SMJ Saratov Medical Journal

ISSN 2712-8253, Saratov Medical Journal

2023. Volume 4. Issue 2. Article CID e0202

DOI: 10.15275/sarmj.2023.0202

Original article

Reprint

Effect of electronic cigarettes and heated tobacco products on condition of periodontium in patients of different ages and genders

Alexey A. Kishkan ✉

✉kishkan92@bk.ru

I.M. Sechenov First Moscow State Medical University (Sechenov University), Moscow, Russia

Received 26 April 2023, Accepted 25 May 2023

Abstract:

Objective: to compare the condition of periodontium in three categories of patients: smokers of electronic cigarettes (EC), smokers of heated tobacco products (HTP) and nonsmokers vs, their age and gender.

Materials and Methods. We carried out a comprehensive analysis of 1,754 patient records including EC smokers (n=1,122) and HTP smokers (n=632).Data from 566 nonsmokers were used as a comparison group (CG). Patients of all groups were distributed among subgroups depending on their age and gender. The clinical condition of the periodontium was assessed using dental indices and indicators. For statistical data analysis, we employed Microsoft Excel and STATISTICA 64 version 20.0 software.

Results. Gingivitis prevailed in all three groups. Itsprevalence in EC smokers decreasedwith age; the opposite trend was observed in HTP smokers. As for CG, gingivitis was recorded in all age groups. The prevalence of acute periodontitis was the highest in EC and HTP smokers aged 35-39 years vs. 30–34-year-old individuals of the CG. In HTP and EC smokers, the prevalence of gingivitis and acute periodontitis was more pronounced in females, while we observed no statistically significant difference of the kind between men and women of the CG. The frequency of occurrence of localized chronic periodontitis was maximum in EC and HTP smokers at the age of 40–44 years vs. 45–50 years in the CG subjects. However, in the HTPGroup, it was more pronounced in females, while in the EC Group it was more characteristic in males. The frequency of occurrence of generalized chronic periodontitis in individuals of all groups was more pronounced in women.

Conclusion. The results of our study confirmed that the use of EC and HTP is a harmful factor causing the occurrence of periodontal disease.

Keywords: smoking, oral health, electronic cigarette, vaping, heatedtobacco product.

Cite as: Kishkan AA. Effect of electronic cigarettes and heated tobacco products on condition of periodontium in patients of different ages and genders. *Saratov Medical Journal* 2023; 2 (2): e0202. https://doi.org/10.15275/sarmj.2023.0202

Introduction

Smokers are at higher risk of developing periodontal disease. This associationwas shown in numerous published studies, including a dose-response relationship between smoking intensity and the risk of periodontal disease, since both the number of cigarettes smoked per unit time and the duration of smoking per se are positively associated with the risk of periodontal disease [1].

Smoking is a significant risk factor for periodontal disease and tooth loss, as shown in several clinical studies comparing smokers and nonsmokers. The relative risk of periodontal disease associated with smoking was estimated in various studies as ranging from 1.4 to 5.0 [2, 3].

Over the past decade, the prevalence of electronic cigarettes (EC) and heated tobacco products (HTP) has increased exponentially worldwide [4]. These tobacco products were proposed as non-combustible alternatives to traditional tobacco products (such as cigarettes), and they were claimed to reduce the negative health effects associated with tobacco smoke [5]. However, the overall health impact and safety of using these products, including taking into account age and gender, remain unclear, which makes it urgent to study the characteristics of the age- and gender-based condition of the periodontium in EC and HTP smokers.

Objective –to compare the condition of periodontium in three categories of patientstaking into account their age and gender: EC smokers, HTP smokers and nonsmokers.

Materials and Methods

We performed a comprehensive analysis of 1,754 electronic dental records of smoking patients, who were distributed among two groups depending on the preferred type of smoking (EC: n=1,122 patients;HTP: n=632 patients), based on the anamnestic survey, while 566 electronic dental records of non-smoking patients were used as a comparison group (CG). Patients of all three groups were distributed among subgroups depending on their age and gender.In order to consider the patterns of the EC effect and HTP impact on the condition of the periodontium, we employed the International Classification of Periodontal Diseases (WHO) including gingivitis, acute periodontitis, localized chronic periodontitis, and generalized chronic periodontitis.

