

Intra-Familial Spread of HBV among HbsAg Positive Parents and their Children in a Defined Rural Community of District Peshawar, Pakistan



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Abstract

Background: HBV horizontal and vertical transmission rate vary among population in different social communities. To know the leading cause of HBV transmission among a community would ease the planning and strategies to minimize the spread. The objectives were to determine the frequency of different mode of intra-familial spread of Hepatitis B among the infected index identified families of rural community of Peshawar.

Methods: This was 18 months descriptive cross-sectional study conducted among married couples of a defined rural community of district Peshawar. After taking informed consent from 797 couples of rural community, 3 to 5 ml blood sample was collected from each respondents for HbsAg screening along with the required data collected using predesigned questionnaire using convenient sampling techniques. HbsAg positive cases were considered as HBV index. Index case of both Hbs Ag positive parents were decided based on past history, previous exposure, past diagnosis and treatment record. The spouses and children of index cases were screened for serological determinants like HbsAg, HbeAg and ALT. Data was gathered and analyzed using SPSS version 16.0.

Results: A total of 797 couples (1593 parents) were selected with proportion of household from ten different blocks of village Budhni. The prevalence of HBV infection among parents was found 1.5%. Nineteen HBV index families were detected among 797 parents screened for HbsAg. Spouse transmission rate of HBV were found 26.3% on average Transmission of HBV infection rate from index mother to children was 11.8%. About 10.5% index females were HbeAg positive.

Conclusion: HBV transmission was high among the spouses followed by vertical transmission in a rural community of district Peshawar.

Keywords: Intra-familial, Transmission, Hepatitis B, HBV index, vertical transmission

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Introduction

The hepatitis B virus (HBV) is a type of viral hepatitis causing life threatening conditions like chronic liver disease leading to liver cirrhosis and hepatocellular carcinoma. It is estimated that more than two billion people are infected with the HBV and more than three million are suffering chronically from this disease (1). Infection with HBV may lead to chronic state of hepatitis in 5–10% of patients who acquired the infection in the adult life and in 80–90% of patients who acquired the infection in the infancy (2). In countries where HBV infection is endemic, most infections result from the vertical transmission from the mother to child in the peripartum period or from the infection in the early childhood (3). HBV infection through perinatal route is of utmost importance because it is associated with a considerable risk of getting chronic; and serious preventive measures have been suggested to block this transmission (4).

In the low HBV endemic regions, the neonatal or the childhood HBV infection is rare or even infrequent and the transmission of HBV occurs primarily among unvaccinated adults through the sexual transmission and injecting drug use (5). Higher prevalence of intra-familial transmission of HBV is due to close contacts between family members, mother to child, and sexually transmission among spouses (6).

In contrast, HBV intra-familial transmission is well documented outside of Pakistan, and HBV is far more infectious as compared to hepatitis C virus (HCV) or human immune deficiency virus (HIV) (7, 8).

The reported prevalence of HbsAg among family members of index cases ranges from 11–25% (9, 10) and a study from Turkey reported 38 % prevalence of HbsAg11. Another report from turkey showed that fathers of the index cases had a higher level of antigen positivity than mothers (61% vs. 47%) (12).

The time sequence of transmission among family members in the aforementioned studies is

unclear, and it cannot be assured and justified that the index case is the first family member infected or carrier of HBV. HBV horizontal and vertical transmission rate vary among population in different social communities. To know the leading cause of HBV transmission among a community would ease the work of policy makers and service providers for planning and designing strategies to minimize the spread. Keeping in view the above parameters this study was planned and was carried out among HBV positive index families to determine the actual transmission rate and intra-familial spread of Hepatitis B among the index families of rural community of Peshawar.

Methodology

This was 18 months descriptive cross sectional study conducted among screened HBV index families of a defined rural community of district Peshawar. The defined rural community of Village Budhni Peshawar comprised of ten blocks with a total of 797 households. (Table 1) Sample size of 37 households (index families) was calculated according to 4% reported prevalence 14 at 95% confidence interval and 5% margin of error. Convenient sampling technique applied to obtain patients as per inclusion criteria.

