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Assessing the Seroprevalence of and Knowledge, Attitudes and Practices Related to Hepatitis B and Hepatitis C Among Dental Health Professionals in the Country of Georgia, 2023

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Abstract

Dental health professionals (DHPs) are at risk for bloodborne viruses. We evaluated hepatitis B and hepatitis C seroprevalence and knowledge, attitudes and practices regarding viral hepatitis in Georgia. We randomly selected 214 dental facilities. DHPs underwent face-to-face interviews and provided blood samples. High knowledge and practice were defined as correctly responding to 70% or more of the questions. Samples were tested for antibodies against hepatitis C virus (anti-HCV) and, if reactive, for HCV RNA; total hepatitis B core antibodies (anti-HBc) and, if reactive, for hepatitis B surface antigen (HBsAg). Specimens reactive for HBsAg were tested for antibody to hepatitis D virus (anti-HDV). Among 519 participants, 6.6% and 7.9% correctly identified all HBV and HCV transmission modes, respectively. Approximately half had high knowledge scores for hepatitis B and hepatitis C. Nurses had lower odds than dentists to have high scores. While 56% agreed that the hepatitis B vaccine is essential for healthcare workers, only 23.9% reported being vaccinated. Overall, 89.4% had high practice scores; 41.6% experienced a blood splash on their face, 43.7% a needle-stick injury and 20.6% an injury with a contaminated instrument. Practice scores were lower among those who had not been screened or vaccinated for hepatitis B. Among 517 blood samples tested, 0.8% were anti-HCV reactive, but none had detectable HCV RNA; 12.2% were anti-HBc reactive and 0.6% were HBsAg reactive. None tested

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Author Contributions

I.T.S., M.T., T.M., M.A., and N.C. contributed to the study conception and design. I.T.S., M.T., M.A., L.K., T.M., A.K., K.G., and Z.A. contributed to the study implementation and data collection. L.K., S.S., S.S., I.T.S. and R.A.T. contributed to data analysis and interpretation. L.K., S.S., S.S., I.T.S. and R.A.T. drafted the manuscript. All authors reviewed and provided critical feedback and approved the final version of the manuscript.

Conflicts of Interest

F.A. and G.C. receive salary and have stock in Abbott Diagnostics.

reactive for anti-HDV. Enhanced training and policy reforms are critical to improve hepatitis knowledge, vaccination uptake and infection control practices among DHPs in Georgia.

Keywords

dental health professionals; Georgia; hepatitis B; hepatitis C; KAP; knowledge and attitudes

1 | Introduction

Viral hepatitis remains a significant global health challenge, with over 300 million persons estimated to be living with hepatitis B or hepatitis C in 2022. According to the World Health Organization's 2024 Global Hepatitis Report, mortality due to viral hepatitis increased from 1.1 million in 2019 to 1.3 million in 2022 [1]. Hepatitis B accounted for 83% of these fatalities.

Despite notable advancements in care and treatment, only 13% of estimated individuals with chronic hepatitis B and 36% of those with hepatitis C have been diagnosed [2].

In 2015, Georgia launched a hepatitis C elimination program to diagnose and treat people with hepatitis C virus (HCV) infection. In 2024, almost 89% of the Georgian adult population had been screened for hepatitis C and 86% of those diagnosed were treated [3]. In 2021, a serosurvey in Georgia revealed that 6.8% (95% Confidence Interval (CI), 5.9–7.7) of adults had antibodies against HCV (anti-HCV), 1.8% (95% CI, 1.3–2.4) had detectable HCV RNA, 21.7% (95% CI, 20.4–23.2) were reactive for total hepatitis B core antibodies (total anti-HBc) and 2.7% (95% CI, 2.3–3.4) were hepatitis B surface antigen (HBsAg) reactive [4, 5]. Those results indicated significant progress in the elimination of hepatitis C in Georgia with a 67% decline in prevalence of chronic HCV infection compared to 2015 [4]. However, the prevalence of hepatitis B virus (HBV) infection remained unchanged compared to 2015 [5]. In 2024, Georgia launched the hepatitis B elimination program to decrease the burden of disease.

Safe injections and medical practices are important prevention measures for the elimination of viral hepatitis [6]. In addition, medical professionals are at risk of contracting bloodborne infections including HBV and HCV [7]. Dental settings can contribute to HBV and HCV transmission if infection prevention and control (IPC) measures are inadequate. Hepatitis B and hepatitis C outbreaks can occur in dental settings due to improper sterilisation and unsafe injection practices [8, 9]. Limited data exists on the contribution of dental settings in the transmission of viral hepatitis in Georgia. A case control study in Georgia showed that exposure to invasive medical procedures, including dental surgery, increased the risk of infection with HBV and HCV, and a national cross-sectional survey showed that previous exposure to HBV was associated with invasive medical procedures [5, 10]. A 2014 cross-sectional study evaluating the knowledge, attitudes and practices (KAP) of almost 200 dental health professionals (DHPs) in three cities in Georgia regarding blood-borne diseases found significant gaps in knowledge regarding hepatitis B and hepatitis C [7]. However, no study has previously estimated the prevalence of hepatitis B and hepatitis C among DHPs in Georgia.

We conducted a serosurvey and KAP survey among DHPs in Georgia to estimate the prevalence of hepatitis B and hepatitis C and evaluate their knowledge, attitudes and practices related to hepatitis B and hepatitis C, and assess IPC implementation. Findings aim to inform evidence-based policy changes and comprehensive interventions targeted at reducing healthcare-related transmission of viral hepatitis and other bloodborne infections.

