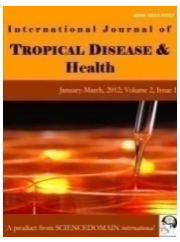

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Prevalence of Hepatitis B Virus Infection among Egyptian Pregnant Women - A Single Center Study

Mortada EL-Shabrawi[1], Mohamed Farouk Mohamed[1*], Mona Salah El Din Hamdi[2], Mohamed Ehab[3], Shaimaa Shaaban Khamiss[4] and Hanaa El-Karaksy[1]

[1]Department of Pediatrics, Faculty of Medicine, Cairo University, Egypt.
[2]Department of Clinical Pathology, Cairo University, Egypt.
[3]Department of Gynecology and Obstetrics, Cairo University, Egypt.
[4]Ministry of Health and Population, Cairo, Egypt.

Authors' contributions

This work was carried out in collaboration between all authors. Author MES designed the study, author MFM wrote the protocol, and wrote the first draft of the manuscript. Author SSK recruited the cases and performed the statistical analysis, and managed the analyses of the study, and author HEK supervised case recruitment and managed the literature searches. All authors read and approved the final manuscript.

Research Article

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ABSTRACT

Background: Hepatitis B virus (HBV) infection still has a relatively high incidence and prevalence worldwide. In the post-vaccination era in developing countries, perinatal vertical transmission remains the most common mode of transmission. Prevention of mother-to-child transmission requires screening for HBV surface antigen (HBsAg) in pregnant women to identify which newborns that must be immunized.
Aim: This study aimed to evaluate the prevalence of HBV infection among pregnant mothers who were attending outpatient clinic of the Obstetric Department, and Social and Preventive Medicine Center at Cairo University Hospital Campus, for routine antenatal care.
Methods: A cross sectional study included 2,000 pregnant women. A rapid screening test

**Corresponding author: Email: m.farouk76@yahoo.com;*

for HBV "One Step HBsAg Rapid Test" was done for all women and all HBsAg-positive cases were confirmed by ELISA for HBsAg. A structured questionnaire for risk factors for HBV acquisition was filled for every pregnant mother positive for HBsAg and a control group of HBsAg negative mothers.
Results: Out of 2,000 pregnant women, 35 (1.75%) were positive by the rapid test, out of whom 32/35 cases (91.43) were confirmed to be positive by the confirmatory test representing 1.6% of the study population. Family history of HBV, previous intravenous (IV) injections, medical clinic attendance, hospital admission, and surgeries were the risk factors for acquiring HBV infection (*P-value*=0.001, 0.003, 0.002, 0.000, and 0.011, respectively).
Conclusion: HBV infection is prevalent among pregnant mothers attending our outpatient services. Therefore we recommend screening for HBV in all Egyptian pregnant mothers to prevent neonatal infection by immunoprophylaxis.

Keywords: Prevalence; epidemiology; Egypt; hepatitis B; perinatal infection; pregnancy.

1. INTRODUCTION

Of estimated 350 million individuals chronically infected with HBV worldwide, it is generally accepted that at least 50% acquired their infections either perinatally or in early childhood, especially in countries where HBV is endemic [1]. Perinatal vertical transmission is the most common mode of transmission worldwide [2]. Vertically transmitted HBV infection is becoming an important risk factor for acquisition of HBV among children born after the era of mass vaccination in Egypt [3]. High maternal viral load and maternal serum HBV envelope antigen (HBeAg) positivity increase the risk of perinatal transmission [4]. Infants born to mothers known to carry HBV can be treated with HB immunoglobulin. When given with the vaccine within 12-24 hours of birth, the risk of acquiring HBV is reduced by 90% [5]. Prevention of mother-to-child transmission requires screening for HBsAg in pregnant women to identify which newborn should be immunized [6].

This study aimed to evaluate the prevalence of HBV infection among pregnant mothers, and to identify risk factors that may lead to HBV acquisition among these women.

2. PATIENTS AND METHODS

In this cross sectional study, randomly chosen 2,000 pregnant women performing routine antenatal care at the outpatient clinic of the Obstetric Department and Social and Preventive Medicine Center at of Cairo University Hospitals Campus were screened for HBV from May 2010 to July 2011.

