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Percutaneous injuries and hepatitis B vaccination among Lithuanian dentists

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SUMMARY

The transmission of blood-borne viruses in dental offices is a potential hazard to patients and dental staff.

The aim of the study was to clarify the current situation regarding hepatitis B virus vaccination, percutaneous injuries among members of the Lithuanian dental community.

Material and Methods. A confidential, self administered questionnaire was send to all 2235 Lithuanian general dental practitioners. The questionnaire collected data on sociodemographic characteristics, practice time, working place and environment, hepatitis B virus (HBV) vaccination, history of hepatitis B infection, and needlestick and sharp instruments injury (NSII).

Results. Overall response rate was 64.7% (87.4% of them were women; 64.1% were working in five major cities of Lithuania and 60.8% in private clinics. Mean age of repondents was 44.8 (range 23 – 74 years). As much as 95.3% dentists expressed concern about the risk of cross-infection from patients to themselves and their dental assistants. Respondents reported: complete immunization against HBV (35.9%); previous hepatitis infection (4.3%); needlestick and sharp instruments injury (78.5%); collecting medical history about HBV from patients (30.9%).

Conclusions. Despite a high risk of needlestick and sharp instruments injury in the dental practice as well as high risk of HBV infection and the existence of strong rules and recommendations for routine HBV vaccination, vaccine coverage among Lithuanian dentists cannot be assumed to be adequate. Further continuing education programs and stronger control measures might be suggested.

Key words: questionnaire, general dental practitioner, hepatitis B, needlestick and sharp instruments injury.

INTRODUCTION

At the beginning of the third millennium, hepatitis B virus (HBV) remains a major public health problem globally [1]. Worldwide, an estimated two billion people have been infected with the HBV, and more than 350 million have chronic (long-term) liver infections [2]. According to the World Health Organization (WHO), there are more than 50 million cases of acute hepatitis B infection annually with 500 000 to 700 000 million deaths per year caused by chronic hepatitis, cirrhosis and hepatocellular carcinoma. The hepatitis B virus is the tenth cause of death globally [3].

The prevalence of HBV is high in the Far East, the Middle East, Africa and parts of South America, with HBsAg rates ranging from 8% to 15%. There is an intermediate prevalence (2–7%) in Japan, parts of South America, Eastern and Southern Europe and parts of central Asia. The prevalence is lowest (<2%) in Northern Europe, Australia, the southern part of South America, Canada and USA [2]. Officially cited prevalence of HBV in Lithuania is low (1%) [4]. However, some Lithuanian studies on the prevalence of seropositives markers for HBV in healthy individuals revealed in 24.3% of the study sample [5]. This fact is in agreement with WHO expert's opinion that prevalence of HBV might be higher as it is in official statistics.

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Hepatitis B virus can be transmitted parenterally by percutaneous and mucous membrane exposures to infected blood, by sexual contact or by perinatal exposure [6]. Needles and syringes may be contaminated by viruses. Accidental injuries with infected needles and syringes can transmit the virus to health care workers (HCWs) [7].

Healthcare-associated infection is an important public and occupational health problem worldwide, with ever-increasing interest on the part of politicians, patients and healthcare workers [8, 9, 10]. Healthcare providers are at risk of infection from blood-borne pathogens, including hepatitis B (HBV), human deficiency (HIV) and hepatitis C virus (HCV) [11, 12]. The transmission of blood-borne viruses in dental offices is a potential hazard to patients and dental staff, particularly to oral and maxillofacial surgeons [13].

Although there is no strong evidence that saliva and gingival cervical fluid can transmit the virus, some studies show hepatitis B surface antigen (HBsAg) in saliva and gingival cervical fluid of HBV-positive patients [14, 15]. Serological studies in different parts of the world have found a higher prevalence of HBV infection with a high potential for transmission, among dentists, especially among surgical specialties (oral and maxillofacial surgeons and periodontists) compared to the general population [16, 17]. Studies conducted in the prevaccination era showed that HBV infection of dentists was approximately three to six times greater than in the general population, and dentists had the highest rate of HBV infection among all HCWs [18].

Strict use of universal precautions systems, safe work with sharp instruments and vaccine against hepatitis B are the most effective procedures to prevent HBV infection transmission.

This study was aimed to clarify the current situation regarding HBV vaccination and percutaneous injuries among members of the Lithuanian dental community.

