

## KNOWLEDGE OF VIRAL HEPATITIS B AMONG HEALTHCARE WORKERS

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### Summary

Healthcare workers are at an increased risk of hepatitis B virus infection due to frequent contact with patients' bodily fluids. Studies indicate that healthcare workers may experience between 1 and 3 needle stick or sharp object injuries per year, each incident increasing the risk of infection with blood-borne viruses, including hepatitis B. A sample of 318 primary healthcare workers was interviewed, including 87 doctors and 231 nurses. The collected data was analyzed using EpiInfo 7.2 software. Among the healthcare workers who participated in this study, 276 (86.79%) had adequate knowledge about HBV transmission routes, including 89.77% of doctors and 85.72% of nurses. It is noteworthy that some workers are unaware of HBV transmission routes, mentioning transmission through kissing – 60 people (18.87%, [95% CI 14.80% - 23.58%]), through coughing and sneezing – 17 people (3.35%, [95% CI 3.14% - 8.41%]), by drinking from a glass already used by an infected person – 34 people (10.69%, [95% CI 7.54% - 14.56%]), while sharing meals – 14 people (4.40%, [95% CI 2.44% - 7.27%]), through vegetables and fruits – 10 people (3.14%, [95% CI 1.52% - 5.70%]). The level of knowledge about the HBV transmission pathway observed in this study is relatively adequate, but at the same time, significant gaps in knowledge about the risks of HBV transmission were highlighted.

**Keywords:** Hepatitis B virus, knowledge, healthcare workers, prevention

### Rezumat

#### Cunoștințele lucrătorilor medicali privind hepatita virală B

Lucrătorii medicali sunt expuși unui risc crescut de infectare cu virusul hepatitic B (VHB), deoarece au contact frecvent cu fluidele corporale ale pacienților. Studiile indică faptul că anual aceștia pot suferi între 1 și 3 accidente cu ace sau alte obiecte ascuțite, fiecare incident crescând riscul de infectare cu virusurile transmisibile prin sânge, inclusiv hepatita B. Într-un studiu realizat în asistența primară, au fost intervievați 318 lucrători medicali, inclusiv 87 de medici și 231 de asistente medicale. Datele colectate au fost analizate folosind programul EpiInfo 7.2. Din totalul participanților, 276 (86,79%) aveau cunoștințe adecvate despre calea de transmitere a VHB, procentajul fiind de 89,77% pentru medici și 85,72% pentru asistentele medicale. Este de menționat faptul că unii lucrători medicali nu posedă cunoștințe corecte despre căile de transmitere a VHB. Printre aceștia, 60 de persoane (18,87%, [95% IC 14,80%-23,58%]) au menționat că virusul poate fi transmis prin sărut, 17 persoane (3,35, [95% IC 3,14%-8,41%]) prin tuse și strănut, 34 de persoane (10,69 [95% IC 7,54%-14,56%]) prin partajarea unui pahar cu o persoană infectată, 14 persoane (4,40% [95% IC 2,44%-7,27%]) prin luarea masei împreună și 10 persoane (3,14% [95% IC 1,52%-5,70%])

prin consumul de legume și fructe. Concluziile studiului indică un nivel relativ adecvat al cunoștințelor privind calea de transmitere a HVB în rândul lucrătorilor medicali, dar subliniază și necesitatea de a corecta lacunele semnificative identificate în înțelegerea riscurilor asociate cu transmiterea HVB.

