



ORIGINAL RESEARCH

COMPARATIVE ASSESSMENT OF PERIODONTAL LESIONS IN PATIENTS WITH VIRAL HEPATITIS B, VIRAL HEPATITIS C AND HIV BEFORE COMPLEX TREATMENT

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ABSTRACT

Background: Periodontal disease is currently a significant problem in dentistry. According to WHO, inflammatory periodontal diseases are one of the most common dental diseases in the world after dental caries. Since the last decades of the 20th century to the present day, there has been an increase in the incidence of VH and HIV.

The **aim** of this study was to compare periodontal lesions in patients with HBV, HCV and HIV.

Material and methods: The study included 281 patients who were divided into 3 groups. Patients of group I with HBV n= 95 - 24 (25.3%) women and 71 (74.7%) men, the average age was 40.17±13.48; group II with HCV n= 96 - 35 (36.5%) women and 61 (63.5%) men, the average age was 50.05±13.29 and group III with HIV n= 90 - 9 (10%) women and 81 (90%) men, the average age was 45.2±8.34. All patients had their stomatological status examined according to pre-developed criteria, which included an external examination of the lips and corners of the mouth, an assessment of the condition of the marginal and alveolar part of the gums, the dental-periodontal complex.

Results: To identify possible characteristics of dental status in HBV, HCV, and HIV infections, we conducted a comparative analysis of the condition of the marginal and alveolar gingiva between groups of patients with VH and HIV. The proportion of individuals with gingival hyperemia in the study groups varied significantly, this symptom was observed in patients in the HIV group 87.8%, which is 1.3 times more common than in the HBV group 66.3% and 4.4 times more common than in the HCV group 19.8% (p<0.001). The comparison of the mean PI index scores revealed a statistically significant difference (p<0.001) between patients in the HBV and HCV groups, where the mean PI index scores were 4.08±0.41 and 4.51±0.64, respectively

Conclusion: Thus, the marginal and alveolar gingiva, unlike HBV and HCV, are more frequently affected by HIV, manifesting as bleeding, swelling, hyperemia, and papillae looseness. The latter is found almost exclusively in HIV patients, while cyanosis is found only in HCV patients. When comparing HBV and C, hyperemia, swelling, and bleeding are more frequently observed in HBV.

Keywords: Oral cavity, periodontal tissues, HBV, HCV, HIV

which depends on the accuracy of the diagnosis ^{1,2}.

INTRODUCTION

Periodontal disease is currently a significant problem in dentistry. This is due to the widespread prevalence of periodontal lesions, the diversity of their clinical forms

and their association with systemic pathologies, and the difficulties in diagnosis and treatment, the success of

According to WHO, inflammatory periodontal diseases are one of the most common dental diseases in the world after dental caries ³.

Since the last decades of the 20th century to the present day, there has been an increase in the incidence of viral hepatitis (VH) and HIV ⁴⁻⁶. The global coverage of

territories and the high epidemic potential of this group of diseases maintain their social and economic significance. The WHO «Global Hepatitis Report» (2017) noted that approximately 325 million people worldwide suffer from viral liver diseases, and mortality from them, unlike HIV infection, tuberculosis and malaria, continues to rise ⁷. According to WHO data, about a third of the planet's population may have contact with the hepatitis B virus (HBV) during their lifetime; 257 million people are chronically infected with the hepatitis B virus, and 71 million with the hepatitis C virus (HCV) ^{8,9}.

Among the important problems of modern practical dentistry, the issues of improving the diagnosis, prevention, and treatment of periodontal tissue diseases, despite numerous studies conducted throughout the world, remain relevant and have great social significance ¹⁰⁻¹². Interest in the study of combined pathology in recent times is explained by the accumulation of new facts, the emergence of new information about interorgan, intertissue and intercellular levels of interaction in the system of the whole organism. In connection with the above, the question of the connection between diseases of the internal organs and organs of the oral cavity becomes relevant ¹³⁻¹⁵.

Periodontal tissues are a complex structural and functional unit and participate in various functions of the body: chewing, swallowing, speech, breathing. In the structure of the main diseases of the organs and tissues of the oral cavity, inflammatory processes in the periodontium occupy one of the leading positions, causing significant functional disorders of the maxillofacial region, caused by tooth loss, according to the conclusions of the WHO, 5 times more often than in complicated forms of caries ^{16,17}. Periodontal diseases in modern dentistry constitute one of the most important problems due to their widespread prevalence, the complex nature of the lesion with the involvement in the pathological process, in addition to the periodontal tissues themselves, of other organs and systems, as well as changes in various links in the homeostasis of the human body, including in the processes of lipid peroxidation, the immune, and cytokine systems ¹⁸⁻²⁰. Many authors point to the high frequency and varied clinical picture of oral cavity lesions in diseases of the gastrointestinal tract ²¹⁻²³.

