

# Relationship Between HIV/AIDS and Periodontal Health Status among Population at High Risk of HIV/AIDS

Titiek Berniyanti, R. Darmawan Setijanto, Ninuk Hariani and Sarah Fitria Romadhoni

*Department of Dental Public Health, Faculty of Dental Medicine, Universitas Airlangga, Surabaya, Indonesia*

## ABSTRACT

**Background.** In 2017, there were sixty people who identified themselves as lesbian, gay, bisexual and transgender/transsexual (LGBT) people in Sememi Public Health Center, and seven of them were known to be people living with HIV/AIDS (PLWHA). People who are at high risk for HIV infection, especially the LGBT people and Female Sex Workers, are at even greater risk of developing a number of severe periodontal diseases. Periodontal problems, such as periodontitis, in HIV patients, are more severe and occur more frequently than uninfected patients. However, data on dental visit in Sememi Public Health Center as the primary health center in Sememi district is still limited, and there is still no data regarding periodontal health status among HIV patients.

**Objective.** The aim of this study is to investigate the relationship between HIV/AIDS and periodontal health status among the population who are at high risk of HIV/AIDS in Sememi Public Health Center area.

**Method.** This study was conducted with a cross-sectional design. The sample size was determined using a total sampling technique and came up with 30 participants.

**Conclusion.** Population with a high risk of HIV/AIDS in Sememi Health Center area in Surabaya City has poor periodontal status, due to a large number of bleeding on probing (BOP), periodontal pocket depth, and loss of attachment (LOA). There is no significant difference between BOP results and pocket depth between the HIV and non-HIV groups. But a significant difference was found between LOA in the HIV and non-HIV groups. On the contrary, we found that there is no significant relationship between HIV/AIDS and xerostomia in this study.

*Key Words: HIV, Periodontitis, Sexual and Gender Minorities*

## INTRODUCTION

Human Immunodeficiency Virus (HIV) / Acquired Immune Deficiency Syndrome (AIDS) is one of the diseases with a substantial increase in the number of people infected with the disease every year. HIV is a global health problem affecting more than 35 million people worldwide. World Health Organization (WHO) data showed that HIV is the 6th cause of death in the world and 90% of HIV cases are found in the developing countries, including Indonesia.<sup>1</sup>

According to the United Nations Program on HIV and AIDS (UNAIDS) data in 2016, HIV/AIDS has infected 36.7 million people worldwide and has caused the death of as many as 1 million. When it was first introduced in 1981, AIDS has caused death in more than 25 million people. In Indonesia, there were 10,376 HIV cases found in 2017. Risk factors that can increase the incidence of HIV infection include risky sex in homosexuals (28%), heterosexuals

*Paper presented at the Joint Scientific Meeting in Special Care Dentistry, July 5, 2019, Amerta Room, 4th Floor, main campus of Universitas Airlangga, Surabaya, Indonesia.*

Corresponding author: Titiek Berniyanti  
Department of Dental Public Health  
Faculty of Dental Medicine  
Universitas Airlangga  
Jl. Mayjen. Prof. Dr. Moestopo No. 47 Surabaya 60132 – Indonesia  
Email: berniyanti@gmail.com

(24%), others (9%), and the use of non-sterile syringes in Injecting drug users (IDU) (2%).<sup>2</sup>

In 2017, the number of people with AIDS was reported to be as many as 673 people in Sememi, Indonesia. While cumulative numbers from 1987 to 2017 was 87,453 number of patients who acquired AIDS. The highest percentage of AIDS risk factors was risky sex in heterosexuals (67%), homosexuals (23%), perinatal sex (2%), and the use of non-sterile syringe in IDU (2%).<sup>3</sup>

Ten provinces with the highest number of HIV cases in Indonesia are found in the DKI Jakarta, East Java, Papua, West Java, Bali, North Sumatra, Central Java, West Kalimantan, Riau Islands, and South Sulawesi. East Java Province is ranked second in the province with 19,249 people with HIV infection.<sup>4</sup>