The Institutional Ethical Committee approved the study, and informed consent was obtained from each participant. All data were confidential for the research use only.

All pregnant women *were* screened for HBV infection by One Step HBsAg Rapid Test - ACON HBsAg; Cat. No. IHB sg-302 (San Diego, CA, USA) at the antenatal care clinic. All HBsAg positive cases with rapid test were confirmed by enzyme-linked immunoassay (ELIZA) for HBsAg using the AbbottAxSYM System (Abbott Laboratories, Abbott Park, Chicago, IL, USA.).

In order to know the risk factors that may lead to acquiring HBV infection; a questionnaire for risk factors for HBV acquisition was filled for every pregnant mother confirmed positive for HBsAg and a control group of HBsAg negative mothers in a ratio of 1 (case): 2 (controls) (Table 1).

Table 1. Questionnaire for risk factors for HBV acquisition*

Case No.						
Name						
Age						
Gestational age						
Address						
Tel. number						
Expected date of delivery						
Work	Housewife			Previous urinary catheter	No	
	Medical staff				Yes	
	Other			Previous blood transfusion	No	
					Yes	
				Previous endoscopy	No	
					Yes	
				Previous visit to dentist	No	
					tooth extraction	
					gum treatment	
					fillings	
HBV vaccination status	No				tooth extraction+ filling	
	Yes				gum treatment + filling	
IV drugs & usage of syringes	No				tooth extraction + gum treatment + filling	
	Yes				others	
Medical clinic attendance	No			History of schistosoma mansoni	No	
	Yes				Yes	
Previous hospital admission	No			History of schistosoma hematobium	No	
	Yes				Yes	
Previous sutures	No			Previous nail care	No	
	Yes				Yes	
Previous surgeries	No			Cauterization	No	
	Yes				Yes	
Previous drained abscess	No			Past history of hepatitis	No	
	Yes				Yes	
Family history of HBV infection	No					
	Yes					
	If yes specify					

** This was filled for every pregnant mother positive for HBsAg by screening test and a control group of HBsAg negative mothers in a ratio of 2:1.*

Three pregnant women with HBV infection who came to Pediatric Hepatology Outpatient clinic for consultation about immnuoprophylaxis for their babies were also included in that comparison.

Also positive cases were instructed how to avoid transmission of infection to other family members and they were referred to Adult Hepatology unit for further evaluation and follow up. Screening for other family members was recommended. All family members were instructed about how to avoid contracting or transmitting the infection.

2.1 Statistical Methods

Data were statistically described in terms of mean ± SD, frequencies and percentages when appropriate. Comparison of numerical variables between the study groups was done using Student t test for independent and for categorical data, χ^2 tests was performed. Exact test was used instead when the expected frequency is <5. Multivariate logistic regression analysis was done to determine the preferential effect of important independent variables on the occurrence of HBV infections. Probability *(P)*-values <0.05 were considered statistically significant. All statistical calculations were done using computer programs SPSS (Statistical Package for the Social Science; SPSS Inc., Chicago, IL, USA) version 15 for Microsoft Windows.

3. RESULTS

This study was carried out on 2,000 pregnant women aged between 16 and 46 years (mean±SD, 26.75±5.75 years). Out of them, 35 (1.75%) were positive by the rapid test, out of whom 32/35 cases (91.43%) were confirmed to be positive by the confirmatory test representing 1.6% of the whole study population, while 3/35 (8.57%) cases were negative for HBsAg by the confirmatory test. Thirty-five confirmed HBs-Ag positive cases (32 newly discovered and confirmed HBsAg positive women in addition to the previously mentioned 3 known HBsAg positive pregnant women who came to the outpatient clinic seeking for immnuoprophylaxis of their babies) were compared with randomly selected HBsAg negative pregnant females serving as controls (n=70).

