Influence of Clinicians' Socio-demographic, Professional and Educational Variables on Their Compliance With Preventive Measures Against Hepatitis B and C

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Purpose: To investigate the influence of a number of variables regarding clinicians' gender, social class, length of time since graduation and the level of knowledge on their use of available preventive measures against hepatitis B and C.

Materials and Methods: A cross-sectional questionnaire-based survey was carried out involving a random and representative sample (n = 319) of the clinicians working in Recife, Pernambuco, North-East Brazil. The participants were interviewed by means of a questionnaire, prepared and pretested by the researchers. Pearson's chi-square and Fisher's exact tests were used in the statistical analyses (significance level: 5%).

Results: Female clinicians were found to make more frequent use of equipment such as lab coats, scrub caps and masks ($P = 0.0357$). With regard to lab coat use in relation to social class, it was seen that clinicians from social class B used it less ($P = 0.0077$). The length of time since graduation was seen to be connected with the use of scrub caps ($P = 0.0003$), coating of equipment with polyvinyl chloride plastic film ($P = 0.037$), use of alcohol for cleaning equipment ($P = 0.0012$), two-handed recapping of needles ($P < 0.0001$) and immunisation ($P = 0.003$), showing that those who graduated most recently were more likely to take adequate infection control steps. The fact that clinicians had been informed about hepatitis B and C, and also their knowledge about its contagion, was positively associated with their levels of vaccination against HBV ($P = 0.0313$ and 0.0108, respectively).

Conclusions: The adherence to preventive practices against hepatitis B and C was shown to be connected with the clinicians' socio-demographic, professional and educational variables.

Key words: clinicians, hepatitis B and C, knowledge, prevention, protection

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Exposure to pathogenic microorganisms represents one of the major risks to which health care workers, including dental surgeons, are exposed. Of these, the viral hepatitis, especially types B and C (caused by the viruses HBV and HCV, respectively) have the highest incidence among these workers, compared with the general public (Figueiredo, 1992).

Epidemiological studies have shown that hepatitis caused by HBV affects around 5% of the world population (about 300 million people) (Hardie, 1992), whereas the global infection rate of HCV

is around 2% (Lauer and Walker, 2001). Given that the risk of HBV transmission is between 6% and 30% and that the HCV transmission risk is between 2% and 10%, international estimates point to 400 new cases of occupational HBV infection per year, and up to 1000 cases of occupational HCV transmission annually (Brevidelli and Cinciarullo, 2001).

Epidemiological studies have shown that clinicians, especially oral and maxillofacial surgeons, face a 10-fold greater risk of HBV infection than the general public, a risk that can also affect their family members and their patients (Pagliari and Melo, 1997; Martins and Barreto, 2003).

The viruses of hepatitis B and C can be found in high concentration in the blood of contaminated patients. HBV can be transmitted through bodily fluids, by breathing in the airborne virus or by hand to mouth (Cerri et al, 1995; Santos et al, 1995), whereas HCV is most efficiently transmitted through blood (Brasil, Ministério da Saúde, 2005). An aggravating factor is the resistance and the stability of HBV in its surroundings, such as the work surfaces in a dental office, on which it can survive for up to 6 months at room temperature, compared with HCV, which survives for over 5 days (Lodi et al, 1998).

To prevent HBV and HCV infections, dental workers must take standard preventive measures, such as the use of personal protective equipment (PPE), especially gloves, lab coat, scrub cap, mask, protective glasses and polyvinyl chloride (PVC) plastic film coating of the equipment (Martins and Barreto, 2003).

For further protection against hepatitis B, dental workers can receive a recombinant DNA vaccine that is safe and highly efficient, and that is offered free to health care workers in Brazil. According to Chen et al (2000), despite the possibility of reducing the prevalence of chronic HBV infection by using infection control strategies, the most effective public health practice for hepatitis B control is mass vaccination. According to Martins and Barreto (2003), clinicians' immunisation should be completed before they begin practising dentistry. Martins and Barreto point out that complete immunisation is achieved through three doses of the vaccine at 0, 1 and 6 months.

The results of vaccination on the global incidence of hepatitis and its effects have been disappointing. This is not a result of the inefficiency of the vaccines used, but rather a consequence of the way in which the vaccination programme has been carried out, without effectively targeting the groups that are mostly at risk (Assad and Francis, 2000).

