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DETECTION AND FREQUENCY OF HBV PROFILE IN CHRONIC HBV POSITIVE PATIENTS IN DISTRICT MARDAN, KHYBER PAKHTUNKHWA

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Abstract

Background: Hepatitis B Virus (HBV) infection is a significant health issue in most parts of the world especially those low-resource settings such as rural Pakistan. Complications of chronic HBV may be serious, as these lead to cirrhosis and hepatocellular carcinoma. The current study considered an evaluation of HBV serological marker prevalence and risk factors of chronic HBV-positive individuals in District Mardan, Khyber Pakhtunkhwa, Pakistan.

Purposes: The aim was to identify the rate of the HBV markers (HBsAg, HBeAg, HBcAg, HBsAb, HBeAb, and HBcAb) and assess vaccination status, access to treatment, and advanced education on the topic of HBV in the patients with the infection.

Methodology: It was a cross-sectional study with 50 samples of HBV positive blood selected in District Mardan. The serological markers were detected with the help of Immunochromatographic Technique (ICT). The processing of data was performed based on SPSS 23.0 and Microsoft Excel and concentrated on demographic allocation, risk factors, and healthcare gaps.

Results: All samples preserved positive results in HBsAg (100 percent) indicating an active infection. Additional markers were also found at a different rate: HBeAg (18%), HBcAg (6%), HBsAb (42%), HBeAb (14%) and HBcAb (4%). Among the primary results were low rates of vaccination (8%), access to treatment (78%), and health education (86%). There were unsafe medical practices and familial transmission as some of the risk factors.

Conclusion: The analysis report singles out the high burden of HBV infection in District Mardan, and a high gap in the prevention and treatment. Emerging Control Measures to curb the spread of HBV and the resulting effects to the community, untimely control measures should be adopted like enhanced vaccination, enhanced diagnostic capacity and community health education.

Keywords: Hepatitis B virus (HBV), Serological markers, Prevalence, Risk factors, Public health interventions.

Introduction

The Hepatitis B virus (or HBV) can be characterized as a small partially double stranded DNA virus which belongs to a family of viruses known as Hepadnaviridae [1]. Hepatitis B virus ranks number seven among all causes of deaths in the entire world. They estimate that greater than 257-291 million persons all around the world are chronically infected with the hepatitis B virus (HBV) [2]. According to the report, there were 2 billion global cases of HBV infection that WHO displayed; the HBV carrier burden on the world population was 5-15 percent. Furthermore WHO approximates the number of people killed by hepatitis to be the same 1.3 million as those of tuberculosis and more individuals are co-infected with HBV compared to those diseases that lead to death of individuals due to HIV. According to the research done in Pakistan, 20 million inhabitants of Pakistan have hepatitis B and C infections, and 150 thousand cases are registered every year [3].

The infection rate is progressively rising everyday and approximately 9 million Pakistanis are infected with HBV of which three percent are the carriers. The actual number of the infected individuals in some areas is not easy to

determine due to insufficiency of studies on the population and most epidemiological surveys would mention hospital patients as being the most highlighted. The low-income population in the rural arrangements comprises 67.5 percent Pakistanis, who are endowed with inadequate healthcare facilities. This is among the reasons that have caused high levels of HBV in these areas and therefore people living there should be taught to guard against the disease [4]. The outbreaks of the Hepatitis B infections in Pakistan are increasing at a blistering rate. Approximately, 3 percent individuals in Pakistan had been found as carrier of the HBV chronically and 7 to 9 million individuals had been infected. In KP there were approximately 0.6 million hepatitis B-infected persons in 2008. Most of the population in Pakistan (67.5 percent) is urban rural and poor [5]. HBV vaccination is possible to manage it, though a great part of people are unaware whether they have an infection and there is a small number of people who realize they have a virus, and even less treat an HBV approach [6].

