Correlation between the socio-demographic characteristics and clinical profile with oral manifestations of HIV/AIDS patients

Maharani Laillyza Apriasari[1*], Nur Aprilyani[1], Amy Nindia Carabelly[2], Juliyatin Putri Utami[3]

[1]Department of Oral Medicine, Faculty of Dentistry Lambung Mangkurat University, Indonesia
[2]Department of Oral Biology, Faculty of Dentistry Lambung Mangkurat University, Indonesia
[3]Department of Biomedics, Faculty of Dentistry Lambung Mangkurat University, Indonesia

ABSTRACT

Introduction: Human Immunodeficiency Virus (HIV) exhibits the capability to weaken human immune system. The infected subject will later be more susceptible to suffer from opportunistic diseases when the CD4 cell count is lesser than 200 cell/μL. Oral thrush, periodontal disease and xerostomia are common oral manifestations in AIDS patient which initially indicate the presence of HIV infection. This study was aimed to analyse the correlation between the socio-demographic characteristics and clinical profile with oral manifestations of HIV/AIDS patients. **Methods:** An analytic study with cross-sectional approach was conducted towards the clinical profile and oral manifestation data of HIV/AIDS patients, which obtained from secondary data in the form of medical record. The 55 samples were taken with total sampling technique. **Results:** The chi-square test found no significant correlation between HIV/AIDS patients socio-demographic and oral manifestations and several significant correlation of the HIV/AIDS patients' clinical profile with the oral manifestation as follows: the total number of CD4 and ARV therapy duration was significantly correlated with the HIV/AIDS patients with candidiasis and oral thrush (p=0.01); while in patients with periodontal disease was only significantly correlated with the total number of CD4 (p=0.02); and no significant correlation found in HIV/AIDS patients with xerostomia. **Conclusion**: There is no correlation between HIV/AIDS patients socio-demographic and oral manifestations. There is a correlation between several HIV/AIDS patients clinical profile with the oral manifestation. The number of CD4 cells and the ARV therapy duration was correlated with patients with candidiasis and oral thrush, while in patients with periodontal disease on correlated with the number and CD4 cells. HIV/AIDS patients with xerostomia have no correlation with any of their clinical profile.

Keywords: clinical profile; oral manifestations; HIV/AIDS patients.

p-ISSN: 1979-0201; e-ISSN: 2549-6212; Available from: http://jurnal.unpad.ac.id/pjd/article/view/26025
DOI: 10.24198/pjd.vol33no1.26025
Submission: Jan 31, 2020; Accepted: Mar 31, 2021; Published online: Mar 31, 2021

**Corresponding author: Maharani Laillyza Apriasari, Department of Oral Medicine, Faculty of Dentistry Lambung Mangkurat University, Indonesia. 128, Jalan Veteran Sungai Bilu, Banjarmasin, South Kalimantan, Indonesia, 70122. Phone: +62 817-0352-1321; e-mail: maharaniroxy@gmail.com*

INTRODUCTION

Human Immunodeficiency Virus (HIV) is a viral strain that instigate the weakening of body's immunity. Someone who is infected with HIV is usually prone to experience opportunistic diseases.[1] The infection will result in a group of manifestations known as Acquired Immunodeficiency Syndrome (AIDS) that can disrupt the human immune system.[2] Ministry of Health of the Republic of Indonesia in 2017 reported that there were 10376 HIV cases in Indonesia, while 673 other cases were disclosed as AIDS. The percentage of the disease based on age group were 17.6% in 20-24 year-olds group, 69.6% in 25-49 year-olds group, and 6.7% in >50 year-old group. Based on gender, the patients were dominated by men with a ratio of 2:1. The risk factors for most patients were due to same-gender sexual intercourse (28%), heterosexual copulation (24%), injection needle use (2%) and others (9%).[3]

Cluster of Differentiation (CD4) is an early indication for the progression of AIDS because CD4 number will decline faster than the clinical condition. CD4 count in HIV-infected patients are classified into four categories, that are the state of non-immunodeficiency (CD4 count of more than 500 cells/μL), the mild state of immunodeficiency (CD4 count of 350-499 cells/μL), the moderate state of immunodeficiency (CD4 count of 200-349 cells/μL), and the severe state of immunodeficiency (CD4 counts of less than 200 cells/μL).[4] When CD4 count is below 200 cells / μL, patient condition has entered the AIDS condition where opportunistic infections frequently occur.[5]