MATERIAL AND METHODS

The study was a cross-sectional survey of all general dentists practicing in Lithuania in 2008. All 2235 general dental practitioners were interviewed by the original questionnaire. A list of dentists was acquired from the Lithuanian Dental Chamber License registry data base. The questionnaire was sent with an explanatory covering letter and with a stamped addressed return envelope. A list of possible responses to each question was given and respondents were invited to choose the answer that best fitted their attitude and circled only one category. The questionnaire was fully piloted and refined for clarity before being issued.

A self-administered questionnaire consisting open-ended (duration of professional activity, geographical localization of workplace) and close-ended items (working environment, vaccination for hepatitis B; history of acute hepatitis B; history of needlestick and sharp instruments injuries (NSII); and whether the dentists' clinical dental chart contains a question on a history of infectious diseases, was used for the data collection (Table 1).

In order to analyze the influence of work experience (professional activity), the sample was categorized into four groups: less than 10 years (group A); 10 to 19 years (group B); 20 to 29 years (group C); and 30 years or more (group D). The working environment

Table 1. The operationalisation of the study variables and their scales of measurement

Study variables	Measurements & measurement scales (nominal, ordinal, interval)
Work place	Geographical location of a dental clinic (nominal scale)
Duration of the professional activity	Years of dental practice (ordinal scale) A group (less than 10 years) B group (10-19 years) C group (20-29 years) D group (more than 30 years)
Working environment	Public clinic (1), Public and private clinics (2), Private clinic (3) (nominal scale)
Vaccination for hepatitis B	Not vaccinated (1), Incomplete vaccination (2), Complete vaccination (3) (ordinal scale)
History of acute hepatitis B	No (1), Not knowing (2), Yes (3) (ordinal scale)
History of needlestick and sharp instrument	No (1), Not knowing (2), Yes (3) (ordinal scale)
Collection from patient a history of hepatitis and HIV	No (1), Yes (2) (ordinal scale)

Table 2. Gender, workplace localisation, work environment according to the duration of professional activity

	Groups of respondents				Total n=1446
	A n=320	B n=380	C n=324	D n=422	
Gender of respondents					
Women, %	81.3	84.7	88.0	94.1	87.4
	χ^2=30.6; df=3; p<0.001				
Workplace localization					
Urban area, %	80.3	74.5	57.1	47.9	64.1
	χ^2=109.6; df=3; p<0.001				
Work environment					
Private clinic, %	72.2	66.6	63.6	44.8	60.8
Public clinic, %	6.9	15.8	24.7	44.1	24.1
Both, %	20.9	17.6	11.7	11.1	15.1
	χ^2=163.113; df=6; p<0.001				

Groups are compared employing Chi squared test or Fisher's Exact Test.

Table 3. Vaccination status according to the working environment

Study variables	Vaccination status		
	Complete immmunization	Incomplete immunization	Not vaccinated
Work environment			
Private clinic, %	38.0	6.1	49.0
Public clinic, %	26.6	8.1	58.2
Both, %	41.9	7.8	46.5
	χ^2=17.9; df=4; p=0.001		

Groups are compared employing Chi squared test or Fisher's Exact Test

Table 4. Obtaining of medical history about HBV, HCV and HIV from patients according to the duration of professional activity, workplace localization, and work environment

Study variables	Reply options			
	Always	Often	Sometimes	Never
Duration of professional activity				
Less than 10 years, %	39.5	35.7	22.3	2.5
10-19 years, %	33.2	36.4	24.7	5.7
20-19 years, %	27.9	37.1	33.0	1.9
More than 30 years, %	24.7	33.4	37.8	4.1
Total	30.9	35.5	29.9	3.7
	χ^2=42.0; df=9; p<0.001			
Workplace localization				
Urban area, %	34.2	63.9	26.1	4.2
Rural area, %	24.6	36.1	36.7	2.8
	χ^2=23.6; df=3; p<0.001			
Work environment				
Private clinic, %	35.5	36.3	24.7	3.5
Public clinic, %	18.6	32.8	44.1	4.4
Both, %	32.1	36.7	27.9	3.3
	χ^2=54.7; df=6; p<0.001			

Groups are compared employing Chi squared test or Fisher's Exact Test

was considered as public, private or both. For the workplace localization they were asked to write name of the city, town or village. At the time of data analysis answers were categorized as urban and rural areas (cities and towns with more than 100 000 inhabitants were coded as urban areas, others as rural areas).

