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Article

Screening For Viral Hepatitis and Other Infectious Diseases in a High-Risk Health Care Group in Mexico

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Abstract

Background. Health care workers (HCWs), specifically dentists, are at the front line for acquiring blood-borne virus infections. The highest proportion of occupational transmission is through percutaneous injuries via hollow-bore needles. Several studies around the world have reported that hepatitis viruses and human immunodeficiency virus are the main pathogens for most cases of occupationally acquired blood-borne infection. We aim to investigate the prevalence of hepatitis B virus (HBV), hepatitis C virus (HCV), hepatitis E virus (HEV), and human immunodeficiency virus (HIV) among Mexican dentists. **Methods**. We included 159 dentists who attended the annual meeting at the Medica Sur Clinic & Foundation held in Mexico City in May 2016. A survey was applied in order to obtain data of occupational exposure to blood-borne viruses (BBV). Serum samples were screened serologically using enzyme-linked immunosorbent assays. **Results.** Two dentists (1.2%) were positive for antibodies against HCV antigen, one (0.6%) was positive for antibodies against HBV antigen and three (1.8%) were positive for the detection of IgG antibodies against HEV. Two cases (1.2%) were positive for antibodies against HIV. **Conclusions**. The infection by HEV was the most prevalent among dentists. However, the prevalence of BBV in dentists was similar to that in the general population.

Keywords: Hepatitis C viruses; Hepatitis E virus; Dentists

1. Introduction

New data from the World Health Organization (WHO) have revealed that 325 million people worldwide are living with chronic infection by hepatitis B virus (HBV) or hepatitis C virus (HCV). In 2015, 1.34 million deaths were caused by these viruses (1, 2). In response to this high number of deaths, the WHO has implemented several measures to eradicate HCV infection by 2030. The seroprevalence of HBV infection is about 8% in endemic areas but is 2% or less in low-prevalence areas such as North America (3). The prevalence of HCV infection varies around the world, ranging from 1% in Europe,

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1.7% in the USA and 5.3% in Africa (4). The seroprevalence of hepatitis E (HEV) infection is estimated at 6% in the USA and ranges from 1.3% to 52% in Europe (5, 6).

In Mexico, the prevalence rates are >1.2% for HCV (7), 0.3-1.4% for HBV, and 6.3% for HEV (8). However, the acquisition route of hepatitis virus infection cannot be identified in 30-40% of cases (9). In 2010, González-Huezo et al. studied 374 health care workers (HCWs) in Mexico to assess the prevalence of markers for HBV and HCV (10). They found that five HCWs were positive for anti-HCV antibodies (1.3%) and two for surface antigen of HBV (0.5%). A study by the National Institute of Medical Sciences and Nutrition Salvador Zubirán from 1987 to 1993 investigated the incidence of occupational injuries and reported 250 injuries in 240 workers (11). Interestingly, housekeeping and maintenance staff were the most affected groups (32%), followed by nurses (27%) and senior medical students (20%). Eighty percent of the occupational injuries occurred through contact with a sharp instrument (sharps injury).

Before 1989, HCV infection was observed frequently in blood transfusion recipients, but intravenous drug users are now most at risk of infection by HCV followed by incarcerated and homeless people. Other groups at risk are people with a history of cocaine or marijuana use and people with high-risk sexual behavior (12). Dentists seem to also have a high prevalence of viral hepatitis transmission possibly because of a lack of adherence to infection prevention and control measures (13-14). Islam et al. assessed the knowledge about preventive practices related to HBV, HCV, and liver disease of 892 Mexican HCWs (15). They found that all participants had deficient understanding of liver disease and preventive practices: 57% had inadequate knowledge of liver diseases and 76% and 79% had inadequate knowledge of HBV and HCV infection. These findings suggest that HCWs should be better educated about BBV infection to reduce their risk of acquiring HBV, HCV, or HIV.