Blood-borne viruses known as the Hepatitis B, C, and D viruses (HBV, HCV, and HDV) are mainly spread by penetrating the skin (percutaneous) or mucosa (mucosal). While all hepatitis viral infections are acute, chronic infections can also be caused by hepatitis B, C, and Delta [7]. The hepatitis B virus (HBV) causes viral hepatitis type B, a dangerous and possibly fatal illness that can be avoided with immunization. For many years, most individuals who are (currently) infected with HBV do not exhibit any symptoms and are unaware of their hepatitis status. Hepatitis B virus is a member of the Hepadnaviridae family, and HBV is an oncogenic DNA virus. Identifying the hepatitis B etiologic agent is still a significant scientific accomplishment [8]. Worldwide, hepatitis B virus infection is thought to be the cause of 53% of liver cancer cases and 30% of cirrhosis cases. Between 15 and 40 per cent of patients with chronic HBV will eventually develop cirrhosis, end-stage liver failure, or hepatocellular carcinoma (HCC) [9].Drugs and autoimmune disorders are also causes of hepatitis, but the virus remains the most dominant cause. Hepatitis B virus (HBV) infection is present in humanity [10].

HBsAg will be positive in patients with a persistent HBV infection. These people may have active chronic hepatitis or be inactive HBV carriers. Anti-HBc is present in every patient with a persistent HBV infection. Patients with active chronic hepatitis may or may not have HBeAg. It is a sign of viral representation when it is present (7).POCTs are often called rapid diagnostic tests (RDT), which help to make the diagnosis of HBV faster and easier. The community easily arranges these tests, and the system setting is easily approached because they require only one or two drops of material; use samples easily, and any specific training is not required. Compared with other tests, the sensitivity of these test kits is low [11].

A sampling technique that enables a practical possibility for screening or testing large populations in low-resource surroundings with limited access to testing services. A finger puncture is used to get a drop of patient blood on a paper card that has been chemically processed. The HBV marker is maintained by the chemical on the paper card while the samples are transported from the field to the lab at room temperature. They are examined using sophisticated molecular or immunoassay techniques [12]. The aim of the study is detect the frequency of HBV profile in chronic HBV positive patients in district Mardan, Pakistan.

Methodology

The descriptive cross-sectional study was conducted at Abdul Wali Khan University Mardan.The study area was District Mardan, which has 423,000 inhabitants and ranks as the second most populated city in Khyber Pakhtunkhwa. A total of 50 blood samples were collected, by using sterile syringe and stored in Gel tube for further processing.

Method used for the detection of HBV profile was Immunochromatographic technique (ICT). The ICT is a rapid and simple method used for the qualitative detection of infections such as hepatitis B virus infection, including HBsAg, HBeAg, HBcAg HBs-Ab and others. The ICT test works based on the principle of antigen-antibody reaction and capillary action. In this process, a few drops of the patient's serum were added to a test strip or cassette, and labelled antibodies are present in the strip. As the sample moves along the membrane by capillary action, they interact with labeled antibodies in the strip. If the target antigen (HBsAg, HBeAg, etc.) is present in the sample, it binds to the corresponding reagent on the strip, forming a visible line at the test region. The appearance of a separate control line confirms the validity of the test. The results are interpreted visually within 15-20 minutes the data were collected from districtMardan. The statistical analysis for this research was conducted using a sample size of 50. Data processing and analysis were performed using Statistical Package for Social Sciences (SPSS) 23.0 software. Additionally, Microsoft Excel was utilized for data management and preliminary calculations.

Results

Frequency of HBV Serological Markers among HBV Positive Samples

We collect 50 positive HBV samples among themHBsAg 50 (100%), HBcAg 03 (06%), HBeAg 09(18%), HBsAb 21 (42%), HBeAb 07 (14%), and HBcAb 02 (04%). HBsAg found in 100% of patients, indicates that the patients are

currently infected and can spread the virus. HBcAg it is usually seen in liver tissue 06% found in samples. HBeAg found in 6%, which indicates patients have active infection, and HBsAb found in 42%, indicates patients likely to be recovered, while HBeAb found in 14%, shows infections is improving or slowing down. HBcAb found in 04%,it means the person still has the virus and in the past was infected (as shown in figure 1).

