

## Intra-Familial Cases of Hepatitis B Virus and Their Associated Risk Factors of Transmission in District Mardan

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### ABSTRACT

**Background:** Hepatitis B Virus is a prevalent viral hepatitis, with high morbidity, and mortality worldwide. In our society, the family living system is a joint system, many people live in a single house which results in the sharing of different personal items. Finding intra-family HBV infection cases and the risk factors for transmission within a family in District Mardan was the goal of this investigation.

**Methodology:** In the pathology department of the Mardan Medical Complex in Mardan, a descriptive cross-sectional research was carried out. After ethical approval and informed consent from participants a total of 36 positive families of HBV were taken by using a non-probability convenience sampling method. Data was collected from positive individuals with the help of a pre-designed questionnaire. That data was analyzed through SPSS version 22.

**Results:** Out of 36 families, 50% had no HBV-positive members, while 50% had positive individuals. There were 18 households (50%) with only one member positive for HBV, 12 families (33.3%) with two members, 4 families (11.1%) with three individuals, and 2 families (5.6%) with four members. There were three major risk factors present, which resulted in intra-family HBV transmission. There were 7 (19.4%) families where Vertical transmission was the main risk factor. 7 were (19.4%) due to the use of personal hygiene goods, whereas 4 families (11.1%) were due to unsafe sexual intercourse among couples (husband/wife).

**Conclusion:** There was an equal chance of the hepatitis B virus to affect only one member of a family or have transmission to other members within a family. Multiple risk factors are involved in the transmission of HBV in a family but most of the cases were due to vertical transmission, use of personal hygienic items, and unsafe sexual intercourse between (couples) wife and husband in district Mardan, Pakistan.

**Keywords:** Hepatitis-B virus, Intra-familial, vertical transmission, Mardan, Risk factor

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### INTRODUCTION

The virus known as hepatitis B virus (HBV) is a major global cause of serious liver disorders, morbidity, and death. It is also a highly prevalent cause of viral hepatitis.<sup>1</sup> HBV belongs to the Hepadnaviridae family which is a DNA-enveloped virus with a 3.2 kb genome length. Two billion people worldwide are impacted by HBV infection, which is a global health concern. Those with poor socioeconomic position, little access to healthcare, and ignorance about infectious illnesses are particularly vulnerable.<sup>2</sup> Similar to the Hepatitis C Virus (HCV), intravenous contaminated injections and transfusion of contaminated blood are the main ways that HBV is spread; however, vertical transmission is more common in HBV infections than in HCV infections.<sup>3</sup> HBV is transmitted from mother to fetus during pregnancy (vertical transmission) and also transmitted from blood and other body fluids (like semen, saliva, tears, sweat, etc.) from infected individuals to others (horizontal

transmission).<sup>4</sup> HBV infection causes a wide range of liver problems, including acute-fulminant liver failure, chronic hepatitis, cirrhosis, and hepatic cancer, all of which cause harm to the liver.<sup>5</sup> All forms of viral hepatitis are the most prevalent and deadly infectious liver disease, accounting for the seventh highest death toll worldwide.<sup>6</sup>

Global estimates of HBV prevalence range from 257 to 293 million, according to the WHO Global Hepatitis Report of 2015 and the Polaris Observatory research of 2016.<sup>7, 8</sup> Hepatitis affects 3.5% of the world's population, with 68% of those affected residing in Sub-Saharan Africa and the Western Pacific.<sup>9</sup> Hepatitis B in Pakistan is more than twenty (20) million people are affected by Hep B and C.<sup>10</sup> Egypt and Pakistan are two nations with high rates of hepatitis, both of which are poor to middle-income countries and while Pakistan is one of the ten most populated countries in the world there is also poor hygienic conditions, population burden, and lack of awareness due to which communicable infections

like HBV are easily transmitted from person to person.<sup>10</sup> Serological and molecular methods are used for the detection of HBV, serological include HBsAg, anti-HBs, HBeAg, anti-Hbe, and anti-HBc IgM and IgG antibodies while molecular include the viral load.<sup>11</sup> HBsAg, a serological marker, indicates HBV infection, appearing within 1-10 weeks after acute exposure, and persisting for over 6 months suggests chronic infection.<sup>11</sup>

