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HAI PHONG UNIVERSITY OF MEDICINE AND PHARMACY

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THE CURRENT SITUATION OF CARRYING HEPATITIS B VIRUS IN PREGNANT WOMEN AND THE RESULTS OF PREVENTION INTERVENTIONS IN HAI PHONG, 2017-2020

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1. National Library
2. Library of Hai Phong University of Medicine and Pharmacy

LIST OF THESIS-RELATED SCIENTIFIC WORKS PUBLISHED

1. Nguyen Thi Thuy Linh, Nguyen Thi Tham, Tran Thi Thuy Ha, Hoang Thi Giang, Nguyen Quang Chinh, Pham Minh Khue (2021), "The reality of carrying high-load HBsAg and HBV-DNA in pregnant women visiting for pregnancy examination and management at Hai Phong Hospital of Obstetrics and Gynecology, October 2017-March 2018", Vietnam Journal of Preventive Medicine, Volume 31, No. 1-2921, pages: 189-195.

2. Nguyen Thi Thuy Linh, Nguyen Thi Tham, Tran Thi Thuy Ha, Hoang Thi Giang, Nguyen Quang Hung, Pham Minh Khue (2021), "Mother–to–Child Transmission of Hepatitis B virus and some related factors in HBsAg-positive pregnant women at Hai Phong Hospital of Obstetrics and Gynecology in 2017-2019", Vietnam Journal of Preventive Medicine, Volume 31, No. 1- 2921, pages: 227-235.

3. Pham Minh Khue, **Nguyen Thi Thuy Linh**, Vu Hai Vinh, Luu Vu Dung, and Bang Nguyen Van (2020), "Hepatitis B Infection and Mother-to-Child Transmission in Hai Phong, Vietnam: A Cohort Study with Implications for Interventions". *BioMed Research International*, Volume 2020, Article ID 4747965.

INTRODUCTION

Vietnam has about 7.8 million people living with hepatitis B virus (HBV), which means that 1 out of 11 people in Vietnam is infected with HBV. According to Statistics from the Ministry of Health in 2019, the percentage of HBV carrying in pregnant women in Vietnam was 10-20% and the percentage of mother-to-child transmission of HBV was 5-10%, of which up to 90% of children develop chronic hepatitis B virus.

In Hai Phong, over the past 25 years, after the study of author named Nguyen Tuyet Nga in 1994, there have been no studies to assess the current situation of CHB carrying in pregnant women and the percentage of HBV mother-to-child transmission. Therefore, with the desire to have an answer about the current situation of mother-to-child transmission in the current conditions? How does the effectiveness of health education and communication measures in line with the current actual prevention practices help improve knowledge, attitudes and practices to prevent mother-to-child transmission of HBV? We carry out our study on the topic "**The current situation of carrying Hepatitis B Virus in pregnant women and the results of prevention interventions in Hai Phong city**" with 2 objectives:

1. Describe the current situation of mother-to-child transmission of HBV and some related factors in pregnant women visiting for pregnancy examination and management at Hai Phong Hospital of Obstetrics and Gynecology in 2017-2018.

2. Evaluate the results of interventions to prevent mother-to-child transmission of HBV by health education and communication for mothers and health workers in the study area.

NEW CONTRIBUTIONS OF THE THESIS

In the study, the author contributed to the national data system on the rate of HBV mother-to-child transmission (MTCT) among pregnant women in Haiphong. The study results are the basis for applying the practical prevention interventions to help reduce the rate of MTCT, thereby reducing the rate of CHB infection in the community, resulting in the eradication of HBV. The implementation of a longitudinal follow-up study from the first month of pregnancy to the time of 12 months postpartum is one of the key difficulties.

In the study results, the author also show that the model of health education and communication interventions for pregnant women and obstetric health workers is feasible and meaningful for the implementation of measures to prevent HBV- MTCT.

