Prevalence of percutaneous injuries and associated factors among dental surgeons

Prevalência de acidentes perfurocortantes e fatores associados entre cirurgiões-dentistas

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Abstract

Purpose: The practice of dentistry usually involves contact with secretions from the oral cavity through percutaneous injuries, which is a risk factor for the transmission of infections, especially hepatitis B, between the professional and patients. This study aimed to assess the prevalence of percutaneous injuries and associated factors among dental surgeons.

Methods: A total of 187 dental surgeons from the city of Pelotas, Brazil, participated in this study. Data concerning the socio-demographic aspects, occurrence of accidents, types of instruments, use of personal protective equipment, immunization coverage related to hepatitis B and tests for serum conversion were collected through self-reported questionnaires. The data underwent descriptive analysis and chi-square testing or Fisher's exact test, with $P<0.05$.

Results: The prevalence of percutaneous injuries was 59.8%, and there was no association with the risk factors evaluated. Of the dentists interviewed, 97.3% had been vaccinated against hepatitis B; however, only 86.2% had received the three recommended doses. The use of probes and handling needles were the most common causes of percutaneous injuries (37.0% and 29.0%, respectively).

Conclusion: The results showed that the prevalence of percutaneous injuries was high among dental surgeons, and there is a need for emphasis on the prevention of hepatitis B through the administration of the three vaccine doses and the use of personal protective equipment.

Key words: Occupational accidents; occupational risks; hepatitis B

Resumo

Objetivo: A prática dental geralmente envolve contato com secreções oriundas da cavidade bucal, através de injúrias percutâneas, sendo um fator de risco para transmissão de infecções entre profissionais e pacientes, especialmente hepatite B. Este estudo objetivou avaliar a prevalência de injúrias percutâneas e fatores associados entre cirurgiões-dentistas.

Métodos: Um total de 187 dentistas da cidade de Pelotas, RS, Brasil, participou deste estudo. Dados sobre aspectos socio-demográficos, ocorrência de acidentes, tipos de instrumentos, uso de equipamento de proteção, imunização relacionada à hepatite B e teste para avaliação de soroconversão foram coletados mediante questionário auto-administrado. Os dados foram submetidos à análise descritiva e testes do Qui-Quadrado de Pearson e Fisher para avaliar associação entre o desfecho e as variáveis preditoras, com nível de significância de 0,05.

Resultados: A prevalência de acidentes perfurocortantes foi de 59.8% e não houve associação com os fatores de risco avaliados. Dos dentistas participantes, 97.3% tinham sido vacinados conta a hepatite B, entretanto, 86.2% tinham tomado as três doses recomendadas. O uso de sondas e agulhas foram os maiores agentes causadores de acidentes, respectivamente 37.0% e 29.0%.

Conclusão: Os resultados mostraram que a prevalência de injúrias percutâneas foi elevada entre dentistas e há necessidade de ênfase em prevenção de hepatite B através de adoção das três doses e uso de equipamento de proteção individual.

Palavras-chave: Acidentes ocupacionais; riscos ocupacionais; hepatite B

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Introduction

Percutaneous injuries are a risk factor associated with pathogen transmission between health professionals, especially for dentists (1-3). The injuries are frequently a consequence of the limited field of vision for dentists during clinical work, which is also affected by patient movement (4). Furthermore, the environment in which dentists exert their professional activities harbors a large variability of microorganisms, originating from the patients' blood, saliva or respiratory system, which can be hazardous to the professional (5,6).

The prevalence of percutaneous injuries was 84.6% among dentists in Araçatuba, Brazil (7). In Brasília (Brazil), another study also found a high prevalence (86.5%) of these injuries in dentists (8). Several Brazilian studies have demonstrated a prevalence that varies from 26.0% to 80.8% (3,6,9); such variability could be related to the difference in recall periods investigated, which could be 6 months, one year, or during the entire dentist's professional career (10).

Percutaneous exposition increases the probability of transmission of pathogens, such as the Hepatitis B virus (HBV) or the HIV virus (2,11,13). Such injuries may also cause alterations in the psychosocial conditions of the injured professionals (14). In Brazil, the Ministry of Health estimates that 15% of the population had already contacted HBV and 1% exhibited chronic disease related to this virus, while worldwide, two billion individuals have already been infected with HBV (15).

In 2003, the Center for Disease Control (CDC) (16) stated that HBV is present in high concentrations in the circulating blood of humans and in low concentrations in other organic fluids, and it is approximately 100 times more infectious than HIV and 10 times higher than Hepatitis C virus. Hepatitis B is the major causal agent of acute and chronic liver disease, cirrhosis, and hepatocellular carcinoma (12), and dentists exhibit a 10-fold greater risk of acquiring chronic Hepatitis B than the general population (5).