**Cuvinte-cheie:** hepatita virală B, cunoștințe, lucrători medicali, prevenție

### Резюме

#### Знания о вирусном гепатите В среди медицинских работников

Медицинские работники подвержены повышенному риску заражения вирусом гепатита В из-за частого контакта с биологическими жидкостями пациентов. Исследования показывают, что медицинские работники могут сталкиваться с 1–3 случаями травмирования иглой или другими острыми предметами в год, что увеличивает риск заражения кровяными вирусами, включая гепатит В. Были опрошены 318 медицинских работников первичной медико-санитарной помощи, в том числе 87 врачей и 231 медсестра. Собранные данные были проанализированы с использованием программы EpiInfo 7.2. Среди медицинского персонала, участвовавшего в этом исследовании, 276 (86,79%) имели адекватные знания о путях передачи HBV, включая 89,77% врачей и 85,72% медсестер. Стоит отметить, что некоторые работники не знают о путях передачи гепатит В, упоминая передачу через поцелуи – 60 человек (18,87%, [95% ДИ 14,80% - 23,58%]), через кашель и чихание – 17 человек (3,35%, [95% ДИ 3,14% - 8,41%]), при питье из стакана, из которого уже пил инфицированный человек – 34 человека (10,69%, [95% ДИ 7,54% - 14,56%]), при совместном приеме пищи – 14 человек (4,40% [95% ДИ 2,44% - 7,27%]), через овощи и фрукты – 10 человек (3,14% [95% ДИ 1,52% - 5,70%]). Уровень знаний о путях передачи гепатите В, отмеченный в данном исследовании, является относительно адекватным, но в то же время были выявлены значительные проблемы в знаниях о рисках передачи гепатите В.

**Ключевые слова:** Вирусный гепатит В, знания, медицинские работники, профилактика

### Introduction

Viral hepatitis B is one of the most common and severe viral infections affecting the liver, representing a major global public health problem. According to the World Health Organization, about

257 million people are living with chronic hepatitis B virus infection, and the infection can lead to severe complications such as liver cirrhosis and hepatocellular carcinoma [1]. Hepatitis B virus infection is considered as one of the occupational hazards threatening health care workers. In addition, measuring knowledge, attitudes and practices among these individuals can be considered as one of the most important activities for the development of strategies to prevent HBV infection [2]. The main modes of hepatitis B virus transmission are through exposure to biological fluids such as blood, semen or vaginal secretions, sexual contact, sharing contaminated needles, razors, toothbrushes [3-5]. For example, a study conducted in Cameroon found that although most health workers were aware of the risks associated with HBV, only a small proportion were fully vaccinated [6]. These discrepancies highlight the need for continued educational interventions and vaccination programs to improve protection among healthcare workers. Another study conducted in Nigeria found that the level of knowledge about HBV among health care workers is often insufficient, and attitudes towards vaccination and preventive measures do not always conform to international guidelines [7]. These findings are also supported by research in other countries, such as Sudan, where it was found that the preventive practices of health care workers are significantly influenced by the level of knowledge and attitudes towards HBV infection [8]. By knowing the facts, having the right attitude and awareness, the risk of viral hepatitis can be prevented to a great extent [9-10]. Assessing general knowledge and population awareness of viral hepatitis is crucial in developing targeted and effective strategies [11]. Knowledge about viral hepatitis B among health care workers, particularly in primary care and social care, has been found to be generally poor. Although there have been no large-scale, controlled studies of health care workers' knowledge of chronic hepatitis B, it is clear that knowledge was imperfect in all surveys whose results have been published [12]. The studies found significant variation in the prevalence of infection among health care workers, ranging from 0.6-1.2% in Europe, 9.85% in Asian countries and 2.3-11.8% in Africa, which was driven by low vaccination rates. Research has shown a negative correlation between the level of knowledge and the prevalence of HBV infection. Therefore, assessing health care workers' knowledge, attitudes and practices towards hepatitis B is crucial for the development and implementation of effective prevention strategies.

## Aim of the research

By conducting this study, we aim to gain a clear understanding of the level of knowledge of healthcare workers about HBV to increase the safety of the working environment.

## Materials and Methods

To conduct the study, the questionnaire to assess the knowledge, attitudes and practices on viral hepatitis B was developed and subsequently validated on a sample of 35 healthcare workers. On the basis of the validated questionnaire, a sample of 318 primary health care workers were interviewed, including 87 physicians and 231 nurses. The questionnaire consisted of 106 questions structured in 3 chapters including HCWs' knowledge of HBV, attitudes and observed practices. The collected data were analyzed in EpiInfo 7.2. It is a cross-sectional observational comparative observational research study in which data are collected at a single point in time and participants are selected to compare two distinct groups according to certain characteristics among physicians and nurses.

## Results

Based on the structured questionnaire, a sample of 318 health care workers were interviewed, including 87 physicians and 231 nurses. The knowledge of the healthcare workers was assessed based on 106 questions, which allowed us to identify their gaps regarding viral hepatitis B.

