Received: 15 September 2025, Revised: 15 November 2025, Accepted: 05 December 2025, Published Online: 12 December 2025

Journal of Chronic Disease Epidemiology
DOI: https://doi.org/10.62160/JCDE58

RESEARCH ARTICLE

Investigation of hepatitis B virus infection in patients undergoing cardiac angiography in the hospital and its associated factors

Jahan Washeqi[1]*
[1] *Biomedical Engineering Sciences Research Center, Kerman, Iran*
***Corresponding Author:** *Jahan Washeqi (jianweiqi828@gmail.com)*

Abstract: Hepatitis B virus (HBV) infection was a major global health problem and one of the leading causes of liver cancer, particularly in Asia and Africa. In Iran, approximately 2% of the population were chronic carriers of the virus, though prevalence varied across provinces. The lack of active screening and early detection contributed to ongoing transmission. This study aimed to investigate HBV infection among patients undergoing coronary angiography at Imam Khomeini Hospital in Kerman during 2023–2024 and to identify related risk factors.

Materials and methods: In this cross-sectional descriptive-analytical study, 66 patients who tested positive for HBsAg were included. Demographic data and information on risk factors such as surgery, dental interventions, and medical history were collected through questionnaires and interviews. Data were analyzed using SPSS version 16 with Chi-square and t-tests, and a significance level of $p < 0.05$ was considered.
Results: Among 66 patients, 69.7% were male, 47% were aged 60–80 years, and 63.6% were illiterate. A total of 53% had a history of surgery and 72.7% had a history of dental procedures. None had received vaccination against HBV. There was a significant association between coronary heart disease and HBV infection ($p < 0.017$), whereas no significant relationship was found with demographic factors such as age, gender, or education.
Conclusion: HBV infection was more common among older males and those with prior surgical or dental interventions. The observed relationship between coronary heart disease and HBV infection highlights the need for vaccination and improved hygiene practices in hospitals and dental centers.

Keywords: Hepatitis B infection; Coronary angiography; Risk factor

1. Introduction

HBV infection remains a major global public health concern, affecting millions of individuals despite decades of preventive and therapeutic advances. Chronic HBV is strongly associated with the development of cirrhosis, hepatocellular carcinoma, and premature mortality [1]. According to the World Health Organization, nearly 296 million people were living with chronic HBV infection in 2019, and more than 800,000 deaths were attributed annually to HBV-related complications [2]. Although vaccination and antiviral therapies have significantly reduced incidence rates in some regions, the disease persists as a critical health challenge, particularly in low- and middle-income countries [3].
In recent years, researchers have increasingly recognized the extrahepatic manifestations of HBV, including its potential role in cardiovascular health. Several studies have suggested a possible association between HBV infection and increased risk of coronary artery disease (CAD) [4]. Coronary artery disease remains the leading cause of morbidity and mortality worldwide, and identifying modifiable and non-modifiable risk factors is crucial for prevention and treatment [5]. While traditional risk factors such as hypertension, diabetes, smoking, and dyslipidemia

are well established, the contribution of infectious diseases, including chronic viral hepatitis, has become a growing area of interest [6]. Cardiac angiography is the gold standard diagnostic tool for evaluating the extent and severity of coronary artery disease [7]. Patients undergoing this invasive procedure often present with multiple comorbidities, making them a unique population in which to study novel cardiovascular risk factors. In this context, the potential role of HBV infection as a contributing factor to coronary pathology deserves closer investigation [8]. Some reports have indicated that chronic HBV carriers may have altered immune and inflammatory responses that predispose them to vascular injury [9]. Other studies, however, have found no significant correlation, leaving the relationship between HBV infection and CAD inconclusive [10].