Families of HBV positive individuals are regarded as high-risk groups and are encouraged to get vaccinated.<sup>12</sup> In some studies, it is mentioned that HBV transmission occurs among members of a family if the individual has a high level of HBV DNA load, contact, and sharing of personal hygienic items.<sup>13</sup> Masomeh *et al.*, (2016) evaluate Hepatitis B serological markers among the family members of chronic carriers of HBV in Arak, located in central Iran. Anti-HBsAg, anti-HBs, and anti-HBc prevalence rates were 23.3 percent, 20.4 percent, and 23 percent, respectively. Isolated antiHBc was found in 0.4 percent of family members. HBV infection rates were highest in mothers and lowest in children, respectively.<sup>14</sup> Fariborz, *et al.*, (2013) described a study that aims to ascertain the intrafamilial transmission of Hepatitis B virus among close family members of Hepatitis B individuals in Guilan Province, northwestern Iran. Only 1 (0.2%) of the control group and 44 (10.6%) of family members were HBs Ag positive ( $P=0.0001$ ,  $OR=70.92$ ).<sup>15</sup>

The current survey finds a considerable difference in the prevalence of Hepatitis B between the general population and family members of Hepatitis B patients, indicating horizontal transmission of HBV among household contacts.<sup>16</sup> Khan, *et al.*, (2023) assessed the rate of horizontal and vertical HBV transmission varies by demographic and social community. HBV infection was reported to be 1.5% among parents and the average spouse transmission rate of HBV was determined to be 26.3%. The rate of HBV transmission from index mother to offspring was 11.8%.<sup>17</sup> Intra-familial cases of Hepatitis B Virus and their associated risk factors of transmission in District Mardan.

## MATERIALS AND METHODS

All the ethical issues related to the study are thoroughly discussed with the responsible members of the hospital and different aspects of the research have been evaluated to ensure the confidentiality and privacy of research subjects. After ensuring that take all the measures and ethical considerations, the institute permits us to carry out the study. Verbal consent has been attained from the individuals, and also the hospital pathology department. The current study was conducted in the Department of Pathology, Mardan Medical Complex (MMC) District Mardan, Khyber Pakhtunkhwa (KP), Pakistan. It was a descriptive cross-sectional study. The duration of this study was approximately four months from July 2023 to October 2023. A total of 36 positive index cases of

Hepatitis B were taken male 21 (58.3%), female 15 (41.7%), based on inclusion and exclusion criteria, by using a non-probability convenience sampling method. Those individuals who are positive for HBV irrespective of age and gender. Those individuals who are positive for HBV, transgender, repeated sample of the same individuals and any subject with a language barrier/speech disability were excluded from the study.

After Ethical approval was taken from the ethical committee of MMC Mardan and consent from each participant. Data was collected from positive individuals (index case) by interviewing with the help of a pre-designed questionnaire. 2-3 ml of blood samples were taken from suspected individuals or having signs and symptoms of HBV in a family for screening when there is no history of previous screening. Immunochromatographic techniques (ICT device BioChek ) were used to screen out the suspected individuals in a family. After that, we found out the total number of positive individuals in a single family (who have close contact in a single house), their relation to the index case, and their associated risk factors of transmission in families that have two or more than two individuals positive for HBV. Data analysis was done through SPSS version 22, and descriptive statistical analysis (mean, median, mode, frequency, and standard deviation) were used. The association of education level, history of vaccination, and family relationships were assessed using the chi-square test. Analysis was summarized in graphical, tabular, and chart form.

## RESULTS

The current study included 36 positive index cases (Male = 21 (58.3%), Female = 15 (41.75%)), with a mean age of 33 years, a minimum age of 17 years. Out of 36 families, 18 families (50%) had one member in their family who was positive for HBV, while 18 families (50%) had more than one positive individual in their family including 12 families (33.3%) with two members, 4 families (11.1%) with three individuals and 2 families (5.6%) with four members (Figure 1 & 2).

There were 7 families (19.4%) with HBV-positive offspring. 3 families (8.3%) had positive parents and 3 families (8.3%) had positive siblings with a cumulative frequency of 6 and a percentage of 16.6%.