2 | Methods

2.1 | Participant Selection

A cross-sectional serosurvey among dental health professionals (dentists, nurses, residents and dental assistants) was conducted during May 2023 using a stratified multi-stage cluster design in five major cities of Georgia representing 42.5% of the 3.7 million Georgian population: Tbilisi (32.5%), Kutaisi (3.5%), Batumi (5.0%), Zugdidi (1.0%) and Telavi (0.5%). Based on an estimated 6.8% prevalence of anti-HCV among adults in the general population in 2021 [4], with a 2% margin of error, a population size of approximately 2000 DHPs in the five cities, and a 10% nonresponse rate, the calculated sample size was 519 participants.

Of 360 dental facilities operating in the five cities, 214 were randomly chosen using probability proportional to size sampling (PPS). Similarly, the number of participants to select per facility was determined by PPS. Participants in each facility were then selected using the Kish table method to ensure randomisation and reduce selection bias for a diverse group of certified DHPs [11].

2.2 | Data Collection

A trained interviewer administered a questionnaire, through REDCap software, to participants compiling information on demographic characteristics and assessing knowledge, attitudes and practices related to hepatitis B and hepatitis C among DHPs. Knowledge regarding viral hepatitis was assessed across three categories: (1) general knowledge, (2) knowledge of modes of transmission and (3) knowledge of treatment and prevention.

Attitudes and perceptions were evaluated using questions that assessed dental health professionals' concerns about contracting HBV and HCV infection from patients, their willingness to provide dental services to patients with these diseases, the perceived safety of the hepatitis B vaccine and perception of stigma associated with HBV and HCV infection in Georgia. Answers related to attitudes toward HBV and HCV infection were categorised as agree, neutral, disagree and don't know.

The survey included 17 questions related to hepatitis B and hepatitis C practice and exposure among DHPs. These questions explored areas such as previous screening for HBV and HCV infection, hepatitis B vaccination, implementation of infection prevention and control measures in dental facilities including the use of protective gear and sterilisation of instruments, and practices related to the handling of used syringes and needles among dental health professionals.

After completing the questionnaire, blood samples were collected from study participants to test for hepatitis B and hepatitis C markers.

2.3 | Laboratory Testing

Serum samples collected from participants were tested for anti-HCV using the anti-HCV chemiluminescent microparticle immunoassay on a fully automated ARCHITECT i2000SR analyser (Abbott Diagnostics), and total anti-HBc using the chemiluminescence microparticle immunoassays ARCHITECT Anti-HBc II (Abbott Diagnostics, Wiesbaden and Germany). Anti-HCV reactive samples were tested for HCV RNA using the Xpert HCV Viral Load Assay (Cepheid AB). Total anti-HBc reactive samples were tested for hepatitis B surface antigen (HBsAg) by the ARCHITECT HBs Ag Qualitative A II (Abbott Diagnostics, Sligo and Ireland). Additionally, HBsAg reactive samples were tested for the presence of immunoglobulin G class antibody to hepatitis D virus (anti-HDV).

2.4 | Notification of Results

Negative test results were sent to participants via text message. Persons with any positive test result for HBV or HCV were contacted via phone by staff from the National Centre for Disease Control and Public Health (NCDC) and post-test counselling was provided, including referral to a local healthcare provider for further assessment and treatment initiation.

2.5 | Data Analysis

Descriptive statistics were calculated to summarise participants' characteristics and prevalence of infection. Categorical variables are presented as frequencies and percentages, while continuous variables are presented as means, medians, standard deviations (SD) and interquartile ranges (IQR).

Knowledge and practice scores were evaluated using a point system, with one point awarded for each correct answer. For knowledge, the total possible score for HBV and HCV was 24 for each. The maximum score for practice was 19, assessed using a similar point system. High knowledge score was defined as having at least 17 ($\geq 70\%$) correct responses out of 24. High practice score was defined as having at least 14 ($\geq 73\%$) correct responses out of 19.

Linear regression models were used to identify associations between the knowledge and practice scores and demographic and professional characteristics from adjusted means differences with 95% confidence intervals (95% CI). Variables with $p < 0.2$ in the bivariate linear regression were included in the multivariable model. Multivariable logistic regression analysis assessed factors associated with high knowledge score (≥ 17 out of 24 points) for hepatitis B and hepatitis C and included all variables with $p < 0.2$ in bivariate logistic regression. Variables were assessed for multicollinearity prior to inclusion in the regression models. All linear and logistic regression models included age, sex, profession, place of work, work experience and salary; the linear regression model for practice scores also included hepatitis B vaccination status. Significance was set at $p < 0.05$. Data were analysed using STATA 18 and SAS version 9.4.

2.6 | Ethics

The study was approved by the Institutional Review Board of the National Centre for Disease Control and Public Health, Georgia (registration number for IRB # 2023–024). The U.S. CDC determined the study to be human subjects research in which CDC staff were not engaged.

3 | Results

3.1 | Demographic Characteristics and Prevalence of Hepatitis B and Hepatitis C Among Survey Participants

Of 519 DHPs who participated, 436 (84.0%) were female, and 329 (63.4%) were aged 30–49 years. The region of dental practice followed the regional population distribution, with 81.3% practicing in the capital, Tbilisi. The majority were dentists (76.1%), followed by nurses (15.4%). The majority (65.6%) had 10 or more years of dental work experience, and 45.7% reported a monthly salary of 500–1000 Georgian Lari (GEL; approximately 190–381 U.S. dollars [USD]) (Table 1).

Serum samples were collected for 518 participants with one participant declining and one sample drawn as excluded due to hemolysis. Among the 517 tested, 4 (0.8%) were reactive for anti-HCV; none were HCV RNA positive. Additionally, 63 (12.2%) were total anti-HBc reactive, and 3 (0.6%) were HBsAg reactive; none were anti-HDV positive. One sample was reactive for anti-HCV and anti-HBc and not reactive for HBsAg.

