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Intrafamilial Spread of Hepatitis B Virus in Elfao Province-East of Sudan

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ABSTRACT

The aim of the present study was to determine the intrafamilial spread of HBV in the family members of patients with Hepatitis B in Elfao Province, North of Sudan. In a descriptive-comparative study, 140 persons of 32 families of patients who were positive to Hepatitis B for more than 6 months and considered as index cases and 5250 first time blood donors (all males) in the same area were used as a control group were enrolled. Blood samples were taken from the participants and were checked for HBs Ag and HBC Ab.

A total of 140 individuals, including 24 fathers and 24 mothers, 12 sisters,36 sons,18 daughters, 17 brothers, 2 uncle/son, 1uncle,1uncle/brother, 2 husbands,3 wives from 32 families were investigated. Out of the 140 subjects, (55.7%) were positive for HbsAg and (72.3%) were positive for anti-core. Among the control group (n: 5250), 206 subjects (3.9%) were HbsAg positive.

The present survey indicates that there is a significant difference in the prevalence of Hepatitis B in the general population and family members of Hepatitis B patients and this is an evidence for horizontal transmission of HBV in household contacts.

Keywords : Hepatitis B Virus, familial, Sudan.

I. INTRODUCTION

Hepatitis B virus (HBV) infection is a serious global health problem with2 billion people infected worldwide of whom 350 million people suffer from chronic HBV infection (1, 2). HBV isthe major cause of acute and chronic liver diseases infection (3, 4)that may lead to liver cirrhosis and hepatocellular carcinoma (HCC) which result in up to 1.2 million deaths per year (5).World Health Organization (WHO) divided the world to in zones of low, intermediate and high endemicity of HBV infection.Overall, 45% of the world population live in high prevalence regions (Hepatitis B surface antigen positivity rates of >8%), resulting in the massive global burden associated with the infection (6). Intra familial transmission of HBV have been reported by several studies, suggesting this mode of transmission is an important means by which HBV endemicity rates are maintained in high endemicaity region (7,8).

Clustering of chronic HBV infections within the family is especially common in areas of endemicity [9,10], and maternal or vertical transmission during the perinatal period has been shown to be the major transmission route (11, 12) In addition, horizontal transmission in early life, as a consequence of close family contact, is also important (9, 13, 14).Thus,both perinatal transmission from mother to child and horizontal transmission during childhood from parents and other sibling are important in the epidemiology of the disease (15). It is estimated that about 90% of vertically infected infants would progress to chronic hepatitis and about 30% to 50% of the horizontally infected children between the first and 5th year will also become chronically infected (3).

To the best of our knowledge no study has been carried out so far to assess the likelihood of household

transmission of HBV in Sudan. The present study was carried out in blood donors to explore the intra familial transmission of HBV among families of confirmed hepatitis B surface antigen positive carriers at the Hospital of Alfao town in Eastern Sudan.

The study aimed to determine the prevalence of HBV infection in these families, possible routes of transmission and risk factors for the interfamilial transmission, vaccination rate among family members of chronic carriers and also to define family members with highest risk for infection according to their Family relation to chronic carrier. Our secondary goal was to make more accurate estimation of chronic carriage in the general population through data collected from first-time blood donors, in Alfao area.

II. METHODS AND MATERIAL

Study Design and Sampling

This is a descriptive-comparative study, which was carried out during March to July 2014 in Elfao Province, eastern of Sudan. The study subjects were 140 persons of 32 families of patients who were positive to Hepatitis B for more than 6 months and considered as index cases. The family members of index cases included 24 mothers, 24 fathers, 17 brothers, 12 sisters, 36 sons, 2 uncle/son, 1 uncle, 1 uncle/brother, 2 husbands and 3 wives. Other household's members included grandfathers, grandmothers, uncles, aunts and other people who live in the same house with them.A total of 5250 first time blood donors (all males) in the same area were used as cohort group.

Data Collection

The data was collected using a questionnaire that included demographic data such as marital status, the kind of family relationship, occupation, history of vaccination, and risk factors of HBV were developed.

Sample Collection

Blood samples were collected in plane tubes and centrifuged at 3000 rpm for 5 minutes. Obtained sera were then labelled and stored at -20°C until further analyses.

Serology

Commercial ELISA kits (Biorex, United Kingdom) were used to detect Hepatitis surface antigen (HBsAg) and HB core (HBc) antibodies (prechekBio,Inc, USA) according to the procedure described by the manufacturers. Only 106 person were testes for HBsAg.