There are opportunistic and neoplastic infections that may occur in HIV-infected patients, such as protozoan infections, fungal infections, bacterial infections, and viral infections.[6] Clinical manifestations that often appear in the oral cavity of HIV sufferers include oral candidiasis, periodontal disease, and disorders of salivary glands like xerostomia.[7] Dental practitioners have a high probability to detect HIV-infected patients who have yet been diagnosed when providing services in a dental practice, because they also hold a role in diagnosing and managing the disease. Some of oral diseases are present as the clinical manifestations of systemic diseases, like infectious diseases, inflammatory conditions, metabolic and endocrine disorders, hematological diseases and malignancies. Oral manifestations are very important to discern as it is often the first indication that a person is infected with HIV.[8,9] In South Kalimantan, there is still no data about the oral manifestation of HIV/AIDS. There are not any research that have discussed the interrelation between HIV/AIDS and oral manifestations before, especially in South Kalimantan. This study was aimed to analyse the correlation between the HIV/AIDS patients socio-demographic and clinical profile with the oral manifestations.

METHODS

The population in this study was HIV/AIDS patients treated at the VCT clinic of RSUD. Moh. Ansari Shaleh Banjarmasin and RSUD Ulin Banjarmasin in November 2018-March 2019. The 55 samples were taken with total sampling technique. The samples comprised of HIV/AIDS patients who were being treated at the VCT clinic and HIV/AIDS patients who were being hospitalized at RSUD Moh Ansari Shaleh Banjarmasin and RSUD Ulin Banjarmasin at the time of data collection. The patients were constantly assured to meet the inclusion and the exclusion criteria. The inclusion criteria were patients diagnosed with HIV/AIDS, willing to participate in the study by filling in the informed consent, and in a conscious state. The exclusion criteria were patients who refused to have their oral cavity examined. The variables examined in this study were all of clinical manifestations in the oral cavity of HIV / AIDS patients based on CD4 count, age, gender, marital status and duration of ARV treatment. Oral thrush and periodontal disease as oral manifestations were diagnosed base on the clinical examination, and xerostomia as oral manifestations was diagnosed base on the anamnesis.

The operator visited the VCT clinic at RSUD Ulin and RSUD Moh. Ansari Shaleh Banjarmasin and informed the research subjects about the benefits and the procedures that will be carried out by the researcher. Patients then provided their consent as a sign of approval to be the subject of the study. Further, the operator performed anamnesis and the clinical examinations to collect the data.

This study had been approved for ethical clearance that was issued by Faculty of Dentistry

Lambung Mangkurat University, with the approval number of 115/KEPKG-FKGULM/EC/I/2019. This research was an observational descriptive study with a cross-sectional design obtained from informed consent, history taking and clinical examination of oral cavity among HIV/AIDS patients in Banjarmasin. The tools used were the oral diagnostic tools.

RESULTS

Based on the results, there were 55 subjects of AIDS patients in RSUD Ulin Banjarmasin and RSUD Moh. Ansari Shaleh Banjarmasin. The socio-demographic characteristic of subjects (age, marital status, gender) and clinical profile (CD4 count and duration of ARV therapy) can be seen in Table 1.

Table 1. Socio-demographic characteristics of respondents

Variable	N	%
Age		
<20 y.o	13	23.6
20-35 y.o	29	32.7
>35 y.o	13	23.6
Total of CD4		
>500 cells/µL	10	18.2
350–499 cells/µL	12	21.8
200–349 cells/µL	11	20
<200 cells/µL	22	40
Marital Status		
Single	31	56.4
Married	24	43.6
Gender		
Male	40	72.2
Female	15	27.3
Duration of ARV therapy		
>6 month	30	54.5
<6 month	25	45.5

The data obtained were analyzed using non-parametric because the scale used in this descriptive research is an ordinal scale. Chi-square test to determine the relationship between clinical oral manifestations with CD4 count, age, marital status, gender, and ARV therapy duration in HIV/AIDS patients in Banjarmasin, South Kalimantan.