Recently, there has been a tendency towards an increase in the number of patients with chronic liver pathology, which may be due to an increase in the incidence of viral hepatitis, the use of toxic and medicinal drugs, and poor nutrition ²⁴. In chronic diffuse liver diseases, changes in the periodontium are also observed ^{13,25-27}. Chronic hepatitis, due to its socioeconomic and medical significance, occupies a leading place in human pathology, characterized by global distribution, a steady trend towards increasing incidence, difficulties arising in treatment, and a serious prognosis. Chronic hepatitis is a

systemic pathology in which the oral cavity is affected with high frequency. However, changes in the oral mucosa and periodontium in chronic diffuse liver diseases have begun to attract the attention of researchers relatively recently. Chronic hepatitis is often associated with gingivitis, periodontitis, cheilitis, leukoplakia, candidiasis, herpetic and aphthous lesions of the mucous membrane of the cheeks and tongue ²⁸⁻³¹. The structure of periodontal diseases in patients with chronic VG is represented mainly by chronic generalized periodontitis of mild and moderate severity ^{32,33}.

Oral lesions in people infected with the human immunodeficiency virus (HIV) are among the first symptoms of the disease, which is characterized by a wide variety of clinical courses. The appearance of early signs of immunodeficiency in the oral cavity is understandable: the accompanying suppression of the immune system promotes the proliferation of opportunistic microorganisms, as well as the "disinhibition" of the tumor growth suppression system, which causes characteristic lesions in this area. In this regard, a dentist may be the first specialist an HIV-infected patient consults ^{34,35}. The dental aspects of HIV infection are diverse and not fully understood ^{36,37}. HIV-associated dental diseases can be the first symptoms of infection, are characterized by high frequency, clinical polymorphism and manifest course, significantly aggravate the course of the underlying disease and reduce the patient's quality of life ³⁸⁻⁴⁰. The degree of disturbance of the periodontal and hygienic status in the oral cavity at the time of the onset of HIV infection largely determines the aggressiveness of the course and the effectiveness of treatment of specific HIV-associated periodontal diseases ⁴¹.

It should be noted that the available literature does not contain any data on comparative, cross-sectional, or multifaceted studies of periodontal status in patients in this group. We believe this study will be promising for the development of early diagnostic methods and a comprehensive assessment of the dental status of patients with HBV, HCV, and HIV infection with periodontal disease.

The **aim** of this study was to compare periodontal lesions in patients with HBV, HCV and HIV.

MATERIAL AND METHODS

The study included 281 patients who were divided into 3 groups. Patients of group I with HBV n= 95 - 24 (25.3%) women and 71 (74.7%) men, the average age was 40.17±13.48 (mean±SD); group II with HCV n= 96 - 35 (36.5%) women and 61 (63.5%) men, the average age was 50.05±13.29 (mean±SD) and III group with HIV n= 90 - 9 (10%) women and 81 (90%) men, the average age was 45.2±8.34 (mean±SD). Patients in the main groups, in addition to the underlying disease, had oral lesions. The patients were treated in the Infectious Diseases Clinic of the "Mikaelyan Institute of Surgery", YSMU (Yerevan, Armenia) from 2023 to 2025.

All patients had their stomatological status examined according to pre-developed criteria, which included an external examination of the lips and corners of the mouth, an assessment of the condition of the marginal and alveolar part of the gums, the dental-periodontal complex. An index assessment of periodontal tissue condition: PI⁴², SBI⁴³, and OHI-S indices⁴⁴ was also conducted. The OHI-S determined the oral hygiene status. Acid-base balance and salivary flow were also assessed as well as the state of salivation.

The final diagnosis of HBV was established on the basis of detection of hepatitis B virus surface antigen (HbsAg) in the blood serum by enzyme-linked immunosorbent assay (ELISA) and hepatitis B virus DNA by polymerase chain reaction (PCR), the final diagnosis of HCV was established on the basis of detection of hepatitis C virus RNA in the blood by PCR, and the final diagnosis of HIV infection was established on the basis of the WESTERN-BLOT reaction. All patients in the main groups underwent abdominal ultrasound.

Statistical analysis

Descriptive analysis (Mean±SD for continuous and frequencies/proportion for categorical variables) were computed for all variables of interest. Differences between two groups were evaluated using “chi-square” or “Fisher’s exact” tests for categorical variables and “Wilcoxon signed rank test” for continuous variables. Spearman correlation was performed for determination of relationships between continuous variables. P-value was considered significant at <0.05 and <0.001 for highly significant results. Analyses were conducted using Excel 2013 and R software.