Of the 318 HCWs who participated in the study, all 318 HCWs (100%) had heard of HBV, and 276 (86.79%) of them had adequate knowledge about the route of HBV transmission, including 89.77% in physicians and 85.72% in nurses. Notwithstanding the fact that, most of the health care workers have knowledge about HBV, however, it is noteworthy to mention that some workers do not have knowledge about HBV transmission routes (Table 1). A series of questions shown in Table 1 were used to assess the level of knowledge about viral hepatitis B among doctors and nurses.

The results show that almost all participants, both physicians and nurses, believe that there is a risk of transmission of Hepatitis B during dental treatments. 97.80% of the respondents believe that dental treatments pose a risk of transmission of viral hepatitis B, reflecting a widespread perception among health care workers. In 100% of physicians responded that there is a risk, indicating a complete awareness of the possibility of HBV transmission in this context. 96.97% of nurses indicated that there is a risk. Although the percentage is slightly lower than that of the physicians, it is still high, indicating

**Table 1***Knowledge on HBV transmission route*

Questions	Answers	Doctors (n=87) abs (%) [95% CI]	Nurses (n=231) abs (%) [95% CI]	TOTAL (N=318) abs (%) [95% CI]
Have you heard about Hepatitis B?	Yes	87 (100%) [95,85%-100%]	231 (100%) [98,42%-100%]	318 (100%) [98,84%-100%]
	No	0	0	0
	Don't know	0	0	0
While treating teeth	Yes	87 (100%)	224 (96,97%) [93,86%-98,77%]	311 (97,80%) [95,63% - 99,06%]
	No	0	5 (2,16%) [0,71%-4,98%]	5 (1,57%) [95,52% - 3,64%]
	Don't know	0	2 (0,87%) [0,11%-3,09%]	2 (0,63%) [95,08% - 2,25%]
From a person who shows no signs of disease and appears completely healthy	Yes	74(85,06%) [75,8% - 91,8%]	175 (75,76%) [69,7%-81,14%]	249 (78,30%) [95,60% - 82,48%]
	No	11(12,64%) [6,48% - 21,5%]	43 (18,61%) [13,81%-24,24%]	54 (16,98%) [95,03% - 21,81%]
	Don't know	2(2,3%) [0,28% - 8,06%]	13 (5,63%) [3,03%-9,43%]	15 (4,72%) [95,67% - 7,66%]
Through kissing	Yes	15 (17,24%) [9,98% - 26,84%]	45 (19,48%) [14,58%-25,18%]	60 (18,87%) [95,80% - 23,58%]
	No	67(70,01) [66,75% - 85,36%]	179 (77,49%) [71,55%-82,71%]	246 (77,36%) [95,27% - 81,93%]
	Don't know	5(5,75%) [1,89% - 12,9%]	7 (3,03%) [1,23%-6,14%]	12 (3,77%) [95,96% - 6,50%]
By injecting drugs with a needle already used by an infected person	Yes	87 (100%) [95,85% - 100%]	215 (93,07%) [89% - 95,95%]	302 (94,97%) [95,89% - 97,29%]
	No	0	13 (5,63%) [3,03%-9,43%]	13 (4,09%) [95,19% - 6,92%]
	Don't know	0	3 (1,30%) [0,27%-3,75%]	3 (0,94%) [95,20% - 2,72%]
Through sexual contact with multiple partners, with condom use	Yes	49 (56,32%) [45,26% - 66,94%]	134 (58,01%) [51,36%-64,45%]	183 (57,55%) [95,08% - 62,86%]
	No	33 (37,93%) [27,74% - 48,97%]	84 (36,36%) [30,15%-42,93%]	117 (36,79%) [95,60% - 42,19%]
	Don't know	5 (5,75%) [1,89% - 12,9%]	13 (5,63%) [3,03%-9,43%]	18 (5,66%) [95,41% - 8,80%]
Through tattooing or piercing	Yes	85 (97,70%) [91,94% - 99,72%]	216 (93,51%) [89,52%-96,32%]	301 (94,65%) [95,54% - 97,01%]
	No	2 (2,23%) [0,28% - 8,06%]	5 (2,16%) [0,71%-4,98%]	7 (2,20%) [95,88% - 4,46%]
	Don't know	0	10 (4,33%) [2,1%-7,82%]	10 (3,15%) [95,52% - 5,68%]
From mother to fetus during pregnancy	Yes	64 (73,56%) [63,02% - 82,45%]	145 (62,77%) [56,19%-69,02%]	209 (65,72%) [95,43% - 70,73%]
	No	21 (24,14%) [15,6% - 34,5%]	73 (31,60%) [25,66%-38,02%]	94 (29,56%) [95,90% - 34,55%]
	Don't know	2 (2,3%) [0,28% - 8,06%]	13 (5,63%) [3,03%-9,43%]	15 (4,72%) [95,67% - 7,66%]