Statistical analysis of the data was carried out via Microsoft Excel and STATISTICA 64 version 20.0. software (StatSoft, Inc.). For pairwise assessment of statistically significant differences between groups, the Mann–Whitney U test was used. Statistical significance of differences in the frequencies was assumed at $p<0.05$. Due to the skewed distribution of values, data were analyzed using nonparametric tests. We calculated the proportion of different categories of patients within groups, the maximum and minimum values, as well as the median value and its interquartile range (25% and 75%).

Results

The proportion of gingivitis and acute periodontitis in the analyzed groups of patients was 44.3% and 33.8% (EC Group) vs. 46.7% and 29.7% (HTP Group), while in CG these values were 49.1% and 23. 3%, respectively (*Figure 1*). We revealed a statistically significant difference in the percentage of detected gingivitis between EC smokers and nonsmokers (CG) at the level of p=0.009, with higher gingivitis prevalence in the ECG roup. At the same time, the proportion of acute periodontitis was statistically significantly different between the EC Group and CG (p=0.007) and between the HTP Group and CG (p=0.017) with higher acute periodontitis prevalence in the EC Group.

The prevalence of localized chronic periodontitis was 12.9% in EC smokers and12.8% in the HTP Group, while nonsmokers (CG) experiencedlocalized chronic periodontitis in 15.7% of cases. Generalized chronic periodontitis was diagnosed in 166 patients, of which 9% were EC smokers, 10.7% were HTP smokers, and remaining 11.8% of patients were nonsmokers. There were no statistically significant differences in the occurrence of revealedlocalized chronic periodontitis and generalized chronic periodontitis between the groups, albeit their values prevailed in the CG.

Analysis of data on the diagnostic structure of the periodontium depending on age (*Figure 2*) yielded that the frequency of gingivitis in EC smokers decreased with age from 30.6% at the age of 20-24 years to 26.8% at the age of 35-39 years. Contrariwise, in the HTP group, the frequency of detected periodontal pathology increased from 17.6% at the age of 20-24 years to 36.6% of those examined at the age of 35-39 years, with a complete absence of gingivitis in patients of the older age group. We also revealed a statistically significant difference in the percentage of detected gingivitis between age groups of patients (p=0.009), with the highest values in EC smokers of younger age (20-24 years) and in the older age group (35-39 years) of HTP smokers. In contrast to thispattern, gingivitis was recorded in all age groups of nonsmokers with its dynamics from 14.4% in the age group of 20-24 years to 7.2% in the age group of 45-50 years.

The prevalence of acute periodontitis was maximum in EC and HTP smokers 35-39 years of age with its prevalence of 49.9% and 35.6% of the examined patients, respectively; the lowest prevalence of acute periodontitis in EC and HTP smokers was recorded at the age of 20-24 years with its values of 7.4% and 13.8% of the examined patients, respectively. It should be noted that acute periodontitis was nonexistent in the older age group (45-50 years) of EC and HTP smokers. In the CG, the prevalence of acute periodontitis was maximum at the age of 30-34 years with an occurrence rate of 28.8%, while its minimum values werecharacteristic for the age group of 20-24 years with an occurrence rate of 3.8% of those examined.

The prevalence of localized chronic periodontitis in both EC and HTP smokers was maximum in the age group of 40-44 years (52.4% and 40.7%, respectively); it was minimum in the age group of 30-34 years (4.8% of EC smokers) and 45-50 years (7.4% of HTP users). In the CG, we observed the highest frequency of localized chronic periodontitis in the age group of 45-50 years (60.7%), whilethe lowestrate was characteristic of the age group of 25-29 years (1.1%). A complete absence of localized chronic periodontitis was observed in the younger age category (20-24 years) of all analyzed groups.

The prevalence of generalized chronic periodontitis was maximum in EC and HTP smokers aged 40-44 years (77.2% and 35.3% of the examined patients, respectively), while the minimum prevalence rates were characteristic of 45–50-year-old EC smokers (10.9%) and 30–34-year-old HTP smokers (23.5%). In the CG, the prevalence of generalized chronic periodontitis was maximum at the age of 45-50 years (95.5%). Its complete absence in all analyzed groups was observed in age groups ranging from 20 to 34 years.

Analysis of the diagnostic structure of periodontal disease depending on gender (*Figure 3*) showed that the frequency of gingivitis in individuals of HTP Groupwas more pronounced in women than in men (51.9% vs. 43.6%, respectivelyp=0. 08), while in the EC Group these values were 51.5% in women vs. 39% in men (p=0.006). In nonsmokers, gngivitis was observed in 47% of female patients and 51.2% of male patients (p=0.09).