Fig. 1 demonstrates the frequency distribution of cases and controls according to age groups. Although HBsAg was detected at a higher rate in pregnant women aged ≥25 years [(38.33% (23 out of 60)] than in women aged <25 years [(26.66% (12 out of 45)], the difference was not statistically significant (*P*-value=0.20).

Regarding gravidity status and occupation, no significant differences were detected between both groups (Table 2).

Regarding the distribution of our study populations according to their residence, most of our cases (22/35) and controls (37/70) were living in rural areas representing 62.9% and 52.9% of their populations respectively. None of our cases had previously received HBV vaccine but 4.3% (3 out of 70) of controls had previously received HBV vaccine.

A positive family history of HBV infection was reported in a significant number of HBV-positive cases (*p*-value 0.001). Therefore, a pregnant woman with a family history of HBV infection had a greater chance of acquiring HBV infection (Table 3).

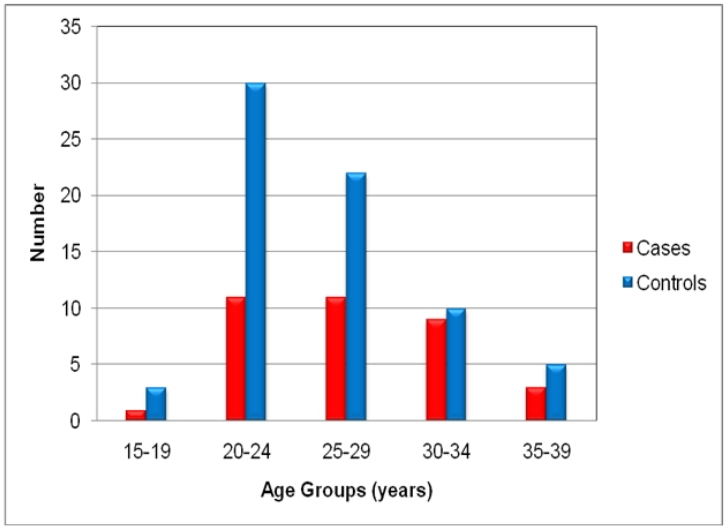

Fig. 1. Frequency distribution of cases and controls according to age groups

Table 2. Comparison between cases and controls regarding gravidity status and occupation

Item	Cases (n= 35)	Controls (n=70)	X^2	*P*-Value
	Number (%)	Number (%)		
Gravidity status				
• Primigravida	3 (8.57%)	12 (17.14%)	0.78	0.37
• Multigravida	32 (91.42%)	58 (82.85%)		
Occupation				
• Housewife	34(97.1%)	66 (94.3%)	4.020	0.13
• Working	1 (2.9%)	4 (5.7%)		

**P value less than 0.05 is considered statistically significant.*

Table 3. Comparison between cases and controls regarding family history of hepatitis B infection

Family history	Cases (n= 35)	Controls (n=70)	X^2	*P*-Value	Odds ratio (95% CI)
	N (%)	N (%)			
No	18 (51.4%)	57 (81.4%)	10.29	0.001*	4.14
Yes	17(48.6%)	13 (18.6%)			(1.69-10.14)

*CI = Confidence interval; *P value less than 0.05 is considered statistically significant.*

Fig. 2 demonstrates distribution of HBV infection among family members of both cases and controls. HBV infection of the husband or infection of a close family member (father, mother, brother, or sister) could be an important risk factor for acquiring infection.

Table 4 compares HBsAg positive cases with HBsAg negative controls regarding other risk factors for HBV infection. All HBsAg positive mothers (100%) had at least one of the risk

factors for infection. Previous IV drugs, medical clinic attendance (for antenatal care, and other medical problems), hospital admission, and surgeries were the risk factors for acquiring HBV (*P*-value = 0.003, 0.002, 0.000, and 0.011, respectively). All cases and controls (100%) had history of ear piercing and none of them had a past history of Schistosomiasis and non of the cases had past history of hepatitis but 1.4% of controls (1 out of 70) had past history of hepatitis.