Through coughing and sneezing	Yes	2 (2,30) [0,28% - 8,06%]	15 (6,49%) [3,68%-10,48%]	17 (5,35%) [95,14% - 8,41%]
	No	84 (96,55%) [90,25% - 99,28%]	210 (90,91%) [86,44%-94,28%]	294 (92,45%) [95,92% - 95,05%]
	Don't know	1 (1,15%) [0,03% - 6,24%]	6 (2,60%) [0,96%-5,57%]	7 (2,20%) [95,88% - 4,46%]
Sexually transmitted	Yes	80 (91,95%) [84,12% - 96,7%]	202 (87,45%) [82,47%-91,43%]	282 (88,68%) [95,74% - 91,98%]
	No	6 (6,9%) [2,57% - 14,41%]	26 (11,26%) [7,49%-16,06%]	32 (10,06%) [95,92% - 13,89%]
	Don't know	1 (1,15%) [0,03% - 6,24%]	3 (1,30%) [0,27%-3,75%]	4 (1,26%) [95,34% - 3,20%]
If drinking from a glass that an infected person has drunk from	Yes	5(5,75%) [1,89% - 12,9%]	29 (12,55%) [8,57%-17,53%]	34 (10,69%) [95,54% - 14,56%]
	No	76 (87,36%) [78,5% - 93,52%]	191 (82,68%) [77,18%-87,33%]	267 (83,96%) [95,34% - 88,05%]
	Don't know	6 (6,9%) [2,57% - 14,41%]	11 (4,76%) [2,4%-8,36%]	17 (5,35%) [95,14% - 8,41%]

almost unanimous awareness. Dental treatment often involves handling instruments that may come into contact with the patient's blood or other bodily fluids, such as saliva, which may contain HBV. The risk is heightened by the frequent use of sharp objects such as needles and scalpels, which, if not properly sterilized, can lead to transmission of the virus.

Hepatitis B is a viral disease that can be transmitted through contact with infected blood and other body fluids.

The virus can be present in the body even in the absence of clinical symptoms, which means that a person can be a carrier and transmit the virus to others without knowing they are infected. It is essential that healthcare workers are aware that asymptomatic people can transmit HBV. This awareness helps to implement universal precautions in all interactions with patients. However, only 78.30% of all participants believe that HBV can be transmitted from asymptomatic persons. A slightly higher level is evidenced among physicians - 85.06% compared to nurses - 75.76%.

Although the virus may be present in saliva, the risk of transmission through kissing is considered extremely low compared to other modes of transmission, such as sexual contact, use of contaminated needles or blood transfusion. The amount of virus in saliva is usually insufficient to cause an infection, unless there are sores or ulcers in the mouth that could allow the virus to enter the bloodstream. The data show that the overwhelming majority of participants do not consider kissing as a major mode of transmission of HBV. However, there is a significant percentage who believe that kissing may be a mode of transmission. 60 respondents (18.87%)

believe that HBV can be transmitted by kissing. The total percentage reflects a significant minority who believe that there is a risk of transmission by kissing. This percentage reflects a minority within the medical community, but clearly demonstrates gaps in health care workers' knowledge of the risk of HBV transmission. It is noteworthy that 15 doctors (17.24%) believe that HBV can be transmitted through kissing, and 45 nurses (19.48%) share this belief, demonstrating a lower level of knowledge compared to doctors. However, the differences observed between the proportions of physicians and nurses who believe that BVH can be transmitted by kissing are not statistically significant at the 5% significance level. The t value obtained is approximately -0.465. This indicates that the perceptions of both groups are similar regarding this mode of transmission.