In Mexico, our group has published studies to assess the prevalence of viral hepatitis infection in several populations. In one study, we analyzed 300 asymptomatic people at outpatient center to determine HCV prevalence and found a rate of 2% (16). The most common risk factors were receiving manicures or pedicures with non-personal instruments or having more than three sexual partners. We suggested that this HCV prevalence in asymptomatic people may indicate that the number of HCV-positive persons is probably higher. In another study, we assessed 376 nurses at Medica Sur Hospital and found that 1.6% were positive for antibodies against hepatitis B core antigen (17). In that study, we also found that the main risk factors for disease transmission were having more than four sexual partners and having a tattoo. However, the seroprevalence for HCV was lower than in the general population. By contrast, in blood donors treated in a tertiary referral hospital, we found prevalence rates of 0.11% for HBV and 0.47% for HCV (18). The main risk factors for viral hepatitis infection were undergoing dental procedures (11.6% for HCV and 20%, for HBV) and having unsafe sexual practices (20%). To extend our estimations in other HCWs, we aim to investigate viral hepatitis exposure and transmission among Mexican dentists.

2. Materials and Methods

We conducted a cross-sectional study to identify anti-HBV, anti-HCV, and anti-HIV antibodies using an enzyme-linked immunosorbent assay (ELISA) (Bio-Rad, Marnes-la-Coquette, France). We also used an ELISA with recombinant target antigens of HEV genotypes 1 and 3 (Euroimmun Medizinische Labordiagnostika AG, Lübeck, Germany) for the detection of IgG and IgM antibodies against HEV. According to the manufacturer's recommendations, we defined positive values as those >2.2 IU/mL.

The study involved an anonymous survey of 159 dental professionals from Metropolitan areas who attended an annual meeting at the Medica Sur Clinic & Foundation held in Mexico City in May 2016. The survey's purpose was to collect information about their dental practices and demographic variables. The sample was divided into groups according to the length of professional experience:

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Group 1, <10 years, Group 2, 10-20 years, and Group 3 >20 years of practice. All participants provided written informed consent, and the protocol was approved by the Ethics & Investigation Committee of our institution.

A blood sample was obtained from all participants to evaluate their virus exposure.

Statistical analyses

The variables were analyzed using the Chi-Squared Test, and differences were considered significant at $p<0.05$. All statistical analyses were performed using the Stata statistical package (version 12, StataCorp., College Station, TX).

3. Results

Of the 159 oral health specialists, 48 (30.2%) dentists had practiced for <10 years (Group 1), 41 (25.8%) for 10-20 years (Group 2), and 70 (44%) for >20 years (Group 3). The ratio of females to males was 4:1. HEV was the most prevalent of the viruses identified, especially in the Group 3. The prevalence rates for viral exposure were 0.6% for HBV, 1.2% for HCV and 1.8% for HEV (table I).

A substantial percentage (19%) of participants who had not been vaccinated against HBV had worked >20 years. Group 3 had a higher percentage of dentists who reported accidental exposure to body fluids in the preceding 2 years of practice compared with Group 2 (57% and 28%, respectively; $p=0.03$). Group 3 also had the highest percentage of sharps injury (50%) in the past 2 years. Surprisingly, 46 (43%) dentists in Group 3 did not know whether they had attended patients who were positive to HBV or HCV. Many in this group (43%) reported that they had never requested testing for exposure to HBV or HCV among their patients. Groups 1 and 2 had higher prevalence rates for antibodies to HIV, HBV and HCV whereas Group 3 had the highest prevalence for antibodies to HEV.

We analyzed the use of personal protection devices and methods for disinfection and sterilization of instruments in the three groups. Group 2 reported occasional use of a facial mask (65.8%) when treating patients. Group 3 had the highest percentage of dentists (63/70) who frequently used gloves when treating patients. The autoclave method was used to sterilize surgical instruments more often in Group 1 (83.3%) than in Group 3 (60.0%). The glutaraldehyde method was used more often to disinfect surfaces in Group 1 (93.7%) than in Group 2 (46.3%).

Table 1. CLINICAL CHARACTERISTICS AND PROFESSIONAL EXPERIENCE

	Group and number of years in professional practice (n/%)		
Variable	Group 1 <10 years (48/30.2)	Group 2 10-20 years (41/25.8)	Group 3 >20 years (70/44.0)
Male (N=30) n (%)	10 (33)	6 (20)	14 (47)
Female (N=129) n (%)	32 (25)	43 (33)	41 (32)
Vaccination			
No HBV vaccine (N=24) n (%)	5 (10)	6 (15)	13 (19)
Accidental exposure			
Any exposure (N=42) n (%)	16 (38)	6 (14)	20 (48)
Past year (N=77) n (%)	26 (34)	24 (31)	27 (35)