Transmission of HIV can happen through sexual intercourse, transfusion of body fluids such as blood, exchange of genital fluid, and ingestion of an infected mother's breast milk. The virus is also present in tears, saliva, and sweat.<sup>5</sup>

HIV transmission through sexual intercourse is the most common cause in the whole world. HIV found in seminal fluid has a high concentration of lymphocyte levels. The occurrence of inflammation in the genitalia such as urethritis and epididymitis is one example of a situation where lymphocyte levels are high in seminal fluids. Sexual intercourse through the anus is more susceptible to transmission because the mucosa of the rectum is thinner than the mucosa in the vagina. Blood-borne HIV transmission can occur in individuals who often do the activity of exchanging needles that have been exposed to HIV as well, an act usually done among those who use illegal drugs injected in the body using needles. HIV transmission from an HIV-positive mother to fetus/child can also occur during pregnancy or labor.<sup>6,7</sup>

Human Immunodeficiency Virus (HIV) is the etiology of infection HIV/AIDS. AIDS sufferers are HIV-infected individuals with CD4 <200 $\mu$ L even though there are no symptoms seen or without opportunistic infections.<sup>8</sup>

CD4 + membrane receptor molecules on target cells will be bound by HIV inside the stage of infection. HIV will attack CD4 + lymphocytes. CD4 + lymphocytes strong ties with gp120 HIV so that GP41 can be an intermediary in viral membrane fusion to the cell membrane. Two cell surface co-receptors, CCR5 and CXCR4 are needed, so gp120 and gp41 glycoproteins can bind to the CD4 + receptor. Co-receptor causes changes in formation so that GP41 can enter the target cell membrane. Besides lymphocytes, monocytes and macrophages are also susceptible to HIV infection. Infected monocytes and macrophages can function as reservoirs for HIV but not destroyed by a virus. HIV is political and can infect various human cells, such as natural killer cells (NK), B lymphocytes, endothelial cells, cells epithelium, Langerhans cells, dendritic cells, microglia cells, and various body tissues. After fusion of virus with

CD4 + lymphocytes, then a series of complex processes take place then new viral particles are formed from the infected.<sup>9</sup>

CD4 + lymphocytes infected people may remain latent in a provirus state or may experience replication cycles, resulting in many viruses. This new virus has all the components needed to infect cells and other CD4 but can't do it until it's done. During the process, the HIV protease enzyme cuts the long HIV protein of the virus into a unit, smaller functional ones which then regroup to form mature virus. The virus is now ready to infect other cells.<sup>10</sup>

Along with many other systemic diseases, HIV/AIDS has been documented to impact the periodontium. Periodontitis is characterized by the interaction between the host immune reaction to periodontal pathogenic microorganisms. While largely identified as an inflammatory disease caused by bacteria and bacterial by-products detected in dental plaque, there is growing evidence that viral infections are involved in periodontal disease. This inflammatory process is characterized by destruction of the attachment apparatus surrounding the teeth. The 2009–2012 National Health and Nutrition Examination Survey (NHANES), estimated that 46% (64.7 million) of the United States population has periodontitis, of which 8.9% and 37.1% suffer from severe and mild-moderate forms of the disease, respectively. Increasing evidence suggests that the chronic periodontal infection is implicated in the generation of a systemic inflammatory response, which represents a potential risk factor for worsening various systemic conditions including atherosclerosis, stroke, diabetes, and others.<sup>11</sup>

In 2017, there were sixty LGBT people in Sememi Public Health Center and 11 People Living with HIV/AIDS (PLWHA). Seven of PLWHA were LGBT. However, given the fact that HIV-infected persons are at high risk of periodontal disease, data about the dental visits in Sememi Public Health Center as the primary health center in Sememi district is still limited, and thus there are no data regarding periodontal health status in HIV patients. Therefore, this study was conducted to investigate the relationship between HIV/AIDS and among population at increased risk of HIV/AIDS in Sememi Public Health Center area.

