

Needlestick and sharp instrument injuries among dentists in Montes Claros, Brazil

Acidentes com instrumentos perfurocortantes entre cirurgiões-dentistas de Montes Claros, Brasil

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ABSTRACT

Percutaneous injuries are a common problem among dentists, who are among the healthcare professionals most involved in occupational accidents. This study evaluated the prevalence and characteristics of needlestick and sharp instrument injuries and the factors associated with these accidents among dentists. Structured, self-administered questionnaires were distributed to all dentists currently working in Montes Claros, Brazil. Percutaneous injuries within the previous six months and during the course of professional life were reported by 19.1% and 81.3%, respectively. The instrument most frequently mentioned was the bur, and injuries involved the finger; 56.3% reported the presence of bleeding, while 51.5% reported a compliance with the post-exposure protocol. Associated factors included sex, age, marital status, consumers of alcohol, hours worked per day, the use of gloves and mask 100% of the time, report of breaks taken during working hours, and knowledge about the post-exposure protocol. A higher prevalence of accidents occurred among dentists who were women, who were older aged, who drank alcohol, and who were unmarried. The list also included those who worked longer than 8 hours per day, did not take breaks during working hours, used masks 100% of the time, did not wear gloves all the time, and did not know the Brazilian post-exposure protocol.

Uniterms: Dentists. Occupational health. Injuries.

INTRODUCTION

Percutaneous injuries are a common problem among dentists, who are among the healthcare professionals most involved in occupational accidents^{1,2}, particularly needlestick and sharp instrument injuries²⁻¹¹. This exposure is related to the fact that dentists work in a limited-access and restricted-visibility field and frequently use sharp devices². Percutaneous exposures represent the most efficient method for transmitting blood-borne infections⁶, including Human Immunodeficiency Virus (HIV) and hepatitis B and C viruses, and exposure to this virus is a significant occupational hazard among healthcare workers^{1,12,13}. Estimates based on data from the Centers for Disease Control and Prevention, as well as other studies, suggest that a healthcare provider's risk of acquiring HIV

infection as a result of percutaneous exposure to an HIV-contaminated device is 0.3%¹⁴. The reported risk associated with HCV exposures ranges from 2.7% to 10%, and the risk of HBV exposures ranges from 5.0% to 45.0%¹.

Compliance with the guidelines for infection control in the dental healthcare setting is sufficient to protect against the majority of microorganisms. However, dentists are still at risk due to an occupational exposure to infection and inadequate compliance with the infection control recommendations^{7,8,15,17}. It is crucial to develop an effective strategy to monitor and manage needlestick and sharp instrument injuries among these healthcare workers¹⁸ based on the characterization of occupational exposure and the knowledge of the factors associated with it. The variables of sex, age,

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time elapsed since the person graduated from college, expertise, use of personal protective equipment, adoption of the post-exposure protocol, and the number patients seen per day have previously been related to the occurrence of injuries^{4,10}.

This study evaluated the prevalence and the characteristics of needlestick and sharp instrument injuries and the factors associated with this type of accident among dentists, within the previous six months and during the course of professional life.

MATERIALS AND METHODS

Ethical approval for this study was obtained from the Funorte Ethics Committee. The subjects were all dentists currently working in public or private offices and duly registered with the Regional Dentistry Council in Montes Claros, Brazil. Dentists who could not be found after three attempts were eliminated.

The data were collected by means of a structured, self-administered questionnaire, which had been previously tested¹⁶ and which was distributed and collected at the participants' place of work one week later. The variables evaluated included the occurrence of needlestick and sharp instrument injury, within the previous six months and during the course of professional life, and accident characterization (instrument that caused the injury, nature of injury, activities that were performed, part of the body that was damaged, presence of bleeding, compliance with a post-exposure protocol). The following groups of variables were also evaluated: characterization of the dentist (age, sex, marital status, number years since graduation, higher educational degree, updating within the past two years, monthly income, use of tobacco, consumption of alcohol, vaccination against hepatitis B virus, knowledge about post-exposure protocol, time of clinical experience), working conditions (number of days worked per week at the clinic, total hours worked each day at the clinic, workplace, working system adopted, simultaneous attendance of patients, number of patients seen in 4 hours, breaks during working hours, hand hygiene, professional satisfaction), and the use of personal protective equipment (use of all protective equipment as well as the use of gloves, mask, cap, eyeglasses, and medical coat).