THE THESIS'S STRUCTURE

The main part of the thesis is 134 pages long, including the following sections:

Introduction : 2 pages

Chapter 1 – Overview : 37 pages

Chapter 2- Subjects and methods applied to the study: 25 pages

Chapter 3- Results reached of the study: 36 pages

Chapter 4- Discussion: 31 pages

Conclusion and recommendations: 2 pages

The thesis refers to 184 documents, including 35 Vietnamese documents and 149 English ones. The thesis includes 39 tables, and 10 figures. The thesis's appendix consists of 6 appendices of 35 pages long.

Chapter 1 : OVERVIEW

1.1. Overview of Hepatitis B Virus

1.1.1. Definition, etiolog of disease

Chronic hepatitis B virus (CHB) is an infectious disease caused by hepatitis B virus (HBV), manifested in two forms, acute and chronic HBV. Hepatitis B virus has 3 types of antigen, corresponding to the 3 above types of antigen are 3 types of antibodies. The presence of antigens (HBsAg, HBeAg, HBcAg) and antibodies (anti-HBs; anti-HBc; anti-HBe) are important in the identification of the disease, its form, and its course. The disease can cause dangerous complications such as acute liver failure, cirrhosis, liver cancer and possibly death.

1.1.2. Transmission routes of hepatitis B

Transmission route of HBV can occur vertically (mother-to-child transmission) and horizontally (blood-borne and sexual transmission through contact with blood and articles of blood or secretions of an infected person).

1.1.3. Epidemiology of hepatitis B in pregnant women

According to WHO in 2019, there was about 257 million people infected with CHB worldwide, of which the Western Pacific region had the highest proportion (115 million people). Every year, about 1.4 million people died related to HBV (acute hepatitis, cirrhosis and liver cancer). The rate of HBV infection in pregnant women in Nigeria ranged from 2 to 15.2%; in East Africa it was 11.8%; in Ethiopia, it was 6.7%; in China, it was 3.1%; in Laos, it was 5.44% and in the Philippines, it was 9.6%.

In Vietnam, about 7.8 million people are living with hepatitis B, which means that one out of 11 people is infected with HBV. In a study by the author named Nguyen Thi Tuyet Nga (1994), the existing

prevalence of HBsAg positive in pregnant women who gave birth at Hai Phong Hospital of Obstetrics and Gynecyology, and Ngo Quyen district's Medical Center was 12.59%. The study by the author named Dinh Thi Binh (1996) at 108 Military Central Hospital, there were 166 out of 1564 (accounting for 10.61%) pregnant women carrying HBsAg(+) in the last 3 months of pregnancy. The study by the author named Chu Thi Thu Ha on 1,300 healthy 28-week-old pregnant women living in Hanoi in 2006, the prevalence of HBV infection among pregnant women in Hanoi was 12.5%. The study by the author named Nguyen Van Hien on 93,638 pregnant women at the National Hospital for Obstetrics and Gynecology for 5 years (2006–2010) showed that the percentage of pregnant women giving birth with HBV infection is 16.2%. The study by the author named Dao Thi My Phuong was carried out from August 2013 to April 2014 on 1,010 pregnant women representing the pregnant women community in Binh Duong province, in which the percentage of pregnant women carrying HBV was 10.5%. According to Statistics from the Ministry of Health in 2019, the percentage of HBV carrying in pregnant women in Vietnam ranges from 10-20%.

1.2. Factors associated with mother-to-child transmission of HBV

- Maternal HBV - DNA levels
- Anti-HBV therapy
- Active - passive immunotherapy
- Breastfeeding
- Method of childbirth
- Knowledge, attitude and practice of mothers about hepatitis B
- Knowledge, attitude and practice about hepatitis B among healthcare workers

1.3. Measures to prevent mother-to-child transmission of HBV

- Vaccine hepatitis B schedule.
- Hepatitis B immune globulin injection (HBIg).
- Anti-HBV therapy.
- Use of hepatitis B immune globulin during pregnancy.
- Health education and communication as well as knowledge improvement for mothers.
- Knowledge improvement for health workers.