The prevalence of acute periodontitis in the HTPGroup was more pronounced in women than in men (40.2% vs. 22.6%, respectively; p=0.002); in the EC Group, these values were 38.3% in women vs. 30.4% in men (p=0.062). In the CG, acute periodontitis was present in 23.2% of females vs. 23.5% of males (p=0.38). The frequency of localized chronic periodontitis in HTP Group was more pronounced in women than in men (18.4% vs. 9%, respectively; p=0.001); while in the EC Group, these values were 12.6% in women vs. 13.2 % in men (p=0.37). In the CG, these values were similar: 15.8% in female patients vs. 15.7% in male patients (p=0.77). The prevalence of generalized chronic periodontitis in individuals from the HTP Group was more pronounced in women (25.8%) than in men (7.7%), p=0.001; while in the EC Group, these values were 11.1% in women vs. 7 .5% in men (p=0.003). In nonsmokers, these values were 12.3% in female patients vs. 11.4% in male patients (p=0.45).

Discussion

In the process of analyzing the results of our study, we revealed that acute periodontitis was more common among EC users than among HTP smokers, with a statistically significant predominance of both groups over nonsmokers. We also established that nonsmokers were to a greater extent (statistically significant pattern) susceptible to periodontal damage in the form of gingivitis than EC smokers, but were not different in this respect from the HTP Group.

Statistics in recent years showed an increase in the number of smokers, including females, young people, and teenagers. Cases of initiation of smoking at a younger age are increasing worldwide due to the spread of modern methods of tobacco delivery (or of its substitutes) [6]. According to the results of our study, in people with dependence on EC or

HTP, the frequency of more severe forms of inflammatory diseases of periodontal tissues increased with age, and the occurrence of periodontal diseases and their severity were higher among women in the HTP Group. These results support the data of several earlier studies [7, 8].

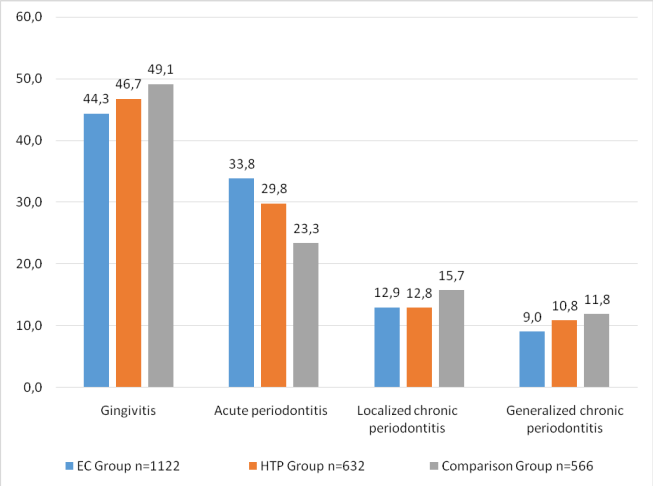

Figure 1. Diagnostic structure of oral diseases in the analyzed groups, %

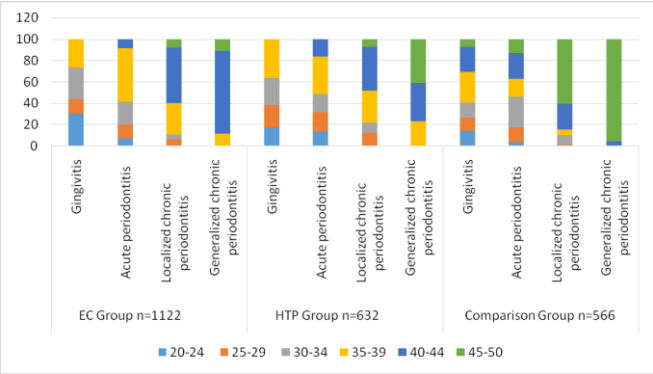

Figure 2. Structure of periodontal disease in study groups depending on age, %

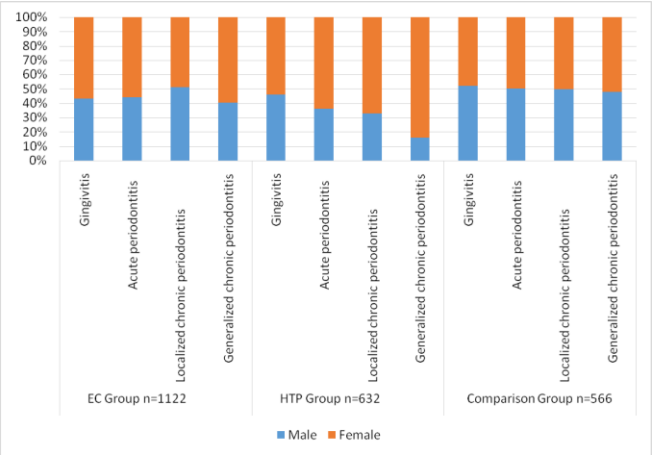

Figure 3. Structure of periodontal disease in study groups depending on gender, %