III. RESULT AND DISCUSSION

Results

A total of 140 individuals, including 24 fathers and 24 mothers,12 sisters,36 sons,18 daughters, 17 brothers, 2 uncle/son, 1uncle,1uncle/brother, 2 husbands,3 wives from 32 families were investigated. The number of family contacts enrolled was2– 10 persons per family. The ages groups included were less than 5 years, 6-18 years, 19-30 years, and >30 years .The ages of the control group ranged between 19 years and 45 years. Out of the 140 subjects, (55.7%)werepositive forHbsAgand (72.3%) werepositive for anti-core. Among the control group (n: 5250), 206 subjects (3.9%) were HbsAg positive.

According to the gender, HBsAg were detected in (82.8%) males and (17.2%) females. HB anti-core were detected in (58%) males and (41.3%) in females (Table 1 and 2).

Based on age group, the distribution of 58 patients positive for HBsAg were (1.7%), (17.2%), (46.6%) and (34.5%)in age groups <5 year, 6-18 years, 19-30 years and >30 yearsold, respectively (Table 3).

The distribution of 104 persons positive for HBV anti-core were (5.8%), (19.2%), (44.2%) and (30.8%) in age groups <5 year, 6-18 years, 19-30 years and >30 yearsold, respectively (Table 4).

The frequency of 58 patients positive for HbsAg were (41.4%), (48.3%) and (10.3%) in family size <4 person, 5-6 persons and 7-10 persons, respectively (Table 5).

The frequency of 104 patients positive for HBV anti-core were (38.5%), (36.4%) and (9.3%) in family size <4 persons, 5-6 persons and 7-10 persons, respectively (Table 6).

Table [1]: Prevalence of anti-coreAb and HbsAg in the test and control group

Gender	Test group (Positive)		P-value
	Anti-coreAb	HbsAg	
Male	61/81 75.3 %	48/62 82.8%	
Female	43/59 72.9%	10/44 17.2%	0.746
Total	104/140 74.3%	58/106 54.7%	

Table [2]: Prevalence of HbsAb in the test and control group according to age

Age	Test group		P-value
	Positive	Negative	
< 5 years	1/7 14.3%	6/7 85.7%	
6 – 18 years	10/21 17.2%	11/21 52.4%	0.746
19 – 30 years	27/45 60%	18/45 40%	
>30 years	20/33 61%	13/33 39%	
Total %	58/106 54.7%	47/106 44.3%	

Table [3]: Age prevalence of anti-coreAb in the test and control group

Age	Test group		P-value
	Positive	Negative	
< 5 years	6/22 27.3%	16/22 72.7%	
6 – 18 years	20/32 62.5%	12/32 37.5%	
19 – 30 years	46/51 90.2%	5/51 9.8%	0.001 *
>30 years	32/34 91.4%	3/35 8.6%	
Total %	104/140 74.3%	36/140 25.7	

Table [4]: Prevalence of HBsAg according to Family size

Family size	Positive	Negative	p-value
<4 person	24/42 57.1%	18/42 42.9%	
5-6 person	28/52 53.8%	24/52 46.2%	0.894
7-10 person	6/12 50%	6/12 50%	
Total %	58/106 54.7	48/106 45.3	

Table [5]: Prevalence of HBcAb according to Family size

Family size	Positive	Negative	p-value
< 4 person	40/52 76.9%	12/52 23.1%	
5-6 person	51/65 78.5%	14/65 21.5%	0.101
7-10 person	13/23 56.5%	10/23 43.4%	
Total %	104/140 74.3	36/140 25.7	

Discussion

Over 2 billion people worldwide are infected with HBV and more than 350 million have chronic infection [1, 16].The prevalence of hepatitis B surface antigen (HBsAg) in Sudan was reported to range between 6.8% in Central Sudan to 26% in Southern Sudan (17).

The impact of socio economic and demographic variables on the prevalence ofHBV infection is greater than blood or medical care dependent variables (18).Therefor it is suggested that HBV in such cases

may be transmitted through intra familial contact and high rates of carriers among sibling is associated with early infancy Infection (19). In addition, horizontal transmission through close family contact is also important in early life (4,20).It has been suggested that household members can transmit HBV possibly through direct or in direct personal oral, mucosal or percutaneous contacts. Assessment of routes of HBV transmission is essential for establishment of an appropriate strategy for prevention and vaccination (21).

In the present study, the prevalence of HBsAg in the first time blood donors was 3.9%, which is similar to the figures estimated by WHO, and may represent the general prevalence in the population in Eastern Sudan. While it was 57.5 % in our study group.

In comparison, the higher prevalence of intra-familial transmission of HBV is due to close contacts between family members, mother to child, and sexual transmission among spouses. In the respect, the differences between the rates of transmission in different studies is unclear and may be due to socio-cultural and habitual factors, our study area is a rural area with low standard of living and consequently lower health and hygienic conditions.

