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Occurrence of Herpes Simplex Virus Type 1 in Dental Students: A Cross-Sectional Study

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Objectives Herpes viruses are ubiquitous human pathogens that can be found in the oral environment. Dental practitioners have a close relationship with many patients and are at risk of cross-infection. Thus, the herpes simplex virus type 1 (HSV-1) infection as a potential occupational hazard for dental workers is important. This study aimed to measure the level of HSV1 antibody in dental students.
Methods This descriptive cross-sectional study was performed on 100 dental students of Birjand University of Medical Sciences during a six-month period. After taking written informed consent, demographic information and history of genital or oral lesions were recorded using a researcher-made questionnaire. Next, peripheral blood samples (5 mL) were taken from the participants, and the level of anti-HSV1 IgG was measured by a pathologist using the respective kit by ELISA. Data were analyzed by SPSS 21.
Results About half of the subjects (41%) had contact with HSV1 and were antibody carriers. The prevalence of HSV1 antibody was higher in senior than junior dental students but not significantly (P>0.05).
Conclusion The prevalence of HSV1 antibody in dental students evaluated in this study was lower than the level reported in European countries, which may be due to cultural differences; however, further studies are required.
Keywords Herpes Simplex; Cross Infection; Dentistry

Introduction

Herpes simplex virus (HSV) infections are among the most common infections. There are two separate serotypes: HSV-1 and HSV-2. An increase in the prevalence of infectious diseases over the past decades has attracted worldwide attention. Thus, many efforts have been made to control these diseases.[1]

In Iran, the prevalence of HSV1 and HSV2 infections was 42.04% and 6.5%, respectively as mentioned in a meta-analysis.[2] The epithelial mucosa of the mouth, nose, ears, pharynx, anus, genitalia, cervix, and urinary tract is prone to HSV. HSV1 usually causes ulcers in the lips and mouth areas which are usually recurrent and painful. The mean rate of recurrence of HSV infection is 2 to 3 times a year, but it may occur up to 12 times a year.[3] Factors such as local skin trauma, exposure to ultraviolet radiation, hormonal and systemic changes in the body, fever, surgery, stress, and immune deficiency may play a role in this regard.[4] Recurrent herpes labialis virus causes painful mucosal lesions. It is estimated that 30% of the population are affected by it.[5]

Cross-infections are likely to occur during dental procedures due to direct and frequent contact with blood, saliva, and other body fluids, and indirect contact with contaminated surfaces, as well as airborne particles.[6]

In the recent years, much attention has been paid to infection transmission and the antibody level of dentists and dental students due to the risk of infection transmission and presence of diseases such as hepatitis, AIDS, and HSV infections.[7]

Also, the prevalence of infections in dental profession is high, because dentists are more exposed to blood, saliva, and risk of sharps.[8] The frequency of herpetic whitlow was observed to be higher among practicing dentists compared with the normal population.[9] However, transmission of infection from patients to dental staff has been reported in the literature.[10] Also, cross-infection of HSV from the dental staff to patients has been reported. A dental hygienist with a herpetic whitlow, who did not wear gloves, infected 20 out of 46 patients.[11] However, studies on cross-transmission and infection of HSV-1 through dental practice are limited.[12, 13]

Adherence to safety principles is essential during dental treatment to ensure the health of dentist, patients, and clinic staff, and their families. Since dental students are in close contact with patients during their education and are prone to cross-infection, they are at risk of HSV1 transmission through exposure to saliva and mucus secretions of patients if they do not well adhere to the infection control principles. Therefore, the purpose of this study was to investigate the rate of HSV1 antibody titer in dental students of Birjand University of Medical Sciences in 2018-2019.

Methods and Materials

In this descriptive cross-sectional study, dental students of Birjand University of Medical Sciences were selected using a stratified sampling method over a six-month period during 2018-2019.

Finally, 100 students from 3 different academic levels

(freshman, junior, and senior) were randomly selected as the study sample based on random number stable. After explaining the research project, each student completed an informed consent form. Information regarding the age, sex, marital status, educational level, history of genital or oral lesions, and use of any antiviral or immunosuppressive drugs was recorded.