Chapter 2: SUBJECTS AND METHODS

2.1. Subjects, Location and Time applied to the study

2.1.1. Subjects applied to the study

- The pregnant women living in Hai Phong come to examine and manage their pregnancy at Hai Phong Hospital of Obstetrics and Gynecology from October 2017 to March 2018.

Selected criteria:

  - Pregnancy in the first month with their plan to manage their pregnancy at Hai Phong Hospital of Obstetrics and Gynecology; Agree to participate in the study
  - Have a detail address (30 km radius from the city center).

- Children born to the mothers with chronic HBsAg (+) who give a consent to participate in longitudinal follow-up study from October 2017 to March 2018.
- Health workers in departments that have directly contact with pregnant women: Department of Prenatal Diagnosis, Department of Obstetrics and Department of Testing: agreed to participate in the study; There are no plans to change jobs in the next 12 months.

2.1.2. Location applied to the study: Hai Phong Hospital of Obstetrics and Gynecology.

2.1.3. Time applied to the study: from October 2017 to January 2020

2.2. Methods applied to the study

2.2.1. Design for the study:

Longitudinal follow-up study and community intervention.

2.2.2. Sample size for the study:

(1) Sample size for longitudinal follow-up study:

- Sample size for determining chronic HBV-carrying pregnant women: 1721 pregnant women
- Sample size to assess the rate of HBV MTCT: 150 mother-infant pairs followed up to the time of 12-month postpartum.

(2) Sample size for intervention study:

- 176 pregnant women who are chronically positive for HBsAg in the time of 6-month postpartum.
- 131 health workers in Department of Prenatal Diagnosis, Department of Obstetrics and Department of Testing, Hai Phong Hospital of Obstetrics and Gynecology.

2.2.2. Variables and indicators in the study

(1) Current situation of MTCT in pregnant women with CHB infection:

The rate of mother-to-child transmission of HBV

+ Percentage of pregnant women with CHB by age, education level, occupation, number of pregnancies, average income, history of hepatitis B vaccination, personal and family history of hepatitis B.

+ Percentage of pregnant women by hepatitis B markers status: high HBV-DNA levels above 200,000 IU/ml (10^6 copies/ml); HBeAg positive; ALT level more than twice the upper limit of normal ALT.

+ Percentage of pregnant women with their indications for anti-HBV therapy (including prevention of MTCT and CHB therapy).

+ Percentage of children by childbirth method, birth weight, nurturing methods, neonatal dose of hepatitis B vaccine injection, HBIg injection and the prevalent rate of HBsAg-positive in the blood in the umbilical cord of infants after birth.

+ The rate of MTCT at the period of 12 months of age of child.

Factors associated with mother-to-child transmission of HBV

+ Family factors: the family has someone infected with HBV (including the father).

+ Maternal factors: Previous hepatitis B vaccination; know your HBsAg carrying status; maternal HBeAg carrying status; maternal HBV DNA levels above 200,000 IU/ml; Participate in anti-HBV therapy.

+ Child factor: hepatitis B birthdose coverage (HepB-BD); HBIg; HepB3 according to the immunization program.

(2) Evaluation of the results of prevention interventions with health education and communication for mothers and health workers:

+ Percentage of KAP criteria before and after intervention

2.3. Techniques and tools for information collection

(1) Collect information on the rate of MTCT:

- Use self-designed medical records for the study for each mother - child pair in the study.
- Conduct testing to collect information about maternal serological markers for hepatitis B at 7 months of pregnancy, at birth; in the blood in the umbilical cord and at 12 months of age.
- Standards for assessing the CHB status, criteria for anti-HBV treatment according to Decision 5448/QĐ-BYT.

(2) Information collection for intervention study:

The intervention includes two components: health education and

communication for mothers with chronic HBV and health workers about hepatitis B.

- Use pre-designed questionnaires from the standardized questionnaires of the author named Pham Thi Thanh Hang and the author named Y. Chen in 2017 to assess KAP criteria of mothers and health workers before and after intervention.
- The threshold for assessing achievement of KAP criteria in mothers is more than 50% of the correct answers and in health workers is when 70% of the questions are correctly answered answered about knowledge - attitude - practice.
- For mothers' practice on preventing mother-to-child transmission of HBV, assessed by participating in anti-HBV therapy when indicated; combined with checking immunization books to assess HepB-BD; HBIg injection within 12 hours of birth and HepB3 according to the immunization program.