Given the situation described above, this study aims to investigate some variables regarding the clinicians' gender, social class, length of the period since graduation and the level of knowledge, and how these factors influence their use of the available preventive measures against hepatitis B and C (use of PPE, handling of contaminated material and equipment and immunisation).

METHODS

In this cross-sectional questionnaire-based research, 319 clinicians answered a questionnaire that had been prepared and pretested by the researchers, with general and specific questions about hepatitis B and C related to dental care. It also contains questions about preventive and protective measures, especially the use of PPE, the recapping of needles and the immunisation against HBV. The pretest was carried out in a separate group of clinicians, prior to its application to the study group. The participants, who were visited at their workplaces from September 2005 to April 2006, were randomly chosen to make up a representative sample of the clinicians working in Recife, Pernambuco, North-East Brazil.

This research was approved by the Committee of Ethics and Research of the UFPE (Federal University of Pernambuco) and registered with protocol number 164/2005 (CEP/CCS/UFPE). All the participants signed a research consent form.

In an attempt to verify the association between the compliance with preventive measures and social status, the participants in the research were divided into groups according to the average income of the heads of household in the neighbourhood in which they practice, from where it is supposed that the majority of their patients come from. These data were taken from the 2000 census (Fundação Instituto Brasileiro de Geografia e Estatística, 2000). Three groups were formed: Group A (average monthly income above 7 minimum salaries), Group B (average monthly income from 3.5 to 7 minimum salaries) and Group C (average monthly income below 3.5 minimum salaries).

After data collection, the data were analysed by means of absolute and percentage point distributions, univaried and bivaried (techniques of descriptive statistics). Pearson's chi-square test, or when necessary Fisher's exact test, was used in the statistical analysis. The statistical calculations were obtained using the SAS (Statistical Analysis System, Cary, USA) software, version 8.0. The significance level of the statistical tests was 5%.

RESULTS

Preventive measures against hepatitis B and C, although not universally practised, were shown to be relatively frequent among the clinicians surveyed. The most adopted PPE was gloves, used by 99.1% of the clinicians, and the least adopted was the PVC plastic coating on equipment, used by 80.4%. Regarding the vaccination rate, only 79.3% reported having taken the three doses that are needed to induce complete immunisation, and this can be seen in Table 1.

The data in Table 2 show the number of clinicians who answered the questions correctly regarding the means of infection of hepatitis B and C (87.8%) and who had received technical information about the viruses (69.4%).

A significant correlation was found between the HBV and the HCV preventive practices and several variables related to the clinicians surveyed; these data are presented in Table 3.

Female clinicians were found to use equipment such as a lab coat, scrub cap and mask more frequently. The use of the lab coat was seen to be less common among the social class B clinicians (in neighbourhood where the heads of household have an average monthly income from 3.5 to 7 minimum salaries), in comparison with the results for class A and class C groups, which were similar to each other.

Results showed that clinicians who had graduated < 10 years before made greater use of scrub caps and coating of equipment with PVC plastic film. The significance of the length of time since graduation was also reflected in the statistics regarding the use of alcohol (70%) for cleaning clinical and surgical equipment, this being more common among clinicians who graduated < 21 years ago. Furthermore, it was seen that clinicians practising for < 10 years were less likely to recap needles with both the hands and that this group also had the highest proportion of HBV-vaccinated clinicians.

The fact that the clinicians had been informed about hepatitis B and C was also associated with a higher level of HBV vaccination (see Table 3). Clinicians had received this information through several channels, the most common of which were universities, scientific journals and congresses.

Moreover, the clinicians who were aware of the principal means of HBV and HCV infections were among the group that least frequently washed their dental instruments without wearing gloves, and that had the highest vaccination rate (see Table 3).