3.2 | Knowledge and Attitudes Related to Hepatitis B and Hepatitis C

Almost 95% of DHPs reported that healthcare workers and dentists are at a high risk of exposure to HBV and HCV. Approximately a third were able to identify all listed groups at risk for HBV (36.4%) and HCV (35.3%) infection (Table 2).

The majority correctly identified blood as a potential source of HBV (95.2%) and HCV (97.1%) infection, while sharing needles or syringes was identified as a potential source by 75.0% for HBV and 78.4% for HCV. Sexual contact was identified as a source of transmission by 58.0% and 54.9% of respondents for HBV and HCV, respectively. Fewer respondents identified sharing household objects like razors or toothbrushes (38.0% for HBV and 41.2% for HCV), and mother-to-child transmission (21.4% for HBV and 24.1% for HCV). Some participants had misconceptions on modes of transmission of HBV and HCV, with nearly one in five reporting that HBV (19.7%) and HCV (16.0%) are transmitted by respiratory droplets. Overall, 6.6% and 7.9% of participants correctly identified all modes of transmission of HBV and HCV, respectively. While 79.6% correctly reported that HCV infection can be cured, only 26.8% knew that HBV cannot be cured. The majority (77.8%) stated that hepatitis B is preventable by vaccination, while 42.8% knew that there was no vaccine for hepatitis C (Table 2).

Overall, participants had a median knowledge score of 16 (IQR 14–19) out of a maximum 24 points for HBV and 17 (IQR 14–19) of 24 correct answers for HCV. Overall, 49.1% and 51.1% of participants had a high knowledge score for HBV and HCV, respectively.

Overall, 70% of DHPs reported that persons with hepatitis B or hepatitis C in Georgia face stigma due to their infection. More than half of participants stated that it is essential for them to receive the hepatitis B vaccine as healthcare providers (56.3%) and 55% reported that the hepatitis B vaccine was safe. The majority of respondents indicated they would conduct dental procedures on patients with HBV (93.3%) and HCV (92.3%), while 45.5% and 46.1% were concerned about getting HBV or HCV from their patients, respectively (Figure 1).

3.3 | Self-Reported Behaviours and Practices Related to Infection Prevention and Control and Occupational Exposures

Of 519 dental health professionals, 41.6% reported ever experiencing a blood splash on the face, 43.7% reported a previous needle-stick injury and 20.6% reported being previously injured with a contaminated instrument (Table 3). The majority reported being screened for HBV (83.4%) and HCV (90.8%), while 23.9% reported having been vaccinated against hepatitis B. Most (60.3%) DHPs routinely ask patients about their HBV and HCV status, and 18% reported changing their behaviour with patients having hepatitis B or hepatitis C.

The majority (97.7%) always wear gloves during patient care, and among them 99.4% properly dispose of the gloves afterward. Overall, 64.9% and 83.4% reported always using protective eyewear and clothing, respectively; 88.2% used new protective covers for each patient and 96.5% said they do not reuse single-use instruments. Additionally, 95.6% reported always washing their hands before and 95.0% after examining patients. Only 59.5% of respondents reported cleaning all required areas with disinfecting solutions, and 76.1% directly disposed of used needles and syringes in sharp containers, while 10.4% reported leaving the used syringes uncapped on surfaces for maintenance staff (Table 3).

Of the 519 interviewed DHPs, the median total correct practice score was 17 [IQR 15–18] out of 19 possible correct answers. The majority had a high practice score (89.4%), answering ≥ 14 questions correctly.

3.4 | Factors Associated With Knowledge and Practice Scores for Hepatitis B and Hepatitis C

The analysis of both knowledge and practice scores among DHPs in Georgia's five cities through multivariable linear regression highlights several key findings (Table 4).

Participants' age and sex were not associated with knowledge or practice scores. However, compared to dentists, nurses had lower mean knowledge scores for hepatitis B (adjusted means difference [$a\beta$]: -1.2 [95% CI: $-2.0, -0.3$]), and hepatitis C ($a\beta$: -1.2 [95% CI: $-2.1, -0.4$]) and lower practice scores ($a\beta$: -1.9 [95% CI: $-2.5, -1.2$]). Compared to dental health professionals in Tbilisi, knowledge scores were higher among those in Batumi for hepatitis B ($a\beta$: 1.4 [95% CI: $0.5, 2.3$]) and hepatitis C ($a\beta$: 1.5 [95% CI: $0.6, 2.3$]), but lower in the city of Zugdidi for both hepatitis B ($a\beta$: -2.4 [95% CI: $-3.8, -0.9$]) and hepatitis C ($a\beta$: -2.7 [95% CI: $-4.2, -1.3$]). Participants in Kutaisi also had a lower hepatitis C mean knowledge score than those in Tbilisi ($a\beta$: -1.7 [95% CI: $-3.1, -0.3$]). For practice scores, compared to Tbilisi only those in Telavi had a significantly lower mean score ($a\beta$: -2.5 [95% CI: $-4.4, -0.7$]). Having a higher salary (> 2000 GEL [> 763 USD]) per month was

also associated with a higher mean knowledge score for hepatitis B ($\alpha\beta$: 1.7 [95% CI: 0.4, 3.0]) and hepatitis C ($\alpha\beta$: 1.6 [95% CI: 0.4, 2.9]), and higher practice score ($\alpha\beta$: 1.0 [95% CI: 0.1, 2.0]) compared to those making < 500 GEL (< 190 USD) per month. Practice scores were lower among dental health professionals who had not been screened for hepatitis B ($\alpha\beta$: -1.3 [95% CI: -2.1, -0.5]) or had not been vaccinated against hepatitis B ($\alpha\beta$: -1.3 [95% CI: -1.8, -0.9]) compared to those who had been screened or vaccinated.

