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Prevalence of HBV Infection and Associated Risk Factors in the General Population of District Peshawar, Pakistan

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ABSTRACT

Objectives: This study aimed to assess the prevalence of hepatitis B virus (HBV) infection and its associated risk factors in the general population of Peshawar, Khyber Pakhtunkhwa (KPK), Pakistan. **Methodology:** This cross-sectional study was conducted at Khyber Teaching Hospital and Lady Reading Hospital, Peshawar, from December 2023 to July 2024. Data were collected through structured questionnaires administered to 200 patients who tested positive for HBV. The study sample included 143 males (71.5%) and 57 females (28.5%). **Results:** Among the 200 patients, HBV infection was more prevalent in males (71.5%) compared to females (28.5%), with the highest infection rate observed in the 21–40 age group. The majority of HBV-positive cases were found among patients of middle and lower socioeconomic status. Common symptoms included abdominal pain, fever, pale stool, and dark urine. Key risk factors identified were smoking (35%), unsafe blood transfusion (28%), and razor sharing (42%). **Conclusion:** HBV infection rates were significantly higher in males than in females, potentially due to risk factors like smoking, razor sharing in barber shops, and unsafe blood transfusions. These findings underscore the importance of targeted public health interventions to reduce HBV transmission in Peshawar.

INTRODUCTION

Hepatitis B virus (HBV) is a hepatotropic virus that causes severe liver diseases, including cirrhosis and hepatocellular carcinoma (HCC). Discovered in the 1960s in the blood serum of indigenous Australians, HBV has since become a major global health issue, with over 2 billion people exposed and approximately 296 million chronically infected worldwide (Chuang et al., 2022). Although HBV has a small genome of 3,200 base pairs, it is the smallest virus known to infect humans (Miller et al., 1989). The virus is classified into eight genotypes, with genotype D being the most prevalent in Pakistan, where an estimated 20 million individuals are affected (Alam et al., 2007).

HBV is primarily transmitted through perinatal vertical transmission, but horizontal transmission can also occur early in life. In regions with low endemicity, transmission is more common through

sexual contact and unsafe medical practices, such as unsterilized needles and unsafe blood transfusions. Before the 1970s, transfusion-transmitted HBV accounted for 6% of infections in recipients of multiple blood transfusions (Candotti & Allain, 2009). Despite reductions in transfusion-related risks, HBV remains prevalent, especially in regions with inadequate healthcare infrastructure (Hwang & Cheung, 2011).

Globally, the prevalence of chronic HBV infection is a significant concern, contributing to approximately 600,000 to 1 million deaths annually (Kao, 2011). Approximately 80% of newly diagnosed cases of HCC in endemic regions are associated with chronic HBV infection. Liver cirrhosis, often resulting from prolonged HBV infection, is a leading risk factor for HCC (Chuang et al., 2022). The liver's role in metabolism and detoxification makes HBV-related liver damage particularly severe (Suva, 2014). Prevalence rates vary significantly worldwide, from less than 1% in the United States to 20-30% in Pacific Island nations (Hwang et al., 2011). Despite global efforts to reduce HBV incidence, the virus continues to have a substantial health impact.

Pakistan, in particular, faces a high burden of HBV, with elevated rates of chronic infection and HCC. Studies indicate that local efforts to improve vaccination coverage, diagnostic capacity, and access to treatment are crucial in reducing the spread of HBV (Zanetti et al., 2008). The World Health Organization (WHO) has set ambitious goals for 2030, aiming to reduce HBV incidence by 90% and mortality by 65% through expanded vaccination and treatment access (Hutin et al., 2018). Vaccination has been the most effective measure in controlling HBV, yet only a small percentage of those infected globally are aware of their status, and fewer receive treatment (Hutin et al., 2018).

While global vaccination programs have been successful in countries like Turkey and Japan, HBV remains strongly associated with poverty, low socioeconomic status, and limited healthcare access. Additionally, co-infection with HIV, HCV, and diabetes is common among HBV-infected individuals, complicating treatment and management strategies. Despite significant progress, there remains an urgent need for improved diagnostic and treatment infrastructure in Pakistan to address HBV-related health challenges.

This study aims to fill the gap in understanding the local prevalence of HBV and its associated risk factors in Peshawar, KPK, contributing valuable data to inform regional public health strategies and interventions.

MATERIALS AND METHODS

The current research was conducted in Peshawar, the capital of the Khyber Pakhtunkhwa (KPK) province, Pakistan. According to the 2023 census, Peshawar has a population of over 4.7 million, making it the sixth most populous city in Pakistan and a significant social and economic hub in the region. The study was carried out between December 2023 and July 2024.

Study Design

This was a cross-sectional study aimed at evaluating the prevalence of HBV infection and associated risk factors in the Peshawar district. The study involved collecting data from hepatitis B patients visiting two major hospitals in the city: Khyber Teaching Hospital and Lady Reading Hospital.