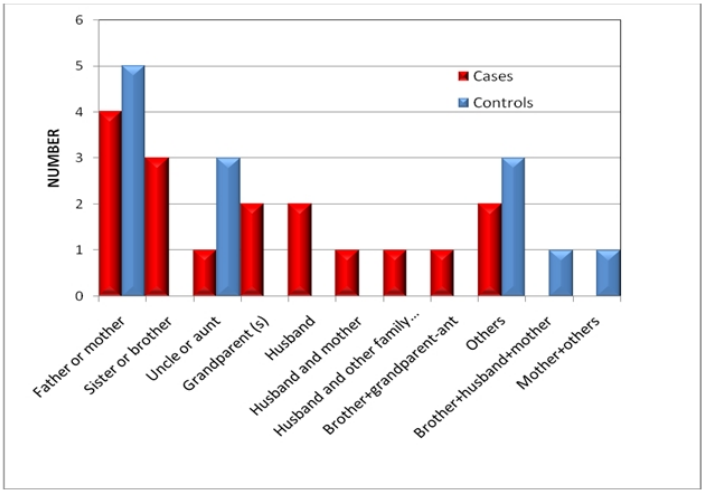

Fig. 2. Positive family history of hepatitis B virus infection among cases and controls

Table 4. Assessment of risk of HBV infection among cases and controls

Variables	Cases (n=35)	Controls (n=70)	X^2	*P* value	Odds ratio (95% CI)
	N (%)	N (%)			
Previous abortions	8 (22.8%)	24 (34.3%)	0.95	0.33	0.57(0.22-1.4)
IV drug administration	28 (80%)	34 (48.6%)	9.53	0.003*	4.24(1.64-10.97)
Medical clinic attendance	31 (88.6%)	41 (58.6%)	9.74	0.002*	5.48(1.74-17.23)
Previous hospital admission	29 (82.9%)	32 (45.7%)	13.22	0.00*	5.74(2.12-15.56)
Previous sutures	29 (82.9%)	47 (67.1%)	2.88	0.108	2.37(0.86-6.50)
Previous surgeries	28 (80%)	38 (54.3%)	6.60	0.011*	3.37(1.30 -8.73)
Previous abscess drainage	4 (11.4%)	5 (7.1%)	0.54	0.47	1.677(0.42-6.69)
Previous urinary catheterization	20 (57.1%)	29 (41.4%)	2.31	0.15	1.89(0.83-4.29)
Previous blood transfusion	3 (8.6%)	6 (8.6%)	0.00	1.00	1.00(0.23-4.26)
Previous endoscopy	3 (8.6%)	3 (4.3%)	0.79	0.39	2.09(0.40-10.96)
Previous nail care	5 (14.3%)	6 (8.6%)	0.81	0.50	1.78 (0.50-6.29)
Previous cauterization	0 (0.0%)	1 (1.4%)	0.50	1.00	0.65(0.03-16.44)
Previous visits to dentist	23 (65.7%)	33 (47.1%)	2.53	0.11	2.15(0.93-4.98)

*HBV = Hepatitis B virus; IV = Intravenous; *P-value less than 0.05 is considered statistically significant.*

In order to know how acquisition of HBV varied with family history, previous IV drugs, medical clinic attendance, hospital admission, and surgeries; multiple regression analysis was done where the results showed that none of the risk factors had the significant contribution for the acquisition of HBV infection (*P*-value >0.05) (Table 5).

Table 5. Multiple regressions for predictors of HBV infection

Risk factors	*P* value
Hospital admission	0.09
Surgeries	0.10
Medical clinic attendance	0.20
Family history	0.68
Previous IV drugs	0.80

*HBV = Hepatitis B virus; *P-value less than 0.05 is considered statistically significant.*

4. DISCUSSION

The prevalence of HBV varies between 2% in developed countries where the prevalence is low to about 8% in developing countries where infection is endemic with sex, age and socioeconomic status as important risk factors for infection [7,8]. Countries are classified as having low endemic rates (<2%), intermediate endemic rates (2-8%), or high endemic rates (>8%) positive for HBsAg [9]. The prevalence of HBV in Egypt is of intermediate endemicity (2-8%) [10,11]. Badawy and El-Salahy [12] reported a rate of materno-fetal transmission in 51.8% of HBsAg-positive women in Egypt.