Table 2 shows the correlation between oral thrush and CD4 count with p=0.01 (p<0.05). The table also presents that there was a significant relationship between oral thrush and the duration of ARV treatment with p=0.01 (p<0.05). No significant relationship was observed between age,

Table 2. Correlation between HIV/AIDS patients' clinical profile with candidiasis manifestation

Clinical profile	Candidiasis		Sig
	Yes	No	
Total of CD4			
>500 cells/µL	0%	33.3%	0.01*
350 – 499 cells/µL	8%	33.3%	
200 – 349 cells/µL	16%	23.3%	
<200 cells/µL	76%	10%	
Age			
<20 y.o	32%	16.7%	0.2
20 – 35 y.o	40%	63.3%	
>35 y.o	28%	20%	
Marital Status			
Single	48%	63.3%	0.25
Married	52%	36.7%	
Gender			
Male	76%	70%	0.61
Female	24%	30%	
Duration of ARV Therapy			
>6 month	36%	70%	0.01*
<6 month	64%	30%	

Table 3. Correlation between HIV/AIDS patients' clinical profile with oral thrush manifestation

Clinical profile	Oral thrush		Sig
	Yes	No	
Total of CD4			
>500 cells/µL	0%	33.3%	0.01*
350 – 499 cells/µL	8%	33.3%	
200 – 349 cells/µL	16%	23.3%	
<200 cells/µL	76%	10%	
Age			
<20 y.o	32%	16.7%	0.2
20 – 35 y.o	40%	63.3%	
>35 y.o	28%	20%	
Marital Status			
Single	48%	63.3%	0.25
Married	52%	36.7%	
Gender			
Male	76%	70%	0.61
Female	24%	30%	
Duration of ARV Therapy			
>6 month	36%	70%	0.01*
<6 month	64%	30%	

Table 4. Correlation between HIV/AIDS patients' clinical profile with periodontal disease

Clinical profile	Periodontal disease		Sig
	Yes	No	
Total of CD4			
>500 cells/µL	0%	33.3%	0.02*
350 – 499 cells/µL	20%	23.3%	
200 – 349 cells/µL	16%	23.3%	
<200 cells/µL	64%	20%	
Age			
<20 y.o	36%	13.3%	0.61
20 – 35 y.o	52%	53.3%	
>35 y.o	12%	33.3%	
Marital status			
Single	52%	60%	0.55
Married	48%	40%	
Gender			
Male	80%	66.7%	0.26
Female	20%	33.3%	
Duration of ARV therapy			
>6 m	44%	63.3%	0.15
<6 month	56%	36.7%	

Table 5. Correlation between HIV/AIDS patients' clinical profile with xerostomia manifestation

Clinical profile	Xerostomia		Sig
	Yes	No	
Total of CD4			
>500 cells/µL	3.8%	31%	0.07
350 – 499 cells/µL	23.1%	20.7%	
200 – 349 cells/µL	23.1%	17.2%	
<200 cells/µL	50%	31%	
Age			
<20 y.o	15.4%	31%	0.13
20 – 35 y.o	50%	55.2%	
>35 y.o	34.6%	13.8%	
Marital Status			
Single	57.7%	55.2%	0.85
Married	42.3%	44.8%	
Gender			
Male	84.6%	62.1%	0.06
Female	15.4%	37.9%	
Duration of ARV therapy treatment			
>6 m	44.8%	65.4%	0.12
<6 month	55.2%	34.6%	

gender, and marital status with the occurrence of oral thrush (p>0.05).

Table 2 and Table 3 presented a significant relationship between number of CD4 cells with candidiasis, oral thrush, and periodontal disease.

Based on Table 4, it can be observed that there was a relationship between periodontal disease and CD4 count with p=0.02 (p<0.05), and there was no significant relationship between age, gender, marital status and duration of treatment on the presence of periodontal disease (p>0.05).

Based on Table 5 show that there was no significant relationship between xerostomia with CD4, age, gender, marital status and duration of ARV therapy because of the number of p-value>0.05.

Table 5 also showed that there was no significant relationship between CD4, age, gender, marital status and duration of ARV therapy on xerostomia because p>0.05.

DISCUSSION

There was no significant relationship between xerostomia and CD4 counts in people with HIV/AIDS observed in this study. Xerostomia can be caused by the side effect of the drug that used by the patients. This is contrasting with the result of Rahayuningtyas et al.[11] showed that the t-cells in the salivary gland are interconnected with the sympathetic and parasympathetic nerves which are responsible in stimulating the flow of saliva and inhibiting the production of saliva. These nerves are associated with many cells in the salivary gland such as ducts, epithelial cells and blood vessels. When the salivary gland is inflamed and enlarged caused by microorganisms, the function of the parasympathetic nerve will be disrupted and will cause the decrease in salivary flow. Decreased flow of saliva will induce an acidic state in oral environment. Low pH in mouth (4,5–6,5) will cause microorganisms to become pathogens, one of which is *Candida albicans*.[10,11]

