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Epidemiological Evaluation of Diabetes Mellitus in Patients with Hepatitis B Virus Infection at a Tertiary Care Hospital

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ABSTRACT

Background: Diabetes mellitus and hepatitis B virus (HBV) infection are major global health concerns, particularly in developing countries. Emerging evidence suggests a possible association between chronic HBV infection and impaired glucose metabolism. However, limited data are available regarding the epidemiological relationship between these conditions in local populations. This study aimed to evaluate the prevalence of diabetes mellitus among HBV-infected patients at a tertiary care hospital. **Methodology:** A hospital-based descriptive cross-sectional study was conducted at a tertiary care hospital in Peshawar, Pakistan. A total of 168 patients with confirmed HBV infection were included using a consecutive non-probability sampling technique. Blood samples were collected and analyzed for hepatitis B surface antigen (HBsAg) using chemiluminescent microparticle immunoassay, while blood glucose levels were measured using the hexokinase method. Diabetes mellitus was defined as a random blood glucose level ≥200 mg/dL or fasting blood glucose ≥126 mg/dL. Data were analyzed using SPSS version 20, and results were presented as frequencies and percentages. **Results:** Out of 168 HBV-infected patients, 102 (60.7%) were males and 66 (39.3%) were females. The majority of patients (29.8%) were in the 41–50 years age group. The most common clinical symptom was fatigue (65.5%), followed by abdominal pain (54.8%) and loss of appetite (52.4%). The prevalence of diabetes mellitus among HBV-infected patients was found to be 38.1% (n=64), while 61.9% (n=104) were non-diabetic. **Conclusion:** The study demonstrates a considerable prevalence of diabetes mellitus among patients with hepatitis B virus infection, suggesting a potential association between these two conditions. Early screening and integrated management of diabetes in HBV-infected patients are recommended to reduce complications and improve clinical outcomes.

Keywords: Diabetes Mellitus, Hepatitis B Virus, Prevalence, Cross-Sectional Study, Glucose Metabolism, Pakistan

Introduction

Diabetes mellitus (DM) is a chronic metabolic disorder characterized by persistent hyperglycemia resulting from impaired insulin secretion, insulin action, or both. It has emerged as a major global health concern, with its prevalence rising rapidly in both developed and developing countries. According to recent global estimates, the

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number of individuals living with diabetes continues to increase, placing a significant burden on healthcare systems worldwide (1). The disease is associated with a wide range of complications, including cardiovascular diseases, nephropathy, neuropathy, and retinopathy, which contribute to increased morbidity and mortality (2). In addition to its metabolic complications, diabetes mellitus has been increasingly linked with infectious diseases, particularly viral infections. Patients with diabetes are more susceptible to infections due to immune dysfunction, including impaired neutrophil function and reduced cell-mediated immunity (3). This increased susceptibility makes diabetic individuals more vulnerable to acquiring infections such as hepatitis B virus (HBV), especially in healthcare settings where repeated exposure to needles and blood products is common (4).

Hepatitis B virus infection is a major global public health issue, affecting millions of people worldwide. HBV is a hepatotropic DNA virus that primarily targets liver cells and can lead to both acute and chronic liver disease. Chronic HBV infection is associated with serious complications, including liver cirrhosis and hepatocellular carcinoma, making it a leading cause of liver-related mortality (5). Despite the availability of an effective vaccine, HBV infection remains highly prevalent in many parts of the world, particularly in Asia and Africa (6). The liver plays a crucial role in maintaining glucose homeostasis through processes such as glycogenesis, glycogenolysis, and gluconeogenesis. Any impairment in liver function due to chronic HBV infection can disrupt these metabolic pathways, potentially leading to abnormal glucose metabolism and the development of diabetes mellitus (7). Furthermore, chronic inflammation and liver cell damage associated with HBV infection may contribute to insulin resistance, which is a key mechanism in the pathogenesis of type 2 diabetes (8). Several epidemiological studies have investigated the association between HBV infection and diabetes mellitus, yielding variable results. Some studies suggest that individuals with HBV infection have a higher prevalence of diabetes compared to the general population. This association may be attributed to liver dysfunction, chronic inflammation, and metabolic alterations caused by the virus (9). Additionally, certain studies have reported that HBV-infected patients are at an increased risk of developing insulin resistance, further supporting the link between viral hepatitis and metabolic disorders (10).