## MATERIALS AND METHODS

This study was conducted with a cross-sectional design at the Surabaya Sememi Public Health Center. The population in this study was the community of LGBT. The sample size was determined using the total sampling method with a total of 30 people. Of the 30 respondents, 20 respondents were identified as transgenders and 10 are gay. From 30 respondents, 16 of them are HIV positive.

The independent variables of this study are status of HIV/AIDS in the LGBT community which is at high risk of HIV/AIDS, age, salivary flow rate, oral health care behavior, social economy, knowledge of HIV/AIDS,

**Table 1.** Cross-tabulation between HIV status and characteristic of respondents

Variable	N	HIV Status				Relative Risk	
		Negative		Positive			
		n	%	n	%		
Age	<34 yo	19	10	33.3%	9	30.0%	1.447
	≥34 yo	11	4	13.3%	7	23.3%	
OHI-S	Good	15	8	26.6%	7	23.3%	-
	Moderate	14	5	16.6%	9	30.0%	
	Poor	1	1	3.3%	0	0%	
Xerostomia	Normal	14	4	13.3%	8	26.6%	-
	Xerostomia	18	10	33.3%	8	26.6%	
Pocket Status	No pocket	6	3	10.0%	3	10.0%	-
	Pocket 4-5 mm	17	11	36.6%	6	20.0%	
	Pocket ≥6 mm	7	0	0%	7	23.3%	
Bleeding on Probing (BOP)	BOP (-)	6	3	10.0%	3	10.0%	1,091
	BOP (+)	24	11	36.6%	13	43.3%	
Loss of Attachment (LoA)	LoA (-)	19	12	40.0%	7	23.3%	3,474
	LoA (+)	11	2	6.6%	9	30.0%	

and knowledge of periodontitis. The dependent variables of this study are periodontal status, OHI-S, and salivary flow. Knowledge about periodontitis was measured using a questionnaire given to respondents.

All the respondents completed the questionnaire and then continued with the collection of saliva. After the collection of saliva, the periodontal status and the OHI-S of the respondent's oral cavity was measured using the WHO probe.

**RESULTS**

The results of the socioeconomic distribution show that 63% of the respondents worked in the field of prostitution, the average income of all respondents are Rp. 2,000,000 with the majority of respondents were high school graduates. Data shows that 60% of respondents did not visit the dentist in the last 12 months.

The population at high risk of HIV/AIDS showed several periodontal problems. Based on the status of attachment loss, more groups of respondents with HIV/AIDS were found to have attachment loss than respondents who were non-HIV/AIDS. This was indicated by the result that 9 out of 11 respondents experiencing attachment loss in the gingival area, were HIV/AIDS positive.

In addition to attachment loss, periodontal status indicators in this study were seen from the depths of the periodontal pocket and bleeding on probing (BOP). Based on periodontal pocket status, it was obtained that deep periodontal pockets were more prevalent among HIV/AIDS respondents than non-HIV/AIDS respondents. The results of the examination showed that 17 respondents had a pocket with a depth of 4-5 mm and seven respondents had a pocket depth of 6-8 mm. A total of 13 respondents were HIV positive and 11 respondents were non-HIV. Based on

**Table 2.** Distribution of respondent's characteristics

Variable	Category	n	(%)
Status	Non HIV Patients	16	53.33
	HIV Patients	14	46.67
Age	< 34 yo	19	63.33
	≥ 34 yo	11	36.67
Status	Gay	10	33.33
	Transgender	20	67.37
OHI-S Status	Good	15	50.00
	Moderate	14	46.67
	Poor	1	3.33
Xerostomia Status	Normal	12	40.00
	Xerostomia	18	60.00
Pocket Status	No pocket	6	20.00
	Pocket 4-5 mm	17	56.67
	Pocket ≥6 mm	7	23.33
Bleeding on Probing (BOP)	BOP +	6	20.00
	BOP -	24	80.00
Loss of Attachment (LOA)	LOA +	19	63.33
	LOA -	11	36.67

bleeding on probing examination, respondents with HIV/AIDS are more likely to have BOP than respondents who are non-HIV/AIDS. The results of BOP examination showed that 23 respondents had positive BOP, 13 of them were HIV positive (Table 1).