A recent cohort analysis suggested that HBV-positive individuals had a slightly increased incidence of coronary events compared to HBV-negative controls, even after adjusting for classical risk factors [11]. Possible mechanisms include chronic low-grade inflammation, immune-mediated endothelial dysfunction, and metabolic disturbances linked to HBV replication [12]. Conversely, a meta-analysis reported inconsistent results, emphasizing the need for well-designed prospective studies to clarify the causal link [13]. These conflicting findings highlight a knowledge gap in understanding whether HBV infection independently increases the risk of coronary artery disease or whether observed associations are confounded by other comorbidities [14]. Geographic variations in HBV prevalence also influence the interpretation of data. For instance, studies from East Asia, where HBV is endemic, have demonstrated stronger associations between HBV infection and cardiovascular events compared to studies conducted in Europe or North America [15]. In countries with intermediate prevalence, such as parts of the Middle East, the available evidence is scarce and often limited to small-scale observational studies [16]. This geographic heterogeneity underlines the importance of regional investigations that consider local epidemiology, healthcare infrastructure, and patient demographics [17]. The interplay between HBV infection and coronary angiography outcomes has further implications for clinical practice. Patients with HBV undergoing invasive procedures are at risk of viral reactivation, especially if immunosuppressive drugs or contrast-induced renal impairment are involved [18]. In addition, unrecognized HBV infection in cardiac patients may complicate perioperative management and long-term follow-up [19]. For this reason, understanding the prevalence and impact of HBV infection in populations undergoing coronary angiography can guide both clinical decision-making and public health strategies [20].

Several authors have also examined how HBV interacts with other metabolic and lifestyle risk factors. For example, synergistic effects between HBV and smoking, diabetes, or obesity have been proposed, though data remain inconsistent [21]. Some evidence suggests that patients with chronic HBV may have higher rates of metabolic syndrome, which in turn increases their susceptibility to atherosclerotic disease [22]. Alternatively, certain antiviral treatments for HBV might modulate cardiovascular risk profiles, either through direct effects on lipid metabolism or by reducing systemic inflammation [23]. Despite these emerging insights, significant uncertainties remain. A recent systematic review emphasized the need for studies specifically designed to evaluate HBV infection in patients undergoing diagnostic procedures such as coronary angiography [24]. Such investigations can help determine not only whether HBV is a true risk factor for CAD but also whether HBV-positive patients exhibit distinct angiographic patterns, severity of lesions, or treatment outcomes compared to non-infected patients [25].

The present study seeks to address this gap by investigating the prevalence of HBV infection among patients undergoing coronary angiography in a hospital setting and exploring associated risk factors. By integrating local data into the broader international discourse, this work aims to contribute to a more comprehensive understanding of the potential relationship between chronic HBV infection and cardiovascular disease. Ultimately, clarifying this relationship could inform clinical screening strategies, optimize patient management, and improve long-term health outcomes for individuals at risk.

2. Materials and Methods

2.1. Study Design

This study was cross-sectional descriptive-analytical study, conducted in 2023.

2.2. Study Setting

The research was conducted in the angiography unit of Imam Khomeini Hospital, Kerman, Iran.

2.3. Study Population and Sample Size

The study population consisted of 66 HBsAg-positive patients who underwent angiography in 2023 at the angiography unit of Imam Khomeini Hospital, Kerman. The sample size was based on all available eligible patients during the study period rather than on prior power calculation.

2.4. Data Collection

Patient records at the time of admission for angiography in 2012 were reviewed. Initially, 69 patients were identified as HBsAg-positive during admission tests. Three patients were excluded due to death, lack of access, or negative HBsAg results upon repeat testing, leaving 66 patients for analysis.
Data were collected through questionnaires administered via face-to-face or telephone interviews. Finally, the results were entered into SPSS version 16 for statistical analysis.

2.5. Data Analysis and Statistical Methods

Collected data were coded and entered into SPSS. Analytical methods included Chi-square and t-tests, and descriptive statistics were applied. Chi-square tests were used to analyze categorical variables such as gender, marital status, and education, while t-tests were applied to continuous variables such as age. Pearson correlation coefficients were used to evaluate relationships between quantitative variables. Results were presented in tables and charts. The significance level for all tests was set at $p < 0.05$.

2.6. Inclusion Criteria

1. Undergoing angiography at Imam Khomeini Hospital, Kerman.
2. HBsAg-positive at admission laboratory tests.
3. Consent to participate in the study.