Table 1 Frequency of use of preventive measures against hepatitis B and C

Variables	n	%
PPE used		
Gloves	314	99.1
Lab coat	305	96.2
Scrub cap	250	78.9
Mask	311	98.1
Protective glasses	281	88.6
PVC plastic coating on equipment	255	80.4
Base[a]	317	–
Cleaning of clinical and surgical equipment		
With rubber gloves, water and soap or detergent	300	95.9
Without gloves, with water and soap or detergent	14	4.5
Using alcohol (70%)	29	9.3
Base[b]	313	–
Recapping needles with two hands?		
Always	117	37.6
Sometimes	100	32.2
Never	94	30.2
Total[c]	311	100.0
Vaccination against hepatitis B		
Yes	312	98.4
No	5	1.6
Total[d]	317	100.0
Number of doses of vaccine against hepatitis B		
One	11	3.6
Two	50	16.2
Three	245	79.3
Do not know	3	1.0
Total[e]	309	100.0

Answers unknown for (a) two, (b) six, (c) eight, (d) two and (e) three respondents.

Table 2 Distribution of respondents in relation to knowledge of hepatitis B and C

Variables	n	%
Answers about the principal means of infection of hepatitis B and C		
Correct	280	87.8
Wrong	8	2.5
Did not answer	31	9.7
Total	319	100.0
Scientific information received about hepatitis B and C		
Yes	209	69.4
No	92	30.6
Total[a]	301	100.0

[a]Answers unknown for 18 respondents.

Table 3 Value of *P* for the association between preventive measures against hepatitis B and C, and variables related to clinicians surveyed

Preventive measures	Gender	Social class	Length of time since graduation	Informed about HBV and HCV	Aware of forms of infection
PPE used					
Gloves	ns[a]	ns[a]	ns[a]	ns[a]	ns[a]
Lab coat	0.0019[a]	0.0077[a]	ns[a]	ns[a]	ns[a]
Scrub cap	< 0.0001[b]	ns[b]	0.0003[b]	ns[b]	ns[b]
Mask	0.0357[a]	ns[a]	ns[a]	ns[a]	ns[a]
Glasses	ns[b]	ns[b]	ns[b]	ns[b]	ns[a]
PVC plastic coating for equipment	ns[b]	ns[b]	0.037[b]	ns[b]	ns[b]
Cleaning of equipment					
With rubber gloves, water and soap/ washing liquid	ns[b]	ns[a]	ns[a]	ns[a]	ns[a]
Without rubber gloves, and with water and soap/washing liquid	ns[b]	ns[a]	ns[a]	ns[a]	0.0223[a]
Using alcohol (70%)	ns[b]	ns[b]	0.0012[b]	ns[b]	ns[a]
Recapping needles with two hands	ns[b]	ns[b]	< 0.0001[b]	ns[b]	ns[a]
Vaccination against hepatitis B	ns[b]	ns[a]	0.003[a]	0.0313[b]	0.0108[a]

ns: no significant connection ($P > 0.05$).
[a]Fisher's exact test; [b]Pearson's chi-square test.

With regard to injuries from sharp instruments, the majority of clinicians surveyed (71.5%) said that they had received injuries of this type. When asked if they had been infected by hepatitis B and/or C, 5.4% answered 'yes' and 28.6% were unable to answer.

DISCUSSION

The data from this study are the representable findings of Recife, Pernambuco, North-East Brazil. However, it can also be considered relevant for all of Brazil, taking into account the restrictions of relevancy that apply to any study of this type.

Infection control in a clinical environment, including dentistry services, should be carried out regularly and carefully, given the biological risks presented by the contamination of equipment, instruments and materials used, and the possible occupational and cross infections when appropriate steps are not taken (Frazão and Bortolotti, 2006).

Garcia and Blank (2006) showed that the routine use of a long-sleeved lab coat and protective glasses reduces the frequency of accidental occupational contact with biological materials on the lower arms and eyes.

One of the principal causes of occupational exposure to biological material is needlestick injuries (McCarthy et al, 1999b). The percentage of injuries from sharp instruments suffered by the clinicians participating in our research (71.5%) is similar to that reported in other studies, such as 75% in the study by Martins and Barreto (2003) in the region of Montes Claros in Minas Gerais (South-East Brazil) and 70% in the study by Magro-Filho et al (1991) in Araçatuba and Birigui (São Paulo, South-East Brazil).

When the frequency of needlestick injuries reported in our survey is compared with the high proportion of clinicians surveyed who use PPE, it is impossible to state that the use of protective clothing has resulted in a considerable reduction in the number of accidents of this type. However, it is possible that the use of PPE significantly reduces the risk of infection when this type of accident does happen. We believe that the prevention of such an accident can only be achieved if clinicians avoid taking risks such as recapping needles with two hands or throwing away sharp instruments in inappropriate containers.