In the multivariable logistic regression, DHPs in Batumi were twice as likely to have a high knowledge score for hepatitis B (aOR 2.12 [95% CI: 1.08, 4.15]) compared to those in Tbilisi, while those in Zugdidi were significantly less likely to have high knowledge score for both hepatitis B (aOR 0.08 [95% CI: 0.01, 0.63]) and hepatitis C (aOR 0.07 [95% CI: 0.01, 0.55]) (Table 5). Participants in Kutaisi were also less likely to have a high knowledge score for hepatitis C (aOR 0.05 [95% CI: 0.01, 0.35]) compared to those in Tbilisi. Nurses were half as likely as dentists to have a high knowledge score for hepatitis B (aOR 0.53 [95% CI: 0.29, 0.99]) and hepatitis C (aOR 0.53 [95% CI: 0.29, 0.97]). Finally, participants earning > 2000 GEL per month (> 763 USD) had more than 3 times the odds of having a high knowledge score for both hepatitis B (aOR 3.21 [95% CI: 1.25, 8.23]) and hepatitis C (aOR 3.25 [95% CI: 1.28, 8.27]) compared to those earning < 500 GEL (< 190 USD) per month.

Assessment of collinearity between age and work experience indicated it was not a major concern, with a condition index of 15.4 and a variance inflation factor of 4.1. Both variables were retained to capture potentially distinct effects of chronological age and years of practice on knowledge and practice outcomes.

4 | Discussion

This study is the first to estimate the prevalence, knowledge, attitudes and practices related to hepatitis B and hepatitis C among dental health professionals in Georgia. Our study showed that none of the tested dental health professionals had chronic HCV infection, which is lower than that reported in the general population (1.8%) [4]. The prevalence of chronic hepatitis B was much lower among dental health professionals (0.8%) compared to the general population (2.7%) in Georgia [5]. Compared to a survey among dental health workers in Georgia in 2013, respondents to our survey in 2023 had a lower frequency of needle stick injuries and occupational exposure to blood [7]. These findings suggest a possible downward trend of transmission of HBV and HCV infections between dental health professionals and patients in Georgia and potential improvement in infection prevention and control among dental professionals.

Almost half of study participants had a high knowledge score for HBV and HCV. These results are comparable to survey results among primary healthcare physicians in Georgia, where 62.8% had a medium to high knowledge [12]. However, gaps in knowledge among DHPs remain. Less than 60% and 21% of respondents identified sexual contact and mother-to-child transmission, respectively, as modes of transmission of hepatitis B, which might impact adoption of behavioural or prevention practices to avoid infection. Overall, less than 10% of dental professionals could identify all modes of transmission of hepatitis B or

hepatitis C, and misconceptions about transmission were common. For example, 20% and 16% of respondents mistakenly believed HBV and HCV, respectively, could be transmitted via droplets, which is much higher than the 3% of primary healthcare physicians in Georgia who had those misconceptions [12]. Similar misconceptions were reported in a 2021 study in Iran, where 12.3% of dentists thought HBV and HCV infections could spread through air or water, and 77.4% misunderstood risks related to social behaviours like sharing utensils [13]. In addition, a study evaluating the knowledge, attitude and practice regarding HBV and HCV among medical, dental, nursing and physiotherapy students in India found that while most interns were aware of HBV and HCV infections, their understanding of transmission modes and vaccination was unsatisfactory [14]. Hence, trainings on modes of transmission and prevention of viral hepatitis need to be integrated in training curriculum of dental health workers in Georgia.

Nurses had lower HBV and HCV knowledge and practice scores compared to dentists. This is in line with findings from other studies in China, Ethiopia, Sudan, Nigeria and Vietnam [15-19]. A study among healthcare workers in India revealed significant gaps in knowledge, attitudes and practices toward hepatitis B prevention, particularly among paramedical staff [20]. In addition, nursing interns had lower awareness related to hepatitis B and hepatitis C infections compared to dental and medical interns in India [14]. These findings highlight the importance of targeted trainings on viral hepatitis and prevention of bloodborne infections for nurses and non-dentists working in dental settings.

Significant regional and economic disparities were noted in knowledge and practice scores, with DHPs in Zugdidi scoring lower than their counterparts in Tbilisi and Batumi and dental professionals with higher salaries having higher knowledge and practice scores. These findings are consistent with the cross-sectional study conducted among dental healthcare workers in 2013 [7] and a 2021 nationwide serosurvey in Georgia, which highlighted regional disparities in healthcare knowledge and health care access [4]. Addressing these inequities requires region-specific interventions, including localised training programs.

While 78% of dental health professionals recognised that hepatitis B was preventable by vaccination, only 56% thought that healthcare providers should get vaccinated and 55% thought that the vaccine was safe. More importantly, only 24% reported being vaccinated against hepatitis B. These findings were similar to a recent survey conducted among primary healthcare physicians in Georgia where 26% reported being vaccinated against hepatitis B despite 83% reporting that the vaccine was safe [12]. In comparison, 68.8% of healthcare workers in Northern Vietnam reported receipt of hepatitis B vaccine and 47.4% of healthcare workers in Mongolia had completed the full three-dose HBV vaccination series [21]. This highlights the need to prioritise vaccination access and mandates for healthcare professionals in Georgia.

Overall adherence to infection prevention and control practices was high among study participants and improved compared to a previous survey conducted in 2013 [7]. However, 10% of DHPs in the current study left used syringes uncapped, similar to the 7.8% observed in the survey conducted in 2013 in Georgia [7]. In comparison, 4.6% of healthcare workers in Mongolia did not follow proper instructions for needle disposal in 2019 [21] while 60%

of health workers in Northern Vietnam did not adequately dispose of used needles based on data collected in 2017 [19]. In addition, a meta-analysis on the prevalence of needlestick injuries in dental assistants indicated a pooled prevalence of needlestick injuries of 44% among dental assistants, particularly during procedures involving cleaning instruments and handling syringes [22].