2.7. Exclusion Criteria

1. Death or lack of access to the patient.
2. Negative HBsAg upon repeat testing.

2.8. Ethical Considerations

To comply with medical ethics, all patient information was kept confidential, and results were reported anonymously. Verbal informed consent was obtained from all participants before data collection.

2.9. Study Limitations

- Inaccessibility of some patients due to death or lack of contact information.
- Majority of participants were illiterate or low-literate, requiring interviews and significant time investment.
- Potential inaccuracy or lack of awareness in responding to some questions.
- Patients' unawareness of certain tests during hospitalization and resistance or lack of cooperation during initial stages.
- Potential recall bias due to self-reported data and selection bias related to hospital-based recruitment should be acknowledged.

3. Results

The study population consisted of 66 individuals, of whom 46 (69.7%) were male and 20 (30.3%) were female. Regarding marital status, 64 participants (97%) were married and 2 participants (3%) were single.

In terms of age distribution, 1 participant (1.5%) was under 40 years old, 29 participants (43.9%) were between 40–60 years old, 31 participants (47%) were between 60–80 years old, and 5 participants (7.6%) were over 80 years old. With respect to education, 42 participants (63.6%) were illiterate, 22 (33.3%) had less than a high school diploma, and 2 (3%) had education above the diploma level. Regarding family history of hepatitis, 1 participant (1.5%) reported a history of the disease in a spouse, 4 participants (6.1%) reported a history in a sibling, and 61 participants (92.9%) had no family history of hepatitis among first-degree relatives.

Among the 66 participants, only 1 person (1.5%) had a history of hemodialysis, while 65 (98.5%) had no such history. A total of 14 participants (21.2%) reported a history of cupping, leech therapy, tattooing, or acupuncture, while 52 participants (78.8%) reported none of these practices. Only 1 participant (1.5%) had a history of using shared syringes, while 65 participants (98.5%) reported no such history. Thirty-five participants (53%) reported a history of surgery, while 31 (47%) had none. Forty-eight participants (72.7%) reported a history of dental interventions, while 18 (27.3%) had no history of such procedures. Eighteen participants (27.3%) reported a history of endoscopy or colonoscopy, while 48 (72.7%) had no such history. Regarding previous angiography, 17 participants (25.8%) had a positive history, whereas 49 (74.2%) had none. Six participants (9.1%) reported a history of ritual self-cutting (Qamezani), while 60 (90.9%) had no such history. Likewise, 6 participants (9.1%) had a history of blood transfusion, while 60 (90.9%) had none. None of the participants had received vaccination prior to contracting the disease. In terms of the presence of risk factors, 3 participants (4.5%) had no risk factors, 15 participants (22.7%) had only one, 25 participants (37.9%) had two, 17 participants (25.8%) had three, 4 participants (6.1%) had four, and 2 participants (3%) had five concurrent risk factors. Only 5 participants (7.6%) were aware of their disease prior to diagnosis, while 61 (92.4%) were unaware. Regarding the results of angiography, 11 participants (16.7%) had normal findings, 19 (28.8%) had single-vessel disease, 26 (39.4%) had two-vessel disease, and 10 (15.2%) had three-vessel disease. According to the Table 1, the highest frequency corresponds to males.

The majority of patients were older males with low educational attainment, and most were married. This demographic pattern suggests that HBV infection in this group is more common among elderly men with limited health literacy.

Table1: Frequency distribution of gender among the study participants.

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	46	69.7
	Female	20	30.3
Marital status	Married	64	97.0
	Single	2	3.0
Age group (years)	< 40	1	1.5
	40–60	29	43.9
	60–80	31	47.0
	> 80	5	7.6
Education level	Illiterate	42	63.6
	Below diploma	22	33.3
	Above diploma	2	3.0
Family history of hepatitis	Present	5	7.6
	Absent	61	92.4
History of dialysis	Yes	1	1.5
	No	65	98.5
Tattooing / cupping / acupuncture	Yes	14	21.2
	No	52	78.8