Peripheral blood samples (5 mL) were collected from the participants. The specimens were placed in sterile capped storage tubes. After serum separation, the samples were kept at -28°C until the collection of all samples. Then, presence of anti-HSV1 antibody was evaluated by a pathologist using anti-HSV1 IgG kit by the ELISA method. Experienced technicians performed the blood sampling.

Statistical analysis:

Data were analyzed using SPSS version 21. Normal distribution of data was assessed using the Kolmogorov-Smirnov test. Then, the mean and standard deviation values were reported. T-test, Mann-Whitney test, Chi-square test, and Fisher's exact test were used for analyses. P<0.05 was considered significant.

Results

A total of 100 dental students (43 males and 57 females) participated in this study as shown in Table 1 with a mean age of 22.8 ± 3.9 years. Their age ranged from 19 to 46 years.

Of all, 31% of dental students had a history of herpes and 1% had a history of taking antiviral drugs. The mean IgG titer in dental students was 16.1±17.2 AU/mL with a median of 3.35 AU/mL (range 0.8 to 45.9 AU/mL), and 59% of dental students had a negative antibody titer. No significant difference was found in antibody titer status by sex or age of dental students (P>0.05, Table 1).

There was no statistically significant difference in the status of antibody titer according to marital status and educational level (P>0.05). However, antibody titer was significantly lower in subjects with a history of herpes than in students without such a history (20.3% vs. 87.1%; P<0.001, Table 1).

Table 1- Comparison of the frequency distribution of antibody titers according to the demographic variables of dental students

Antibody titer status Variable		Negative	Positive	χ^2 test
Sex	Male	22(51.2)	21(48.8)	χ^2=1.92, df=1
	Female	37(64.9)	20(35.1)	P=0.17
Age (yrs.)	<21	27(60)	18(40)	χ^2=0.17, df=2
	22-24	21(60)	14(40)	P=0.92
	>25	11(55)	9(45)	
Marital status	Single	51(58.6)	36(41.4)	χ^2=0.04, df=1
	Married	8(61.5)	5(38.5)	P=0.84
Educational level	Freshman	21(61.6)	12(36.4)	χ^2=0.52,
	Junior	17(54.8)	14(45.2)	df=2
	Senior	21(58.3)	15(41.7)	P=0.77
History of herpes	Yes	4(12.9)	27(87.1)	χ^2=39.5, df=1
	No	55(79.7)	14(20.3)	P<0.001

According to Table 2, no statistically significant difference was observed in the mean IgG titer in terms of gender, marital status, educational level, or age of dental students (P>0.05), but IgG antibody titer in students with a history of herpes was significantly higher than students without such a history (P<0.001).

Table 2- Comparison of the mean IgG antibody titer by demographic variables of dental students

Antibody titer status Variable		Mean± SD	Mann-Whitney or Kruskal–Wallis test
Sex	Male	17.97±2.94	Mann-Whitney U=67 P=0.51
	Female	16.37±2.17	
Age (yrs.)	<21	16.1±17.42	Kruskal-Wallis H =0.53, df=2 P=0.77
	22-24	15.1±16.73	
	>25	17.77±18.2	
Marital status	Single	16.16±17.22	Mann-Whitney U=5.91 P=0.95
	Married	15.5±17.67	
Educational level	Freshman	14.59±16.77	Kruskal-Wallis H =0.09, df=2 P=0.84
	Junior	17.63±17.58	
	Senior	16.1±17.6	
History of herpes	Yes	38.8±12.69	Mann-Whitney U=67 P=0021
	No	33.2±13.1	

Discussion

Infectious diseases are a serious health challenge worldwide. Due to the frequent contact of dental workers with blood and saliva of patients and because most human pathogens can be transmitted through blood and saliva, risk of infectious diseases among dental personnel is higher than other people in the community, indicating the significance of prevention of cross-contamination.

Since dental students are future dentists of the community, knowledge about their HSV1 antibody levels may indicate the need for further adherence to infection control measures. The results of this study showed that 59% of students had negative antibody titer and 41% had positive antibody titer. In a study by Malary et al, HSV1 antibody was reported in 44.3% of the cases.[14] In another study on HSV1 and HSV2 antibody titers of university students the rate of HSV1 antibody was 79.2%.[15] Various studies conducted in industrialized countries have reported different antibody titers.[16, 17] These difference in results may be due to social position and different age groups.