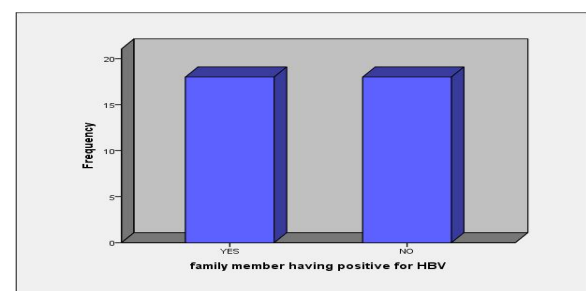


Figure 1: Frequency of those families which have multiple members positive of HBV

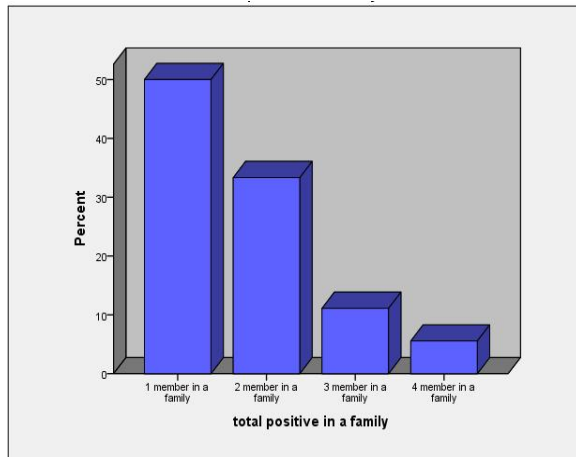


Figure 2: Total positive in a family in percentage 2 families where husbands and 2 families where the wife had HBV, for a total frequency of 11.2%. One family had a cousin who tested positive for HBV (2.8%) (Figure 3).

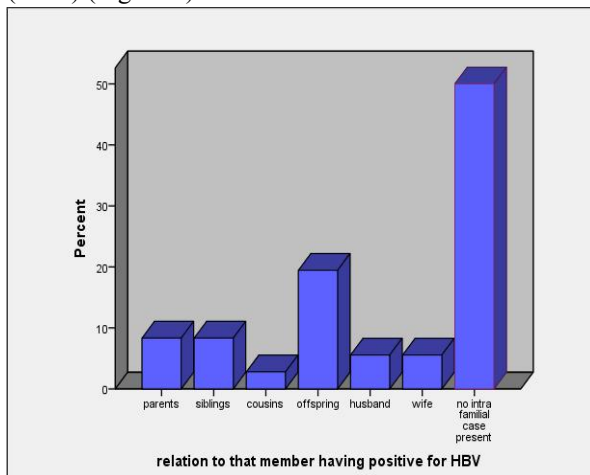


Figure 3: Percentage of most affected family members

There were 18 households with multiple cases of HBV. There were three major risk factors present, which resulted in intra-familial HBV transmission. Vertical transmission was a significant risk factor present in 7 of the 18 families (19.4%). 7 families were (19.4%) due to the use of personal hygiene goods as main risk factors), whereas 4 (11.1%) were due to unsafe sexual intercourse among couples

(husband/wife). Table 3.4 lists the risk variables that contributed to the intrafamilial spread of HBV in these families.

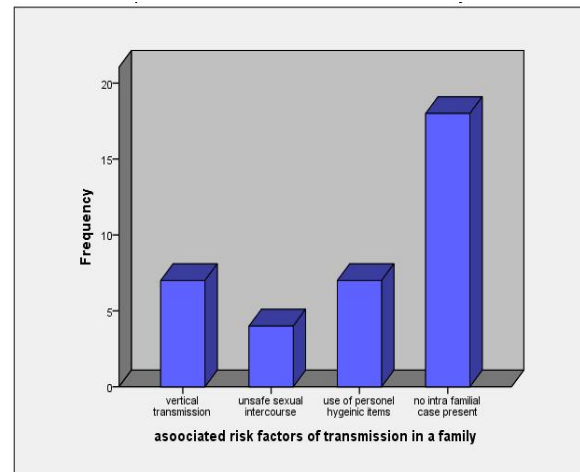


Figure 4: Risk Factors of transmission of HBV in intra-familial cases

According to the education level, all families were categorized into 4 categories i.e., illiterate, primary (1-5 years of education), secondary (5-12 years of education), and higher (above 12 years of education). 18 families were those who have one member positive in their family. Their education status shows that 8 were illiterate, 7 were primary, 2 were secondary and 1 had higher level. 12 families were those who had two members positive in their family, their education status shows that 3 were illiterate, 4 were primary, and 5 were secondary level. 4 families were those who had three members positive in their family, their education status shows that 1 was illiterate, 1 was secondary and 2 were higher level. 2 Families were those who have four members positive in their family, and their education status shows the secondary level (Table 1).

The study found, that there was a total of 36 positive families, in which one of the family members was vaccinated and the rest of 35 were un-vaccinated (Table 2). According to relation to that member having positive for HBV, all families were categorized into 7 categories, including parents, siblings, cousins, offspring, husband, wife, and having no intra-familial case present.