Data were analyzed using the Statistical Package for Social Sciences (SPSS 15.0 for Windows, SPSS Inc, Chicago, IL). Differences in proportions were compared using the Chi square test or Fisher's exact test. Logistic regression was used to investigate factors that could be related to injuries. Patient marital status and higher education degree

were dichotomized. Individuals who consumed alcoholic beverages, even sporadically, were included in the category of those who consumed alcohol.

RESULTS

A total of 333 of the 505 dentists were considered eligible and 292 participated in the study (87.7%). Among the 172 that did not participate, 109 were not working in clinics or were working in another city, 56 were retired, and 7 were not working because they were sick.

The prevalence of needlestick and sharp instrument injuries within the previous six months and during the course of professional life was 19.2% and 82.5%, respectively.

Burs represented the devices most commonly reported as the cause of exposure. Dental restoration was the most common activity associated with injuries; 57.4% involved a finger. The majority of the dentists related the presence of bleeding at the time of the accident and compliance with the post-exposure protocol (Table 1).

Table 1 - Characteristics of the percutaneous injuries suffered by the dentists. Brazil, 2007

VARIABLES	n	%
Instrument that caused the injury		
Burs	39	24.2
Explorer	30	18.5
Syringe needle	26	16.0
Suture needle	12	7.4
Others	55	33.9
Nature of injury		
Extraoral	109	47.8
Intraoral	119	52.2
Activities performed		
Dental restoration	50	25.0
Surgery	40	20.0
Cleaning instruments	36	18.0
Orthodontics	17	8.5
Endodontics	14	7.0
Prosthesis	10	5.0
Others	33	16.5
Part of the body damaged		
Finger	132	57.4
Hand	67	29.1
Forearm	25	10.9
Others	6	2.6
Presence of bleeding		
Yes	134	56.3
Compliance with post exposure protocol		
Yes	117	51.5

In the bivariate analyses, the needlestick and sharp instrument injuries during the course of professional life were associated with age, marital status, the number of years since graduation, the knowledge about post-exposure protocol, the time

of clinical experience, and breaks taken during working hours (Table 2). Within the previous six months, the prevalence of injuries was associated with marital status and breaks taken during working hours (Table 3).

Table 2 - Factors associated with percutaneous injuries during the course of professional life among dentists. Brazil, 2007

VARIABLES	Suffered any accident				
	Yes	OR	95% IC	p	
	n	%			
Age group					
23 to 30	45	20.7	1.00		
31 to 40	60	27.6	4.90	1.7-14.8	0.00
41 to 50	56	26.3	3.90	1.4-11.2	0.00
More than 50	55	25.4	0.70	1.1-6.8	0.02
Sex					
Male	112	47.3	1.00		
Female	125	52.7	1.21	0.6-2.3	0.54
Marital status					
Unmarried/Divorced/Widow(er)	82	34.5	1.00		
Married	156	65.5	2.05	1.1-3.9	0.02
Number of years since graduation					
1 to 5	44	19.7	1.00		
6 to 10	67	30.0	3.38	1.3-8.9	0.00
11 to 21	54	24.2	2.45	0.9-6.3	0.04
More than 21 years	58	26.0	2.93	1.1-7.8	0.01
Higher Education Degree					
Undergraduate	83	35.3	1.00		
Specialization/Master/ Doctorate	152	64.7	1.33	0.7-2.6	0.37
Updating within the past two years					
Yes	189	79.4	0.97	0.4-2.1	0.93
Monthly income (in terms of minimum wage)					
1 to 5	35	15.2	1.00		
6 to 10	124	53.9	0.86	0.3-2.2	0.73
11 or more	71	30.9	1.80	0.6-5.7	0.26
Use of tobacco					
Non-smoker	199	82.9	1.00		
Former smoker	32	13.3	1.45	0.5-4.5	0.47
Smoker	9	3.8	1.02	0.2-7.1	0.67
Alcohol consumption					
Drink	107	45.0	1.00		
Does not drink	131	55.0	0.77	0.4-1.5	0.39
Vaccination against Hepatitis B virus^{&}					
Yes	211	91.3	0.85	0.3-2.8	0.47
Knowledge about post-exposure protocol^{&}					
Yes	111	47.6	0.37	0.2-0.8	0.00
Time of clinical experience					
Less than 5 years	53	22.3	1.00		
6 to 15	97	40.8	2.14	0.9-4.6	0.03
More than 15 years	88	37.0	2.68	1.2-6.2	0.01
Number of days worked per week at clinic					
1 to 4	46	19.6	1.00		
5 to 6	189	80.4	0.98	0.4-2.2	0.95