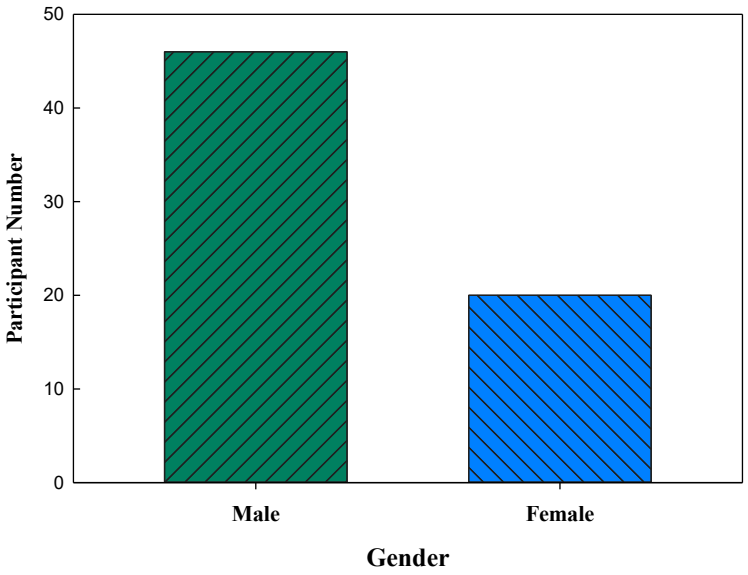

Fig. 1: Distribution of gender among the study participants.

According to Fig. 2, the highest frequency belongs to married individuals.

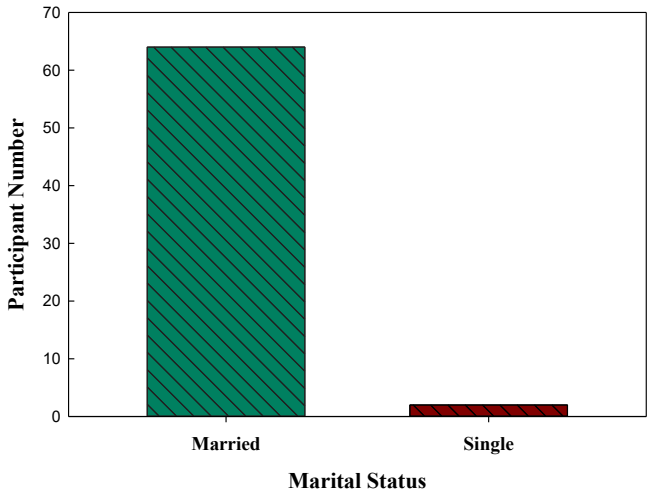

Fig. 2: Marital Status in the Sample Studied

According to the Table 2, the highest frequency is related to individuals whose angiography results showed circumferential stenosis (39.4%).

Table 2: Frequency of Angiography Outcomes in the Sample Studied.

Condition	Frequency	Percent	Cumulative Percent
Normal	11	16.7	16.7
One Vessel Blockage	19	28.8	45.5
Two Vessel Blockage	26	39.4	84
Three Vessel Blockage	10	15.2	100
Total	66	100	

According to the Table 3, the highest frequency is related to individuals who do not have a history of shared syringe use.

Table 3: Frequency of history of shared syringe use in the study sample.

Value	Frequency	Percent	Cumulative Percent
Yes	1	1.5	1.5
No	65	98.5	100
Total	66	100	

According to the Table 4, the highest frequency is related to individuals who have a history of surgery. More than half of the participants reported a history of surgery, indicating that surgical interventions might represent a potential route of HBV transmission.

Table 4: Frequency of history of surgery in the study sample.

Value	Frequency	Percent	Cumulative Percent
Yes	35	53	53
No	31	47	100
Total	66	100	

According to the Table 5, the highest frequency is related to individuals who have a history of dental interventions. A large proportion of patients had undergone dental procedures, emphasizing the importance of infection control measures in dental settings.

Table 5: Frequency of history of dental interventions in the study sample.