The most common method of preventing percutaneous injuries is to use adequate individual protection equipment (1, 9,13,17) and to receive a vaccination against HBV (1,11, 14,17) with posterior serum conversion analysis (11).

In Brazil, there is little information about the occurrence of percutaneous injuries in dentists, and considering the potential harmful consequences of such injuries, new studies are needed to estimate the magnitude of the problem, which could help to develop strategies to prevent these injuries. Thus, this study sought to assess the prevalence of percutaneous injuries and associated factors among dentists in Southern Brazil. We believe that percutaneous injuries are common in daily practice.

Methodology

Sample

Prior to the study, it was submitted and approved by the Institutional Ethics Committee at the Federal University of Pelotas. The study had a cross-sectional design, and it was carried out in the city of Pelotas, southern Brazil, between March and June 2009. Dentists with complete information (n=276) registered in the Sectional Brazilian Dentistry Council, section of Pelotas, constituted the study population.

Data collection

For data collection, a self-applied closed questionnaire was used, including socio-demographic information (sex and self-reported skin color), professional characteristics (time since graduation, level of specialization, place of work), the use of individual protection equipment (mask, gloves and surgical cap), the occurrence of percutaneous injuries during professional life (and the causing instruments), information regarding vaccine coverage against Hepatitis B (yes/no and number of doses) and information related to the serum conversion examination (yes/no). The questionnaire did not include information that allowed for the identification of the dentist, and the study questions were pre-tested with dentists that did not enroll in the study.

The questionnaires were personally delivered to each dentist's office, and an explanation was given to the dentists about the importance of their participation and the objectives of the study. After one week, in a second visit to their offices, the questionnaires were recovered, together with the signed informed consent to participate in the study. If the dentists failed to sign the consent form or return the questionnaire, they were excluded from the study.

Data Analysis

The data underwent a descriptive analysis, and the associations between the time since graduation and the attendance of continuing education courses were tested with the chi-square or Fisher's exact tests (FET). The analyses were carried out with the *Stata* 10.0 (StataCorp, College Station, TX) software package. The level of significance was set at $P<0.05$.

Results

Of the dentists in practice in Pelotas (Rio Grande do Sul, Brazil) that were included in the sample, 187 (68%) participated in the study. The losses and refusals were mainly due to the lack of questionnaire return or the lack of a signature on the informed consent form. Because the questionnaire was self-applied, some dentists did not answer all questions, and the number of answers for each question varied accordingly.

Table 1 presented the descriptive analysis of the study participants, showing that 52.4% were females and 96% were white. The time of graduation was most frequently within the past 10 years (45.4%), and 64% of the dentists had been trained in some kind of formal continuing education (i.e., master's degree, specialized courses). In relation to the place of work, 66.1% spent more time in private practice. The prevalence of percutaneous injuries was 59.8%, and 98% of the dentists reported to be vaccinated against Hepatitis B, with 86.2% having received the three recommended

doses. Concerning the blood exams to investigate the serum conversion (antibodies against HBV), only 46.6% had undergone the examination.

Table 2 demonstrates the occurrence of percutaneous injuries and the association with the investigated independent variables. None of the variables under evaluation presented associations with the prevalence of injuries, and only the variable "location of work" was close ($P < 0.06$). Additionally, it was possible to verify that among those that suffered injuries, 84.9% had already received the three vaccine shots, and only 47.0% had undergone the serum conversion examination.

Table 1. Number of observations and frequencies in the studied variables among dentists (N=187). Pelotas, Rio Grande do Sul, Brazil, 2009

Variables	n*	(%)
Sex	187	
Male	89	47.6
Female	98	52.4
Self-reported skin color	186	
White	180	96.8
Light black skinned	4	2.1
Black	2	1.1
Time since graduation (years)	185	
≤ 10	84	45.5
11-20	43	23.2
21-30	28	15.1
> 30	30	16.2
Level of specialization	182	
General dentists	66	36.3
Specialization/Master's Degree	116	63.7
Place of work	183	
Only Private	121	66.1
Only Public	17	9.3
Private/Public	22	12,0
Professor	23	12.6
Percutaneous injuries	184	
No	74	40.2
Yes	110	59.8
Facial mask use	187	
No	13	7.0
Yes	174	93.0
Gloves usage	184	
No	5	2.8
Yes	179	97.2
Surgical cap usage	185	
No	27	14.6
Yes	108	58.4
Sometimes	50	27.0
Vaccination against Hepatitis B	186	
No	5	2.7
Yes	181	97.3
Number of doses	181	
1	4	2.2
2	21	11.6
3	156	86.2
Serum conversion testing	176	
No	94	53.4
Yes	82	46.6