An insignificant relationship was also found between xerostomia and 6 months ARV therapy. This result was contrasting with the result from the study conducted by Neha et al.[12], which showed that long-term use of antiretroviral drugs will cause a decrease in the salivary flow rate, especially in HIV-positive patients. HIV/AIDS sufferers prescribed with a long-term antiretroviral therapy have a risk to experience salivary gland hypo-function which will change the composition of saliva and cause xerostomia.[12] The results of this study did not show a significant

relationship between xerostomia and age in people with HIV/AIDS. This is contrasting with the result of research conducted by Han et al.[13] that revealed a high level of vulnerability at the age of two to three decade.[13]

It was found that candidiasis did not have a significant relationship with age in patients with HIV/AIDS. Frimpong et al.[2] suggested that HIV prevalence was reported to be higher in the second decade (23%) and the third decade (34.2%). The highest prevalence was observed between 20-35 year-olds age group which was associated with the most contagious factors of HIV/AIDS, namely homosexual intercourse.[16] Candidiasis and marital status did not show any significant relationship with people with HIV/AIDS ad well. This research is supported by a study from Anglewicz et al.[16] which described that HIV/AIDS patients are mostly married individual who change partners and remarried with a prevalence of 66.4%.[17] The results of this study indicate no significant relationship between Oral thrush and gender in people with HIV/AIDS. Men have twice the risk of getting HIV/AIDS compared to women. Gender differences is associated with the frequency of changing sexual partners where the largest proportion were discovered in men.[18]

The results of this study also indicate that there is a significant relationship between oral cavity manifestations namely candidiasis with CD4 counts<200 cells/µL. This is contrasting with the result of Cassone et al.[19] this prompted by the immunocompromized conditions which generally present in HIV / AIDS patients and the high incident rates of opportunistic infections found in the oral cavity. The most common oral manifestations of opportunistic infections in people with HIV / AIDS are candidiasis. It may also relate to low levels of serum vitamin B12 and folate were shown in HIV patients, indicating the need for early nutritional intervention to ensure optimal nutritional status and prevention of oral lesions in HIV patients.[20]

The analysis between the duration of ARV treatment and candidiasis resulted in a significant relationship. ARV therapy will reduce the number of viruses or viral load and increase CD4 cell counts in the body to improve the dysregulation of body's immune system.[18] When consuming ARVs, the production of proteinase in HIV will be hindered, which also generate the inhibition of *Candida albicans* growth *in-vitro* and *in-vivo*. Consumption of anti-retrovirals may increase the number of CD4 cell. An increase in CD4 cell counts were reported with an increase in the amount of sIgA. SigA is a specific humoral response to *Candida* which is responsible in inhibiting candidal colonization and attachment to the oral epithelium.[22]

In this study, there was a significant relationship between periodontal disease showed bone reduction was seen with x-rays and there was a probe examination pocket over 3mm and age in people with HIV/AIDS. HIV/AIDS sufferers who experienced periodontal disease in this research were found in the age of 20–35 years old. Previous study, pathognomonic periodontal manifestation such as Necrotizing Ulcerative Gingivitis (NUG) and Necrotizing Ulcerative Periodontitis (NUP) was found in Indonesian PLWHA which are associated with low CD4+ level reflecting the immune suppression level, and it can be used to predict HIV/AIDS stage of progression. Toljic et al.[22] reported that the number of gingivitis and periodontitis cases was significant in patients aged over 50 years, whereas the number of linear gingival erythema cases were mostly observed in patients aged <35 years.[23] Periodontal disease and marital status shows no significant relationship in people with HIV/AIDS. This is related to the transmission route of HIV/AIDS, namely sexual activity outside marriage with the same or opposite sex.[24]

No significant relationship is found between gender and periodontal disease. Valentine et al.[25] suggested that men suffer more from periodontal disease than women in 26-35 year-olds age group.[25] Treatment of ARVs also has no significant relationship with periodontal disease which is ratified by Fricke et al.[20] where no significant relationship was distinguished. Patients who took ARVs for longer period had better periodontal health than those who did not. Patients who took part in the monitoring programs will be benefited and become healthier in general than those who did not follow the therapy program.[19]