2.4. Health education and communication interventions

a. Intervention for mothers

The communication activities were implemented 3 times by the staff of Hai Phong University of Medicine and Pharmacy in the form of individual direct communication: in the first time when 7 months pregnant; the second time is 2 weeks before the estimated due date and the third time is 3 weeks after the birth. All activities during the intervention are recorded, including the pregnant woman's information (full name, year of birth, address, phone number (of the pregnant woman and her family member, estimated due date), date of participation in the study, status of participation in interventions.

b. Interventions for health workers

The communication activities were carried out once in the form of small group communication from 30-35 health workers in each specialized faculty, conducted by the researchers from Hai Phong University of Medicine and Pharmacy. The content of communication includes: provision of knowledge about hepatitis B epidemiology (incidence, consequences, transmission routes), screening, preventive measures and HBV vaccine for health workers at the study site.

2.5. Data processing: The data after collection was entered using Epidata 3.1 software and processed with Stata 12.0 software.

2.6. Ethics in the study process

The study was carried out under the consent of the PhD thesis proposal council of Hai Phong University of Medicine and Pharmacy. The data in the study is used with the permission of the city-level research team. All information about subjects applied to the study is kept confidential according to a strict design process. The measures to prevent mother-child transmission of HBV are advised for pregnant women based on the guidance of the Ministry of Health on diagnosis and treatment of viral hepatitis.

Chapter 3: RESULTS OF THE STUDY

3.1. Current situation of mother-to-child transmission of HBV among pregnant women coming to examine and manage their pregnancy at Hai Phong Hospital of Obstetrics and Gynecology

Our study was carried out on 1,721 pregnant women in the first month of pregnancy who came to examine and manage pregnancy at Hai Phong Hospital of Obstetrics and Gynecology from October 2017 to March 2018. The average age of pregnant women was 30 (Min-

Max: 14 - 42 ages) and the majority did not know about their own HBV carrying status (74.1%).

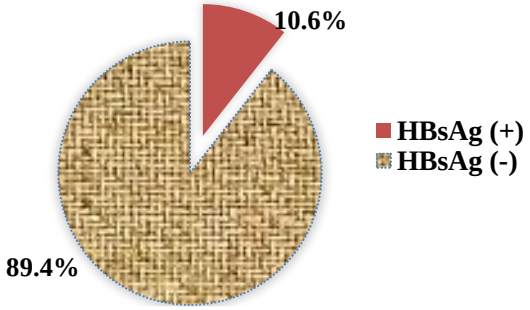

Figure 3.1. The rate of chronic HBV carrying in pregnant women (n=1721)

Comment: The prevalence of HBsAg-positive among pregnant women in the first month of pregnancy visiting Hai Phong Hospital of Obstetrics and Gynecology from October 2017 to March 2018 was 10.6%.

Table 3.1. Demographic characteristics of pregnant women with CHB (n = 1721)

Demographic characteristics	Pregnant women tested n(%)	HBsAg positive (n=183) n (%[95%CI])	p
Occupation			
Farmer	66 (3.8)	6 (9.1 [2.1 – 16.1])	
Worker	663 (38.5)	70 (10.6 [8.2 – 12.9])	
Office staff/ Bank staff/ teacher/ doctor	583 (33.9)	64 (10.9 [8.4 – 13.5])	0,96
Saler/ Housewife	409 (23.8)	43 (10.5 [7.5 – 13.5])	
Educational level			
Below high school	66 (3.8)	7 (10.6 [3.1 - 18.1])	0.98
High school	763 (44.4)	80 (10.4 [8.3 - 12.7])	
	892 (51.8)	96 (10.8 [8.7 - 12.8])	