RESULTS

To identify possible characteristics of dental status in HBV, HCV, and HIV infections, we conducted a comparative analysis of the condition of the marginal and alveolar gingiva between groups of patients with VH and HIV. Data on the condition of various parts of the periodontium are presented in Table 1

Table 1. The state of the marginal and alveolar parts of the gums in patients with HBV, HCV and HIV

Sign		HBV n=95		HCV n=96		HIV n=90		Meaning	
		abs.n.	%	abs.n.	%	abs.n.	%	χ ²	p value
Hyperemia	no	32	33.7	77	80.2	11	12.2	92.53	p<0.001
	yes	63	66.3	19	19.8	79	87.8		
Cyanosis	no	65	68.4	30	31.2	79	87.8	65.52	p<0.001
	yes	30	31.6	66	68.8	11	12.2		
Oedema	no	32	33.7	50	52.1	10	11.1	35.47	p<0.001
	yes	63	66.3	46	47.9	80	88.9		
Papillae looseness	no	95	100	95	99	26	28.9	171.41	p<0.001
	yes	0	0	1	1	64	71.1		
Gingival atrophy	no	58	61.1	47	49	47	52.2	2.94	p>0.25
	yes	37	38.9	49	51	43	47.8		
Bleeding	no	24	25.3	49	51	2	2.2	56.75	p<0.001
	yes	71	74.7	47	49	88	97.8		
Desquamation of gingival epithelium	no	91	95.8	94	97.9	85	94.4	1.51	p>0.6
	yes	4	4.2	2	2.1	5	5.6		

As can be seen from the data obtained, the proportion of individuals with gingival hyperemia in the study groups varied significantly. The highest incidence of this symptom was observed in patients in the HIV group 87.8%, which is 1.3 times more common than in the HBV group 66.3% and 4.4 times more common than in the HCV group 19.8%. Gingival cyanosis was statistically reliably detected in all groups examined: in patients with HCV, it occurred in 68.8% of cases, which is 2.2 times more often than in patients with HBV, where it was observed in 31.6%, and almost 6 times more often than in patients with HIV 12.2%. Analysis of data on the detection of gingival swelling revealed that this symptom is, with a high degree of reliability, most characteristic of HIV 88.9%. In groups with VH, gum swelling occurs less frequently: with HBV – in 66.3% of cases, with HCV – in 47.9% of those examined, which is 1.3 and 2 times less frequent than in the group with HIV, respectively. As our observations have shown, such a symptom as papillary looseness was characteristic of HIV with a high degree of reliability and was determined in 71.1% of patients with this pathology, in only 1% of cases with HCV, and was not detected with HBV. A comparative analysis of the detection of the symptom “bleeding gums” showed that the latter is detected with a high degree of reliability in almost all subjects with HIV 97.8% and is pathognomonic for this pathology. It should also be noted that this symptom, observed less frequently among patients with VH, was described in more than 2/3 (74.7%) of patients in the HBV group and in almost half (49%) in the HCV group. When comparatively analyzing data regarding gingival atrophy (p>0.25) and epithelial desquamation (p>0.6) in the examined groups, no significant differences were found.

A comparative analysis of the state of the dental-periodontal complex in the studied groups was carried out on the basis of the data presented in Table 2.

Table 2. The state of the dental-periodontal complex in patients with HBV, HCV and HIV

Sign		HBV n=95		HCV n=96		HIV n=90		Meaning	
		abs.n.	%	abs.n.	%	abs.n.	%	χ^2	p value
Supragingival dental plaque									
no		14	14.7	43	44.8	35	38.9	17.3	p<0.001
yes		81	85.3	53	55.2	55	61.1		
Subgingival dental plaque									
no		28	29.5	54	56.2	60	66.7	27.46	p<0.001
yes		67	70.5	42	43.7	30	33.3		
Tooth mobility	I degree	22	23.2	38	39.6	23	25.6	7.19	p<0.025
	II degree	49	51.6	26	27.1	45	50	14.58	p<0.001
	III degree	3	3.2	0	0	1	1.1	3.49	p>0.1
Periodontal pockets >3.5 mm									
no		12	12.6	8	8.3	5	5.6	2.92	p>0.25
yes		83	87.4	88	91.7	85	94.4		
Purulent discharge from pathological pockets									
no		55	57.9	60	62.5	79	87.8	25.57	p<0.001
yes		40	42.1	36	37.5	11	12.2		
The presence of bad breath									
no		27	28.4	40	41.7	14	15.6	15.43	p<0.001
yes		68	71.6	56	58.3	76	84.4		