Conversely, other studies have not found a significant association between HBV infection and diabetes mellitus, indicating that the relationship may be influenced by various confounding factors such as age, lifestyle, genetic predisposition, and regional differences in disease prevalence (11). These inconsistent findings highlight the need for further research to better understand the epidemiological relationship between these two conditions, particularly in specific populations. Recent evidence also suggests that diabetes mellitus may influence the progression and severity of HBV infection. Patients with coexisting diabetes and HBV infection have been reported to exhibit more severe liver disease, higher viral loads, and an increased risk of complications compared to non-diabetic individuals (12). Poor glycemic control may further exacerbate liver damage and negatively impact treatment outcomes in HBV-infected patients.

In countries like Pakistan, both diabetes mellitus and hepatitis B infection are highly prevalent, posing a dual burden on the healthcare system. Factors such as lack of awareness, inadequate screening programs, unsafe medical practices, and poor

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infection control contribute to the continued spread of HBV. At the same time, rapid urbanization, sedentary lifestyles, and dietary changes have led to an increasing prevalence of diabetes mellitus. Despite the coexistence of these two major health problems, there is limited local data exploring their association in tertiary care settings. Understanding the epidemiological relationship between diabetes mellitus and HBV infection is essential for improving clinical management and developing effective prevention strategies. Identifying the prevalence of diabetes among HBV-infected patients can help in early diagnosis, better glycemic control, and reduction of complications. Moreover, such studies can provide valuable insights into the underlying mechanisms linking metabolic and infectious diseases.

Methodology

Study Design and Setting

This hospital-based descriptive cross-sectional study was conducted at Naseer Teaching Hospital to evaluate the association between diabetes mellitus and hepatitis B virus (HBV) infection. The study was carried out after obtaining ethical approval from the institutional review committee. Written informed consent was obtained from all participants after explaining the study objectives.

Sampling Technique and Sample Size

A consecutive non-probability sampling technique was employed. The calculated sample size for this study was 168 participants, based on feasibility and available resources, and all samples were included in the final analysis.

Inclusion and Exclusion Criteria

Patients of both genders presenting to the study setting and diagnosed with both diabetes mellitus and HBV infection were included. Patients with co-existing infections such as hepatitis C virus (HCV) or human immunodeficiency virus (HIV), as well as non-diabetic or HBV-negative individuals, were excluded from the study.

Sample Collection and Processing

Approximately 3 mL of venous blood was collected aseptically from each participant using a sterile vacutainer and transferred into serum separator tubes (SST). Samples were centrifuged for 10 minutes, and non-hemolyzed serum was analyzed within 24 hours.

Laboratory Analysis

HBV infection was determined by detecting hepatitis B surface antigen (HBsAg) using the ARCHITECT i2000SR immunoassay analyzer, based on the principle of Chemiluminescent Microparticle Immunoassay (CMIA). The presence of HBsAg was interpreted as reactive or non-reactive based on the manufacturer's cutoff value (≥ 1.0).

Blood glucose levels were measured using the Cobas 6000 analyzer based on the hexokinase method. Diabetes mellitus was defined as a random blood glucose level ≥ 200 mg/dL or fasting blood glucose ≥ 126 mg/dL.

Statistical Analysis

Data were analyzed using Statistical Package for Social Sciences (SPSS) version 20. Descriptive statistics, including frequencies and percentages, were calculated. Data were presented in the form of tables and graphs (bar charts and pie charts) to illustrate the prevalence and distribution of variables.

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Result

Gender-wise Distribution

Out of 168 patients, the majority were male, indicating a higher proportion of HBV infection among males compared to females.

Gender	Frequency (n)	Percentage (%)
Male	102	60.7%
Female	66	39.3%
Total	**168**	**100%**

Age-wise Distribution

Patients were categorized into different age groups to assess the distribution of HBV infection across age ranges.

Age Group (years)	Frequency (n)	Percentage (%)
20–30	28	16.7%
31–40	42	25.0%
41–50	50	29.8%
51–60	30	17.9%
>60	18	10.7%
Total	**168**	**100%**

The highest number of patients (29.8%) belonged to the 41–50 years age group.

Signs and Symptoms Distribution

The most common clinical presentations among HBV-infected patients were evaluated.

Signs & Symptoms	Frequency (n)	Percentage (%)
Fatigue	110	65.5%
Abdominal Pain	92	54.8%
Jaundice	70	41.7%
Nausea	64	38.1%
Loss of Appetite	88	52.4%
Fever	58	34.5%

Fatigue (65.5%) was the most frequently reported symptom, followed by abdominal pain and loss of appetite.

