezes, T.O., Pessoa, O.F., Oliveira-Filho, A.B., Carvalho, T.R.B., de Oliveira, P.G.F.P., Tanaka, E.B. and Nogueira, J.S.E., 2022. HIV Infection and Oral Manifestations: An Update. In Future Opportunities and Tools for Emerging Challenges for HIV/AIDS Control. IntechOpen.
15. Dhlodhlo, N.M., Mukhari-Baloyi, N.A. and Madiba, T.K., (2024). Knowledge and attitudes of oral health care workers on HIV-associated oral lesions: A study at PHC facilities in Gauteng. South African Dental Journal, 79(3), pp.137–143.
16. Erfaninejad, M., Zarei Mahmoudabadi, A., Maraghi, E., Hashemzadeh, M., & Fatahinia, M. (2022). Epidemiology, prevalence, and associated factors of oral candidiasis in HIV patients from southwest Iran in the post-highly active antiretroviral therapy era. Frontiers in https://doi.org/10.3389/fmicb.2022.983348
17. Ezera, A. (2020). Diagnostic oral biomarkers of immunosuppression in an apparently healthy seropositive HIV population. Southwestern Uganda. J Microbiology, Biochemical Technology, 12(429), p.5.
18. Gaitán-Cepeda, L. A., Castillo-Martínez, N. A., Villanueva-Vilchis, M. D. C., Chávez-Méndez, J. R., Peralta-Alegría, Á. G., Ferré-Soto, J. P., & Rivera-Reza, D. I.,2024. Oral Health-Related Quality of Life in an Institutionalized Population with HIV+/AIDS in the Northern Region of Mexico. Healthcare (Basel, Switzerland), 12(13), 1352. https://doi.org/10.3390/healthcare12131352
19. Gift, H.C., Atchison, K.A. and Dayton, C.M., 1997. Conceptualising oral health and oral health-related quality of life. Social science & medicine, 44(5), pp.601-608.
20. González, I.C., Hernández, L.Y.P., Ayala, D.P., Falero, D.M.L. and Silva, J.W., 2024. Periodontal status in people with HIV in the municipality of Pinar del Río. Odontología (Montevideo), 2, pp.121-121.
21. Gopalan, K. and Ahamed, R., (2020). Prevalence of oral manifestations among HIV patients–A cross-sectional study. Journal of Pakistan Association of Dermatologists, 30(2), pp.298-305.
22. HSRC - Human Sciences Research Council. (2024b). Free State Province reports the third-highest HIV prevalence rate in South Africa - HSRC. [online] Available at: https://hsrc.ac.za/press-releases/phsb/free-state-province-reports-third-highest-hiv-prevalence-rate-in-south-africa/.(Accessed: 05 April 2025).
23. https://www.npr.org/2026/06/05/nx-s1-5846846/south-africa-hiv-lenacapavir-aid. Accessed on 06/05/2026
24. Indrastiti, R.K., Wardhany, I.I., & Soegyanto, A.I., (2020). Oral manifestations of HIV: Can they be an indicator of disease severity? (A systematic review). Oral diseases, 26 Supplementary 1, 133-136
25. Jana, P. K., Sahu, S. K., Sivaranjini, K., Hamide, A., & Roy, G. (2022). Prevalence of Oral Lesions and Its Associated Risk Factors Among PLHIV Availing Anti-Retroviral Therapy from a Selected Tertiary Care Hospital, Puducherry - A Cross-Sectional Analytical Study. Indian Journal of Community Medicine: official publication of Indian Association of Preventive & Social Medicine, 47(2), https://doi.org/10.4103/ijcm.ijcm_850_21
26. Justman, J.E., & Syowai, M. (2025). Advanced HIV disease and epidemic control in sub-Saharan Africa. The Lancet Global Health, 13(3), pp e375-e376.
27. Locker, D., 1995. Health outcomes of oral disorders. International journal of epidemiology, 24(Supplement_1), pp.S85-S89.
28. Lomelí-Martínez, S.M., González-Hernández, L.A., Ruiz-Anaya, A.D.J., Lomelí Martínez, M.A et al. (2022). Oral manifestations associated with HIV/AIDS patients. Medicine, 58(9), p.1214.