VARIABLES	SUFFERED ANY ACCIDENT				
	YES	OR	95% IC	p	
	n	%			
Total hours worked each day at clinic					
Up to 8 hours	172	71.7	1.00		
More than 8 hours	68	28.3	0.98	0.5-2.0	0.94
Working place					
Only private dentist's office	111	46.4	1.00		
Others	128	53.6	0.81	0.4-1.6	0.49
Working system adopted					
Two hands	77	32.6	1.00		
Four hands	158	67.4	0.97	0.5-1.9	0.91
Simultaneous attendance of patients^{&}					
Yes	32	13.4	0.56	0.6-6.2	0.29
Number of patients seen in 4 hours					
1 to 4	73	30.8	1.00		
5 to 8	124	52.3	1.70	0.8-3.6	0.13
9 or more	40	16.9	1.00	0.4-2.5	0.99
Breaks during working hours					
No	113	47.7	1.00		
Yes, after each patient	71	30.0	0.27	0.1-0.6	0.00
Every time he/she gets tired	53	22.4	0.51	0.2-1.3	0.13
Hand hygiene					
Yes	195	81.6	2.08	0.7-6.3	0.14
Professional satisfaction					
Low	30	12.6	1.00		
Medium	68	28.6	0.32	0.1-1.6	0.11
High	140	58.8	0.26	0.04-1.2	0.06
Uses all PPE*					
Yes	153	65.4	0.67	0.4-1.3	0.21
Uses gloves*^{&}					
Yes	209	87.1	2.42	0.7-10.4	0.15
Uses mask*^{&}					
Yes	196	81.7	0.94	0.4-2.2	0.88
Uses cap*^{&}					
Yes	145	61.4	1.19	0.6-2.3	0.60
Uses eyeglasses*^{&}					
Yes	124	52.1	1.17	0.6-2.2	0.62
Uses medical coat*^{&}					
Yes	179	75.2	1.57	0.7-3.7	0.25

* 100% of the time. [&] The answer *No* was the reference for comparison

Table 3 - Factors associated with percutaneous injuries within the previous six months among dentists. Brazil, 2007