Our study showed that out of 2,000 pregnant women, 35 were positive by rapid screening test (1.75%), out of whom 32/35 cases (91.43%) were positive by confirmatory test representing 1.6% of the whole study population. This result was in agreement with Khalil et al., from Saudi Arabia [13] and EL-Magrahe et al., from Libya [14] who reported that 2.4% and 1.5% of their studied women were positive for HBsAg, respectively. Eke et al., from Nigeria [15], and Sharifi-Mood et al., from Iran [16], reported higher prevalence rates of HBV of 8.3%, and 6.5% respectively. Other studies from the North Africa and Middle East reported rates of 4% from Tunisia [17], 4.3% from Jordan [18]. From Pakistan, Taseer et al., [19] and Azhar et al., [20] also reported prevalence rates of seropositive HBsAg among pregnant women of 4.6% and 5.7%, respectively. High prevalence rates of HBsAg were also reported from Ghana (10.5%) [21] and Yemen (13.2%) [22]. Prevalence of HBV infection varies in different parts of the world. In addition, this prevalence varies from country to country, from one region to another region and from one group to another group in a country [23]. Factors influencing incidence and prevalence of HBV infection in a particular community in addition to ethnicity and immigration patterns include intravenous drug use and high-risk sexual activity [24].

The age of acquiring infection is the major determinant of the incidence and prevalence rates [25]. In our study, although HBsAg was detected at a higher rate in pregnant women aged >25 years than in women aged <25 years, the difference was not statistically significant. Habiba and Memon [26] from Pakistan also reported that the majority of those that tested positive to HBsAg were in the age range 25-35 years. Other studies also observed a high prevalence rate of HBV in pregnant women >25 years that those <25 years [14,19]. The increased age among HBsAg positive mothers may be due to increase the chance of exposure to HBV for each pregnancy. However, Eke et al., [15] reported a highest prevalence of HBsAg among pregnant women whose age ranged 20-24 years. The authors

attributed that difference to the early marriage and pregnancy of women in South-Eastern Nigeria. Hence, those positive to HBsAg are likely to be picked when screened during their antenatal care.

Pregnant women are considered at a higher risk due to increased exposure to risk factors (as blood transfusion, intravenous drugs or surgical procedures) [27]. However, our results showed that 91.42% of cases, 82.85% of controls were multigravidae with no significant difference between both. These were in agreement with Eke et al., [15] and Buseri et al., [28]. However, Azhar et al. [20] reported a higher frequency of HBV infection among multigravidae. It might be at increased risk of HBV infection among multigravidae because of their past pregnancies, hospital admission blood transfusion and/or any surgical procedure in the past [29]. Therefore, with each pregnancy and childbirth chances of exposure to HBV become greater.

Occupation is a known predisposing factor for HBsAg infection [30]. Compared with the general population, physicians (7.4% fold) and other medical staff (16 fold) are exposed to a considerably higher risk of contracting acute viral hepatitis from contact with HBV infected patients [31]. In our study, 97.1% of cases and 94.3% of controls were housewives and only 2.9% of cases and 5.7% of the controls were working. No significant difference was detected between both groups. Our results are nearly similar to Sharifi-Mood et al. [16] and Taseer et al. [19]; however, Eke et al. [15] reported that eight out of the 36 health care workers screened were positive to HBsAg; this was statistically significant. Those HBsAg-positive women were midwives at maternity centers and they were exposed to body fluids from women during delivery and possibly acquired the infection from body fluids from these women at delivery.

Rural residence could be a risk factor for HBV infection. Socioeconomic conditions among the poor and less educated, and crowded living condition especially in the rural areas, may contribute to HBV exposure [32,33]. In our study, most of HBsAg-positive women and controls were belonging to rural areas with poor socioeconomic and low educational status with no significant difference between them. In addition, none of our cases and controls had previously received HBV vaccine; this is because they were not oriented about the importance of the vaccine. Woodruff et al. [34] also concluded that the prevalence of HBV did not differ by educational level, occupation, or rural versus urban residence.