Moreover, 40% of DHPs in our survey reported not disinfecting all surfaces between patients. Transmission of hepatitis B virus and hepatitis C virus between patients has been documented in dental settings [23, 24]. Therefore, there is a need to implement continuous refresher trainings on injection safety and adequate IPC practices among dental students, practicing dentists and nurses. Regular inspections by public health authorities focusing on adherence to IPC practices in dental settings could also ensure prevention of transmission of infections between patients attending those clinics.

This study was unique in assessing the prevalence of hepatitis B and hepatitis C and KAP related to viral hepatitis among dental health professionals and is the largest study in this population in Georgia. However, the survey has some limitations. First, the survey sampled dental clinics in five regions in Georgia, which include half of the population, and results might not be generalisable to all dental professionals in Georgia. Second, self-reported data is subject to social desirability bias and cannot be validated. Additionally, small sample sizes for some cells may limit the relevance of certain findings.

In conclusion, this survey underscores a need for enhanced educational programs specifically designed for dental health professionals in Georgia to improve their knowledge of HBV and HCV transmission, improve hepatitis B vaccination coverage and injection safety practices. The current policies on hepatitis B vaccination, in effect since 2019, require mandatory vaccination for all at-risk groups, including dentists, and annual training on infection prevention and control (IPC). However, policy changes are needed to monitor compliance in the implementation of these recommendations.

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Disclosure

The findings and conclusions in this report are those of the authors and do not necessarily represent the official views of the US Centres for Disease Control and Prevention. Use of trade names and commercial sources is for identification only and does not imply endorsement by the Centres for Disease Control and Prevention, the Public Health Service or the US Department of Health and Human Services.

Data Availability Statement

The data that support the findings of this study were collected through the questionnaire interviews and laboratory database. Due to Georgian legislation on data confidentiality and restrictions imposed by the Georgian Government, these data are not publicly available. However, data may be available upon reasonable request to the corresponding author, subject

to approval from the Ministry of Internally Displaced Persons from the Occupied Territories, Labour, Health and Social Affairs of Georgia, and the NCDC.

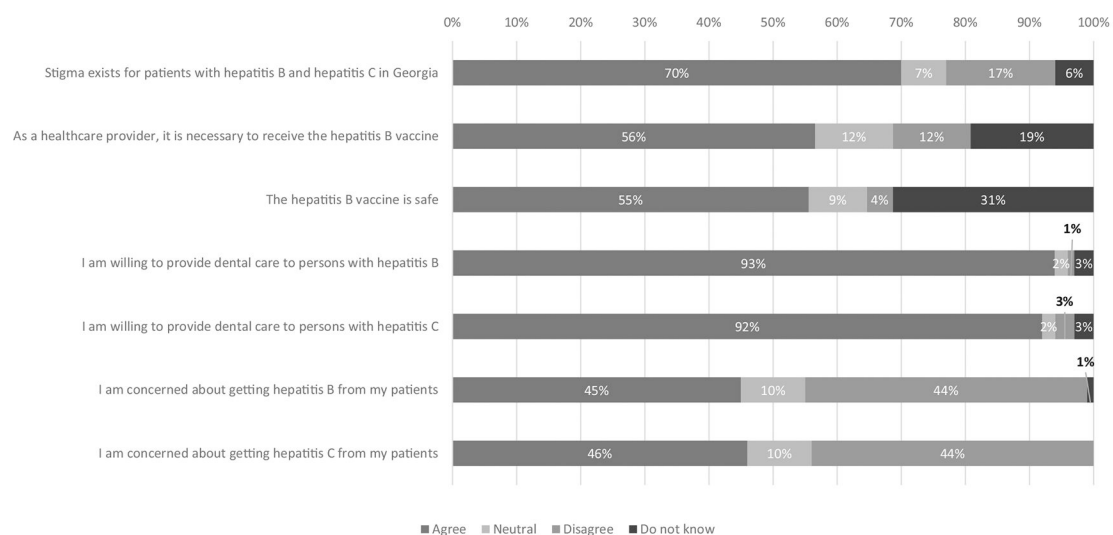
Abbreviations:

anti-HBc	antibody to hepatitis B core antigen
anti-HCV	antibody to hepatitis C virus
CDC	Centres for Disease Control and Prevention
DHPs	Dental Health Professionals
HBsAg	Hepatitis B Surface Antigen
HBV	Hepatitis B Virus
HCV	Hepatitis C Virus
HDV	Hepatitis D Virus
IPC	Infection Prevention and Control
KAP	Knowledge, Attitudes, and Practices
NCDC	National Centre for Disease Control and Public Health
PPS	Probability Proportional-to-Size Sampling

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**FIGURE 1 I.**

Attitudes and perceptions of dental health professionals toward hepatitis B and hepatitis C in the country of Georgia, 2023. DHP, dental health professional.

TABLE 1 |Characteristics of dental health professionals participating in the survey, Georgia, 2023 (*N* = 519).

Characteristics	Number	%
Sex		
Male	83	16.0%
Female	436	84.0%
Age, years		
18–29	85	16.4%
30–39	164	31.6%
40–49	165	31.8%
≥ 50	105	20.2%
Region of dental practice		
Tbilisi	422	81.3%
Batumi	52	10.0%
Kutaisi	20	3.9%
Zugdidi	18	3.5%
Telavi	7	1.3%
Profession		
Dentist	395	76.1%
Nurse	80	15.4%
Resident	25	4.8%
Dental assistants	19	3.7%
Specialty ^a		
General dentistry	372	71.7%
Surgery	189	36.4%
Paediatric dentistry	63	12.1%
Orthodontics	156	30.1%
Periodontics	42	8.1%
Other	45	8.7%
Work experience, years		
< 5	94	18.1%
5–9	84	16.2%
10–19	182	35.1%
≥ 20	158	30.5%
Salary, GEL per month (USD) ^b		
< 500 (< 190 USD)	62	11.9%
500–1000 (190–381 USD)	185	35.6%
1001–2000 (382–763 USD)	109	21.0%
> 2000 (> 763 USD)	49	9.4%
Refused	114	22.0%

Abbreviations: GEL, Georgian Lari; USD, U.S. dollars.