Needle sharing, especially in the context of injecting drugs, is a well-documented and extremely risky mode of transmission. HBV is highly infectious and can survive on contaminated surfaces, including needles, for long periods of time. The analysis of the perception of the risk of transmission by injecting drugs with an already used needle shows that 302 respondents (94.97%) correctly consider the risk of transmission, indicating a broad awareness of the risk. 87 doctors (100%) consider that there is a high risk of HBV transmission by injecting drugs with a used needle, indicating almost absolute certainty among doctors. Among nurses, 215 (93.07%) answered correctly. Although this percentage is high, it still indicates that there is a segment, about 7%, who either do not recognize the risk or are not sure. There is a slight but significant difference between physicians and nurses in risk awareness. These discre-

pancies may have important implications for infection prevention and patient safety. We determined the statistical difference between the proportions of physicians and nurses who recognize the risk of transmission of HBV by injecting drugs with a used needle by using the Z-test for two proportions. The Z value obtained is approximately 2.54. At a significance level of 0.05, the Z value of 2.54 is greater than 1.96, so the difference is statistically significant.

Next, the perception of risk of transmission through sexual contact with multiple partners using condoms was analyzed. HBV is efficiently transmitted through unprotected sexual contact, especially when multiple partners are involved. Although condom use significantly reduces the risk of transmission of the virus, it does not completely eliminate the risk, especially if the condom is not used correctly or breaks. Thus, out of the total respondents (318 health workers), 183 respondents (57.55%) believe that HBV can be transmitted through sexual contact with multiple partners, even with condom use, including 49 physicians (56.32%) and 134 nurses (58.01%). The calculated Z value is -0.262 being much lower than the critical values for the 0.05 level. This means that there is no statistically significant difference between the proportions of physicians and nurses who believe that Hepatitis B can be transmitted through sexual contact with multiple partners, even with condom use.

Tattooing and piercing procedures involve the use of sharp objects that penetrate the skin and may come into contact with blood. If these objects are not properly sterilized, the risk of virus transmission is very high. The use of reusable equipment without proper sterilization can also lead to contamination. The perception of the risk of transmission through tattooing or piercing shows a wide awareness of the risk among healthcare workers. Thus, 301 respondents (94.65%) correctly answered that HBV can be transmitted by tattooing or piercing, of which 85 physicians (97.70%) and 216 nurses (93.51%), but 2 physicians (2.23%) and 15 nurses (6.49%) did not recognize this mode of transmission as risky. The Z value obtained is approximately 1.425, and is less than the critical values 0.005. Thus, we can state that there is no statistically significant difference between the proportions of physicians and nurses who believe that BVH can be transmitted by tattooing or piercing.

Hepatitis B can be transmitted from mother to fetus during pregnancy (vertical transmission), especially during childbirth. HBV can cross the placenta and infect the fetus. This is a major mode of transmission in areas with high prevalence of the virus and can lead to chronic infections in newborns

if appropriate preventive measures are not taken. The analysis of data on the perception of the risk of mother-to-child transmission during pregnancy highlights a ridiculous level of knowledge among health workers. However, only 209 respondents (65.72%) believe that HBV can be transmitted from mother to fetus during pregnancy, including 64 physicians (73.56%) and 145 nurses (62.77%). This percentage reflects a low awareness of the risk among healthcare workers. Thus, 23 physicians (26.44%) and 86 nurses (37.23%) do not recognize the risk, which may have important implications for preventing the transmission of infections during pregnancy and childbirth. It is noteworthy that although the level of knowledge reports gaps in the perception of the risk of HBV transmission from mother to fetus, yet the Z value obtained of 1.655, demonstrates that there is no statistically significant difference between the proportions of physicians and nurses who believe that HBV can be transmitted from mother to fetus during pregnancy.