We detected statistically significant differences in the dynamics of age groups, as well as in the indicators between the EC and HTP groups in terms of more severe forms of inflammatory diseases of periodontal tissue in the EC Group vs. the HTP Group when EC and HTP were used at a younger age. Statistically significant differences were revealed in female patients between both HTP Group and ECGroup with CG in terms of the gingivitis prevalence, while among men, on the contrary, gingivitis was significantly more often recorded in nonsmokersthan in the EC and HTP smokers. At the same time, in the EC and HTP groups, men were less likely (albeit statistically insignificantly) to suffer from all forms of periodontitis than in the CG, while women in the HTP Group were more likely to develop acute or chronic periodontitis than in EC Group or CG ($p<0.001$).

Conclusion

Hence, we conclude that acute periodontitis is more common among EC smokers and less common among HTP smokers with a statistically significant predominance over nonsmokers (CG). We noted that CG patients were more statistically significantly susceptible to periodontal damage in the form of gingivitis as compared with the EC smokers, but did not differ in this respect from the HTP users. In individuals who were dependent on EC or HTP consumption, the prevalence of more severe forms of inflammatory diseases of periodontal tissues was significantly higher in older age groups.An increase in the prevalence of periodontal tissue diseases and their severity was typical for women in the HTP Group. Statistically significant differences were revealed between female patients of the HTP or EC smokers and nonsmokers (CG) in terms of the gingivitis prevalence, while among male subjects, on the contrary, gingivitis was significantly more often recorded among the control individuals than in the EC and HTP smokers.

Conflict of interest. None declared.

References

1. Abaykhanova MA.The effect of electronic cigarettes on the oral mucosa condition. *Fundamental Aspects of Mental Health* 2018; (2): 22-5. (In Russ.).
2. Kaladze NN, Gorobets SM, Gorobets IV, et al.Analysis of the effect of electronic cigarettes (vapes) on dental status. *Crimean Journal ofInternal Diseases* 2020; (3): 74-9. (In Russ.).
3. Petrova AP, Pavlova AO, Miroshnichenko ED, Sergeev AA. The effect of vaping and tobacco cigarettes on the oral mucosa. *International Student Scientific Newsletter* 2018; (1): 35-9. (In Russ.).
4. Mammadov VV, Safrarov DA, Aleskerova SM. Pathogenetic aspects of the influence of smoking on the condition of organs and tissues of the oral cavity. *Bulletin of Issues in Biology and Medicine* 2017; 1-2(136): 367-72. (In Russ.).
5. Pesce P, Menini M, Ugo G, et al. Evaluation of periodontal indices among non-smokers, tobacco, and e-cigarette smokers: A systematic review and network meta-analysis. *Clin Oral Investig*. 2022; 26(7): 4701-14. https://www.doi.org/10.1007/s00784-022-04531-9.
6. Ralho A, Coelho A, Ribeiro M, et al. Effects of electronic cigarettes on oral cavity: A systematic review. *J Evid Based Dent Pract.* 2019; 19(4): 101318. https://www.doi.org/10.1016/j.jebdp.2019.04.002.

7. Ratajczak A, Jankowski P, Strus P, Feleszko W. Heat not burn tobacco product – a new global trend: Impact of heat-not-burn tobacco products on public health: A systematic review. *Int J Environ Res Public Health* 2020; 17(2): 409-12. https://www.doi.org/10.3390/ijerph17020409.
8. D'Ambrosio F, Pisano M, Amato A, et al. Periodontal and peri-implant health status in traditional vs. heat-not-burn tobacco and electronic cigarettes smokers: A systematic review. *Dent J (Basel)*. 2022; 10(6): 103. https://www.doi.org/10.3390/dj10060103.

Authors:
Alexey A. Kishkan – PhD Student, Department of Therapeutic Dentistry, I.M. Sechenov First Moscow State Medical University (Sechenov University), Moscow, Russia, https://orcid.org/0009-0000-7978-3535