All returned forms were coded by a single operator and the data were entered in a personal computer. Data were analyzed with the statistical software SPSS 15. The Chi-square test was used to compare proportions among groups and the significance threshold for all tests was set at p<0.05.

RESULTS

From the 2235 questionnaires mailed, a total of 1446 questionnaires containing useful information were returned, which comprises the response rate of 64.7 % of the total. Years in practice among them were distributed as follows: group A – 320 (22.1%), group B – 380 (26.3%), group C – 324 (22.4%) and group D – 422 (29.2%). According to the geographical localization of working place the distribution of respondents was, as follows: 64.1% from urban area and 35.9% from rural area.

Of the respondents 87.4 % were female. The mean age of the respondents was 44.8 years (range 23-74 years). Distribution of respondents according working place and duration of professional activity is shown in Table 2. From the table decrease in number of dentists working in rural area from A and B groups is seen. Majority of dentists (60.8%) were working in private clinics.

Of all, 95.3% respondents agreed that infection control procedures are useful to prevent infection spread from patient to health care worker and in opposite way. Statistically significant difference in opinion was found between dentists with less than 10 years duration of practical activity and longer than 30 years (98.7% and 92.4% accordingly) (χ^2=23.9; df=6; p=0.01).

Of total, 35.9 % of respondents reported having been immunized against HBV (complete three doses immunization). Even 50.8% of study participants were not vaccinated. Among all respondents, 4.3% of the dentists reported previous acute hepatitis infection. Of all, 7.1% of respondents stated not knowing if they had hepatitis previously. Statistically significant difference was observed according to the rate of immunization between dentists working in urban and rural areas (41.7% and 25.5% accordingly) (χ^2=37.1; df=4; p<0.001). There was no statistically significant difference in a history of previous hepatitis B infection between dentists working in rural and urban areas.

Immunization status was associated with professional activity duration. Dentists with less than 10 years of experience had greater prevalence of immunization when compared to dentists with more than 10 years experience: group A – 63.7%, group B – 42.9%, group C – 27.3%, group D – 14.7% (χ^2=231.7; df=12; p<0.001). Dentists with more than 20 years of professional activity more often had a history of hepatitis: group A – 0.6%, group B – 3.8%, group C – 6.2%, group D – 5.9% (χ^2=231.7; df=12; p<0.001). HBV vaccination was more prevalent between dentists working in private practice than in public dental clinics (χ^2=27.4; df=8; p<0.001) (Table 3).

Altogether, 78.5% of respondents reported at least one needlestick or sharp instrument injury during their carrier. There was statistically significant difference of the proportions of injured dentists between groups according to working experience: group A – 87.4%, group B – 80.1%, group C – 72.8%, group C – 74.6% (χ^2=34.9; df=9; p<0.001).

Only 30.9% of respondents at the time of first visit "always" obtain information from patients about history of infectious diseases (HBV, HBC, HIV). The rate of this fact was noted to be lower between dentists of group with more than 30 years work experience, and working in public clinics and rural areas (Table 4).

DISCUSSION

The present study determined the distribution of occupational bloodborne exposures and rate of vaccination against HBV among Lithuanian general dentists.

Dentists appear particularly prone to blood-borne infections, as their routine practice includes the use of sharp instruments in an environment contaminated with saliva and blood. Although virus transmission via saliva may be possible, the major occupational risk is accidental needle stick injuries [19, 20].

The number of needlestick and sharp instrument injury (NSII) recorded in this study was much higher than reported in other countries. In a study from Germany, 61.7% of respondents had sustained at least one NSII [21]. Interestingly, results of this German study showed that exposure was more prevalent in specialists of operative dentistry (36.2%), and oral surgery was only the second specialty with rate of 19.6% of percutaneous exposures [21]. Injuries in dental offices might happen because of a confined space of working field, the frequent patient movement and the variety of sharp dental instruments used in normal dental practice [22]. The present study indicates that NSII is associated with less practical experience.

The pre-exposure hepatitis B vaccination and the use of standard precautions to prevent exposure to blood are the most important measures for preventing health care workers from occupational infections with HBV [23]. A vaccine against hepatitis B has been available since 1982. Hepatitis B vaccine is 95% effective in preventing HBV infection and its chronic consequences [2].