Our study found that the clinicians' decisions to take preventive measures against HBV and HCV infection were connected with socio-demographic factors (such as clinicians' gender and social class), professional factors (how recently they had graduated) and educational factors that involve training and how much they know about hepatitis. It is important that these factors are identified so that more efficient steps can be taken to inform the clinicians about preventive measures in a better way.

Female clinicians were more committed to the consistent use of PPE (see Table 3) and these results are in agreement with a study by McCarthy et al (1999a), who identified the female gender as a significant predictor of 'excellent compliance' with infection control practices (odds ratio = 2.7). In keeping with these data, male clinicians were identified as those who are more likely to suffer accidents or percutaneous injuries in exposure-prone procedures (McCarthy et al, 1999b).

The connection found between the social class and the use of PPE, specifically the lab coat, was not identified in other studies. Although it was found in our research, we could not find any other factor that could explain convincingly the low-level usage of the lab coat by clinicians in the social class B group.

With specific regard to hepatitis B, it can be seen that, despite the opportunity for free vaccination, not all Brazilian clinicians are immunised. Bonanni and Bonaccorsi (2001) argue for HBV immunisation for all health care workers, including those working in dentistry, whose work brings them into regular physical contact with patients and their bodily fluids. However, these workers may decide against vaccination for a number of reasons: unawareness of the hepatitis B death rate, negligence of the occupational risks of infection, lack of confidence in the safety and effectiveness of the vaccines available and the illusion of invulnerability on the part of workers who behave as if they are not susceptible to infection. In their study on hepatitis B vaccination acceptance by paramedics and emergency medical technicians, Lee et al (1997) found that the most frequently cited reason for not getting vaccinated was the fear of contracting the HBV from the vaccination (26%). Vaccination scheduling difficulties (23%) and the lack of time to get vaccinated (20%) were also cited.

Cassidy and Mahoney (1995) found that one of the challenges for getting young people vaccinated against hepatitis B is that this should be done before they reach an age when they are participating in activities that put them at risk for infection. This lends value to the argument that undergraduates should be vaccinated before they come in contact with the patients.

Technical papers give data that show the importance of training to clinicians, especially through continuing education, to reduce the risk of occupational exposure and the consequent risk of contamination at work (Epstein et al, 1995; Chen, 2000; Sofola and Savage, 2003; Garcia and Blank, 2006). Centers for Diseases Control (2003) confirms the importance of training when it says that people are more likely to adhere to infection control measures when they fully understand why these measures are necessary. This argument is supported by Epstein et al (1995), who report that a higher acceptance of infection control measures in Canada was achieved through continuing education.

The principles and the norms of biosecurity must be dealt with and strictly adhered to in undergraduate and postgraduate degrees, with an emphasis on infection control (Garcia and Blank, 2006).

In a study by McCarthy et al (1999a), continuing education was cited as the most important factor for 'excellent' compliance with recommended infection control practices. This was confirmed by the findings of our study that the clinicians with a greater knowledge about hepatitis were the ones with the highest level of HBV immunisation and who wear rubber gloves while washing their surgical equipment.

CONCLUSIONS

Given the threat represented by the potential exposure to bloodborne pathogens, it is important to assess how health care workers are dealing with this risk and to gather useful information to persuade them to adopt adequate behaviour towards infection control.

In the light of our results, the adherence to preventive practices against hepatitis B and C was shown to be connected with clinicians' socio-demographic, professional and educational variables, in such a way that female gender, shorter length of time since graduation and knowledge about hepatitis B and C were positively associated with the commitment to such practices.

It is necessary to widen the knowledge of clinicians regarding the transmission of diseases and how life-threatening the infectious diseases can be, and also to raise their awareness of the importance of adhering to infection control measures. This can be achieved through continuing education, and will contribute to a reduction of occupational and cross infections in clinical practice.