After taking informed consent from 797 couples of rural community, 3 to 5 ml blood sample was collected from each respondents for HbsAg screening along with the required data collected using predesigned questionnaire by convenient sampling techniques. HbsAg positive cases were considered as HBV index. Index case of both Hbs Ag positive parents of a single family was decided based on past history, previous exposure, past diagnosis and treatment record. The spouses and children of index cases were screened for serological determinants like HbsAg, HbeAg and ALT. HbsAg testing was done through immunochromatographic technique (ICT). HbeAg testing was determined by Enzyme Linked Immunosorbent Assay (ELISA). Serum ALT determined enzymatically using Microlab 300. Families having liver diseases excluded to ensure asymptomatic chronic infection.

Statistical analysis: The data was entered and analyzed using SPSS version 16 and frequencies of variables like index cases, age, gender etc. were calculated. The Chi square test was also used to determine the significant difference by comparing the vertical and horizontal HBV transmission rate with respect to index gender.

Results

The frequency of Hbs Ag positivity among overall screened parents in this study was found 24(1.5%). The Hbs Ag screened parents included in the study were with higher frequency in age range of 31-40 years 614 (38.5%) followed 18-30 years 485 (30.4%). HbsAg positivity was found high 9 (2.8%) in parents between ages of 41-50 years (Table 2). Study showed that that out of 24 HBV infected parents 5 (45 %) female couples and 4 (30.8%) male couples were unaware either they were infected before marriage or after marriage (Table 3). It was found 19 HBV index families among 797 household parents screened for HbsAg. A total 28 HBV positive cases were screened in the 19 index families with 19 index HBV cases, 5 HBV positive spouses and 4 HBV

positive children of index cases. A 2(10.5%) index HBV cases were with Hbe Ag positive and the elevated ALT level considered as active cases while 17 index cases were carrier of HBV infection. In only 1 (5.2 %) index HBV cases HBV viral DNA was detected (Table 4). Spouse transmission rate were found 5 (26.3%) among index cases. Out of 5 HBV positive spouses HBV transmission to spouses from index females was observed 4 (40%) while from index male its rate was low 1 (11%) (Table 5). Transmission of HBV infection rate from index mother to children was found 11.8% with a significant P value 0.036, while no HBV infected child of index father was found. The chi square test was used to determine P value as the data was not normally distributed (Table 6).

Table 1: Frequency of couples screened for HBsAg in different Blocks of Village Budhni

Block	Number of Parents	Number of screened couples
J	214	107
H	154	77
G	138	69
F	122	61
E	98	49
D	294	147
C	232	116
B	110	55
AE	94	47
A	137	69
Total	1593	797

Table 2: Age wise distribution of couples screened for HBs Ag (n= 1593)

Age range (Years)	Frequency (%)	HBsAg + ve (%)	Screened HBs Ag +ve couple identified as Index case	HBs Ag +ve spouses of index cases	Number of children with +Ve HBs Ag of relevant age index cases
18-30	485 (30.4)	1 (0.2)	1(5.2)	0 (0)	0 (0)
31-40	614 (38.5)	11 (1.8)	10 (26.3)	3 (60)	3 (75)
41-50	321 (20.2)	9 (2.8)	8 (42)	1 (20)	1 (25)
51-60	150 (9.4)	3 (2.0)	2 (10.5)	1 (20)	0 (0)
Above 60	23 (1.4)	0 (0)	0 (0)	0 (0)	0 (0)
Total	1593 (100)	24 (1.5)	19 (100)	5 (100)	4 (0)

Table 3: Pre-Marriage HBV infection status of HBs Ag +ve parents

Gender	HBV Infection before marriage			Total
	Yes (%)	No (%)	Don't Know (%)	
Male	1 (7.7%)	8 (61.5%)	4 (30.8%)	13 (100)
Female	0	6 (55%)	5 (45%)	11 (100)
Total	1 (4.2%)	14 (58.3%)	9 (37.5%)	24 (100)

Table 4: HBV infection status and Biochemical Profile among index, infected spouses and children