Table 1: Distribution of intra-familial cases according to their education level

The education level of the participants	Total positive in a family				Total	P-value
	1 member of a family	2 members of a family	3 members in a family	4 members in a family		
Illiterate	8	3	1	0	12	0.18
Primary	7	4	0	0	11	
Secondary	2	5	1	2	10	
Higher	1	0	2	0	3	
Total	18	12	4	2	36	

This study found that there were 36 positive families including there were 3 families in which parents were affected, 3 families in which siblings were affected, 1 family in which cousin was affected, 7 families in which offspring were affected, 2 families in which husbands were affected, 2 families in which wife were affected.

Table 2: Distribution of families according to their vaccination history

Vaccinated for HBV before infection	Yes	No	Total
Positive Families	1	35	36
Total	1	35	36
P-value	0.42		

## DISCUSSION

HBV spread by parenteral, sexual, vertical, and horizontal contact.<sup>18</sup> Family members of HBV-positive transmitters are at a higher risk of infection and HBV infection clustering within families is widespread.<sup>19-21</sup> HBsAg positive parents or siblings were usually found in spouses, but anti-HBs positive siblings were common. Furthermore, mothers with infections serve as the primary carriers of infection, resulting in vertical as well as horizontal transmission.<sup>21</sup> Hepatitis B surface antigen positive was more common in mothers of index individuals than in their partners, implying that mother-to-child transmission of hepatitis B virus is quicker than sexual transmission.<sup>21</sup> Since the establishment of a universal immunization program in the Iranian region in 1993, incidence has decreased,<sup>22</sup> and the potential factors for getting infections with HBV moved from childhood to puberty.<sup>23</sup> Given that the kids of index persons had a high prevalence of HBV infection, the current investigation's findings indicate that vertical transmission is a more effective form of HBV transmission than sexual transmission.<sup>24</sup> In addition, the usage of personal hygiene products (such as sharing personal care items like toothbrushes, razors, nail clippers, etc.) had favorable cases in the same number of index families. Furthermore, the elevated risk of infection in children could be ascribed to a poor national immunization program and a lack of a comprehensive policy for hepatitis B virus diagnosis in Mardan, Pakistan. In the Iranian area, seroprevalence rates have been reported to range from 6% in Golestan County<sup>25</sup> to 10.6% in Guilan County<sup>16</sup>, 11% in Nahavand<sup>18</sup>, 22.2 % in Babol<sup>26</sup>, and 37.1 % in Hamadan metropolis.<sup>27</sup> The seroprevalence incidence in other countries varied from 12.1 percent in the Bosnian Republic of Herzegovina<sup>13</sup> to 12.2 percent in the Egyptian region,<sup>28</sup> 14.1 percent in the Republic of Korea,<sup>29</sup> sixteen percent throughout Australia,<sup>30</sup> 18.8 percent in Greek,<sup>19</sup> 19.4 percent in the Indian region,<sup>31</sup> twenty-one percent in Brazilian,<sup>32</sup> thirty-five percent in Turkish,<sup>33</sup> and 33.5

percent in Spanish.<sup>34</sup> According to Roushan et al. a result shows 23.4% of the family members in the current study were infected with HBV.<sup>26</sup> According to this study, mothers in the Mardan region are the common source of intrafamilial HBV spread. Numerous factors, such as an inadequate level of public health education, inadequate hygiene, household delivery, and the absence of hepatitis screening in Mardan, Pakistan, contribute to the spread of hepatitis B virus infection within communities and households. There is a lack of proper awareness about HBV, immunization against HBV, and the factors that are involved in the transmission of HBV.

## CONCLUSION

There was an equal chance of the hepatitis B virus affecting only one member of a family or having transmission to other members of a single family. Multiple risk factors are involved in the transmission of HBV in a family but most of the cases were due to vertical transmission use of personal hygienic items and unsafe sexual intercourse among couples (wife and husband) in district Mardan, Pakistan. The major source of transmission of HBV within families was mothers. A strong strategy is required to reduce the intra-familial spread of HBV in populations with frequent HBV screening. HBV is a treatable disease that can be prevented with immunization or vaccination. Vertical transmission can be avoided in most cases by giving the newborn the proper dosage of HBV vaccination and HBIG at delivery. There is an urgent need for significant public awareness campaigns to be conducted by the Government and local authorities, to implement preventive strategies to reduce the transmission.

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