None of our cases and 4.3% of the controls had previously received HBV vaccine. Other studies also reported lower HBV vaccination rates among their studied pregnant mothers [15, 20]. This lower vaccination rate could be explained by the fact that our pregnant women were born before introducing hepatitis B vaccine within our national immunization program.

HBV can be transmitted between family members within households; HBsAg contamination of surfaces is widespread in homes of chronically infected persons, which may explain the interpersonal spread of HBV such as among household contacts [35]. In our study, a positive family history of HBV infection was reported in 48.6% of cases, which was statistically significant. The role of family history as an important risk factor in acquiring HBV infection had been previously identified in other studies [15,16,36].

Inadequate sterilization of medical and dental instrument and unsafe injection practice continues to be a problem and may account for a majority of HBV infections [37]. In our study, previous history of dental extraction, filling, or gum treatment was not a significant risk

factor for acquiring HB infection. Similar observations were reported by other studies [13,14,19,20,38].

In our study, previous history of intravenous drug administration was reported in 80% of cases and 48.6% of controls with a statistically significant difference between both. Taseer et al. [19] reported that multiple injection therapy was the second important risk factor in HBV transmission.

History of previous surgeries was reported in 80% of our cases and 54.3% of controls, which was also significant. History of previous surgeries is a major risk factor for transmission of HBV [19]. However, Khalil et al. [13] and Vázquez-Martínez et al. [39] reported a nonsignificant distribution of previous surgeries in the transmission of HBV infection among their studied women.

Blood transfusion continues to cause hepatitis B infection in countries, where blood donor is not screened. Transmission of HBV from transfusion of unscreened blood continues to be a problem and may account for a majority of infections among children and adults [37]. In our study, history of previous blood transfusion was not observed in a significant number of cases. Our study comes in agreement with Khalil et al. [13] and Vázquez-Martínez et al., [39]. However, other studies reported that blood transfusion was an important risk factor for acquiring HBV infection [19,36].

In our study, previous hospital admission was reported in 82.9% of cases, and in only 45.7% of controls. This difference between both groups was highly significant. From Iran, Ahmadi et al. [40] also reported that previous surgery and hospitalization were observed in a higher percent of HBsAg positive cases than HBsAg negative controls but the difference between both groups was not of statistical significance.

None of our cases had a past history of symptoms of hepatitis. This is similar to Sharifi-Mood et al. [16]. However, Vázquez-Martínez et al. [39] reported that 8% of the whole study reported signs and symptoms supporting hepatitis infection. In addition Shamsuddin and Marmuji [36] stated that 198 out of 7172 (whole study) had previous history of jaundice, 4.5% were HBsAg positive, and that was statistically significant. A very few number of pregnant women which had previous signs and symptoms of hepatitis is because most cases of hepatitis are asymptomatic.

5. CONCLUSION AND RECOMMENDATIONS

In the post-vaccination era in Egypt, HBV infection prevalence among pregnant females is low. Family history of HBV infection, previous IV injections, medical clinic attendance, hospital admission, and surgeries are the major risk factors for acquiring HBsAg infection. Most of HBV-infected pregnant women are asymptomatic and unaware of their infection until being unraveled by screening; therefore, antenatal screening of pregnant women for HBsAg is important to identify which newborn should be immunized. The “One Step HBsAg Rapid Test” could serve as a reliable screening test for HBV.

The study is considered as a pilot study, to help in implementing a national program for prevention of vertical transmission of HBV as the schedule of HBV vaccine in our country is at the age of 2, 4, 6 months.

CONSENT

Consent was obtained from all study candidates. If they had questions, a study physician would clarify the consent form from a standardized set of key points that covered each section. Candidates who indicated that they understood and agreed to the terms of the study provided the consent.

ETHICAL APPROVAL

The Scientific Research Committee of Pediatrics Department, Faculty of Medicine-Cairo University, approved the study design. Data confidentiality was preserved according to the Revised Helsinki Declaration of Bioethics.

CONFLICTS OF INTEREST

Authors have declared that no competing interests exist.

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