HBV may be present in saliva, but transmission through coughing and sneezing is considered extremely rare and unlikely under normal conditions, because the amount of virus present in aerosols produced by coughing and sneezing is insufficient to cause infection. However, when analyzing the data on the perception of the risk of transmission by coughing and sneezing, we found that 17 respondents (5.35%) believe that HBV can be transmitted by coughing and sneezing, of which 2 physicians (2.30%) and 15 nurses (6.49%), and 1 physician (1.15%) and 6 nurses (2.60%) are unaware of this fact. For  $Z = -1.425$ , the P value for a two-tailed test is twice the probability that Z is less than -1.425 or greater than 1.425. The P-value of 0.1544 indicates that there is no statistically significant difference between the proportions of physicians and nurses who believe that HBV can be transmitted by coughing and sneezing, at the 0.05 significance level. However, when calculating the Odds Ratio of approximately 0.333, we highlight that physicians are approximately three times less likely to believe that HBV can be transmitted by coughing and sneezing compared to nurses. Although most physicians and nurses do not consider coughing and sneezing as significant modes of transmission of HBV, nurses are more likely than physicians to recognize this risk, even if it is very small.

Although the overwhelming majority of doctors and nurses recognize the risk of sexual transmission of HBV, there are minor differences between the two groups. Doctors are slightly more aware of this risk than nurses. Of the total of 318 respondents, only 282 respondents (88.68%) consider that HBV can be sexually transmitted, including 80 physicians

(91.95%) and 202 nurses (87.45%). However, it is worth mentioning that 36 respondents (11.32%) do not consider this mode of transmission as risky, including 7 physicians (8.05%) and 29 nurses (12.56%). The P-value of 0.2924 indicates that there is no statistically significant difference between the proportions of physicians and nurses who believe that HBV can be sexually transmitted, at a significance level of 0.05. However, the Odds Ratio of approximately 1.717 indicates that physicians are approximately 1.717 times more likely to believe that HBV can be sexually transmitted compared to nurses. Thus, risk perception is slightly higher among physicians than among nurses. The Odds Ratio indicates a slight but significant difference in risk perception between the two groups, with physicians being more likely to recognize the risk.

Although the virus may be present in saliva, transmission by drinking from a glass used by an infected person is considered extremely rare and unlikely under normal conditions. The amount of virus present in saliva and the fact that the virus cannot survive well in the external environment make this mode of transmission insignificant. However, 34 respondents (10.69%) mentioned that HBV can be transmitted by drinking from a glass used by an infected person, including 5 physicians (5.75%) and 29 nurses (12.55%), which demonstrates gaps in the correct perception of the risk of transmission by drinking from a glass used by an infected person. The P value of 0.1032 indicates that there is no statistically significant difference between the proportions of physicians and nurses who believe that HBV can be transmitted by drinking from a glass used by an infected person, at a significance level of 0.05. Odds Ratio of about 0.433 indicates that physicians are about 0.433 times less likely to think that HBV can be transmitted by drinking from a glass used by an infected person compared to nurses. Thus, nurses are more likely to perceive this mode of transmission as risky compared to physicians, although both groups generally consider this risk to be low.

In 95.40% [95% CI: 88.64%-98.73%] of physicians, had been vaccinated against hepatitis B, indicating a high rate of compliance with vaccination recommendations, and 94.37% [95% CI: 90.57%-96.97%] of nurses had also been vaccinated, a percentage very close to that of physicians. However, there is a small percentage of health care workers who have not been vaccinated or do not know if they have been vaccinated, which underlines the need for awareness campaigns and verification of vaccination status. The percentage of health care workers who are infected with HBV is 7.55%, including 6.90% [95% CI: 2.57%-14.41%] - physicians

and 7.79% [95% CI: 4.68%-12.04%] - nurses, which is significant given the increased risk of exposure to the virus in the workplace.

These data indicate that, despite high vaccination rates, there is still a notable proportion of healthcare workers who have contracted the virus, probably before being vaccinated or due to multiple exposure.

## Discussion

In this study, we assessed the perceptions of healthcare workers regarding different modes of transmission of HBV. The study included physicians and nurses, and the results were analyzed to identify differences in awareness and knowledge of the risks of transmission. Exposure to blood-borne pathogens, such as HBV infection, remains a significant occupational hazard for healthcare workers, particularly in countries where the prevalence of HBV infection is high. KAP (knowledge, attitudes and practices) surveys among healthcare workers are needed to assess and improve awareness of the transmission pathway, prevention and management of infectious diseases. This study was conducted to assess the knowledge of HBV among healthcare personnel in primary care. Healthcare workers are at the forefront of healthcare delivery and are expected to know the transmission routes of different infectious agents to protect their patients and themselves from nosocomial infections. The results of the current study revealed an adequate level of knowledge about how HBV is transmitted.