Periodontal disease begins with the presence of bacterial colonization on tooth surface and gingival sulcus which will affect the gingiva and the supporting bone of the tooth. The disease is initiated with an inflammatory process that involves natural and adaptive immune

system. Phagocyte cells, such as PMN, monocytes, neutrophils and magrophages, are the components of natural immune systems, while the adaptive immune system are consisted of T-cells and B-cells that requires time to recognize antigens before retaliate. In periodontal conditions, T-cells are more dominant in secreting CD4 cells compared to CD8 cells. CD4 T-cells function to maintain homeostasis in the presence of biofilm plaques when periodontal diseases occurred. Macrophage cells act as APC (antigen presenting cell) which possesses MHC class II molecules that will be presented towards the surface of T-cells to bind CD4 cells. CD4 cells in the presence of periodontal disease will secrete cytokines and activate B-cells to produce antibodies. The cytokines that play roles during periodontal diseases are IL-1, IL-6, TNF-α, and IFN-Ɣ. If cytokines are produced inappropriately, the destruction of periodontal tissue will occur.[26]

This study reveals that there was a significant relationship between periodontal disease and the number of CD4 cells. This result was also supported by Valentine et al.[25], which showed that due to the T-cells and macrophages dysfunction in the body when CD4 cell counts in HIV/AIDS patients is less than 200 cells/µL. CD4 cells play an important role in immune reactions because they function to produce various types of cytokines, chemokines and hematopoietic growth factors (granulocytes and macrophages). Therefore, losing this "master cell" has a detrimental effect on other components of the immune system.[7] This result was supported by Matafsi et al.[26] who proved that there was a reduction in cytokine secretion among HIV/AIDS sufferers with CD4 cell count less than 200 cells/µL which may interfere in the production of IL-1, IL-6, TNF- α, and INF- Ɣ. This gives rise to more severe signs and symptoms of HIV/AIDS-associated periodontal disease with lower responsiveness in periodontal therapy.[22,23,24,27]

CONCLUSION

There is a correlation between several HIV/AIDS patients clinical profile with the oral manifestation. There is a correlation between several HIV/AIDS patients clinical profile with the oral manifestation. The number of CD4 cells and the ARV therapy duration was correlated with patients with candidiasis and oral thrush, while in patients with periodontal disease on correlated with the number and CD4 cells. HIV/AIDS patients with xerostomia have no correlation with any of their clinical profile.

REFERENCES

1. Yasmin IF, Putra DA, Hakam SA, Fristka L, Lihartanadi J, Biondi M, et al. Knowledge about reproductive health among students in Junior High School 3 Keruak, East Lombok. Sainstek. 2020; 7(2): 77-86. DOI: 10.33476/ms.v7i2.1697
2. Frimpong P, Amponsah EK, Abebrese J, Kim SM. Oral manifestation and their correlation to baseline CD4 count of HIV/AIDS patient in Ghana. J Korean Assoc Oral Maxilofac Surg. 2017; 43(1): 29-36. DOI: 10.5125/jkaoms.2017.43.1.29.
3. World Health Organization. WHO Country Cooperation Strategy of Indonesia 2014–2019. WHO Library Cataloguing-in-Publication data. Geneva: World Health Organization; 2016. p. 1-10.
4. The Republic of Indonesia Health Law No. 62 of 2017. Ministry of Health of The Republic of Indonesia. Jakarta; 2017. p. 18-27.
5. Wuan AO, Banunu AHG, Kambuno NT. Total lymfosit count (TLC) with CD4 in HIV/AIDS patients at Kupang. J Teknol Lab. 2019; 8(2) :16-21. DOI: 10.29238/teknolabjournal.v8i2.189
6. Kumar V, Abbas A, Aster J. Robbins and Cotran Pathologic Basis of disease. 9th ed. St. Louis: Saunders-Elsevier; 2015. p. 458-463.
7. Askynite D, Matulionyte R, Rimkevicius A. Oral manifestations of HIV isease. Stomatologija Baltic Dent Maxillofac J. 2015; 17(1): 22–6.
8. Jain P, Jain I. Oral manifestations of tuberculosis: Step towards early diagnosis. J Clin Diagn Res. 2014; 8(12): ZE18–ZE21. DOI: 10.7860/JCDR/2014/10080.5281
9. Hatta I, Firdaus IWAK, Apriasari ML. The prevalence of oral mucosa disease of Gusti Hasan Aman Dental Hospital in Banjarmasin, South Kalimantan. Dentino (J Ked Gi). 2018; 3(2): 211-4. DOI: 10.20527/dentino.v3i2.5380
10. Gani BA, Soraya C, Sunnati S, Nasution AI, Zikri N, Rahadianur R. Changes in artificial salivary

pH after its interaction with Candida albicans, Streptococcus mutans, and Aggregatibacter actinomycemcomitans. Dent J (Maj Ked Gi). 2013; 5(2): 542-618. DOI: 10.20473/j.djmkg.v45.i4.p234-238