Table 2. Prevalence of percutaneous injuries and associated factors (N=187). Pelotas, Rio Grande do Sul, Brazil, 2009

Variables	Percutaneous injuries	
	n* (%)	*P*
Sex		
Male	54 (49.0)	0.43 (1)
Female	56 (51.0)	
Total	110	
Self-reported skin color		
White	107 (98.2)	0.22 (2)
Light black skinned	2 (1.8)	
Total	109	
Time since graduation (years)		
≤10	43 (39.5)	0.18 (1)
11-20	26 (23.8)	
21-30	18 (16.5)	
> 30	22 (20.2)	
Total	109	
Level of specialization		
General dentist	41 (38.3)	0.38 (1)
Specialization/Master's Degree	66 (61.7)	
Total	107	
Place of work		
Only Private	73 (68.0)	0.06 (1)
Only Public	9 (8.3)	
Private/Public	17 (15.7)	
Professor	9 (8.3)	
Total	108	
Facial mask use		
No	100 (90.9)	0.19 (1)
Yes	10 (9.1)	
Total	110	
Gloves usage		
No	103 (96.3)	0.64 (2)
Yes	4 (3.7)	
Total	107	
Surgical cap usage		
No	31(28.7)	0.63 (1)
Yes	63 (58.3)	
Sometimes	14 (13.0)	
Total	108	
Vaccination against Hepatitis B		
No	4 (3.7)	0.64 (2)
Yes	105 (96.3)	
Total	109	
Number of doses		
1	4 (3.8)	0.30 (2)
2	12 (11.3)	
3	90 (84,90)	
Total	106	
Exam for conversion		
No	54 (53,00)	0,98 (1)
Yes	48 (47,00)	
Total	102	
Immunization against Hepatitis B		
No	2 (3,45)	0,06 (2)
Yes	56 (96,55)	
Total	58	

(1) Pearson's correlation.
(2) Fisher's exact test.

When reporting the instruments that caused the accidents, the dental explorer and needles were reported by 37.0% and 29.0%, respectively, while 13% of dentists reported curettes, 5% reported burs, and 16% reported other instruments (Fig. 1).

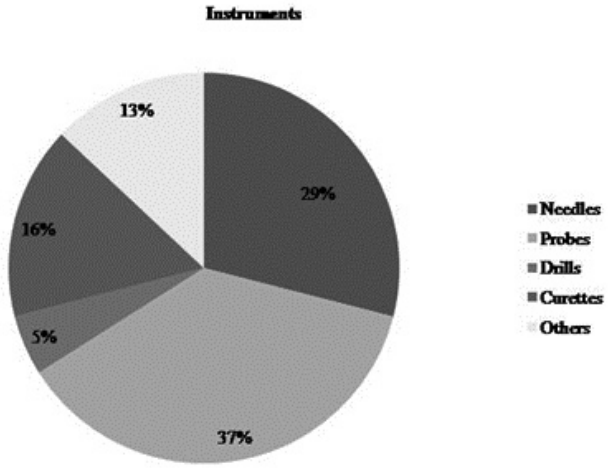

Fig. 1. Instruments related to the frequency of percutaneous injuries

Discussion

The results of this study indicate a high prevalence of percutaneous injuries among dentists in Pelotas, raising the need for preventive measures to avoid these incidents. Such injuries are associated with potential harmful risks as a consequence of contamination from microorganisms present in the blood, saliva or respiratory system of the patients (5). Highlighting this increased risk, several studies worldwide have demonstrated a higher prevalence of HBV in dentists compared to the general population (17).

The prevalence of percutaneous injuries in dentists has scarcely been investigated in Brazil (3,6-9). Considering previous Brazilian studies, the prevalence reported in our investigation (59.8%) is similar to the study in which a prevalence of 64.3% was detected (16). Compared to the other studies, our findings demonstrated a lower prevalence of these incidents (3,7,9). The main factor that accounts for such results is related to the recall period in the occurrence of the percutaneous incidents (six months, one year, the entire professional life) (3), and this could underestimate or overestimate the condition evaluated.

The distribution of professionals that suffered these injuries, according to sex, is variable in the literature, although females are more likely to be injured (3,4,6,8,18). In this study, women exhibited a higher prevalence of injuries, but this difference was not statistically significant.

Despite a lack of significance, a higher rate of accidents (40.0%) were detected in professionals with less than 10 years of clinical experience (3), and this finding could indicate that a greater length of time in clinical practice may be a protective factor against the occurrence of accidents (3). Nevertheless, in a study performed with 80 dentists in Florianopólis, Brazil, a direct relationship was found between the duration of professional clinical activity and an increased probability of injuries (9).