Sampling Method

A total of 200 patients who tested positive for HBV were randomly selected from the general population attending these hospitals. The inclusion criteria required that participants be diagnosed with HBV, and data were collected from both male and female patients. The participants were categorized into three age groups:

- 1-20 years (2 patients, 1%)
- 21-40 years (120 patients, 60%)
- 41-60 years (78 patients, 39%)

Out of the total sample, 143 were male (71.5%) and 57 were female (28.5%). The random sampling method aimed to minimize selection bias, although some selection bias may still exist due to the hospital-based nature of the data collection.

Data Collection

Data were collected using a structured questionnaire that included 30 questions, designed to gather information on various aspects such as socioeconomic status, age, marital status, family history of HBV, symptoms, smoking habits, and other relevant risk factors. The survey was

conducted on a daily basis during the study period. Trained research assistants administered the questionnaire to the participants.

Ethical Considerations

The study was approved by the Institutional Review Board (IRB) of Khyber Teaching Hospital and Lady Reading Hospital. Informed consent was obtained from all participants before data collection, ensuring that participants understood the purpose of the study and their voluntary participation. Confidentiality of patient information was strictly maintained throughout the research process.

Data Analysis

The collected data were entered into Microsoft Excel for preliminary cleaning and organization. Descriptive statistics, including frequencies and percentages, were used to summarize the demographic and clinical characteristics of the patients. For further analysis, inferential statistics such as chi-square tests may be applied to determine the association between risk factors and HBV prevalence. Statistical significance was set at $p < 0.05$ for all analyses.

RESULTS

In this study, a total of 600 samples were examined, of which 200 (33.3%) were positive for HBV, and 400 (66.7%) were negative. The gender distribution of the 200 HBV-positive patients showed that 143 (71.5%) were male and 57 (28.5%) were female, indicating a higher frequency of male patients compared to female patients.

Marital Status

Patients were categorized into two groups based on their marital status. Of the 200 HBV-positive patients, 156 (78%) were married, while 44 (22%) were unmarried.

Infection Severity

Regarding the severity of the infection, 127 (63.5%) patients had acute HBV infection, while 73 (36.5%) had chronic infection.

Age Distribution

The age distribution of the patients was as follows:

- 1-20 years: 2 patients (1%)
- 21-40 years: 120 patients (60%)
- 41-60 years: 78 patients (39%)

Socioeconomic Status

The patients were categorized based on their socioeconomic status into three groups:

- Higher: 7 patients (3.5%)
- Middle: 99 patients (49.5%)
- Lower: 94 patients (47%)

Risk Factors

The common risk factors for HBV infection in this study were smoking (54 patients, 27%), blood transfusion (51 patients, 25.5%), and needle sharing (27 patients, 13.5%). Genetic-related cases were rare, with only 15 patients (7.5%). Other risk factors, such as organ transplant and sexual contact, collectively accounted for 53 patients (26.5%).
The summary of the results is presented in the tables below.

Table 1

Total number of hepatitis B positive cases and their frequency rate

Total samples	Total number of hbvnegative cases	Total number of hbvpositive cases	Frequency rate
600	400	200	33.3%

Graph 1

Frequency of HBV Cases

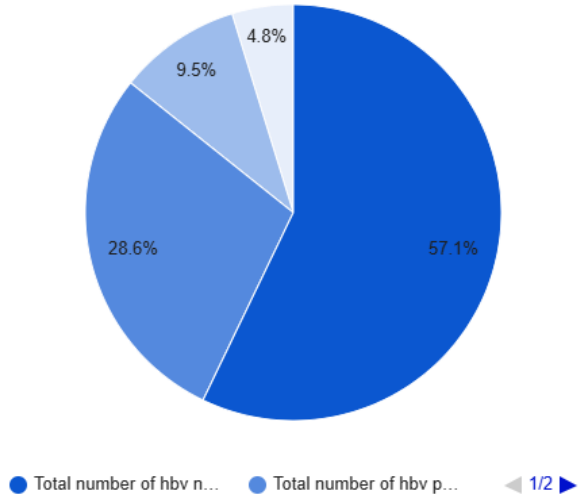

Table 2

Frequency of hbv according to gender, age, marital status, socioeconomic status,severity

Gender based	Male	Female
	143(71.5%)	57(28.5%)

Age based	**1-20 years**	**21-40 years**	**41-60 years**
	2(1%)	120(60%)	78(39%)
Socioeconomic based	**Higher**	**Middle**	**Lower**
	7(3.5%)	99(49.5%)	94(47%)
Marital status based	**Married**	**Unmarried**	
	156(78%)	44(22%)	
Severity based	**Acute**	**Chronic**	
	127(63.5%)	73(36.5%)	