Probable causes of age-dependent increasing of HBV positivity in our study can be attributed to lower socioeconomic and heath levels in previous decades with the possibility of repeated contacts with the virus during the time, as well as risky behaviors such as tattooing and face marking which was widely practiced. Infection in children, sisters, and brothers; on the other hand; could be attributed to the national vaccination program, and screening of pregnant women for serological indices of HBV (22).

Nevertheless, particularly in crowded communities, infected mothers are the main reservoirs of infection leading to horizontal transmission; therefore, cutting the chain of mother-to-infant transmission would remove this important mode of transmission, as well. Therefore, maintaining the infant HB vaccination program plays an important role in reducing familial transmission of the infection. Re-vaccination of young adults, which is another preventive program in our country, can enhance other preventive measures.

In our study the rate of HBcAb is very high indicating high potential risk of infection and transmission can occur in those families with confirmed HBsAg carriers, hence it is not surprising that several members of the same household showed evidence of HBV infection. In such cases, transmission of the virus is usually thought to have occurred by intra-familial contact (23, 24). HBV is transmitted through parenteral, sexual and perinatal contacts as well as child-to-child or household personal contact (25).

In a study in 2002 in Italy (26), 49 individuals from 13 families with sibling clusters of positive HBsAg carriers were investigated, HBV isolates were genotyped following amplification of the surface gene region of the viral genome (27). Similarity of genotypes provided convincing evidence that viral isolates within a family originated from the same source (27). It was reported that the prevalence of HBsAg is significantly higher in family members than in the control group ($P<0.001$) (24). A study in South Korea also reported that among 71 non-vaccinated HBsAg carriers, 10 were positive for HBsAg (14.1%), but none of the controls is positive for HbsAg (28). In a study in Spain, among 330 relatives of 145 HBsAg carriers observed over a mean period of 20.1 mo, 284 were positive for at least one HBV marker (29). It was reported that relatives of 26 positive HBsAg cases present an intra-familial prevalence of HBV infection of 28.8% (30). In other countries, variable results have been reported (31, 32).

This show that all studies we discuss above, the prevalence of the HbsAg is very low comparing to our study. That reflects the high prevalence of HbsAg&HBcAb.

We can make compare by old study done in Africa; in Africa prevalence rate range from 56 % -98% were reported (33).But higher than that obtained in Gambia (33%) (34). On the other hand, (35), while studying a population with similar characteristics of this investigation, found rates of 42 to 65% for HBV in five regions in Zambia, Africa. Other studies showed elevated prevalence rates as 19% in rural populations of Equatorial Africa (36), 9 to 20% in the adult population of Western Africa, and 14.6% in Mozambique (33).

The study was confirmed many age group <5 years, 6-18 years, 19-30 years,>30 years. Anti-core was done

respectively 5.8%, 19.2%, 44.2%, 30.8% (p-value 0.001*).this result indicate that distribution of the virus is high among the age group (19-30) years. alsoHbsAg prevalence age group (19-30) . But in some studies the age groups, but high carriage (~50%) HBV infection

prevalence of HBsAg was different among was most common in those aged ⩾31 years and reached the highest rate in the 41–50 years age group. Moreover, a high carriage rate in the 40–50 years age group has been reported in previous studies from Turkey (37,38). But low prevalence of HbsAg, HBcAb is previous in <5 years, 1.7%, 5.8% respectively I think it's due to vaccination program since 2000. This has been marked in Arab countries such as Libya, where the prevalence among pregnant women dropped from 2.8% to 2.1% in three years from 2003, and then to 1.5% in 2010, which is likely owing to the effect of vaccination, which has been provided since 2000 (39). It was also reported in the study that rate of transmission from the mother index case to the children was 40·6%, and that of transmission from both HBsAg-positive parents to the children was found to reach up to 57·1%. A study from Erzurum, Eastern Turkey has also found similar results on the importance of the mother in HBV transmission (24). This study canapplicated in our study which confirmed all parents (mother, father) and most of them were HbsAg, HBcAb positive.

Our results suggest that intra-familial childhood horizontal transmission (especially mother-to-child) is important for HBV transmission in the community, and highlights the need for screening of adult siblings and mothers of adult HBsAg carriers in addition to their spouses and children. These findings strongly emphasize that an HBV vaccination schedule, along with the investigation of all members of the family for the presence of HBV markers, should be offered immediately and early in life to all family members of chronic carriers. Health education regarding modification of such factors might constitute a very cost-effective ancillary approach to prevention of hepatitis B in Sudan in coordination with the regulations of WHO. Further studies are necessary to establish exactly the route of dissemination of HBV in our country (Sudan).

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