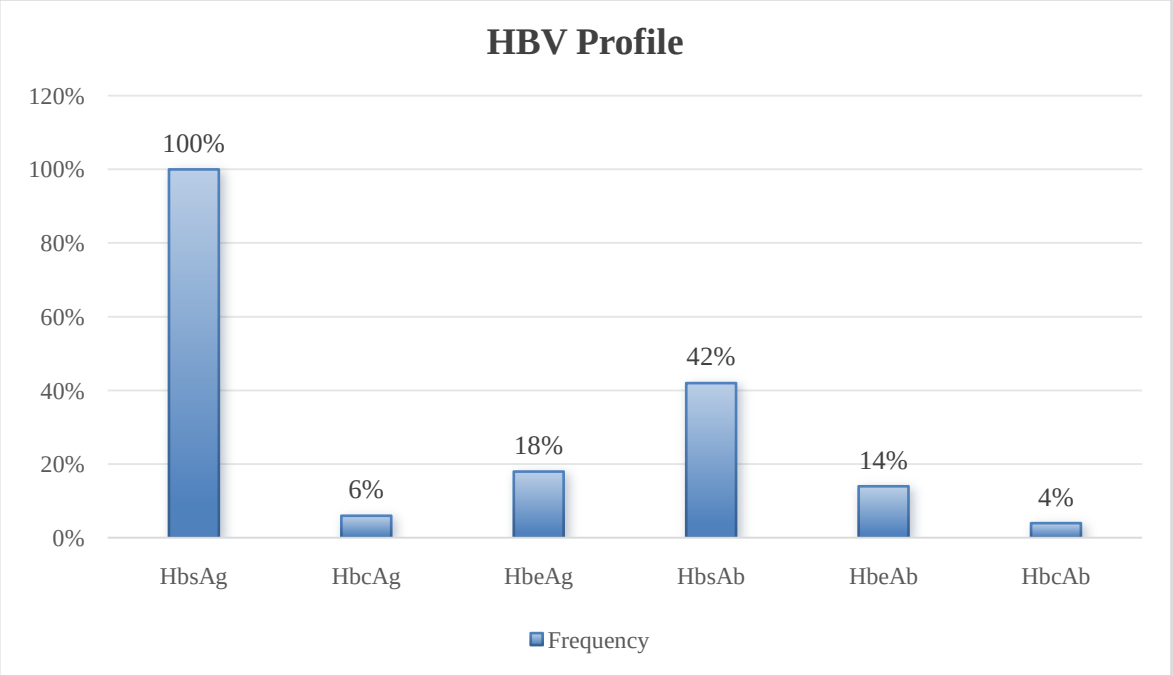

Figure 1: Distribution of HBV Serological Markers

Gender-wise Distribution of HBV Serological Markers

In Gender wise the blood samples were distributed as 30 from males, 20 from females. The results showed higher frequency of **HBsAg (100% in both genders) see table 1.**

Table 1: Gender-wise Distribution of HBV Serological Markers

Marker	Male (n=30)	Female (n=20)
HBsAg	30 (100%)	20 (100%)
HBcAg	2 (6.6%)	1 (5%)
HBeAg	6 (20%)	3 (15%)
HBsAb	12 (40%)	9 (45%)
HBeAb	4 (13.3%)	3 (15%)
HBcAb	1 (3.3%)	1 (5%)

Age-wise Distribution of HBV Serological Markers

In Age wise the blood samples were distributed as10 fromyoung age, 25 frommiddle age and 15 from elderly. The results showed **Young adults, Middle and Elder age patients have** higher **HBsAg (100%) see table 2.**

Table 2: Age-wise Distribution of HBV Serological Markers

Marker	1-20y (n=10)	21-40y (n=25)	41-60y (n=15)
HBsAg	10 (100%)	25 (100%)	15 (100%)
HBcAg	0 (0%)	2 (8%)	1 (6.6%)
HBeAg	3 (30%)	4 (16%)	2 (13.3%)

Marker	1-20y (n=10)	21-40y (n=25)	41-60y (n=15)
HBsAb	6 (60%)	10 (40%)	5 (33.3%)
HBeAb	1 (10%)	4 (16%)	2 (13.3%)
HBcAb	0 (0%)	1 (4%)	1 (6.6%)

Characteristics of Chronic HBV Positive Patients

Our analysis, extended to a group of 50 individuals with a history of HBV infection, identifies a number of significant traits pertaining to their diagnosis, experience with symptoms, and use of care and preventative techniques (see table 3).