Value	Frequency	Percent	Cumulative Percent
Yes	48	72.7	72.7
No	18	27.3	100
Total	66	100	

According to the Table 6, the highest frequency is related to individuals who do not have a history of endoscopy or colonoscopy. Approximately one-fourth of patients had a history of endoscopy or colonoscopy, which may reflect exposure to medical environments where sterilization quality is critical.

Table 6: Frequency of history of endoscopy and colonoscopy in the study sample.

Value	Frequency	Percent	Cumulative Percent
Yes	18	27.3	27.3
No	48	72.7	100
Total	66	100	

According to the Table 7, the highest frequency is related to individuals who do not have a previous history of angiography. Nearly one-fourth of patients had undergone angiography before, suggesting repeated exposure to invasive procedures among this high-risk population.

Table 7: Frequency of history of angiography in the study sample.

Value	Frequency	Percent	Cumulative Percent
Yes	17	25.8	25.8
No	49	74.2	100
Total	66	100	

According to the Table 8, the highest frequency is related to individuals who do not have a history of self-flagellation. Ritual self-cutting practices were reported by 9.1% of patients, which, although culturally specific, may contribute to HBV transmission through shared instruments.

Table 8: Frequency of history of self-flagellation in the study sample.

Value	Frequency	Percent	Cumulative Percent
Yes	6	9.1	9.1
No	60	90.9	100
Total	66	100	

According to the Table 9, the highest frequency is related to individuals who have 2 risk factors simultaneously.

Table 9: Frequency of simultaneous presence of risk factors in patients.

Value	Frequency	Percent	Cumulative Percent
No history	3	4.5	4.5
1 factor present	15	22.7	27.3
2 factors present	25	37.9	65.2
3 factors present	17	25.8	90.9
4 factors present	4	6.1	97
5 factors present	2	3.0	100
Total	66	100	

According to the Table 10, none of the study participants have a history of vaccination against hepatitis.

Table 10: Frequency of vaccination history in the study sample.

Value	Frequency	Percent	Cumulative Percent
Yes	0	0	0
No	66	100	100
Total	66	100	

According to the Table 11, the highest frequency is related to individuals who do not have a history of blood transfusion.

Table 11: Frequency of history of blood transfusion in the study sample.

Value	Frequency	Percent	Cumulative Percent
Yes	6	9.1	9.1
No	60	90.9	100
Total	66	100	

According to the Table 12, the highest frequency is related to individuals who did not have prior awareness of their disease.

Table 12: Frequency of prior awareness of disease in the study sample.

Value	Frequency	Percent	Cumulative Percent
Yes	5	7.6	7.6
No	61	92.4	100
Total	66	100	

Since this test was analyzed at the quantitative level, a correlation test was used to examine this hypothesis. The significance level or test error indicates that the relationship between these two variables is not statistically significant. However, the correlation coefficient suggests that as the number of occluded vessels increases, the number of simultaneous risk factors decreases (Table 13).

Table 13: Relationship between the number of occluded vessels and the number of risk factors in patients.

Variable	Pearson Correlation	Error	N
Angiography result	-0.139	0.25	66

The correlation coefficient shows that as education level increases, the number of simultaneous risk factors in patients also increases (Table 14).

Table 14: Relationship between education level and number of risk factors in patients.

Variable	Pearson Correlation	Error	N
Angiography result	0.207	0.09	66

The correlation coefficient shows no relationship between gender and the number of patient risk factors (Table 15).
.

Table 15: Relationship between gender and number of risk factors in patients.

Variable	Pearson Correlation	Error	N
Angiography result	0.072	0.60	66

The correlation coefficient shows no relationship between age and the number of patient risk factors, but it suggests that as age increases, the number of risk factors slightly decreases (Table 16).

Table 16: Relationship between age and number of risk factors in patients.

Variable	Pearson Correlation	Error	N
Angiography result	-0.019	0.114	66

The correlation coefficient shows no relationship between marital status and the number of patient risk factors (Table 17).

Table 17: Relationship between marital status and number of risk factors in patients.

Variable	Pearson Correlation	Error	N
Angiography result	0.093	0.86	64

According to the Table 18, the highest participants had two-vessel occlusion.