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In the past 2 years (N=40) n (%)	6 (15)	11 (28)	23 (57)
Sharps injury			
Any exposure (N=47) n (%)	17 (36)	7 (15)	23 (49)
Past year (N=50) n (%)	20 (40)	14 (28)	16 (32)
In the past 2 years (N=62) n (%)	11 (18)	20 (32)	31 (50)
Caring for patients with HCV or HBV infection			
Unknown (N=107) n (%)	38 (36)	23 (21)	46 (43)
Past year (N=26) n (%)	7 (27)	4 (15)	15 (58)
In the past 2 years (N=26) n (%)	3 (11)	14 (54)	9 (35)
Past request for HCV or HBV testing			
Never (N=112) n (%)	34 (30)	30 (27)	48 (43)
Sometimes (N=43) n (%)	11 (26)	11 (26)	21 (48)
Often (N=4) n (%)	3 (75)	0	1 (25)
Evidence of HIV infection			
Anti-HIV (N=2) n (%)	1 (2)	1 (2)	
Evidence of hepatitis virus infection			
Anti-HCV (N=2) n (%)		1 (2)	1 (1)
Anti-HBV (N=1) n (%)	1 (2)		
Anti-HEV (N=3) n (%)		1 (2)	2 (3)

4. Discussion

This study is the first to assess the prevalence and risk factors for viral hepatitis and other infectious diseases in dental practitioners in Mexico.

Transmission of HBV and HCV occurs frequently through contact with blood from a carrier of the infection, who may be asymptomatic. Other forms of transmission include unprotected sexual contact, injecting drug use with shared equipment, and vertical transmission (19-20). Current evidence has shown a definite risk of hepatitis virus transmission and cross-contamination in the dental care environment. A meta-analysis of 14 high or moderate quality studies compared the prevalence of HCV infection between HCWs and the general population and reported an odds ratio (OR) of 1.58 in HCWs (21). This study also compared the risk between several types of health professionals, such as medical staff, laboratory staff, and dental care staff, and reported an OR of 3.5 in the dental care group compared with 2.2 in medical and laboratory staff.

Some practices, such as sharps injury, have been identified as the most common route of exposure to BBV infection in health professionals and accounts for 3% of BBV infection (22). The risk of transmission may be related to the number of years in dental practice. However, only 10-30% of cases involving this type of injury are reported to authorities (23-27).

In our study, 20.9-43.9% of the surveyed dentists attended patients with HCV or HBV, but a significantly lower percentage of dentists had requested hepatitis testing of their patients. It was surprising that HEV infection was the most common class of hepatitis in this study population and that 3% of dentists who had practiced for >20 years were positive for HEV. It is well known that the epidemiology and clinical features of HEV differ between developed and underdeveloped countries (28). HCWs may be at a higher risk of exposure to HEV infection if they do not follow appropriate precautions to prevent foodborne or waterborne transmission (29).

HEV infection is at present an underdiagnosed illness because of the use of serological assays with low sensitivity. Unfortunately, molecular assays are not currently standardized and display considerable variation in performance between laboratories (30).

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On the other hand, pregnant women represent another important group with antibodies against HEV. Alvarado-Esquivel et al. reported a 5.7% seroprevalence of HEV in Mexican pregnant women living in a rural zone (31). The main route of HEV transmission was fecal-oral and risk factors for HEV infection included consumption of unpasteurized cow's milk, the number of pregnancies, low socio-economic status and overcrowding in housing. People who handle milk, especially with bare or unwashed hands, may be at increased risk of HEV infection. However, the reason for the association between HEV infection and the number of pregnancies is uncertain but may relate to the number of exposures to contaminated materials at childbirth or cesarean section.

Baptista-González et al. investigated whether high-risk pregnant women living in an urban area of Mexico City have a higher prevalence of HEV compared with asymptomatic people with reactivity to HCV or HBV, and healthy blood donors (32). Using an ELISA to measure the levels of antibodies to HEV genotypes 1 and 3, they found prevalence rates of 0.79% for anti-HEV IgG antibodies in high-risk pregnant women, 2.1% in asymptomatic people with reactivity to HCV or HBV, 7.4% in patients with clinical symptoms suggestive of HEV infection, and 0% in healthy blood donors. However, these rates were lower than expected, which may suggest that the prevalence of HEV is also associated with living in an urban environment.