Table 3: Characteristics of Study Participants (n=50)

Characteristic	Category	Patients (n)	Percentage (%)
Diagnosed with HBV	Yes	50	100%
	No	00	00%
Diagnosed Since (Years)	1 year	13	26%
	1-5 years	24	48%
	5 years	09	18%
	Above 5 years	04	08%
Family History of HBV	Yes	08	16%
	No	42	84%
Received HBV Vaccine	Yes	04	08%
	No	46	92%
Experienced HBV Symptoms	Yes	43	86%
	No	07	14%
Received HBV Treatment	Yes	39	78%
	No	11	22%
Education on HBV Prevention/Management	Yes	08	16%
	No	42	84%

Discussion

The present research sought to determine the prevalence and distribution of HBV markers among the population of Mardan. For this research, 50 samples were collected and screened for different markers of HBV, such as HBsAg, HBeAg, HBcAg, HBsAb, HBeAb, and HBcAb. The prevalence of HBsAg was 100%, making it the most common marker detected, which is a high rate of active HBV infection. The other markers including HBeAg 18% and HBcAg 06% were detected, anti-HBs (HBsAb) in 42%, anti-HBe (HBeAb) in 14%, and anti-HBc (HBcAb) in 04% of the samples taken. All this points towards the continued transmission and mixed levels of infection among the population in question.

Studies conducted showed that the highest affected age group was 30–40 years old with 60% of total positive cases. This is important because it corresponds to the height of economic productivity and social life, thus raising the risk of spread through occupational exposure, surgery, dental visits, or unguarded sexual contact. The rest of the cases were roughly divided between 20–30 years and over 40 years, both being 20% of the cases. This indicates middle-aged adults are especially susceptible to HBV infection and must be the prime target for awareness campaigns and preventive measures [7, 13].

A study performed on HBV showed that out of the 25 male subjects, 23 returned positive for HBV markers, with a 92% positivity rate. In comparison, 22 out of 25 females came back positive, with an 88% positivity rate. These findings support the trend seen in several earlier studies where males have generally shown a higher infection rate compared to females. This disparity can be explained by gender-specific risk behaviours including more frequent barbershop visits, greater chances of workplace exposure, and more participation in behaviours like intravenous drug use or unsafe injection [14].

A greater epidemiological study evaluating 4890 ELISA-positive HBV patients indicated a greater rate among males (68.15%) as opposed to females (31.85%). The study over three years depicted that HBV infection was highest among the age group of 21–30 years (34.93%), then 31–40 years (23.83%). Infection rate significantly reduced in individuals over 40 years of age. The identified key risk factors were unsafe injection practices (26.19%), reuse of syringes (26.60%), and history of visit to barbers (23.60%), dental procedures (11.20%), and surgical procedures (4.26%). The results align with previous work and highlight the importance of targeted interventions to counteract preventable risk factors [11, 15]. All these studies, demonstrate the prevalence of HBV to be very high in Khyber Pakhtunkhwa and especially in Mardan [16].

Another study examined 1439 suspected patients of HBV from different hospitals in Khyber Pakhtunkhwa. Among the 713 HBsAg-positive patients, 83.03% were confirmed for HBV DNA and 16.97% were not, proving that serological tests are not enough to confirm active infection. Interestingly, 5.1% of HBsAg-negative patients were also HBV DNA positive, highlighting the prevalence of occult HBV infection and the essential importance of PCR in correct diagnosis. These observations highlight the importance of better diagnostic procedures, especially in areas where lack of diagnostic facilities could cause underreporting [4].

Conclusion

This study highlights the significant burden of Hepatitis B Virus (HBV) infection in District Mardan, Khyber Pakhtunkhwa, Pakistan, with all sampled individuals testing positive for HBsAg (100%), indicating active infection. The detection of other serological markers, such as HBeAg (18%) and HBcAg (6%), further underscores the ongoing transmission and varying stages of infection within the population. Alarmingly, low vaccination rates (8%), limited access to treatment (78%), and inadequate health education (86%) were identified as critical gaps in public health interventions. Risk factors such as unsafe medical practices and familial transmission exacerbate the spread of HBV. The findings call for urgent measures to curb HBV transmission, including expanded vaccination programs, improved diagnostic capabilities, and community-wide health education initiatives. Targeted interventions focusing on high-risk groups, such as middle-aged adults and individuals with occupational exposures, are essential to mitigate the impact of HBV in the region. Addressing these challenges will require collaborative efforts from healthcare providers, policymakers, and community leaders to reduce the prevalence of HBV and its associated complications in District Mardan.