The present study showed the rate of complete HBV vaccination being 35.9% of respondents. In the study of German dental care providers' population the rate of HBV vaccination was much higher (89.8%) than among Lithuanian dentists [21]. High numbers of vaccinated dental professionals were showed from other studies [24, 25] The number of vaccinated dentists in the world is increasing constantly [1]. Unvaccinated dentists are five times more likely to be infected than vaccinated dentists [27]. In accordance with other studies [28], the present data showed that more vaccinated dentists had fewer years of dental practice (63.7% of respondents from group with less than 10 years and 14.7% from group with more than 30 years professional activity). Explanation of this fact might be that younger dentists have more qualitative knowledge about HBV and its transmission by dentists, more often participate in educational courses and associations and receive information about vaccination from guidelines [28]. Consistent with the present study results data about proportions of vaccinated and nonvactinated dentists were reported from another study in US. Nonvaccination was significantly higher among dentists aged 40

and over, and in dentists, who had not attended refresher courses in the 2 years prior to a survey [27]. Different studies have reported that incomplete vaccination was positively correlated with nonuse of gloves during work [17, 25]. In the literature, it is strongly suggested that even with HBV vaccination, the dentist must use other prevention methods, because HBV-positive patients may also be infected with other blood-borne pathogens such as HIV [1].

It should be noted, that such low rate of immunization against HBV is despite strong rules of infection control in Lithuania [29] and worldwide recommendations [30]. The present study did not explain reasons of nonvaccination. In other studies, the principal reasons stated for not having been vaccinated were concern over vaccine safety, the vaccination was not offered, did not get around to obtaining it, and that HBV is not so serious [31].

The study results confirm statement that HBV infection is more prevalent in Health care workers population. Overall 4.3% of respondents reported previous hepatitis B infection while prevalence of HBV in Lithuanian population is 1% [4]. Despite the present study limitation the results are consistent with the results of other studies showing that HBV is more frequent between dentists than in general population [1]. According to the present and several other studies, the incidence of HBV infection increases with the length of clinical practice of dentists [32], dentists age, irregular use of protective glasses and clothing [17, 27] and presumed contact with infected blood [33].

In the present study over 30.9% of the dentists reported that they "always" obtain from their patients a risk factor history for hepatitis B and C, and HIV. A study from Jordan indicated even lower numbers (25%) of recorded patient medical histories [25]. Numerous other studies have shown higher numbers of dentist obtaining history of infectious diseases (73-97%) [25, 34]. In addition, patients often hide their infection from dentists [35] and identification of patients with blood-borne infections is not always possible [36].

Although this study provides new information concerning NSII and HBV immunization rates among Lithuanian dentists, it nevertheless has limitations, because it used a self-reported anonymous questionnaire. Data has been obtained through a survey without data verification; the reliability is dependent of the accuracy of the individual's memory and honesty of their response.

The data of the present and similar studies provide a baseline from which to work at reducing NSII rates in the future. It demonstrates the need to improve and to evaluate the impact of prevention measures and to implement prevention strategies [21]. Studies from different parts of the world show that dental professionals have totally different levels of knowledge about viral hepatitis transmission and about prevention and infection control programs [37,38].

The infections control recommendations focus to use universal precautions systems from the necessity of treating all patients, although they are infected with HBV, HCV or HIV. Thus, additional precautions for infected patients are unnecessary [39].

Ashkenazi M. and coauthors concluded that dentists who usually adhere to basic infection control measures are not at an increased risk for HCV [40]. Dentists and dental staffs in clinics should prepare an environment, where infected patients can be treated easily and safely [1]. A safe working environment reduces the risk of healthcare-associated infections among patients and occupational exposures among health care workers [40, 41, 42].

CONCLUSIONS

Despite a high risk of needlestick and sharp instruments injury in the dental practice as well as high risk of HBV infection and the existence of strong rules and recommendations for routine HBV vaccination, vaccine coverage among Lithuanian dentists cannot be assumed to be adequate. The rate of complete HBV vaccination was recorded in 35.9% of respondents and 78.5% of all respondents reported at least one needlestick or sharp instrument injury during their practice. .Further continuing education programs and stronger control measures might be suggested.