It was found that the groups differed significantly in the frequency of supragingival plaque. This pathological feature, with the highest frequency 85.3%, should be considered pathognomonic for patients with HBV. The next highest frequency is the HIV group 61.1% and the HCV group 55.2%. The proportion of individuals with subgingival plaque varied significantly across the study groups. This indicator was also highest in the HBV group 70.5%. However, unlike supragingival plaque, subgingival plaque was detected 1.6 times less frequently among patients with HCV 43.7% and 2.1 times less frequently among those with HIV 33.3%. Purulent discharge from periodontal pockets was detected in 42.1% of patients with HBV. This rate was significantly lower in the HCV group 37.5% and significantly 3.5 times lower in the HIV group 12.2%. A comparative analysis of the presence of pathological pockets >3.5 mm between the groups revealed no significant differences. The proportion of individuals with bad breath significantly differed between the study groups, reaching 84.4% and being highest in the HIV group, followed by the HBV 71.6% and HCV 58.3% groups.

An analysis of data on pathological tooth mobility in the compared groups revealed no statistically significant difference in degree III tooth mobility (p>0.1). Degree I tooth mobility was most frequently detected in the HCV group 39.6%, while degree II tooth mobility was most frequently detected in the HBV group 51.6%. The latter was observed in an average of half of the patients in both the HBV and HIV groups. This symptom was detected in 27.1% of patients with HCV, which is statistically significantly less than in the other groups.

An index assessment of the periodontal tissue condition was performed. The following indices were calculated: PI according to Russell, SBI according to Mühlemann and Son, OHI-S according to J.C. Green - J.K. Vermillion (Table 3).

Table 3. Index assessment of the state of periodontal tissues in patients with HBV, HCV and HIV (mean ± SD)

Indicators	HBV n=95	HCV n=96	HIV n=90
PI, points	4.08±0.41	4.51±0.64	4.08±0.9
SBI, points	2.82±0.21	3.02±0.1	3.01±0.11
OHI-S, points	2.16±0.46	2.01±0.51	2.03±0.47

The comparison of the mean PI index scores revealed a statistically significant difference (p<0.001) between

patients in the HBV and HCV groups, where the mean PI index scores were 4.08 ± 0.41 and 4.51 ± 0.64 , respectively. The same mean PI index score was recorded in the HBV and HIV groups ($p > 1$). The mean PI index score in the HCV group (4.51 ± 0.64) was statistically significantly ($p < 0.001$) higher than the same index score in the HIV group (4.08 ± 0.9). A comparison of the mean SBI scores revealed a statistically significant difference ($p < 0.001$) between the groups with viral hepatitis B and C (2.82 ± 0.21 and 3.02 ± 0.1). In patients with HIV, the mean score of this index was 3.01 ± 0.11 and did not differ statistically from that in the groups with VH. When comparing the average OHI-S index scores in patients with HBV and HCV, which were 2.16 ± 0.46 and 2.01 ± 0.51 , respectively, a statistically significant difference was found ($p < 0.0208$). Comparison of these indicators between the groups with HBV - HIV and HCV - HIV infection did not reveal a statistically significant difference ($p > 0.0789$ and $p > 0.776$, respectively).

The acid-base balance of oral fluid was studied in the examined patient groups. Differences in pH values were established between the groups. Thus, when comparing pH values in the groups with HBV and HCV, the obtained values, averaging 4.95 ± 0.55 U and 4.77 ± 0.55 U, respectively, differed statistically significantly ($p < 0.0249$). With a high degree of reliability ($p < 0.001$), the pH of oral fluid was higher in patients with HIV and amounted to 5.7 ± 0.47 U.

A comparative analysis of the level of salivation was conducted and it was found that the indicator of the normal level of salivation, detected in 33.3% of patients with HIV, was statistically significantly ($p < 0.001$) 3 times higher than the same indicator in the HBV group (10.5%) and almost 4 times higher in the HCV group (9.4%). The value of the hyposalivation indicator differed with a high degree of reliability ($p < 0.001$) when comparing the main groups. The highest value of hyposalivation was recorded in the HCV group (90.6%), which was higher than in the HBV group (89.5%) and almost 1.5 times higher than in the HIV group (66.7%).