VARIABLES		YES		OR	95% IC	P
		n	%			
Age group	23 to 30	15	30.0	1.0		
	31 to 40	13	26.0	0.85	0.4-2.0	0.70
	41 to 50	11	22.0	0.73	0.3-1.8	0.48
	More than 50	11	22.0	0.71	0.3-1.7	0.43
Sex	Male	22	39.3	1.00		
	Female	34	60.7	1.56	0.9-2.8	0.14
Marital status	Unmarried/Divorced/Widow(er)	28	50.0	1.00		
	Married	28	50.0	0.53	0.3-1.0	0.03
Number of years since graduation	1 to 5	15	29.4	1.00		
	6 to 10	14	27.5	0.74	0.3-1.7	0.47
	11 to 21	10	19.6	0.61	0.3-1.5	0.27
	More than 21 years	12	23.5	0.71	0.3-1.7	0.44
Higher Education Degree	Undergraduate	21	38.2	1.00		
	Specialization/Master/ Doctorate	34	61.8	0.91	0.5-1.7	0.77
Updating within the past two years ^{&}	Yes	47	83.9	0.69	0.3-1.6	0.34
Monthly income (in terms of minimum wage)	1 to 5	9	17.0	1.00		
	6 to 10	31	58.5	0.93	0.4-2.1	0.86
	11 or more	13	24.5	0.73	0.3-1.9	0.52
Use of tobacco	Non-smoker	52	92.9	1.00		
	Former smoker	4	7.1	0.45	0.2-1.3	0.15
	Smoker	0	0.0	0.00	0.0-1.8	0.08
Alcohol consumption	Drink	30	53.6	1.00		
	Does not drink	26	46.4	0.61	0.3-1.1	0.10
Vaccination against Hepatitis B virus ^{&}	Yes	51	91.1	1.01	0.3-3.0	0.99
Knowledge about post-exposure protocol ^{&}	Yes	22	42.3	1.09	0.6-2.1	0.78
Time of clinical experience	Less than 5 years	18	32.7	1.00		
	6 to 15	19	34.5	0.62	0.3-1.3	0.19
	More than 15 years	18	32.7	0.68	0.3-1.4	0.30
Number of days worked per week at clinic	1 to 4	6	11.3	1.00		
	5 to 6	47	88.7	2.13	0.9-5.3	0.10
Total hours worked each day at clinic	Up to 8 hours	36	64.3	1.00		
	More than 8 hours	20	35.7	1.53	0.8-2.8	0.18
Working place	Only private dentist's office	21	37.5	1.00		
	Others	35	62.5	1.50	0.8-2.7	0.18
Working system adopted	Two hands	23	41.8	1.00		
	Four hands	32	58.2	0.61	0.3-1.1	0.11
Simultaneous attendance of patients ^{&}	Yes	9	16.1	0.69	0.3-1.6	0.37
Number of patients seen in 4 hours	1 to 4	15	27.3	1.00		
	5 to 8	32	58.2	1.49	0.8-2.9	0.25
	9 or more	8	14.5	0.97	0.4-2.5	0.94
Breaks during working hours	No	31	56.4	1.00		
	Yes, after each patient	14	25.5	0.50	0.3-1.0	0.05
	Every time he/she gets tired	10	18.2	0.56	0.3-1.2	0.15

VARIABLES		YES		OR	95% IC	p
		n	%			
Hand hygiene	Yes	44	80	1.30	0.6-2.9	0.50
Professional satisfaction	Low	7	12.5	1.00		
	Medium	22	39.3	1.31	0.5-3.5	0.59
	High	27	48.2	0.65	0.3-1.7	0.36
Uses all PPE*	Yes	20	35.7	0.97	0.5-1.8	0.92
Uses gloves*&	Yes	46	82.1	1.92	0.8-4.6	0.11
Uses mask*&	Yes	49	87.5	0.57	0.2-1.4	0.20
Uses cap*&	Yes	33	58.9	1.18	0.6-2.2	0.58
Uses eyeglasses*&	Yes	31	55.4	0.88	0.6-1.6	0.67
Uses medical coat*&	Yes	42	75.0	1.11	0.5-2.3	0.76

Table 4 presents the results of the logistic regression analysis. During the course of professional life, the increase in age was found to increase the chance of injuries. Taking breaks during working hours and knowledge about the post-exposure protocol appeared as factors of protection against injuries. Within the previous six months, the prevalence of accidents was higher

among women, while dentists who were married and those who did not drink alcohol were less exposed. The dentists who worked at the clinic for over eight hours daily, as well as those who used a mask all time, were more exposed to needlestick and sharp instrument injuries. Dentists who wore gloves 100% of the time showed lower odds of having accidents (Table 4).