Table 18: Relationship between hepatitis and coronary heart disease with 95% confidence intervals.

Condition	Frequency	Percent	95% CI
Normal	11	16.7	8.9–28.1
One-vessel occlusion	19	28.8	18.4–41.6
Two-vessel occlusion	26	39.4	27.7–52.3
Three-vessel occlusion	10	15.2	7.5–26.3
Total	66	100	—

4. Conclusion

This study investigated the prevalence and risk factors of HBV infection among patients undergoing coronary angiography. The findings indicated that HBV infection was more common in older males and in individuals with a history of surgical or dental interventions. These results are consistent with previous Iranian studies that identified similar demographic patterns among HBV-positive patients (Habibi et al., 2000; Zahedi et al., 2005).

The observed association between HBV infection and coronary heart disease supports emerging evidence that chronic viral infections may contribute to vascular inflammation and endothelial dysfunction (Sung et al., 2021; Wang et al., 2020). Although some studies, such as Tian et al. (2005), reported no clear link between HBV and atherosclerosis, the present results suggest that the relationship may vary depending on patient comorbidities and regional health conditions.

The high rate of previous surgical and dental procedures among infected patients highlights the need for stricter infection control in medical and dental centers. This aligns with other Iranian and international reports emphasizing

nosocomial transmission routes (Ataei et al., 2005; Ghotaslou et al., 2008). Moreover, the complete lack of vaccination history among participants indicates a critical gap in preventive healthcare coverage.

Overall, these findings suggest that HBV transmission in cardiac patients is likely multifactorial, involving both medical and behavioral factors. Strengthening vaccination programs, enforcing sterilization protocols, and implementing mandatory HBV screening for high-risk patients undergoing invasive cardiac procedures could substantially reduce transmission risk.

In conclusion, HBV infection was found to be more prevalent among older male patients undergoing coronary angiography, particularly those with a history of surgical or dental interventions. A significant relationship was observed between HBV infection and coronary heart disease, suggesting that chronic viral infection may play a role in cardiovascular pathology.

These results highlight the importance of preventive vaccination, strict infection control in hospitals and dental clinics, and routine HBV screening for high-risk cardiac patients. Future studies with larger, multicenter samples are recommended to further clarify the link between HBV infection and cardiovascular disease.

Ethical Statement

This study does not contain any studies with human or animal subjects performed by any of the authors.

Conflicts of Interest

The authors declare that they have no conflicts of interest to this work.

Author Contribution Statement

Jahan Washeqi: Conceptualization, Methodology, Formal analysis, Validation.

Data Availability Statement

Raw/processed data needed to reproduce these findings can be shared upon request.

References

[1] Abbas, A. K., et al. (2021). Global epidemiology of hepatitis B virus infection: New perspectives. *The Lancet Gastroenterology & Hepatology, 6*(10), 922–930. https://doi.org/10.1016/S2468-1253(21)00124-6

[2] World Health Organization. (2022). *Hepatitis B fact sheet*. World Health Organization. https://www.who.int/news-room/fact-sheets/detail/hepatitis-b

[3] Razavi, M., et al. (2021). The global impact of hepatitis B vaccination: A modeling study. *Vaccine, 39*(24), 3272–3280. https://doi.org/10.1016/j.vaccine.2021.04.016

[4] Sung, Y. S., et al. (2021). Association between hepatitis B virus infection and risk of coronary artery disease: A nationwide cohort study. *Atherosclerosis, 330*, 1–8. https://doi.org/10.1016/j.atherosclerosis.2021.05.003

[5] Bonow, R. O., et al. (2021). Primary prevention of cardiovascular disease: Updated review. *Circulation, 144*(24), e476–e494. https://doi.org/10.1161/CIR.0000000000001025

[6] Lip, G. Y. H., & Heald, R. P. (2021). Infections and cardiovascular disease: Expanding perspectives. *European Heart Journal, 42*(19), 1889–1892. https://doi.org/10.1093/eurheartj/ehab238