According to the results of the present study, the mean HSV1 antibody titer in different age groups increased with age from 16.1 AU/mL in those <21 years to 17.77 AU/mL in those < 25 years of age, but this increasing trend was not statistically significant. Other researchers, in different countries, such as Sweden, Italy, Germany, and Switzerland reported that age was an effective factor in increasing the HSV1 antibody titer, which was similar to the results of the present study.[18-21]

Another finding of this study was that 35.1% of women and 48.8% of men were positive for HSV1 IgG antibody.

Although men accounted for a higher percentage than women, there was no significant relationship between gender and HSV1 antibody titers.

In a study by Smith et al, the prevalence of HSV-1 was 57.7% and 42.3% in women and men, respectively.[22] Also, Smith et al, and Sukik et al. reported a higher prevalence of antibodies in women than men, which was not consistent with the results of the present study. In some studies, there was no significant correlation between gender and frequency of HSV1 antibody, which was consistent with the results of the present study.[22-24]

According to the results of this study, the prevalence of HSV1 antibody in junior and senior dental students was higher than in freshmen, but there was no significant relationship between antibody titer and educational level. In a study by Hilterbrand et al, which examined the sero-epidemiology of HSV among dental workers and students, there was no significant correlation between HSV1 antibody and educational level, but antibody level in senior dental students was higher than in junior dental students.[25] The reason is probably the higher contact of senior dental students with patients. The results showed no significant correlation between the prevalence of HSV1 and marital status, which was similar to the present study.

Another study investigated the sero-epidemiology of HSV1 and HSV2 and reported marital status as an effective factor on HSV1 antibody levels,[18] which was inconsistent with the results of this study. In the present study, 20.3% of students who did not have herpes had a positive antibody titer because those with anti-HSV antibody may have contracted oral HSV infection during childhood, but it did not recur and therefore they did not report a history of herpes.

Conclusion

This study showed that about half of the subjects had contact with HSV1 virus and had HSV1 antibody. There was no significant correlation between the prevalence of HSV1 antibody and age, sex, or marital status of students. It is recommended to design programs to increase the students' awareness about the principles of infection control when dealing with patients with HSV.