29. Lorentz, B.C.D.S., Guimarães, L.F.D.C., Barra, S.G., Candido, C.B.D.S.D.A. and Paiva, D.F.F., 2024. Necrotizing gingivitis in patients with and without HIV: a systematic literature review and meta-analysis. RGO-Revista Gaúcha de Odontologia, 72, p.e20240039.
30. Lustosa de Souza, B. K., Faé, D. S., Lemos, C. A. A., Verner, F. S et al. (2023). Associated oral manifestations with HIV southeastern Brazilian patients on antiretroviral therapy. Brazilian journal of otorhinolaryngology, 89(3), 425–431. https://doi.org/10.1016/j.bjorl.2023.01.001
31. Malele-Kolisa, Y., 2021. Oral-health-related quality of life and oral health needs of adolescents living with HIV in Johannesburg (Doctoral dissertation, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg).
32. Manfredini, M., Pellegrini, M., Rigoni, M., Veronesi, V., Beretta, M., Maiorana, C. and Poli, P.P., 2024. Oral health-related quality of life in implant-supported rehabilitations: a prospective single-center observational cohort study. BMC Oral Health, 24(1), p.531.
33. Mary, E. O., Abiola, O. A., Titilola, G., Mojirayo, O. O., & Sulaimon, A. A. (2018). Prevalence of HIV related oral lesions in people living with HIV and on combined antiretroviral therapy: a Nigerian experience. The Pan African Medical Journal, 31, 180. https://doi.org/10.11604/pamj.2018.31.180.13574.
34. Moodley, A. and Wood, N.H., 2015. HIV-associated oral lesions in HIV-seropositive patients at an HIV treatment clinic in South Africa.
35. Moosazadeh, M., Shafaroudi, A.M., Gorji, N.E., Barzegari, S. and Nasiri, P., 2021. Prevalence of oral lesions in patients with AIDS: a systematic review and meta-analysis. Evidence-Based Dentistry, pp.1-10.

36. Muralidharan, S., Mahendrakar, S., Talekar, A., Nara, A., Kanitkar, A. A., Kanitkar, A., & Kulkarni, D.,2020. Oral Health-related Quality of Life in HIV: A Systematic Review. The journal of contemporary dental practice, 21(5), 585–592.
37. Murererehe, J., Kolisa, Y.M., Niragire, F. and Yengopal, V., 2023. Periodontal disease and associated risk factors among people living with HIV and HIV-negative adults in Rwanda: a comparative cross-sectional study. PAMJ Clinical Medicine, 11(43).
38. Murererehe, J., Malele-Kolisa, Y., Niragire, F. and Yengopal, V., 2023. Prevalence of dental caries and associated risk factors among people living with HIV/AIDS and HIV uninfected adults at an HIV clinic in Kigali, Rwanda. Plos one, 18(4), p.e0276245.
39. Murererehe, J., Malele-Kolisa, Y., Niragire, F. and Yengopal, V., 2024. Oral health-related quality of life among people living with HIV and HIV-negative adults in Kigali, Rwanda: a comparative cross-sectional study. BMC Oral Health, 24(1), p.128.
40. Noor, A., 2024. Improving Oral Health and Quality of Life in Vulnerable Populations. Frontiers in Oral Health, 5, p.1364777.
41. Novianti, Y. and Sufiawati, I., 2023. Clinical assessment and management in improving the quality of life of HIV/AIDS patients with oral candidiasis: a case series. HIV/AIDS-Research and Palliative Care, pp.683-696.
42. Oladokun, R.E., Okoje, V.N., Osinusi, K. and Obimakinde, O.S., (2013). Oral lesions and their association with CD4 count and viral load in HIV positive Nigerian children. Oral health and dental management, 12(4), pp.200–204.Who.int. (2012).
43. Ottria, L., Lauritano, D., Oberti, L., Candotto, V., Cura, F., Tagliabue, A. and Tettamanti, L., 2018. Prevalence of HIV-related oral manifestations and their association with HAART and CD4+ T cell count: a review. Journal Biology Regul Homeostatic Agents, 32(2 Supplementary 1), pp.51-9.
44. Pamela, G. and Sufiawati, I., 2024. Research Trend of Oral Manifestation in HIV Patients, from 1984 to 2023: A Bibliometric Analysis. Malaysian Journal of Medicine & Health Sciences, 20.