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REFERENCES

1. Assad S, Francis A. Over a decade of experience with a yeast recombinant hepatitis B vaccine. Vaccine 2000;18:57–67.

2. Bonanni P, Bonaccorsi G. Vaccination against hepatitis B in health care workers. Vaccine 2001;19:2389–2394.
3. Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Departamento de Vigilância Epidemiológica. Manual de aconselhamento em hepatites virais. Brasília: Ministério da Saúde, 2005.
4. Brevidelli MM, Cinciarullo TI. Aplicação do modelo de crenças em saúde na prevenção dos acidentes com agulha. Rev Saúde Pública 2001;35:193–201.
5. Cassidy WM, Mahoney FJ. A hepatitis B vaccination program targeting adolescents. J Adolesc Health 1995; 17:244–247.
6. Centers for Diseases Control (CDC). Guidelines for Infection Control in Dental Health Care Settings – 2003. MMWR 2003;52(RR17):1–61.
7. Cerri A, Oldani AC, Spagnuolo AC, Taban AC, Allegretti CV, Noronha MOP et al. Análise estatística do conhecimento do cirurgião-dentista frente à hepatite. Revista Paulista de Odontologia 1995;3:18–22.
8. Chen D-S. Public health measures to control hepatitis B virus infection in the developing countries of the Asia-Pacific region. J Gastroenterol and Hepatol 2000; 15(Suppl):E7–E10.
9. Chen CJ, Wang LY, Yu MW. Epidemiology of hepatitis B virus infection in the Asia-Pacific region. J Gastroenterol and Hepatol 2000;15(Suppl):E3–E6.
10. Epstein JB, Mathias RG, Bridger DV. Survey of knowledge of infectious disease and infection control practices of dental specialists. J Can Dent Assoc 1995;61:35–44.
11. Figueiredo RM. Opinião dos servidores de um hospital escola a respeito de acidentes com material perfurocortante na cidade de Campinas-SP. Revista Brasileira de Saúde Ocupacional 1992;20:26–33.
12. Frazão P, Bortolotti MGLB. Desigualdades nas condições de controle de infecção em consultórios odontológicos em município brasileiro. Cad Saúde Pública 2006;22:965–974.
13. Fundação Instituto Brasileiro de Geografia e Estatística. Censo Demográfico 2000. Available at: www.ibge.gov.br/. Accessed 25 August 2006.
14. Garcia LP, Blank VLG. Prevalência de exposições ocupacionais de cirurgiões-dentistas e auxiliares de consultório dentário a material biológico. Cad Saúde Pública 2006;22:97–108.
15. Hardie J. A 1992 update on hepatitis B vaccination. J Can Dent Assoc 1992;58:569–570.
16. Lauer G, Walker B. Hepatitis C virus infection. N Engl J Med 2001;345:41–52.
17. Lee DJ, Carrillo L, Fleming L. Epidemiology of hepatitis B vaccine acceptance among urban paramedics and emergency medical technicians. Am J Infect Control 1997;25:421–423.
18. Lodi G, Porter SR, Scully C. Hepatitis C virus infection: review and implications for the dentist. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 1998;86:8–22.
19. Magro-Filho O, Melo MS, Martin SC. Métodos de esterilização, desinfecção e paramentação utilizados pelo cirurgião-dentista e auxiliar no consultório odontológico. Levantamento entre profissionais. Rev Assoc Paul Cir Dent 1991;45:589–592.
20. Martins AMEBL, Barreto SM. Vacinação contra a hepatite B entre cirurgiões-dentistas. Rev Saúde Públic 2003;37: 333–338.
21. McCarthy MM, Koval JJ, MacDonald JK. Compliance with recommended infection control procedures among Canadian dentists: results of a national survey. Am J Infect Control 1999a;27:377–384.
22. McCarthy MM, Koval JJ, MacDonald JK. Occupational injuries and exposures among canadian dentists: the results of a national survey. Infect Control Hosp Epidemiol 1999b;20:331–336.
23. Pagliari AV, Melo NSFO. Prevalência da vacinação contra a hepatite B entre estudantes de Odontologia da Universidade Federal do Paraná. Rev FOB 1997;5:79–86.
24. Santos CN, Haddad J Jr, Santos WAG. Análise da incidência de hepatite entre cirurgiões-dentistas, acadêmicos de Odontologia e seus familiares. ROBRAC 1995; 5:18–22.
25. Sofola OO, Savage KO. Assessment of the compliance of Nigerian dentists with infection control: a preliminary study. Infect Control Hosp Epidemiol 2003;24:737–740.