HBV Infected cases	Number of HBsAg positive cases (%)	N (%)		
		High ALT	Positive HBe Ag	Detectable DNA
HBV Index cases	19	02 (10.5)	02 (10.5)	01(5.2)
Spouses	05	01(20)	02(40)	01(20)
Children	04	01(25)	01 (25)	01 (25)
Total	28	04 (14.2)	05 (17.8)	03 (10.7)

Table 5: Frequency of HBV transmission in spouses from HBV index cases

HBV Index gender	Frequency of HBsAg positive Index (%)	Frequency of HBsAg positive spouse (%)	Frequency of HBsAg negative spouses (%)	P value
Female	10 (52.6)	4 (40)	6 (60)	0.153
Male	9 (47.4)	1 (11)	8 (89)	
Total	19 (100)	5 (26.3)	14 (73.7)	

Table 6: Frequency of HBV transmission in children from HBV index cases

HBV index gender	Frequency of HBsAg positive Index (%)	Frequency of HBsAg positive Children (%)	Frequency of HBsAg negative Children (%)	Total	P value
Female	10 (52.6)	4(11.8)	30 (88.2)	34 (100)	0.036
Male	9 (47.4)	0	35 (100)	35 (100)	
Total	19 (100)	4 (5.8)	65 (94.2)	69 (100)	

Discussion

The present study was designed to determine the rate of intra-familial HBV transmission either horizontal (Spouse transmission) or vertical transmission (Parents to children) in a model community population. The study was limited to a predefined model research village and among parents having children, therefore the reported HBV prevalence of 1.5% among married couples was found comparatively lower than the actual prevalence of HBV in Pakistan 2-8% (13, 14). The assumption of HBV index cases (37 index families) was calculated initially for this study was also based on the prevalence of HBV (15). The exact prevalence of HBV in Pakistan are still debatable as its frequency rate varies from 2-8% in different studies among different population group. A national hepatitis survey conducted in Pakistan in 2010 predicts hepatitis B mean prevalence 2.5% in Pakistani population with varying rate in different population and region (16).

The study found that the young parents below 40 years participated in the study with high frequency 68.9% and responded well in this study. The education, knowledge and sensitization regarding health issues among young parents could be a reason of their active participation in present community based study. HBV infection was observed more frequently (2.8%) in spouses aged between 41-50 years. The pattern of infection is similar with another study done in Ethiopia among pregnant women where infection rate was

high with increased age (17). Present study provided similar pattern of results found in another study conducted among general population about prevalence of HBV infection. This study also predict a high rate of HBV infection among adults age above 40 years (18).

HBV transmission from index mother to her spouse was reported high 40% in present study while its rate from index father to spouse was 11%. It was also determined in another study that household contacts were more likely chronic HbsAg carriers, and positivity in the young contact was more likely when the index case was the mother (18). In another study it was suggested that mother should be screened to control HBV transmission in sibling and spouses (19). It was observed in present study that HBV infection in children of infected mother was 11.8% while no child was seen infected of HBV index father. It showed that mother was the main source of HBV transmission in children vertically which is consistent with the findings of the other studies (20). Present study was done among healthy population of rural community. It shows high sero-conversion rate and only 10.5% index cases were Hbe Ag positive. It may be the index cases were old chronic cases however in spouses and children the Hbe Ag positivity was relatively high.

Majority of the positive cases were inactive carriers with a high occurrence of Hbs Ag negativity. This points to the preponderance of pre-core mutants in our population. A multicenter study conducted on pre-core mutants show that 31% of chronic Hbs Ag positive patients were possible pre-core mutants (21). Infected mothers may be a source of infection both for their spouses and also can contribute to vertical transmission if not treated with immunoglobulins during pregnancy. High prevalence of transmission from mothers to their spouses warrants awareness and screening of pregnant women.

This study depicted mothers in rural areas are the main source of intra-familial HBV transmission. Many factors like lack of health education, improper sanitation, home delivery and unavailability of hepatitis screening in rural areas of Pakistan are the key elements to promote proliferation of HBV infection within families and communities.

Conclusion

HBV transmission was high among the spouses (26.5%) followed by vertical transmission (11.8%) in a rural community of district Peshawar. Mothers in rural areas are the main source of intra-familial HBV transmission. Aggressive approach needed to control intra-familial HBV transmission among communities with frequent hepatitis screening.

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