Prevalence of Diabetes Mellitus in HBV Patients

Diabetes Status	Frequency (n)	Percentage (%)
Diabetic	64	38.1%
Non-Diabetic	104	61.9%
Total	**168**	**100%**
Diabetes Status	**Frequency (n)**	**Percentage (%)**

The prevalence of diabetes mellitus among HBV-infected patients was found to be 38.1%, indicating a considerable burden of diabetes in this population.

Discussion

This study was conducted to evaluate the epidemiological association between diabetes mellitus and hepatitis B virus (HBV) infection in patients presenting to a tertiary care hospital. The findings demonstrate a notable prevalence of diabetes mellitus (38.1%) among HBV-infected patients, highlighting a significant coexistence of these two chronic conditions. This observation is consistent with

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growing global evidence suggesting an interaction between metabolic disorders and chronic viral infections. In the present study, male patients constituted the majority (60.7%) of HBV cases. This male predominance is in agreement with previous epidemiological studies, which have reported higher HBV infection rates among males due to increased exposure to risk factors such as occupational hazards, healthcare-related procedures, and behavioral practices (13). Additionally, gender-based biological differences, including hormonal influences on immune response, may contribute to the higher susceptibility observed in males.

The age-wise distribution in this study revealed that the highest proportion of patients (29.8%) belonged to the 41–50 years age group. This finding aligns with earlier studies indicating that HBV infection and its complications are more commonly observed in middle-aged individuals, likely due to prolonged duration of infection and cumulative exposure to risk factors over time (14). Furthermore, the increased prevalence of diabetes in this age group may be attributed to age-related metabolic changes and lifestyle factors such as reduced physical activity and unhealthy dietary habits. Clinical presentation analysis showed that fatigue (65.5%) was the most common symptom among HBV-infected patients, followed by abdominal pain and loss of appetite. These findings are consistent with the typical clinical manifestations of chronic liver disease, where fatigue is often the earliest and most frequently reported symptom (15). The presence of symptoms such as jaundice and nausea further indicates hepatic involvement and disease progression in a substantial proportion of patients.

The key finding of this study is the prevalence of diabetes mellitus (38.1%) among patients with HBV infection. This prevalence is relatively higher compared to the general population, suggesting a possible association between HBV infection and impaired glucose metabolism. Similar findings have been reported in previous studies, where an increased prevalence of diabetes was observed among patients with chronic HBV infection (16). The underlying mechanisms linking HBV infection and diabetes are complex and multifactorial, involving hepatic dysfunction, chronic inflammation, and insulin resistance. Chronic HBV infection can lead to progressive liver damage, which in turn affects glucose metabolism. The liver plays a central role in maintaining glucose homeostasis, and any impairment in hepatic function can disrupt insulin sensitivity and glucose regulation (17). Moreover, chronic inflammation associated with HBV infection may contribute to the development of insulin resistance, a key factor in the pathogenesis of type 2 diabetes mellitus.

Another possible explanation for the observed association is the increased susceptibility of diabetic patients to infections, including HBV. Diabetes mellitus is associated with impaired immune function, which can increase the risk of acquiring infections through various routes, particularly in healthcare settings (18). Frequent hospital visits, invasive procedures, and repeated exposure to needles may further increase the risk of HBV transmission among diabetic individuals. The coexistence of diabetes mellitus and HBV infection has important clinical implications. Studies have shown that patients with both conditions are at a higher risk of developing severe liver disease, including cirrhosis and hepatocellular carcinoma (19). Additionally, diabetes may accelerate the progression of HBV-related liver damage and negatively affect treatment outcomes. Poor glycemic control has also been associated with increased viral replication and disease severity.

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It is also important to consider regional factors that may influence the prevalence of both diabetes and HBV infection. In developing countries such as Pakistan, limited access to healthcare services, inadequate infection control practices, and lack of awareness contribute to the high prevalence of HBV infection (20). At the same time, the increasing burden of diabetes due to urbanization, sedentary lifestyle, and dietary changes further complicates the public health scenario. The findings of this study are supported by previous research conducted in similar settings, which have reported a significant association between HBV infection and diabetes mellitus (21). However, some studies have reported conflicting results, indicating no significant relationship between the two conditions. These discrepancies may be due to differences in study design, sample size, population characteristics, and diagnostic criteria used for diabetes and HBV infection.