45. Payagala, S., & Pozniak, A. (2024). The global burden of HIV. Clinics in dermatology, 42(2), pp.119-127.
46. Permatasanti, A. and Sufiawati, I., 2024. Case Series of HIV-Associated Oral Lesions Across Different Clinical Stages in People Living with HIV. HIV/AIDS-Research and Palliative Care, pp.289-299.
47. Sheiham, A., 2005. Oral health, general health, and quality of life. Bulletin of the World Health Organisation, 83, pp.644-644.
48. Shiboski, C.H., Patton, L.L., Webster-Cyriaque, J.Y., Greenspan, D., Traboulsi, R.S., Ghannoum, M., Jurevic, R., Phelan, J.A., Reznik, D., Greenspan, J.S., and Oral HIV/AIDS Research Alliance, Subcommittee of the AIDS Clinical Trial Group, 2009. The Oral HIV/AIDS Research Alliance: Updated Case Definitions of Oral Disease Endpoints. Journal of oral pathology & medicine, 38(6), pp.481-488.
49. Shu, W., Li, C., Du, F., Bai, J., & Duan, K. (2020). A real-world, cross-sectional study of oral lesions and their association with CD4 cell counts and HIV viral load in Yunnan, China. Medicine, 99(40), e22416. https://doi.org/10.1097/MD.0000000000022416
50. Slade, G.D. and Spencer, A.J., 1994. Development and Evaluation of the Oral Health Impact Profile. Community Dental Health, 11(1), pp.3-11.
51. Slade, G.D., 1997. Derivation and validation of a short-form oral health impact profile. Community dentistry and oral epidemiology, 25(4), pp.284-290.
52. Souza, B.K.L.D., Faé, D.S., Lemos, C.A.A., Verner, F.S., Machado, R.A., Ortega, R.M. and Aquino, S.N.D., 2023. Associated oral manifestations with HIV southeastern Brazilian patients on antiretroviral therapy. Brazilian Journal of Otorhinolaryngology, 89, pp.425-431.
53. Sufiawati, I., Amalia, T., Dewi, T.S. and Wisaksana, R., 2024. The association between oral mucosal lesions and oral health-related quality of life using the validated Indonesian version of OHIP-14 among people living with HIV/AIDS. HIV/AIDS-Research and Palliative Care, pp.9-16.
54. Tappuni, A.R., 2020. The global changing pattern of the oral manifestations of HIV. Oral Diseases, 26, pp.22-27.
55. UNAIDS.,2024. Global HIV and Statistics-2024 Fact Sheet.[online] UNAIDS. Available at: https://www.unaids.org/en/resources/fact-sheet.
56. Velasquez, C.S., Valverde, S.V.C., Largo, A.A.R., Castillo, J.L.C. and Tayo, A.E.L., 2024. Lesions of Oral Mucosa in People Living with HIV: A Literature Review. Ciencia Latina: Revista Multidisciplinary, 8(1), pp.8182-8196.
57. Vohra, P., Jamatia, K., Subhada, B., Tiwari, R. V. C., Althaf, M. N., & Jain, C. (2019). Correlation of CD4 counts with oral and systemic manifestations in HIV patients. Journal of family medicine and primary care, 8(10), 3247–3252. https://doi.org/10.4103/jfmpc.jfmpc_767_19
58. Wang, Y., Ramos-Gomez, F., Kemoli, A.M., John-Stewart, G., Wamalwa, D., Benki-Nugent, S., Slyker, J. and Seminario, A.L., 2023. Oral diseases and oral health-related quality of life among Kenyan children and adolescents with HIV. JDR Clinical & Translational Research, 8(2), pp.168-177.
59. WHO (2025). WHO recommends injectable Lenacapavir for HIV prevention. [online] Who.int. Available at: https://www.who.int/news/item/14-07-2025-who-recommends-injectable-lenacapavir-for-hiv-prevention.
60. Who.int. (2012). WHOQOL - Measuring Quality of Life| The World Health Organisation. [online] Available at: http://www.who.int/healthinfo/survey/whoqol-qualityoflife/en [Accessed 29 Mar. 2025].
61. WHOQOL - Measuring Quality of Life| The World Health Organisation. [online] Available at: http://www.who.int/healthinfo/survey/whoqol-qualityoflife/en [Accessed 29 Mar. 2025].