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Conflict of Interest
The authors declare no conflict of interest.

Informed Consent
Informed consent was obtained from participants.

Ethical Statement
The study was approved by a recognized ethics committee.

Author Contribution
Rasheed Ahmad (concept, design)
Hamad Ali (design, corresponding, writing)
SadeeqBacha (analysis, styles)
SubhanUllah (design, writing)
SaeedUllah (design, review)
Qaisar Ali (concept, data collection)

References

1. Caballero A, Tabernero D, Buti M, Rodriguez-Frias F. Hepatitis B virus: The challenge of an ancient virus with multiple faces and a remarkable replication strategy. Antiviral research. 2018 Oct 1;158:34-44.
2. Lim JK, Nguyen MH, Kim WR, Gish R, Perumalswami P, Jacobson IM. Prevalence of chronic hepatitis B virus infection in the United States. Official journal of the American College of Gastroenterology| ACG. 2020;115(9):1429-38.
3. MUHAMMAD T, AHMAD H, ULLAH H. Sero-prevalence and Associated Complications of Hepatitis B Virus Infected Patients of Khyber Pakhtunkhwa (2021).
4. Awan ZU, Shah AH, Khan S. Molecular characterization of hepatitis B virus (HBV) genotypes in HBsAg positive individuals of Khyber Pakhtunkhwa, Pakistan. African Journal of Microbiology Research. 2012 Jun 28;6(24):5237-42.
5. Gohar M, REHMAN I, Ahmad J, Ahmad F, Bashir K, Ikram S, et al. Prevalence of hepatitis b virus and genotypes in the region of khyber pakhtunkhwa Pakistan. Bulletin of Biological and Allied Sciences Research. 2023;2023(1):53-.
6. Aziz S, Akbar A, Iqbal S, Tawab F, Inayat N. Prevalence of HBV Infection and Associated Risk Factors in the General Population of District Peshawar, Pakistan. Indus Journal of Bioscience Research. 2024;2(02):418-23.
7. Bosan A, Qureshi H, Bile KM, Ahmad I, Hafiz R. A review of hepatitis viral infections in Pakistan. JPMA-Journal of the Pakistan Medical Association. 2010;60(12):1045.
8. Pattyn J, Hendrickx G, Vorsters A, Van Damme P. Hepatitis B vaccines. The Journal of infectious diseases. 2021;224(Supplement_4):S343-S51.
9. Hwang EW, Cheung R. Global epidemiology of hepatitis B virus (HBV) infection. North American Journal of Medicine and Science. 2011;4(1).
10. Mehmood S, Raza H, Abid F, Saeed N, Rehman HM, Javed S, et al. National prevalence rate of hepatitis B and C in Pakistan and its risk factors. Journal of Public Health. 2020;28:751-64.
11. Rizzo GEM, Cabibbo G, Craxì A. Hepatitis B virus-associated hepatocellular carcinoma. Viruses. 2022;14(5):986.
12. Kumar M, Pahuja S, Khare P, Kumar A. Current challenges and future perspectives of diagnosis of hepatitis B virus. Diagnostics. 2023;13(3):368.
13. Kuhns MC, Holzmayer V, Anderson M, McNamara AL, Sauleda S, Mbanya D, et al. Molecular and serological characterization of hepatitis B virus (HBV)-positive samples with very low or undetectable levels of HBV surface antigen. Viruses. 2021;13(10):2053.
14. Conners EE. Screening and testing for hepatitis B virus infection: CDC recommendations—United States, 2023. MMWR Recommendations and Reports. 2023;72.
15. Thakur V, Guptan RC, Kazim SN, Malhotra V, Sarin SK. Profile, spectrum and significance of HBV genotypes in chronic liver disease patients in the Indian subcontinent. Journal of gastroenterology and hepatology. 2002;17(2):165-70.
16. Hsu Y-C, Huang DQ, Nguyen MH. Global burden of hepatitis B virus: current status, missed opportunities and a call for action. Nature reviews Gastroenterology & hepatology. 2023;20(8):524-37.