The virus can be present in the body even in the absence of clinical symptoms, which means that a person can be a carrier and transmit the virus to others without knowing that they are infected. It is essential that healthcare workers are aware that asymptomatic people can transmit HBV. This awareness helps to implement universal precautions in all interactions with patients. However, only 78.30% of all participants believe that HBV can be transmitted from asymptomatic persons, with a slightly higher level among physicians (85.06%) compared to nurses (75.76%). These data emphasize the need for continued education to ensure full awareness of the risk.

Although the virus may be present in saliva, the risk of transmission through kissing is considered extremely low compared to other modes of transmission, such as sexual contact, use of contaminated needles or blood transfusion. The data show that although the overwhelming majority of participants do not consider kissing as a major mode of transmission of HBV, nevertheless 60 respondents (18.87%) believe that HBV can be transmitted by kissing. The

low level of knowledge in this aspect, are also reflected in the study conducted in hospitals in Khartoum, Sudan (2019) [8].

The shared use of needles, especially in the context of injecting drugs, is a well-documented and highly risky mode of transmission. The analysis of the perception of the risk of transmission by injecting drugs with an already used needle reveals that 302 respondents (94.97%) correctly consider the risk of transmission, indicating a broad awareness of the risk.

Health care workers have a key role in educating patients about the risks of transmission of HBV. In the survey, we observed that although the majority of doctors and nurses recognize the risk of sexual transmission of HBV, there is a significant percentage who do not consider this mode of transmission as risky. If a significant percentage of them do not correctly perceive the risk of sexual transmission, patients may be insufficiently informed, which may lead to risky sexual behavior. Lack of awareness of risk may contribute to the increased incidence of HBV in the population, as patients will not receive adequate advice to prevent infection through sexual contact. Healthcare workers who do not perceive the risk of sexual transmission may not implement all necessary preventive measures while caring for infected patients.

In the survey, 34 respondents (10.69%) mentioned that HBV can be transmitted by drinking from a glass used by an infected person, which can lead to unnecessary stigmatization of HBV-infected people and unwarranted fear among the public. This can lead to avoidance of normal social interactions, such as sharing meals or common utensils. Focusing on unlikely risks can distract attention from the real and significant ways in which HBV can be transmitted, such as unprotected sexual contact and the use of contaminated needles. This can undermine infection prevention and control efforts.

In the same vein, the misperception that there is no risk of transmission of HBV through tattooing and piercing by a segment of health care personnel may have serious consequences for public health and clinical practice, as they may provide incorrect information to patients and the general public. This can lead to unsafe practices and an increase in infections.

Vertical transmission of HBV from mother to fetus during pregnancy is a major mode of transmission. In this context, a detailed epidemiological review of HBV infection including vertical transmission and the impact of vaccination programs is presented by a group of authors [13]. The authors mention the awareness and knowledge of healthcare workers

about the risks of transmission and the necessary preventive measures.

## Conclusions

This study assessed the perceptions and knowledge of healthcare workers regarding the different modes of transmission of Hepatitis B (HBV), including transmission during dental treatment, from asymptomatic persons, by kissing, injecting drugs, sexual contact, tattooing, and piercing, and from mother to fetus during pregnancy. A proper understanding of these risks is essential for effective infection prevention and implementation of safe clinical practices. The level of knowledge of the HBV transmission pathway observed in this study is relatively adequate, but at the same time, significant gaps in knowledge of the risks of HBV transmission were revealed. Thus, we emphasized the need for continuous education and well-targeted awareness campaigns to ensure that healthcare workers are well informed about the risks of HBV transmission and the necessary preventive measures. By addressing gaps in knowledge and promoting safe practices, we can significantly reduce the risk of HBV transmission and improve overall public health. It is essential to continue education and awareness-raising efforts to ensure informed and safe medical practice, thereby protecting patients and the community from HBV infections.

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