Some studies have examined HEV prevalence in candidates for kidney and heart transplantation. A higher seroprevalence of HEV has been reported in heart transplant candidates through the identification of anti-HEV IgG antibodies, probably because of the frequent exposure of patients with advanced cardiac disease to blood products (33).

There is a need to decrease exposure to BBV infections, and vaccination is the main way to achieve this. Surprisingly, the percentage of the population that is not vaccinated against HBV may be increasing, but this may also reflect the lack of collected data (34). According to the WHO, each year 5.9% of HCWs are exposed to HBV, which corresponds to about 66,000 HBV infections worldwide among HCWs (35). In intermediate and highly endemic countries, as in some parts of Europe and Africa, about 70% of HCWs have been reported to have experienced a sharps injury with an average of two needle pricks per year (36-37).

A vaccine against HBV has been available since 1982 (38). Despite this availability, 19% of the dentists in our sample with >20 years of practice had not received the vaccine. In a study of Brazilian dentists, 73.8% of dentists reported having the three doses of HBV vaccine (39). A Nigerian study reported that only 20% of dental surgeons had received three doses of HBV vaccine (40). A Mexican study by Méndez-Sánchez et al. reported that 10% of nursing staff had received HBV vaccination (18).

It has been reported that 5-10% of normal people do not produce anti-HBV surface antibody after receiving a standard course of HBV vaccine (41-42). However, the main issue in Mexico is the failure to complete the vaccination schedule. Cárdenas-Perea et al. studied medical students and found that 17.5% had been vaccinated with only a single dose and 14.9% had an unknown vaccination status (43). Some of the participants in our study appeared unaware of the importance of receiving vaccines, for example, 19% of the dentists with >20 years of experience had not received the HBV vaccine.

The current direct-acting antiviral combinations have improved the treatment of chronic HCV infection, and the cure rate is 95-98% after 8-12 weeks of treatment. Direct-acting antivirals have a favorable safety profile and a satisfactory tolerability for most patients. However, the strategic plan to eradicate HCV infection must include increasing screening, principally of groups at risk, adequate follow-up with referral to a health care provider, and improved access to care and treatment (44).

Two limitations of our study are the possible bias because of some unreliable answers by subjects and misclassification because of recall bias. However, we measured the prevalence of antibodies to HBV, HCV, HEV, and HIV, and we assessed clinical activities that are probable transmission routes. Our results provide important information about public health screening in high-risk groups such as dentists. Vigilance programs to improve protection against BBV transmission are needed for HCWs.

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5. Conclusions

We found a similar prevalence of HBV and HCV infection compared with the general population in Mexico. HEV was the most prevalent of the hepatitis viruses among the professional dentists included in this study. Surprisingly, 10-19% of dentists in our study had not received the HBV vaccine. The high rates of BBV transmission in HCWs may be related to non-adherence of infection prevention and control recommendations. As noted by the WHO, eradication of HCV requires more studies to identify high-risk groups early and to develop effective preventive measures to reduce the risk of hepatitis virus infection.

Availability of data and material: The datasets used and/or analyzed for the current study are available from the corresponding author on reasonable request

Author Contributions:

N M-S, principal investigator, designed the study, reviewed the literature and wrote the manuscript.

HBG, ERA, FRM, RTG clinical investigator, reviewed the literature and collected the data.

OLRP,VCR, PCL, GPR, CECC, JCC reviewed the literature and collected the data.

NEAO designed the study and analyzed data.

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Conflicts of Interest: The authors declare that they have no competing interests.

Ethics approval and consent to participate

All participants provided written informed consent, and the protocol was approved by the Ethics & Investigation Committee of our institution. The study was conducted in accordance with the provisions of the Declaration of Helsinki (2013), General Health Law in Mexico and ICH Good Clinical Practice procedures (2005).

Consent for publication

Not applicable.

Abbreviations:

BBV - Blood-Borne Viruses

ELISA - Enzyme-Linked Immunosorbent Assay

HAV – Hepatitis A Virus

HBV – Hepatitis B Virus

HCWs - Health Care Workers

HCV – Hepatitis C Virus

HEV – Hepatitis E virus

HIV – Human Immunodeficiency Virus

OR - Odds Ratio

WHO – World Health Organization

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