DISCUSSION

There is virtually no pathology that does not affect the oral cavity. However, the similarity of clinical manifestations in the oral cavity of diseases with different etiologies and pathogenesis contributes to difficulties in establishing a definitive diagnosis⁴⁵⁻⁴⁷. Most researchers consider the periodontium as an integral part of the whole organism and recognize the close pathogenetic relationship between periodontal diseases and somatic pathology. Patients with periodontitis who have concomitant and background

diseases require special attention, both in the diagnosis of combined pathology and in treatment and prevention⁴⁸⁻⁵⁰. Periodontal lesions aggravate the course of diseases and serve as an important addition to the characteristics of the general clinical picture of hepatitis and HIV infection^{41, 48, 51}. Viral liver lesions occupy an important place in the assessment of the dental health of patients⁴⁹. At the same time, dentists and doctors of other specialties do not pay due attention to the condition of the oral cavity in liver diseases⁵². The experience of a dentist in infectious disease departments has shown that the effectiveness of diagnosis and treatment of lesions of the oral cavity depends on the earliest possible examination of the admitted patient⁵³.

Dental care for patients, even with a confirmed diagnosis of viral hepatitis, is provided mainly upon request due to acute pain. There are very few developments in dental tactics for managing patients with hepatitis. Countries with a high level of dental services have also not accumulated experience in this problem^{54,55}. With regard to HIV, dentists should be able to recognize HIV-associated dental diseases and ensure referral of patients to appropriate specialists⁵⁶. Oral lesions in HIV-infected patients are considered as early clinical manifestations and are also an indicator of disease progression.

The data on the condition of the marginal and alveolar gingiva in patients with HBV, HCV, and HIV are of interest. As the figures show, of the seven symptoms we studied that characterize periodontal health, five were significantly more frequently detected in HIV (with the exception of epithelial desquamation, which was detected in a minimal number of patients in the three main study groups). It should be noted that papillary laxity was found almost exclusively in patients with HIV. The difference in the incidence of atrophy in the three groups studied was insignificant. Thus, only cyanosis was significantly more common in HCV. When comparing viral hepatitis B and C, hyperemia, edema, and bleeding were more common in HBV. Based on the above, it can be reliably concluded that the marginal and alveolar parts of the gingiva are affected more frequently in HIV infection than in patients with HBV and HCV. It is worth noting that, according to Fedeli U. et al. (2017), who studied the characteristics of damage to the oral mucosa and periodontium in patients with chronic liver diseases of viral etiology, in chronic hepatitis and liver cirrhosis caused by the hepatitis B virus, more severe degenerative and inflammatory changes are observed in the oral mucosa and periodontal tissues compared to that caused by the hepatitis C virus⁵⁷. Our data indicate that it is probably difficult to draw a definitive conclusion regarding the comparison of the severity of periodontal damage in HBV and HCV, since some symptoms are

significantly more common in HBV, while others are more common in HCV.

Specific HIV-associated periodontal pathology requires timely detection and treatment, special differential diagnostics, since, on the one hand, the periodontal complex can be primary, and often a favorite area of localization of the elements of damage in many HIV-associated diseases of the oral cavity (Kaposi's sarcoma, non-Hodgkin's lymphoma, etc.), and, on the other hand, combined destructive lesions of the periodontium significantly increase the risk of viral, bacterial and fungal systemic infection and can modify the clinical picture of other HIV-associated dental pathology. There is evidence that some periodontopathogens, by promoting trans-infection of HIV-1 from oral keratinocytes to dendritic cells, accelerate the progression of the infectious process⁵⁸⁻⁶⁰.

There are few studies in the available literature that have examined and systematized the symptoms of periodontal disease in HBV, HCV, and HIV, particularly the early manifestations of the disease. The frequency of occurrence of any given symptom has also not been studied. Some authors even point to inconsistent data linking periodontal disease to viral hepatitis. There are isolated studies describing a few isolated symptoms in a small number of patients. No comparative analysis of data on the above-mentioned symptoms in patients with viral hepatitis B and C and HIV has been conducted. We believe this is important, as patient management protocols and treatment regimens differ. It should be noted that the literature contains reviews on this issue, which describe in detail the epidemiological data and pathophysiological mechanisms of extrahepatic lesions in viral hepatitis and HIV [61-63]. However, there is little original research in this area.

CONCLUSION

Thus, the marginal and alveolar gingiva, unlike HBV and HCV, are more frequently affected by HIV, manifesting as bleeding, swelling, hyperemia, and papillae looseness. The latter is found almost exclusively in HIV patients, while cyanosis is found only in HCV patients. When comparing HBV and C, hyperemia, swelling, and bleeding are more frequently observed in HBV.

DECLARATION

Conflict of Interest

There are no conflicts of interest.

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None

Consent Statement

Written informed consent was obtained from the patient for publication of this case report and accompanying

images.

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