11. Rahayuningtyas ED, Setiadhi R. Virus as a cause of salivary gland diseases. Odonto Dent J. 2019; 6(1): 37-42. DOI: 10.30659/odj.6.1.37-42
12. Verma N, Patil R, Khanna V, Singh V, Tripathi A. Evaluation of salivary flow rate and gustatory function in HIV positive patients with or without highly active antiretroviral therapy. Eur J Dent. 2017; 11(2): 226-31. DOI: 10.4103/ejd.ejd_289_16
13. Han P, Suarez-Durall P, Mulligan R. Dry mouth: A critical topic for older adult patients. J Prosthodont Res. 2015; 59(1): 6-19. DOI: 10.1016/j.jpor.2014.11.001.
14. Lopez-Verdin S, Andrade-Villanueva J, Zamora-Perez AL, Bologna-Molina R, Cervantes-Cabrera JJ, Molina-Frechero N. Difference 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. DOI: 10.1155/2013/613278
15. Rahayu RP, Widiyanti, Arfijanto. Genetic variability of Cndida albicans in HIV/AIDS patient with and without ARV therapy and non HIV/AIDS. Dent J. 2012; 45(1): 28-34. DOI: 10.20473/j.djmkg.v45.i1.p28-34
16. Anglewicz P, Reniers G. HIV status, gender, and marriage dynamics among adults in rural Malawi. Stud Fam Plan. 2014; 45(4): 415-28. DOI: 10.1111/j.1728-4465.2014.00005.x
17. Hernawati S. Management of hairy tongue with oral candidiasis in active smokers. Health Notion. 2020; 4(2): 43-7. DOI: 10.33846/hn40203
18. Sobol EK, Fargione RA, Atiya M, Diaz JD, Powell JA, Gritz DC, et al. Case-control study of herpes simplex eye disease. Bronx epidemiology of human immunodeficiency virus eye studies. Cornea. 2016; 35(6): 801-6. DOI: 10.1097/ICO.0000000000000814
19. Cassone A, Cauda R. Candida and candidiasis in HIV-infected patients: Where commensalism opportunistic behavior and frank pathogenicity lose their borders. AIDS. 2012; 26(12): 1457-72. DOI: 10.1097/QAD.0b013e3283536ba8
20. Fricke U, Geurtsen W, Staufenbiel I, Rahman A. Periodontal status of HIV infected patients undergoing antiretroviral therapy compared to HIV therapy naive patientsL: A case control study. Eur J Med Res. 2012; 17(1): 2-6. DOI: 10.1186/2047-783X-17-2
21. Nugraha AP, Triyono EA, Prahasanti C, Sufiawati I, Prasetyo RA, Ernawati DS. The correlation of pathognomonic periodontal manifestation with $CD4^+$ level in people live with Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome in a Tertiary Hospital, Surabaya, Indonesia. J Int Oral Health. 2019; 11(3): 137-40. DOI: 10.4103/jioh.jioh_53_19
22. Toljić B, Trbovich AM, Petrovic SM, Kannosh IY, Dragovic G, Jevtovic D, et al. Ageing with HIV - A periodontal perspective. New Microbiol. 2018; 41(1): 61-6.
23. Speicher DJ, Ramirez-Amador V, Dittmer DP, Webster-Cyriaque J, Goodman MT, Moscicki A-B. Viral infections associated with oral cancers and diseases in the context of HIV: A workshop report. Oral Dis. 2016; 22 (Suppl 1): 181-92. DOI: 10.1111/odi.12418
24. 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; 22(1): 87-97. DOI: 10.1111/odi.12419
25. Newman M, Takei H, Klokkevold P, Carranza F. Newman and Carranza's Clinical Periodontology. 13rd ed. St.Louis; Saunders-Elsevier: 2018. p. 492-8.
26. Mataftsi M, Skoura L, Sakellari D. HIV infection and periodontal disease: An overview of the post HAART era. Oral Dis. 2011; 17(1): 13-25. DOI: 10.1111/j.1601-0825.2010.01727.x
27. Finoti LS, Nepomuceno R, Pigossi SC, Corbi SCT, Secolin R, Scarel-Caminaga RM. Association between interleukin-8 levels and chronic periodontal disease. A PRISMA-compliant systematic review and meta-analysis. Medicine (Baltimore). 2017; 96(22): e6932. DOI: 10.1097/MD.0000000000006932