^aMultiple responses possible.

^b Conversion rate to USD as of May 15, 2023 from <https://www.oanda.com/currency-converter>.

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TABLE 2 |
Knowledge of hepatitis B and hepatitis C among dental health professionals, Georgia, 2023 (N= 519).

Infection with HBV/HCV can cause	Hepatitis B n (%)	Hepatitis C n (%)
Liver cirrhosis and cancer	493 (95.0)	491 (94.6)
Arthritis	99 (19.1)	92 (17.7)
Vasculitis	109 (21.0)	106 (20.4)
Glomerulonephritis and renal failure	140 (27.0)	136 (26.2)
All identified correctly	96 (18.5)	88 (17.0)
Don't know	20 (3.9)	22 (4.2)
Refused to answer	3 (0.6)	3 (0.6)
Groups at high-risk for HBV/HCV exposure		
Health care workers	490 (94.4)	493 (95.0)
Dental workers	501 (96.5)	498 (96.0)
People who received multiple blood transfusions	348 (67.1)	361 (69.6)
People who inject drugs	465 (89.6)	465 (89.6)
Sex-workers	378 (72.8)	368 (70.9)
Children born to HBV/HCV positive mothers	225 (43.4)	208 (40.1)
Persons on haemodialysis	239 (46.1)	247 (47.6)
All identified correctly	189 (36.4)	183 (35.3)
Don't know	4 (0.8)	4 (0.8)
How is HBV/HCV transmitted?		
Droplets ^a	417 (80.3)	436 (84.0)
Food ^a	489 (94.2)	487 (93.8)
Blood	494 (95.2)	504 (97.1)
Sexual contact	301 (58.0)	285 (54.9)
Handshake with an infected person ^a	506 (97.5)	504 (97.1)
Sharing household objects like razors or toothbrushes	197 (38.0)	214 (41.2)
Sharing needles or syringes	389 (75.0)	407 (78.4)
Touching items in public places ^a	495 (95.4)	483 (93.1)
From mother to child during birth	111 (21.4)	125 (24.1)
All correctly answered	34 (6.6)	41 (7.9)

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Don't know	9 (1.7)	7 (1.3)
HBV/HCV infection can be cured with medication		
HBV	HCV	
Yes	249 (48.0)	413 (79.6) ^b
No	139 (26.8) ^b	61 (11.8)
Don't know	131 (25.2)	45 (8.7)
HBV/HCV infection is preventable by vaccination		
HBV	HCV	
Yes	404 (77.8) ^b	122 (23.5)
No	21 (4.0)	222 (42.8) ^b
Don't know	93 (17.9)	175 (33.7)
Refused to answer	1 (0.2)	0 (0.0)

Abbreviations: HBV, hepatitis B virus; HCV, hepatitis C virus.

^aResults reported for correct answer of "No".

^bCorrect answer.

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TABLE 3 |
Occupational exposures and practices of dental health professionals regarding hepatitis B and hepatitis C in the country Georgia, 2023 (N = 519).

Questions	n (%)
Occupational exposures	“Yes” Responses
Have you ever been splashed with blood in the eyes, nose, or mouth?	216 (41.6%)
Have you ever been stuck with a contaminated needle?	227 (43.7%)
Have you ever been cut with a contaminated instrument?	107 (20.6%)
Practices	
Do you ever re-use single used instruments, such as prophylaxis cups and brushes?	
Yes	5 (1.0%)
No	501 (96.5%)
Unsure/refused	13 (2.5%)
Do you ever touch sterilised instruments by used dental tweezers?	
Yes	9 (1.7%)
No	494 (95.2%)
Unsure/refused	16 (3.1%)
Do you use gloves during patient contact?	
Always	507 (97.7%)
Sometimes	1 (0.2%)
Never	10 (1.9%)
After use of gloves, what do you do with them? ^a	
Dispose of them	506 (99.4%)
Reuse with other patients	1 (0.2%)
Reuse after cleaning	1 (0.2%)
Do you use eyewear to prevent injury?	
Always	337 (64.9%)
Sometimes	139 (26.8%)
Never	41 (7.9%)
Do you wear protective clothing to prevent injury?	
Always	433 (83.4%)
Sometimes	71 (13.7%)
Never	12 (2.3%)

Questions	n (%)
Do you use disposable impervious-backed paper, plastic covers for every new patient?	
Always	458 (88.2%)
Sometimes	21 (4.0%)
Never	37 (7.1%)
Do you wash hands before the patient examination?	
Always	496 (95.6%)
Sometimes	4 (0.8%)
Never	18 (3.5%)
Do you wash hands after the patient examination?	
Always	493 (95.0%)
Sometimes	7 (1.3%)
Never	18 (3.5%)
What environmental surfaces do you clean or disinfect between patients? ^a	
Dental unit's table	204 (39.3%)
Dental unit's head gear	195 (37.6%)
Dental unit's light handle	191 (36.8%)
Light curing device	160 (30.8%)
Dental radiograph equipment	109 (21.0%)
Telephones, drawers and drawer handle	24 (4.6%)
All the above	309 (59.5%)
How are used syringes and needles handled? ^b	
Directly in disposable sharp container	395 (76.1%)
Placed on surface uncapped for maintenance staff	54 (10.4%)
Recycle bin	27 (5.2%)
Placed on surface capped for maintenance staff	9 (1.7%)
Plastic bag	3 (0.6%)
Steriliser room	1 (0.2%)
n/a does not use needle at all	43 (8.3%)

Abbreviations: DHP, dental health professionals; HBV, hepatitis B virus; HCV, hepatitis C virus; n/a, not applicable.