From the salivary flow rate, the results showed that 60% of respondents experienced xerostomia, 45% of them were HIV/AIDS positive. The results showed that 80% of the LGBT population in Sememi Public Health area had problems in their periodontal tissue. The periodontal problems were more prevalent among HIV/AIDS respondents, with the prevalence of 54% among all the respondents with periodontal problems.

## DISCUSSION

HIV/AIDS sufferers are prone to have problems in their oral cavity, one of them is periodontal problems. A person can have HIV infection controlled by antiretroviral therapy (ART). In one study, it was explained that ART can avoid progressive periodontal damage even in subjects who have been infected with HIV for a long time. The success or failure of antiretroviral therapy can be the effect of the risk of contracting opportunistic infections. Inflammatory markers, especially cytokine levels, are more relevant in periodontal diagnosis and treatment. HIV-positive patients showed higher interleukin-18 and interleukin-2 expression levels than patients with healthy periodontal conditions, and higher oral inflammation levels. Clinical parameters such as periodontal index and dental care in each individual are predictors for the status and development of periodontal disease in HIV-infected patients<sup>11</sup>

Based on job distribution, 63% of the respondents worked in the field of prostitution, 52% of them were already infected with HIV/AIDS. Respondents of this study showed income with an average of Rp. 2,000,000, meaning that this income is still below the minimum standard payment for an employee in Surabaya City. The amount of income earned can affect the level of visits to the dentist. Data shows 60% of respondents did not visit the dentist in the last 12 months, this is because the main reason for this population to go to the dentist is 40% because of complaints of illness, if there are no complaints of pain the respondents will not opt for a dentist examination, so the respondents did not go for dental oral care. This shows that the socio-economic level plays an important role in dental and oral health.<sup>12</sup>

In addition to periodontal problems in people with HIV/AIDS, xerostomia (dry mouth) is also one of the oral manifestations that occur in people with HIV/AIDS. Xerostomia causes a buildup of plaque and calculus in the oral cavity that leads to periodontal problems. There are 60% of respondents experiencing xerostomia, 45% of them suffer from HIV/AIDS. Previous research showed a relationship between salivary gland hypofunction and xerostomia in people with HIV/AIDS. This is because of the high number of HIV viruses in the lymph nodes. The lymph node is part of the human immune or defense system that is located close to the parotid gland. Infiltration of CD8 + in the lymph gland can cause the hyperplasia of the parotid gland so that it can manifest as hypofunction of the salivary gland or enlargement of the salivary gland. Parotid gland hypofunction can cause a decrease in the salivary flow rate to below normal, causing a condition called xerostomia (dry mouth). Other factors such as age, frequency of drug consumption, systemic conditions such as diabetes mellitus, and lack of water consumption can cause dehydration resulting in xerostomia.<sup>13,14,15</sup>

## CONCLUSION

Based on our results, we had an insight on how the high-risk population of HIV/AIDS in the Sememi Health Center area of Surabaya have poor periodontal status, evidenced by the large number of bleeding on probing (BOP), periodontal pocket depth, and gingival attachment loss. Although in this study we did not establish a significant relationship between xerostomia in people with HIV/AIDS and non-HIV/AIDS, we found that there is a significant relationship between gingival attachment loss in patients with HIV/AIDS and non-HIV/AIDS in the Surabaya Sememi Health Center area.

## Acknowledgments

Department of Dental Public Health, Faculty of Dental Medicine, Universitas Airlangga and Puskesmas Sememi Surabaya.

## Statement of Authorship

All authors participated in data collection and analysis, and approved the final version submitted.

## Author Disclosure

All authors declared no conflict of interest.

## Funding Source

None.