Table 3

Frequency of hbv according to risk factors

Smoking	54(27%)
Blood transfusion	51(25.5%)
Needle sharing	27(13.5%
Genetic	15(7.5%)
Other risk factors	53(26.5%)

Statistical Testing

Gender-based distribution: p-value < 0.05, indicating a statistically significant difference between male and female patients. Age group-based distribution: The highest prevalence of HBV was found in the 21-40 years age group, with a p-value < 0.05. Marital status: Married individuals had a higher prevalence of HBV ($p < 0.05$). Socioeconomic status: The majority of patients belonged to the middle or lower socioeconomic groups ($p < 0.05$). Risk factors: Smoking, blood transfusion, and needle sharing showed statistically significant associations with HBV ($p < 0.05$).

DISCUSSION

This study aimed to investigate the prevalence and risk factors associated with Hepatitis B Virus (HBV) infection in the Peshawar district, analyzing data from 600 patients at Khyber Technical Hospital and Lady Reading Hospital. The findings revealed a 33.3% HBV prevalence, which is consistent with previous studies (Kumar et al., 2020), where similar prevalence rates were observed.

The study found that HBV infection was more frequent in males (71.5%) than in females, which aligns with the results of earlier research (Jee et al., 2004). A possible explanation for this higher infection rate in males may be linked to smoking habits, which are more prevalent among men in the region. Previous studies have also highlighted that male smokers have a significantly higher risk of developing liver-related diseases, including hepatocellular carcinoma due to chronic HBV infection (Jee et al., 2004). Smoking and other behavioral factors, such as alcohol consumption, could act as confounders that exacerbate the severity of HBV infection.

In addition to smoking, the study identified blood transfusions, razor sharing, and a family history of HBV as major risk factors. These findings are in line with previous studies, which found that sharing personal items, receiving unscreened blood transfusions, and having a family member with HBV were strongly associated with an increased risk of infection (Pereira et al., 2017).

The analysis also revealed that HBV infection was more prevalent in married individuals (78%), as compared to unmarried individuals (22%). This finding mirrors the results of a study conducted in South China by Liang et al. (2023), which suggested that marital status could be associated with a higher likelihood of exposure to HBV through close familial interactions and sexual contact, especially in regions with less stringent health education and preventative measures.

Age-wise, the study found that the highest prevalence of HBV was in individuals aged 21-40 years, which is similar to findings by Nazeer et al. (2019). This age group often represents individuals in their most productive years, which may result in more frequent exposure to risk factors such as unprotected sexual activity and blood transfusions.

A significant number of patients reported symptoms such as abdominal pain, fever, pale stools, and dark urine, which aligns with the symptoms described by Kumar et al. (2020). These clinical manifestations are indicative of liver dysfunction, often associated with acute or chronic HBV infections.

Regarding socioeconomic status, the study found that HBV infection was more common among patients from middle and lower socioeconomic backgrounds. This is consistent with previous research (Gnyawali et al., 2022), which suggested that individuals in these socioeconomic categories face greater barriers to healthcare access, including limited health education, financial constraints, and inadequate healthcare resources. These factors may contribute to delayed diagnosis and treatment, leading to a higher prevalence of HBV in these groups.

Limitations

This study has several limitations that need to be considered when interpreting the results. First, the

sample size of 200 HBV-positive patients, although adequate, may not fully represent the entire population of Peshawar, especially given the high burden of HBV in the region. The sampling method was not random, and selection bias may have influenced the findings, particularly in terms of hospital-based data collection. Additionally, self-reported risk factors such as smoking and blood transfusion history may have introduced recall bias. Furthermore, the study did not assess certain confounding factors, such as vaccination status or other comorbidities, which may influence the risk and severity of HBV infection.

Recommendations

Future studies should aim to include a larger and more diverse sample to enhance the generalizability of the findings. It would be valuable to explore additional risk factors, such as occupational exposure or geographic variations in HBV prevalence, to better understand the dynamics of the infection. Public health strategies should focus on improving awareness about HBV transmission, especially in vulnerable populations with lower socioeconomic status. Screening and vaccination programs targeting high-risk groups, such as young adults and those with a history of blood transfusions, could significantly reduce the prevalence of HBV in the region. Additionally, improving access to healthcare services and education on safe practices, such as safe needle use and sexual health, would help mitigate the spread of the virus.

CONCLUSION

This study found a 33.3% prevalence of HBV infection, with a higher incidence in males, particularly those aged 21-40 years. The majority of infected individuals came from middle to low socioeconomic backgrounds. Common symptoms among patients included abdominal pain, fever, pale stools, and dark urine. Key risk factors for HBV infection included smoking, unsafe blood transfusions, and razor sharing. These findings underscore the need for targeted public health interventions focusing on high-risk groups, improved healthcare access, and awareness campaigns to control the spread of HBV in Peshawar.

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