In this study, 93.0% of the surveyed dentists reported the routine use of facial masks, while 97.0% regularly used gloves and only 58.0% used a surgical cap; these rates are similar to those of previously reported studies (3,6,9). Contrarily, in Nigeria, a survey with 185 dentists demonstrated low rates of use of gloves and facial masks (29.4% and 52.7%, respectively) (19). It has already been established that individual protection equipment should be mandatory to minimize the chance of pathogen transmission between the patient and dentist, avoiding the possibility of crossed infection (6,7,14,15,20). Other important protection barriers that are mandatory in dental clinics include instrument sterilization and a program of active immunization for professional and auxiliary personnel (15,17).

The instrument that is most frequently involved in accidents is the explorer, followed by needles. Other reports presented in the literature have found similar results (4,6,7,10). Dentists from Montes Claros, MG, Brazil, reported higher frequencies of injuries with burs, explorers and needles (10). The recommendations from the CDC for infection control include not only the use of individual protection equipment but also the correct handling of instruments and materials (16).

Among those dentists surveyed in this study, 97.0% were already vaccinated against HBV. Previous inquires on dentists' immunization against HBV showed similar rates (3,10,12,17), which were higher than the immunization rate found in Nigeria (50.0%) (19). Importantly, the vaccine against HBV has been available since 1982, and since 1990, it has been recommended for all health professionals whose activities frequently expose them to have contact with blood (21). The vaccine is considered to have a high efficacy without toxicity, and it rarely produces adverse effects (11).

In our survey in southern Brazil, almost 85.0% of dentists had already received the recommended three vaccine shots. Such coverage is higher than the coverage observed in other Brazilian studies in Florianopólis (56%) and Belo Horizonte (73.8%) (12,20). In 241 dentists from Montes Claros, MG, Brazil, complete vaccination was observed in 91.0%; this result was credited to the high comprehension of these dentists regarding the importance of vaccination for the primary prevention of Hepatitis B (10). The Ministry of Health recommends that the complete vaccine regimen of three shots should be performed for all health workers. The second shot should be taken after 1-2 months, and the third should be administered 6 months after the first dose. Following such a protocol, 95% of the vaccinated professionals will develop antibodies, and in these individuals, protection against hepatitis is almost 100% (21).However, it is highly recommended that a serological examination is conducted to assess antibody conversion (21).

Even though the majority (84.9%) of the dentists surveyed in Pelotas had already been vaccinated against HBV with three doses, only 47.0% had performed the serological examination. The present finding is greater than the results found for Belo Horizonte and Montes Claros (14.8% and 12.8%, respectively) (3,12), and these low rates indicate that dentists do not regularly undergo serological examination. The factors that favor a failure of the immunological response, such as concomitant pathologies and the storing and handling conditions of the vaccines, are well known (11). Thus, the verification of serological conversion is essential for the health professional, and it is recommended that serological tests be performed one to three months after completing the vaccination regimen (16).

This study may have been limited by its cross-sectional design, as it was not possible to completely establish the temporal causal nexus. However, this type of investigation is applicable as a preliminary "picture" of the studied condition. Longitudinal studies that follow up with the selected individuals are recommended to determine the more frequent risk factors and the methods that may prevent percutaneous injuries (5). In addition, cross-sectional studies serve to maximize the understanding among dentists and their adhesion to the precautionary measures (3).

Another limitation is related to the method of questionnaire application. Self-applied questionnaires increase the prevalence of memory bias (6). Differently from other studies, the occurrence of percutaneous injuries was not associated with the time in clinical practice (professional life) in this study. Small accidents tend to be forgotten, generating an underestimation (3,6).

Furthermore, because this study was based on self-reported data, the reported prevalence of vaccination may have been overestimated. When professionals are evaluated/questioned, they often change their behavior (3); that is, individuals tend to report that they adhere to recommended protocols, even when they do not (14). Nevertheless, considering that the vaccination against HBV is composed of three doses, performed on pre-determined dates and reported on a vaccination card, it is plausible that those that claimed complete vaccination were truthful (14).

Conclusion

The results presented here allow for the conclusion that a high rate (59.8%) of dentists in Pelotas, southern Brazil, suffered percutaneous injuries and potential biological contamination. Additionally, the low reported adhesion to the serological testing recommendations against Hepatitis B is troublesome.

Therefore, the constant distribution of information to professionals about the risks of contamination with dental instruments and the complete vaccination scheme should be provided, followed by serum conversion testing.

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