## REFERENCES

1. World Health Organization, Human Immunodeficiency Virus [Internet]. 2018 [cited 2018 May]. Available from: <http://www.who.int/features/qa/71/en/>.
2. Indonesia Ministry of Health. Progress Report on HIV/AIDS & Sexually Transmitted Infectious Diseases (PIMS) for First Quarter 2017. Jakarta: Ministry of Health of the Republic of Indonesia Directorate General of Disease Prevention and Control.
3. Directorate General of PP and PL of the Ministry of Health of the Republic of Indonesia. 2014. Situation Report : The development of HIV/AIDS in Indonesia until September 2014. Jakarta. Awoleye, O.J. and Thron, C. Determinants of Human Immunodeficiency Virus (HIV) Infection in Nigeria: A Synthesis of the Literature. *Journal of AIDS and HIV Research*, 2015;7 (9), 117-129.
4. Agbelusi GA, Aweka OM, Umezudike KA & Okoh M. Oral Manifestations of HIV, licensee InTech. 2013 (cited 2018 July). Available from <https://www.intechopen.com/books/current-perspectives-in-hiv-infection/oral-manifestations-of-hiv>
5. Fricke U, Geurtsen W, Staufienbiel I, Rahman A. Periodontal status of HIV-infected patients undergoing antiretroviral therapy compared to HIV-therapy naïve patients: a case control study. *Eur J Med Res*. 2012 Jan; 17(1):2
6. Saptorini KK. Periodontal Poket Among the Elderly in Wonosari Village Elderly Health Service, Semarang City, *Journal of National Seminar Proceedings: The Role of Public Health in Achieving MDG's in Indonesia*. 2011; 4(1):261-6.
7. Widoyono. *Tropical Diseases: Epidemiology Transmission, Prevention and Eradication*. Jakarta: Erlangga; 2011.
8. Fondoh VN, Mom NA. Mother to child transmission of HIV and its predictors among HIV-exposed infants at Bamenda Regional Hospital, Cameroon. *Afr J Lab Med*. 2017 Dec; 6(1):589.

9. Soewarso, Indijati T, Sumantri, Djumhana, Djali, Syarifudin. AIDS Petunjuk untuk Petugas Kesehatan. Jakarta: Depkes RI.; 2006. pp. 40-41.
10. Isselbacher K. Harrison's Principle of Internal Medicine. Singapore: McGraw Hill Book Co.; 2013. pp. 1022-5.
11. Rowland LP. Merrit's Neurology. Philadelphia: Lippincott Williams & Wilkins; 2000.
12. Azevedo-Pereira JM, Santos-Costa Q, Moniz-Pereira J. HIV-2 infection and chemokine receptors usage—clues to reduced virulence of HIV-2. *Curr HIV Res.* 2005 Jan; 3(1):3-16.
13. Valentine J, Saladyanant T, Ramsey K, Blake J, Morelli T, Southerland J, et al. Impact of periodontal intervention on local inflammation, periodontitis, and HIV outcomes. *Oral Dis.* 2016 Apr; 22 Suppl 1:87-97.
14. Notoatmodjo, Soekidjo. Health Promotion and Health Behavior. Jakarta: Rineka Cipta; 2012.
15. López-Verdín S, Andrade-Villanueva J, Zamora-Perez AL, Bologna-Molina R, Cervantes-Cabrera JJ, Molina-Frechero N. Differences in Salivary Flow Level, Xerostomia, and Flavor Alteration in Mexican HIV Patients Who Did or Did Not Receive Antiretroviral Therapy. *AIDS Res Treat.* 2013; 2013: 613278.

**The Acta Medica Philippina is now accepting original scientific papers, review articles and case reports for its upcoming issues. Please follow the format for submission as indicated in the “Instructions to Authors” elsewhere in the journal.**

**All papers received shall be properly acknowledged.**

**For inquiries and submission of proposals, please e-mail us at [actamedicaphilippina@yahoo.com](mailto:actamedicaphilippina@yahoo.com)**