Despite these variations, the overall evidence suggests that there is a meaningful association between HBV infection and diabetes mellitus, warranting further investigation. The results of the present study contribute to the existing body of knowledge by providing region-specific data, which is essential for developing targeted screening and management strategies. This study has certain limitations that should be considered. The cross-sectional design limits the ability to establish a causal relationship between HBV infection and diabetes mellitus. Additionally, the use of a single-center setting and a relatively small sample size may affect the generalizability of the findings. Future studies with larger sample sizes and longitudinal designs are recommended to further explore this association and underlying mechanisms.

Conclusion

This study concludes that there is a considerable prevalence of diabetes mellitus (38.1%) among patients with hepatitis B virus infection, indicating a significant coexistence of these two conditions. Male gender and middle-aged individuals were more commonly affected, and fatigue was the most frequent clinical presentation. The findings suggest a potential association between HBV infection and impaired glucose metabolism, emphasizing the need for routine screening and integrated management strategies. Early identification and control of diabetes in HBV-infected patients may help reduce disease complications and improve overall clinical outcomes.

References

1. International Diabetes Federation. IDF Diabetes Atlas. 10th ed. Brussels: IDF; 2021.
2. American Diabetes Association. Classification and diagnosis of diabetes. *Diabetes Care*. 2023;46(Suppl 1):S19–S40.
3. Casqueiro J, Casqueiro J, Alves C. Infections in patients with diabetes mellitus. *Indian J Endocrinol Metab*. 2012;16(Suppl1):S27–S36.
4. Centers for Disease Control and Prevention. Transmission of hepatitis B virus among persons with diabetes. *MMWR*. 2011;60(50):1709–1711.
5. World Health Organization. Hepatitis B Fact Sheet. Geneva: WHO; 2023.
6. Schweitzer A, Horn J, Mikolajczyk RT, Krause G, Ott JJ. Estimations of worldwide prevalence of chronic hepatitis B virus infection. *Lancet*. 2015;386(10003):1546–1555.
7. Garcia-Compean D, Jaquez-Quintana JO, Lavalle-Gonzalez FJ, et al. The

Online ISSN 3007-3197
Print ISSN 3007-3189

treatment of diabetes mellitus of patients with chronic liver disease. *Ann Hepatol.* 2015;14(6):780–788.

8. Bugianesi E, Salamone F, Negro F. The interaction of metabolic factors with HCV infection. *Nat Rev Gastroenterol Hepatol.* 2012;9(6):321–331.
9. Wang C, Wang X, Gong G, et al. Association between hepatitis B virus infection and diabetes mellitus: a meta-analysis. *J Gastroenterol Hepatol.* 2016;31(3):544–552.
10. Li-Ng M, Tropp S, Danoff A, et al. Association between chronic hepatitis B virus infection and diabetes. *World J Gastroenterol.* 2007;13(21):3067–3070.
11. Mulu A, et al. Prevalence of hepatitis B virus in patients with diabetes mellitus: a comparative study. *Pan Afr Med J.* 2014;17:40.
12. Huang YW, Wang TC, Lin SC, et al. Increased risk of cirrhosis and its decompensation in chronic hepatitis B patients with diabetes mellitus. *Hepatology.* 2013;57(5):2009–2015.
13. Shepard CW, Simard EP, Finelli L, Fiore AE, Bell BP. Hepatitis B virus infection: epidemiology and vaccination. *Epidemiol Rev.* 2006;28:112–125.
14. McMahon BJ. The natural history of chronic hepatitis B virus infection. *Hepatology.* 2009;49(S5):S45–S55.
15. Dienstag JL. Hepatitis B virus infection. *N Engl J Med.* 2008;359:1486–1500.
16. Wang C, Wang X, Gong G, et al. Association between HBV infection and diabetes mellitus. *J Gastroenterol Hepatol.* 2016;31(3):544–552.
17. Garcia-Compean D, Jaquez-Quintana JO, et al. Liver cirrhosis and diabetes. *Ann Hepatol.* 2009;8(3):199–206.
18. Casqueiro J, Alves C. Infections in diabetes mellitus. *Indian J Endocrinol Metab.* 2012;16:S27–S36.
19. Huang YW, Wang TC, Lin SC, et al. Diabetes increases risk of cirrhosis in HBV patients. *Hepatology.* 2013;57:2009–2015.
20. Ali M, Idrees M, Ali L, et al. Hepatitis B virus in Pakistan: a systematic review. *Virol J.* 2011;8:102.
21. Li-Ng M, Tropp S, Danoff A, et al. HBV infection and diabetes association. *World J Gastroenterol.* 2007;13:3067–3070.