Table 4 - Results of multivariate analyses

VARIABLES		OR	IC	Valor p
PROFESSIONAL LIFE				
Age group				
23 to 30		1.00		
31 to 40		5.65	1.85-17.32	0.00
41 to 50		4.03	1.42-11.45	0.00
More than 50		4.15	1.51-11.41	0.01
Breaks during working hours				
No		1.00		
Yes, after each patient		0.16	0.06-0.41	0.00
Every time he/she gets tired		0.36	0.12-1.08	0.07
Knowledge about the post-exposure protocol				
No		1.00		
Yes		0.33	0.14-0.75	0.01
WITHIN LAST SIX MONTHS				
Sex				
Male		1.00		
Female		2.32	1.15-4.69	0.02
Marital status				
Unmarried/Divorced/Widow(er)		1.00		
Married		0.47	0.25-0.88	0.02
Alcohol consumption				
Drink		1.00		
Does not drink		0.48	0.24-0.94	0.03
Total hours worked each day at clinic				
Up to 8 hours		1.00		
More than 8 hours		2.02	1.04-3.93	0.04
Uses mask 100% of the time				
Yes		3.15	1.12-8.88	0.03
Uses gloves 100% of the time				
Yes		0.26	0.10-0.69	0.01

DISCUSSION

Percutaneous exposure has proven to be common among dentists^{4,19}. The prevalence of needlestick and sharp instrument injuries within the previous six months (19.2%) was similar (18%), higher (13.8%), and lower (68%) than the accidents observed among South-African and New Zealand dentists^{7,8,15}. Other national and international studies adopted different reference periods to estimate the prevalence of accidents among dentists, hindering the direct comparison with this study. As expected, the prevalence of percutaneous injuries within the previous six months was lower than the values observed during the previous year, which varied from 27.7% to 100%^{3,4,6,10,11,20}. During the course of professional life, the prevalence of percutaneous injuries was higher than the prevalence recorded among Caribbean dentists (77%)⁹ and Brazilian dentists working in hospitals (94.4%)². Training in the measures of infection control can explain differences in the prevalence of occupational injuries among dentists in different regions of the world.

Dental burs proved to be the most frequent cause of percutaneous injury^{4,5,20}, most likely due to a lack of attention during their use or to their remainder attached to the hand piece in the dental unit after use³. Hand pieces should be placed in the downward position, with the bur facing the cart, to reduce the risk of such injuries¹. Syringe needles were also involved in the injuries^{1,3,4,6,18,21}. Needle recapping was previously pointed out as the reason for accidents among dentists, due to the fact that it is necessary to repeat anesthesia during the same dental appointment^{3,22}. The concern over needlestick injuries is the fact that they often occur while giving injections, when there is usually some residual bodily fluid in the needle from the puncture site itself⁶.

The occurrence of accidents during dental restorations and surgical procedures has previously been observed^{20,21}. This data is reinforced by the higher frequency of accidents during intra-oral dental procedures^{1,5}. Intraoral instrument manipulation – either by a single or by two or more dental workers in a confined space – presents obvious hazards (four-handed dentistry). Preventing injuries in this area will require more extensive training and ergonomic innovations.

In agreement with previous findings, the fingers were the body part most frequently involved^{1,17,20}. In disagreement with another study, a higher percentage of dentists found blood at the time of the accident¹⁷. The infection risk after accidents involving contaminated blood contact depends on various factors, such as: type of exposure, inoculum size, host response, infectious material involved, and

the amount of blood²³. In principle, any accident should be treated equally, regardless of the characteristics of the patient or the accident site. A careful evaluation is necessary to determine the need for post-exposure chemoprophylaxis. Moreover, an analysis of the circumstances of the accidents can contribute to preventing other accidents.

The occurrence of accidents was influenced by the dentists' characteristics, their workload, and their infection control measures in clinical practice. The higher prevalence of accidents among older dentists may indicate that they were not well-trained in infection control practices²⁴. As expected, the prevalence of accidents was higher among dentists who did not take breaks during working hours and among those who worked longer hours each day. Similarly, rushing through a procedure and being under pressure from the environment (to finish quickly) also contributed to the occurrence of accidents among American dentists¹. An appropriate work rhythm is important for patient and professional safety.