REFERENCES

1. Mahboobi N, Agha-Hosseini F, Mahboobi N, Safari S, Lavanchy D, Alavian SM. Hepatitis B virus infection in dentistry: a forgotten topic. *J Viral Hepat* 2010;17:307-16.
2. Hepatitis B. Media centre. Available at: http://www.who.int/mediacentre/factsheets/fs204/en/
3. Hepatitis B. Immunization service delivery and accelerated disease control. Available at: http://www.who.int/immunization_delivery/new_vaccines/hepb/en/index.html
4. Virusiniai hepatitai. Konferencijos, skirtos Pasaulinei hepatito dienai išvados ir rekomendacijos. 2010 m. gegužės 19 d. Internetinė prieiga: http://www.ulac.lt/downloads/rengin_naujienos/isvados_rekomendacijos.pdf
5. Žagminas K, Ambrozaitis A, Balčiūnienė L, Matvejevienė M. Hepatito B viruso infekcijos seruminių žymenų paplitimas tarp medicinos darbuotojų. *Visuomenės sveikata* 2003;23:23-7.
6. Rizzetto M, Ciancio A. Chronic HBV-related liver disease. *Mol Aspects Med* 2008;29:72-84.

7. Olubuyide IO, Ola SO, Aliyu B, Dosumu OO, Arotiba JT, Olaleye OA, et al. Hepatitis B and C in doctors and dentists in Nigeria. *QJM* 1997;90:417-22.
8. Resende VL, Abreu MH, Paiva SM, Teixeira R, Pordeus IA. Factors associated with seroprevalence of hepatitis C among dentists at a large Brazilian city. *Virol J* 2009;6:228.
9. Humphreys H, Smith ET. Prevalence surveys of healthcare-associated infections; what do they tell us, if anything? *Clin Microbiol Infect* 2006;12:2-4.
10. Fitzpatrick F, McIlvenny G, Oza A, Newcombe RG, Humphreys H, Cunney R, et al. Hospital infection society prevalence survey of Healthcare Associated Infection 2006: comparison of results between Northern Ireland and the Republic of Ireland. *J Hosp Infect* 2008;69:265-73.
11. Deisenhammer S, Radon K, Nowak K, Reichert J. Needlestick injuries during medical training. *J Hosp Infect* 2006;63:263-7.
12. Cleveland JL, Cardo DM. Occupational exposures to human immunodeficiency virus, hepatitis B virus, and hepatitis C virus: risk, prevention, and management. *Dent Clin North Am* 2003;47:681-96.
13. Porter S, Scully C, Samaranayake L. Viral Hepatitis: Current concepts for dental practice. *Oral Surg Oral Med Oral Pathol* 1994;78:682-95.
14. Hutse V, Verhaegen E, De Cock L, Quoilin S, Vandenberghe H, Horsmans Y, et al. Oral fluid as a medium for the detection of hepatitis B surface antigen. *J Med Virol* 2005;77:53-6.
15. Lamster IB, Ahlo JK. Analysis of gingival crevicular fluid as applied to the diagnosis of oral and systemic diseases. *Ann N Y Acad Sci* 2007;1098:216-29.
16. Gillcrist JA. Hepatitis viruses A, B, C, D, E and G: implications for dental personnel. *J Am Dent Assoc* 1999;130:509-20.
17. Martins AM, Barreto SM. [Hepatitis B vaccination among dentists surgeons]. *Rev Saude Publika* 2003;37:333-8.
18. Alavian SM, Izadi M, Zare AA, Moghani-Lankarani M, Assari S, Vardi MM. Survey of the level of anti-HBs antibody titer in vaccinated Iranian general dentists. *Spec Care Dentist* 2008;28:265-70.
19. Ilgüy D, Ilgüy M, Semanur D, Bayirh G. Prevalence of the patients with history of hepatitis in a dental faculty. *Med Oral Patol Oral Cir Bucal* 2006;11:E29-E32.
20. Leggat PA, Smith DR. Prevalence of percutaneous exposure incidents amongst dentists in Queensland. *Aust Dent J* 2006;51:158-61.
21. Wicker S, Rabenau HF. Occupational exposures to bloodborne viruses among German dental professionals and students in a clinical setting. *Int Arch Occup Environ Health* 2010;83:77-83.
22. Bednarsh HS, Klein B. Legal issues for healthcare workers with bloodborne infectious disease. *Dent Clin N Am* 2003;47:745-56.