Conflict of Interest

No Conflict of Interest Declared■

References

1. Coker RJ, Hunter BM, Rudge JW, Liverani M, Hanvoravongchai P. Emerging infectious diseases in southeast Asia: regional challenges to control. Lancet. 2011;377(9765):599-609.
2. Askarian M, Ghanaie RM, Karimi A, Habibzadeh F. Infectious diseases in Iran: a bird's eye view. Clin Microbiol Infect. 2012;18(11):1081-8.
3. Wald A, Ashley-Morrow R. Serological testing for herpes simplex virus (HSV)–1 and HSV-2 infection. Clin Infect Dis. 2002;35(Suppl 2):s173-82.
4. Stock C, Guillen-Grima F, de Mendoza JH, Marin-Fernandez B, Aguinaga-Ontoso I, Krämer A. Risk factors of herpes simplex type 1 (HSV-1) infection and lifestyle factors associated with HSV-1 manifestations. Eur J Epidemiol. 2001;17(9):885-90.
5. Azarkar G, Doosti Z, Osmani F, Ziaee M. Analysis Of Risk Factors For Nonalcoholic Fatty-Liver Disease In Hepatitis B Virus Infection: A Case–Control Study. Hepat Med. 2019;11:153-8.
6. Shams B, Afshari E, Tajadini M, Keikha M, Qorbani M, Heshmat R, et al. The relationship of serum vitamin D and Zinc in a nationally representative sample of Iranian children and adolescents: The CASPIAN-III study. Med J Islam Repub Iran. 2016;30:430.
7. Bhan I, Burnett-Bowie S-AM, Ye J, Tonelli M, Thadhani R. Clinical measures identify vitamin D deficiency in dialysis. Clin J Am Soc Nephrol. 2010;5(3):460-7.
8. Hedayat Mofidi M, Moradi A, Saeedi M, Behnampoor N, Arab YaraMohammadi J. Sero-epidemiological Study of Herpes simplex virus type 1 infections in outpatient population referred to clinical laboratories in Gorgan, IRAN 2006. Med. Lab. J. 2008;2(1):51-6.(Pershian).
9. Heaney RP, Holick MF. High prevalence of vitamin D inadequacy and implications for health. Mayo Clinic proceedings; 2006. 81(3);297-9,353-73.
10. Kamoi K, Okayama A, Izumo S, Hamaguchi I, Uchimaru K, Tojo A, et al. Tackling HTLV-1 infection in ophthalmology: a nationwide survey of ophthalmic care in an endemic country, Japan. Br J Ophthalmol. 2020;104(12):1647-51.
11. D'Affronte L, Platia CL. Overview of Infectious Diseases of Concern to Dental Practitioners: Other Viral Infections. Infection Control in the Dental Office: Springer; 2020. p. 21-49.
12. Khadr L, Harfouche M, Omori R, Schwarzer G, Chemaitelly H, Abu-Raddad LJ. The epidemiology of herpes simplex virus type 1 in Asia: systematic review, meta-analyses, and meta-regressions. Clin Infect Dis. 2019;68(5):757-72.
13. Parvaie p, baghan se, osmani f. Prevalence and associated risk factors for herpes simplex type 1 virus among dental students. Int J Med Dent. 2021;25(2): 173-7.
14. Malary M, Abedi G, Hamzehgardeshi Z, Afshari M, Moosazadeh M. The prevalence of herpes simplex virus type 1 and 2 infection in Iran: A meta-analysis. Int J Reprod Biomed. 2016;14(10):615-24.
15. Baghian A, Chouljenko VN, D'AUVERGNE O, Newman MJ, Baghian S, Kousoulas KG. Protective immunity against lethal HSV-1 challenge in mice by nucleic acid-based immunisation with herpes simplex virus type-1 genes specifying glycoproteins gB and gD. J Med Microbiol. 2002;51(4):350-7.
16. Tognarelli EI, Palomino TF, Corrales N, Bueno SM, Kalergis AM, González PA. Herpes simplex virus evasion of early host antiviral responses. Front Cell Infect Microbiol. 2019;9:127.
17. Petti S, Lodi G. The controversial natural history of oral herpes simplex virus type 1 infection. Oral Dis. 2019;25(8):1850-65.
18. Crimi S, Fiorillo L, Bianchi A, D'Amico C, Amoroso G, Gorassini F, et al. Herpes virus, oral clinical signs and QoL: Systematic review of recent data. Viruses. 2019;11(5):463.
19. Lopatko Lindman K, Hemmingsson ES, Weidung B, Brännström J, Josefsson M, Olsson J, et al. Herpesvirus infections, antiviral treatment, and the risk of dementia—a registry-based cohort study in Sweden. Alzheimer's & Dementia: Translational Research & Clinical Interventions. 2021;7(1):e12119.
20. Marchi S, Trombetta CM, Gasparini R, Temperton N, Montomoli E. Epidemiology of herpes simplex virus type 1 and 2 in Italy: a seroprevalence study from 2000 to 2014. J Prev Med Hyg. 2017;58(1):e27–33.
21. Korr G, Thamm M, Czogiel I, Poethko-Mueller C, Bremer V, Jansen K. Decreasing seroprevalence of herpes simplex virus type 1 and type 2 in Germany leaves many people susceptible to genital infection: time to raise awareness and enhance control. BMC Infect Dis. 2017;17:471.
22. Smith J, Rosińska M, Trzcińska A, Pimenta J, Litwińska B, Siennicka J. Type specific seroprevalence of HSV-1 and HSV-2 in four geographical regions of Poland. Sex Transm Infect. 2006;82(2):159-63.

23. Ziaee M, Ebrahimzadeh A, Azarkar Z, Namaei MH, Saburi A, Fereidouni M, et al. Seroprevalence and risk factors for hepatitis B in an adult population: the first report from Birjand, South Khorasan, Iran. Hepat Mon. 2016 ;16(9):e36452.
24. Sukik L, Alyafei M, Harfouche M, Abu-Raddad LJ. Herpes simplex virus type 1 epidemiology in Latin America and the Caribbean: Systematic review and meta-analytics. PloS one. 2019;14(4):e0215487.
25. Hilterbrand AT, Daly RE, Heldwein EE. Contributions of the four essential entry glycoproteins to HSV-1 tropism and the selection of entry routes. Mbio. 2021;12(2):e00143-21.

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