^a Multiple responses possible.

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509 participants participated 605₇

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TABLE 4 I

Factors associated with hepatitis B and hepatitis C knowledge and practice scores^a among dental health professionals based on multivariable linear regression analysis, Georgia, 2023.

	Knowledge of Hepatitis B			Knowledge of Hepatitis C			Practice		
	Mean score (SD)	Adjusted means difference ^b (95% CI)	p	Mean score (SD)	Adjusted means difference ^b (95% CI)	p	Mean score (SD)	Adjusted means difference ^c (95% CI)	p
Age, years									
18–29	16.6 (3.5)	Ref		16.4 (3.6)	Ref		15.5 (2.6)	Ref	
30–39	16.5 (3.0)	–0.5 (–1.6, 0.5)	0.326	16.8 (3.2)	–0.4 (–1.5, 0.6)	0.439	16.5 (2.3)	–0.4 (–1.2, 0.4)	0.298
40–49	16.2 (3.1)	–0.5 (–1.7, 0.6)	0.387	16.4 (3.0)	–0.4 (–1.5, 0.8)	0.514	16.1 (2.6)	–0.3 (–1.2, 0.5)	0.467
≥ 50	15.9 (3.5)	–0.8 (–2.2, 0.7)	0.288	16.4 (3.3)	–0.3 (–1.7, 1.2)	0.711	15.6 (2.5)	0.0 (–1.1, 1.1)	0.976
Sex									
Female	16.3 (3.2)	0.3 (–0.4, 1.1)	0.393	16.5 (3.2)	0.0 (–0.7, 0.8)	0.960	16.0 (2.6)	0.0 (–0.5, 0.6)	0.926
Male	16.2 (3.2)	Ref		16.8 (3.2)	Ref		16.3 (2.0)	Ref	
Profession									
Dentist	16.5 (3.1)	Ref		16.8 (3.0)	Ref		16.6 (1.7)	Ref	
Nurse	15.3 (3.4)	–1.2 (–2.0, –0.3)	0.009	15.4 (3.5)	–1.2 (–2.1, –0.4)	0.006	14.0 (3.7)	–1.9 (–2.5, –1.2)	< 0.0001
Resident	16.5 (4.0)	0.4 (–1.0, 1.9)	0.568	16.3 (4.2)	0.2 (–1.2, 1.6)	0.816	14.5 (2.8)	–1.0 (–2.1, 0.1)	0.086
Other	15.9 (3.3)	–0.7 (–2.1, 0.8)	0.382	15.8 (3.1)	–0.9 (–2.4, 0.5)	0.211	14.6 (3.5)	–1.6 (–2.7, –0.4)	0.008
Place of work									
Tbilisi	16.3 (3.3)	Ref		16.5 (3.2)	Ref		16.0 (2.6)	Ref	
Batumi	18.2 (2.5)	1.4 (0.5, 2.3)	0.002	18.4 (2.7)	1.5 (0.6, 2.3)	0.001	15.5 (2.2)	0.1 (–0.6, 0.8)	0.750
Kutaisi	14.9 (2.0)	–1.1 (–2.5, 0.2)	0.107	14.7 (0.9)	–1.7 (–3.1, –0.3)	0.015	17.1 (1.3)	0.5 (–0.4, 1.4)	0.305
Telavi	15.7 (2.5)	–1.1 (–3.4, 1.2)	0.342	15.9 (2.4)	–1.3 (–3.5, 1.0)	0.275	13.7 (3.3)	–2.5 (–4.4, –0.7)	0.007
Zugdidi	13.3 (2.4)	–2.4 (–3.8, –0.9)	0.002	13.3 (2.0)	–2.7 (–4.2, –1.3)	0.000	17.7 (1.1)	1.0 (–0.3, 2.3)	0.145
Work experience, years									
< 5	16.1 (3.8)	Ref		15.9 (3.8)	Ref		15.0 (3.1)	Ref	
5–9	16.8 (2.8)	0.9 (–0.1, 2.0)	0.084	16.9 (2.9)	0.9 (–0.1, 2.0)	0.076	16.1 (2.9)	0.4 (–0.4, 1.2)	0.28
10–19	16.2 (3.1)	0.5 (–0.6, 1.6)	0.361	16.6 (3.1)	0.8 (–0.3, 1.9)	0.141	16.5 (2.1)	0.4 (–0.5, 1.2)	0.400
≥ 20	16.2 (3.3)	0.6 (–0.7, 1.9)	0.395	16.6 (3.1)	0.7 (–0.6, 2.0)	0.318	16.1 (2.2)	0.0 (–0.9, 1.0)	0.935
Average salary, monthly, GEL (USD) ^d									