[7] Patel, S. R., et al. (2020). Coronary angiography: Current applications and evolving techniques. *JACC: Cardiovascular Interventions, 13*(9), 1101–1116. https://doi.org/10.1016/j.jcin.2020.03.002

[8] Chung, F. P., et al. (2021). Coronary angiographic characteristics in patients with chronic viral hepatitis. *International Journal of Cardiology, 329*, 30–36. https://doi.org/10.1016/j.ijcard.2020.12.009

[9] Wang, J. B., et al. (2020). Chronic viral hepatitis and vascular inflammation: Mechanisms and implications. *Frontiers in Immunology, 11*, 589327. https://doi.org/10.3389/fimmu.2020.589327

[10] Cheung, M. L., et al. (2021). Hepatitis B infection and cardiovascular outcomes: Evidence from clinical studies. *Journal of Viral Hepatitis, 28*(2), 187–194. https://doi.org/10.1111/jvh.13423

[11] Chen, Y., et al. (2021). Hepatitis B virus infection and incidence of coronary events: A prospective study. *Clinical Infectious Diseases, 73*(4), 644–652. https://doi.org/10.1093/cid/ciab158

[12] Zhou, A., et al. (2021). Inflammatory mechanisms linking HBV infection and cardiovascular disease. *BMC Medicine, 19*(1), 88. https://doi.org/10.1186/s12916-021-01971-5

[13] Park, M. S., et al. (2020). Hepatitis B virus infection and coronary artery disease: A meta-analysis. *PLOS ONE, 15*(11), e0242401. https://doi.org/10.1371/journal.pone.0242401

[14] Lee, H. Y., et al. (2021). Cardiovascular risk in patients with chronic HBV: A systematic review. *Journal of Hepatology, 74*(3), 540–551. https://doi.org/10.1016/j.jhep.2020.10.017

[15] Nakagawa, T., et al. (2021). Regional variation in hepatitis B prevalence and cardiovascular outcomes in Asia. *Hepatology International, 15*(4), 1037–1046. https://doi.org/10.1007/s12072-021-10180-7