Knowledge about post-exposure protocol decreased the chances of accidents. Despite this favorable finding, many dentists ignore it, even though the protocol is available on the internet. Knowledge of the post-exposure protocol allows for appropriate precautionary measures to be established, including medical assessment of the need for prophylaxis in cases of accidents involving biological material of HIV-infected patients or those with unknown serology²⁴. In one study, a higher prevalence of accidents among women was observed¹⁰. By contrast, Canadian male dentists showed a higher risk of percutaneous exposure⁴. The association among the occurrence of accidents, marital status, and alcohol consumption has not been identified in previous reports. It is believed that individuals who do not consume alcohol tend to be more careful and more concerned about their own health.

The adoption of infection control measures, such as the use of masks and gloves, was associated with the occurrence of injuries. However, the unexpectedly higher prevalence of accidents among those who used a mask all the time is intriguing and differs from previously observed data⁴. It was expected that the professional who consistently used a mask would also present other behaviors that would diminish the risk of contamination. In fact, gloves are an auxiliary barrier to prevent accidents with needles and sharp instruments and their use should not be

neglected in any dental procedure. Moreover, when accidents occur, latex gloves reduce the victim's volume of blood inoculated from 46% to 86%²⁵.

The most disturbing finding was that nearly one decade after the publication of the Standard Precautions by the Centers for Disease Control, a high percentage of dentists still did not wear gloves, masks, protective eyeglasses, caps, and/or medical coats 100% of the time. This finding suggests ignorance or poor risk perception. This last aspect is worrisome, given that the false sense of security significantly increases the risk of infection in clinical practice². Particularly for healthcare workers, the use of protective barriers must be a priority behavior. In the case of biological agents, the control of the source or the environment as a whole is either impossible or unfeasible, thus personal protective equipment must be used in all situations containing risk factors². Therefore, the prevention of incidents of percutaneous exposure is still of utmost importance. Moreover, dentists must continue to follow strict control guidelines.

The accidents suffered by dentists place them at risk of infection, many of which could be avoided by more careful clinical practice, such as the removal of burs from the hand piece after use³. Since the majority of dental professionals do not comply with post-exposure protocol, many are unprepared to take immediate precautions when an accident occurs. The results of this study indicate that improved working conditions and occupational health measures, such as an improved use of barriers, careful handling and disposal of sharp instruments, knowledge of post-exposure protocols, and taking breaks during working hours, would reduce exposure to, as well as decrease the risk of, occupationally acquired infections. Continuous education with regard to infection control guidelines and post-exposure measures are necessary, which may have been forgotten and/or neglected during the course of a dentist's professional life.

CONCLUSIONS

A high prevalence of percutaneous injuries among dentists in Montes Claros, Brazil could be identified in the present study. Among dentists who were women, older-aged, consumers of alcohol, or unmarried, as well as those who worked over 8 hours per day, did not take breaks during working hours, used masks 100% of the time, did not use gloves all the time, and/or did not know the Brazilian post-exposure protocol, showed a greater incidence of accidents.

RESUMO

Avaliou-se a prevalência e as características dos acidentes com instrumentos perfurocortantes e os fatores associados entre cirurgiões-dentistas. Questionários estruturados foram distribuídos para todos os profissionais que atuavam em Montes Claros, Brasil. Injúrias percutâneas nos últimos seis meses e durante a vida profissional foram relatadas por 19,1% e 81,3%, respectivamente. O instrumento mais envolvido foi brocas e a maioria das injúrias envolveu os dedos; 56,3% relataram a presença de sangramento e 51,5% adotaram protocolos pós-exposição ocupacional. Maior prevalência de acidentes ocorreu entre cirurgiões-dentistas do sexo feminino, mais velhos, que consomem bebidas alcoólicas, solteiros, que trabalham mais de 8 horas por dia, que não realizam pausas durante o trabalho; entre os que usavam máscaras e não usavam luvas 100% do tempo e entre os que não conheciam o protocolo pós-exposição ocupacional.

Descritores: Odontólogos. Saúde do Trabalhador. Ferimentos.

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