	Knowledge of Hepatitis B			Knowledge of Hepatitis C			Practice		
	Mean score (SD)	Adjusted means difference ^b (95% CI)	p	Mean score (SD)	Adjusted means difference ^b (95% CI)	p	Mean score (SD)	Adjusted means difference ^c (95% CI)	p
< 500 (< 190 USD)	15.6 (3.2)	Ref		15.7 (3.2)	Ref		14.6 (2.7)	Ref	
500–1000 (190–381 USD)	16.6 (3.2)	0.6 (−0.3, 1.5)	0.205	16.8 (3.1)	0.7 (−0.2, 1.6)	0.113	15.5 (2.8)	0.6 (0.0, 1.3)	0.066
1001–2000 (382–763 USD)	16.9 (2.9)	0.5 (−0.6, 1.6)	0.348	17.3 (2.9)	0.8 (−0.2, 1.9)	0.118	16.2 (1.9)	0.3 (−0.5, 1.1)	0.474
> 2000 (> 763 USD)	18.2 (2.4)	1.7 (0.4, 3.0)	0.008	18.2 (2.4)	1.6 (0.4, 2.9)	0.011	16.8 (1.3)	1.0 (0.1, 2.0)	0.024
Refused	14.8 (3.3)	−1.1 (−2.1, 0.0)	0.043	15.1 (3.4)	−0.8 (−1.8, 0.2)	0.131	17.1 (2.3)	1.2 (0.4, 1.9)	0.002
Screened for HBV									
Yes	16.3 (3.1)	Ref		16.5 (3.1)	Ref		16.5 (2.2)	Ref	
No	16.5 (3.6)	−0.3 (−1.5, 1.0)	0.660	16.5 (3.6)	−0.5 (−1.7, 0.7)	0.432	13.9 (2.6)	−1.3 (−2.1, −0.5)	0.003
Screened for HCV									
Yes	16.3 (3.2)	Ref		16.5 (3.1)	Ref		16.3 (2.3)	Ref	
No	16.6 (4.0)	0.3 (−1.2, 1.8)	0.733	16.6 (3.9)	0.5 (−1.0, 1.9)	0.542	13.6 (2.4)	−0.8 (−1.8, 0.2)	0.123
Vaccinated against hepatitis B									
Yes	16.3 (3.3)	Ref		16.6 (3.5)	Ref		17.4 (2.0)	Ref	
No	16.4 (3.2)	0.3 (−0.9, 0.4)	0.479	16.6 (3.1)	−0.2 (−0.8, 0.5)	0.591	15.6 (2.5)	1.3 (−1.8, −0.9)	<0.0001

Abbreviations: CI, confidence interval, DHP, dental health professional; GEL, Georgian Lari; HBV, hepatitis B virus; HCV, hepatitis C virus; Ref, reference category; SD, standard deviation; USD, U.S. dollars.

^a Knowledge and practice scores were evaluated using a point system, with one point awarded for each correct answer. For knowledge, the total possible score for HBV and HCV was 24 for each. The maximum score for practice was 19, assessed using a similar point system.

^b Linear regression models adjusted for age, sex, profession, place of work, work experience, and salary.

^c Linear regression model adjusted for age, sex, profession, place of work, work experience, salary, and hepatitis B vaccination status.

^d Conversion rate to USD as of May 15, 2023 from <https://www.oanda.com/currency-converter>.

Socio-demographic characteristics associated with high hepatitis B and hepatitis C knowledge score^a among dental health professionals, Georgia, 2023.

TABLE 5 |

	High knowledge of Hepatitis B		High knowledge of Hepatitis C	
	High n (row %)	aOR (95% CI) ^b	High n (row %)	aOR (95% CI) ^b
Overall	255 (49.1)	—	265 (51.1)	—
City				
Tbilisi	208 (49.3)	Ref	222 (52.6)	Ref
Batumi	38 (73.1)	2.12 (1.08, 4.15)	38 (73.1)	1.83 (0.93, 3.58)
Kutaisi	6 (30.0)	0.50 (0.18, 1.39)	1 (5.0)	0.05 (0.01, 0.35)
Telavi	2 (28.6)	0.22 (0.04, 1.33)	3 (42.9)	0.40 (0.08, 2.00)
Zugdidi	1 (5.6)	0.08 (0.01, 0.63)	1 (5.6)	0.07 (0.01, 0.55)
Profession				
Dentist	206 (52.2)	Ref	214 (54.2)	Ref
Nurse	28 (35.0)	0.53 (0.29, 0.99)	30 (37.5)	0.53 (0.29, 0.97)
Resident	12 (48.0)	1.21 (0.45, 3.26)	11 (44.0)	0.98 (0.37, 2.65)
Dental assistants	9 (47.4)	0.96 (0.34, 2.73)	10 (52.6)	1.12 (0.40, 3.12)
Work experience, years				
< 5	42 (44.7)	Ref	42 (44.7)	Ref
5–9	46 (54.8)	1.35 (0.64, 2.85)	46 (54.8)	1.43 (0.68, 3.04)
10–19	90 (49.5)	1.15 (0.53, 2.50)	93 (51.1)	1.29 (0.59, 2.81)
20+	77 (48.7)	1.21 (0.48, 3.09)	84 (53.2)	1.18 (0.46, 3.02)
Salary, monthly, GEL (USD) ^c				
< 500 (< 190 USD)	26 (41.9)	Ref	27 (43.5)	Ref
500–1000 (190–381 USD)	98 (53.0)	1.24 (0.66, 2.31)	99 (53.5)	1.32 (0.71, 2.48)
1001–2000 (382–763 USD)	63 (57.8)	1.21 (0.58, 2.52)	70 (64.2)	1.92 (0.91, 4.08)
> 2000 (> 763 USD)	38 (77.6)	3.21 (1.25, 8.23)	38 (77.6)	3.25 (1.28, 8.27)
Refused	30 (26.3)	0.41 (0.20, 0.85)	31 (27.2)	0.48 (0.24, 0.99)

Abbreviations: aOR, adjusted odds ratio; CI, confidence interval; DHP, dental health professional; GEL, Georgian Lari; USD, U.S. dollars.

^aHigh knowledge score was defined as having at least 17 (≥ 70%) correct responses out of 24.

^bMultivariable logistic regression adjusted for age, sex, profession, place of work, work experience, and salary.

^cConversion rate to USD as of May 15, 2023 from <https://www.oanda.com/currency-converter>.