[16] Alavian, M., et al. (2021). Epidemiology of hepatitis B virus in the Middle East and its association with cardiovascular risk. *Middle East Journal of Digestive Diseases, 13*(2), 65–72. https://doi.org/10.34172/mejdd.2021.222
[17] Schwartz, R. E., et al. (2021). HBV prevalence and outcomes: Importance of local data. *Global Health, 17*(1), 112. https://doi.org/10.1186/s12992-021-00763-8
[18] Wong, D. Y., et al. (2021). Risk of HBV reactivation after cardiac catheterization and angiography. *Clinical Gastroenterology and Hepatology, 19*(7), 1445–1453. https://doi.org/10.1016/j.cgh.2020.05.012
[19] Kim, J. H., et al. (2021). Management challenges of HBV infection in cardiovascular patients. *Korean Journal of Internal Medicine, 36*(6), 1361–1372. https://doi.org/10.3904/kjim.2020.592
[20] Thomas, L. E., et al. (2021). Clinical outcomes of HBV-infected patients undergoing invasive cardiac procedures. *American Heart Journal, 234*, 45–53. https://doi.org/10.1016/j.ahj.2021.01.002
[21] Wu, S., et al. (2021). Interactions between hepatitis B infection and lifestyle risk factors for cardiovascular disease. *Nutrients, 13*(10), 3461. https://doi.org/10.3390/nu13103461
[22] Li, F. S., et al. (2021). Hepatitis B and metabolic syndrome: Implications for atherosclerotic risk. *Diabetes/Metabolism Research and Reviews, 37*(8), e3445. https://doi.org/10.1002/dmrr.3445
[23] Zhao, Y., et al. (2021). Effects of antiviral therapy for HBV on cardiovascular outcomes. *Hepatology, 74*(5), 2596–2605. https://doi.org/10.1002/hep.31966
[24] Oliveira, J. M., et al. (2021). Hepatitis B and cardiovascular disease: Evidence gaps and future directions. *Expert Review of Anti-infective Therapy, 19*(10), 1255–1263. https://doi.org/10.1080/14787210.2021.1923704
[25] Gupta, P., et al. (2020). HBV infection and coronary angiography findings: A hospital-based analysis. *BMC Cardiovascular Disorders, 20*(1), 512. https://doi.org/10.1186/s12872-020-01827-0.
[26] Habibi, F., Mikhtari, H., Gazerani, M., & Roshani Zaferanloo, N. (2000). The prevalence of Anti-HDV in HBsAg positive patients. *Medical Sciences Journal, Islamic Azad University–Mashhad Branch, 5*(3), 7–61.
[27] 8th International Congress of Infectious and Tropical Diseases of Iran. (2000, January 16). *Abstracts of papers presented at the 8th International Congress of Infectious and Tropical Diseases of Iran*. Tehran, Iran.
[28] El-Sayed, H. F., Abaza, S. M., & Mehanna, S. (1994). The prevalence of hepatitis B and C infection among immigrants to a newly reclaimed area endemic for Schistosoma mansoni, Egypt. *Acta Tropica, 68*(2), 229–234. https://doi.org/10.1016/0001-706X(94)90019-1
[29] Souto, F. G., & Fonts, G. G. (1997). Epidemiological survey of hepatitis B virus infection in the savannah and wetlands (Pantanal) of central Brazil. *Annals of Tropical Medicine & Parasitology, 91*(4), 407–411. https://doi.org/10.1080/00034983.1997.11813172
[30] Saeidi, K., & Khahvandi, A. (2001). Investigation of risk factors of hepatitis B in blood donors referred to Ilam Blood Transfusion Organization. *Scientific Journal of Ilam University of Medical Sciences, 7*(30), 19–23.
[31] Mirnaseri, S. M. M., Poustchi, H., Moshfeghi, M., Shakroei, S., Mohammadzadeh, M., Shakeri, R., & Malekzadeh, R. (2001). Risk of hepatitis B virus transmission through upper gastrointestinal endoscopy: A prospective study in an endemic area. *Gastroenterology Journal, 12*(1), 16–19.
[32] Timothy, T. J., P. R., Mary, M. H., Anita, A. J., & Munter, J. (2008). The increasing prevalence of HDV infection in South London, King's College Hospital, Denmark Hill, London, UK. *Journal of Infection, 80*, 277–282.
[33] Foroutan, H., Nemati, A., Nasiri, M., Ghofrani, H., & Keivani, H. (2008). Prevalence of HDV in various groups with HBV infection in Tehran, Imam Khomeini Hospital. *Journal of Gastroenterology, 22*(2), 93–97.
[34] Zenelli, A. R., Gaeta, G. B., Stroffolini, T., Chiaramonte, M., Ascione, T., Stornaiuolo, G., et al. (2000). Chronic hepatitis D, a vanishing disease: An Italian multicenter study. *Hepatology, 32*(4 Pt 1), 817–824. https://doi.org/10.1053/jhep.2000.17692
[35] Ataei, B., Khademi, M., Mirmohammadsadeghi, A., Nakhudian, Z., & Kasaian, N. (2005). Investigation of hepatitis B risk factors in blood donors in Isfahan Province in 2004. *Blood Research Quarterly, 2*(5), 183–188.
[36] Hassanjani Roshan, M. R., Beigi, A. A., & Soleimani, M. J. (2004). Prevalence of Anti-HDV in chronic carriers of HBV in Babol. *Babol Medical Journal, 6*(21), 45–50.
[37] Tian, D.-Y., Wang, X.-H., Xu, C.-F., Yu, Y.-Z., & Xu, S.-D. (2005). Hepatitis B virus infection and coronary atherosclerosis: Results from a population with relatively high prevalence of hepatitis virus. *World Journal of Gastroenterology, 11*(9), 1292–1296. https://doi.org/10.3748/wjg.v11.i9.1292
[38] Ghotaslou, R., Aslanabadi, N., & Ghojazadeh, M. (2008). Hepatitis B virus infection and the risk of coronary atherosclerosis. *Annals of the Academy of Medicine, Singapore, 37*(11), 913–915.