23. Wicker S, Cinatl J, Berger A, Doerr HW, Gottschalk R, Rabenau HF. Determination of risk of infection with bloodborne pathogens following a needlestick injury in hospital workers. *Ann Occup Hyg* 2008;52:615-22.
24. Alavian SM, Izadi M, Zare AA, Lankarani MM, Assari S, Vardi MM. Survey of the level of anti-HBs antibody titer in vaccinated Iranian general dentists. *Spec Care Dentist* 2008;28:265-70.
25. AlNegrish A, Al Momani AS, Al Sharafat F. Compliance of Jordanian dentists with infection control strategies. *Int Dent J* 2008;58:231-6.
26. Cleveland JL, Siew C, Lockwood SA et al. Factors associated with hepatitis B vaccine response among dentists. *J Dent Res* 1994;73:1029-1035.
27. Cleveland JL, Siew C, Lockwood SA, Gruninger SE, Gooch BF, Shapiro CN. Hepatitis B vaccination and infection among U.S. dentists, 1983-1992. *J Am Dent Assoc* 1996;127:1385-90.
28. Di Giuseppe G, Nobile CG, Marinelli P, Angelillo IF. A survey of knowledge, attitudes, and behavior of Italian dentists toward immunization. *Vaccine* 2007;25:1669-75.
29. Lietuvos higienos norma HN 47-1: 2003 „Sveikatos priežiūros įstaigos. Higieninės ir epidemiologinės priežiūros reikalavimai“. Lietuvos Respublikos ministro įsakymas, 2003 m. vasario 27 d. Nr.V-136.
30. Kohn WG, Collins AS, Cleveland JL, Harte JA, Eklund KJ, Malvitz DM. Guidelines for infection control in dental healthcare settings - 2003. *MMWR Recomm Rep* 2003;52:1-61.
31. Ammon A, Reichart PA, Pauli G, Petersen LR. Hepatitis B and C among Berlin dental personnel: incidence, risk factors, and effectiveness of barrier prevention measures. *Epidemiol Infect* 2000;125:407-13.
32. Peplonska B, Szeszenia-Dabrowska N. [Epidemiologic analysis of infectious diseases identified as occupational diseases in Poland in the years 1998-2002]. *Med P*r 2003;54:521-8.
33. Batista SM, Andreasi MS, Borges AM. Seropositivity for hepatitis B virus, vaccination coverage, and vaccine response in dentists from Campo Grande, Mato Grosso do Sul, Brazil. *Mem Inst Oswaldo Cruz* 2006;101:263-7.
34. Rhodes A, Aw TC, Allen C, Ridout M. Immunisation status of dental practice staff in Kent. *Br Dent J* 2008;205:562-3.
35. Alavian S-M, Mousavi S-H, Mousavi S-H, Azizi B, Akbari H. Study of admission rate of hepatitis B surface antigen positive patients in 50 dentistry centers in Tehran (Spring 2003). *Hepat Mon* 2008;8:67-9.
36. McCarthy GM, MacDonald JK. A comparison of infection control practices of different groups of oral specialists and general dental practitioners. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1998;85:47-54.
37. Gaze R, Carvalho DM, Tura LF. [Health providers' knowledge on transfusion-transmitted viral hepatitis]. *Rev Saude Publika* 2006;40:859-64.
38. Scully C, Moles DR, Fiske J. Infection control: a survey of UK special care dentists and dental care professionals. *Prim Dent Care* 2007;14:40-6.
39. McCarthy GM, MacDonald JK. Improved compliance with recommended infection control practices in the dental office between 1994 and 1995. *Am J Infect Control* 1998;26:24-8.
40. Ashkenazi M, Fisher N, Levin L, Littner MM. Seroepidemiology of hepatitis C antibodies among dentists and their self-reported use of infection control measures. *Community Dent Health* 2009;26:99-103.
41. Wicker S, Ludwig AM, Gottschalk R, Rabenau HF. Needlestick injuries among health care workers: Occupational hazard or avoidable hazard? *Wien Klin Wochenschr* 2008;120:486-92.
42. Harte JA, Molinari JA. Instrument cassettes for office safety and infection control. *Compend Contin Educ Dent* 2007;28:596-600.

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