College -University/ Postgraduate			
Number of pregnancies			
Time 1	650 (37.7)	68 (10.5 [8.1 - 12.8])	0.98
Time 2	836 (48.6)	90 (10.7 [8.7 - 12.9])	
Time 3	235 (13.7)	25 (10.6 [6.7 - 14.6])	
Average income			
Less than 5 million VND	102 (5.9)	11 (10.8 [4.7 - 16.8])	
5- 10 million VND	1428 (83.0)	151 (10.6 [8.9- 12.2])	0.98
≥ 10 million VND	191 (11.1)	21 (11.0 [6.5 - 15.4])	
Previous hepatitis B vaccination			
Already	984 (57.2)	103 (10.5 [8.5 - 12.4])	0.79
Never/Don't remember	737 (42.8)	80 (10.8 [8.6 - 13.1])	
Know your HBV carrying			
Yes	445 (25.9)	48 (10.8 [7.9 - 13.7])	0.90
No	1276 (74.1)	135 (10.6 [8.9- 12.3])	

Comment: No relationship between demographic characteristics and chronic HBsAg carrying status in pregnant women has been found.

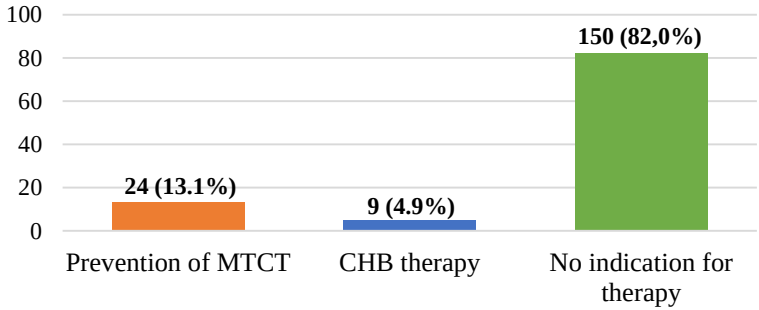

Figure 3.3. Indications for antiviral hepatitis B therapy according to Decision 5448/QĐ-BYT (n=183)

Comment: The percentage of pregnant women with indications for treatment to prevent MTCT was 13.1%; The percentage of pregnant women with indications for CHB therapy was 4.9%.

Table 3.2. Treatment participation of pregnant women with indications for therapy (n=183)

Indication for therapy	Therapy n(%)		Total	p
	Yes	No		
Prevention of MTCT	24 (100%)	0	24 (13.1%)	**<0.001**
Hepatitis B therapy	6 (66.7%)	3 (33.3%)	9 (4.9%)	
No indication	0	150 (100%)	150 (82.0%)	
Total	**30 (16.4%)**	**153 (83.6%)**	**183**	

Comment: The percentage of participation in anti-HBV therapy in the group of mothers with indications for prevention of MTCT is 100%; In the group of mothers with indications for CHB is 66.7%. The difference was statistically significant with $p < 0.001$.

Table 3.4. Information of the infants born from mother with CHB (n=183)

Infants' characteristics		Number	Percentage %
Average birth weight: 3019 $\pm$ 298.2 gram			
Sex	Girl	88	48.1
	Boy	95	51.9
Delivery form	Vaginal delivery	120	65.6
	Cesarean section	63	34.4
Nursery type	Breastfeeding	90	49.2
	Bottle feeding	80	43.7
	Combination	13	7.1

Comment: Out of a total 183 infants were born from mother with chronic HBV, the average birth weight was 3019 + 298.2 gram; the rate is higher in the group of baby boys (51,9%); vaginal delivery (65,6%) và exclusive breastfeeding (49,2).

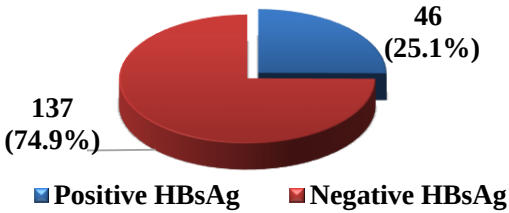

Chart 3.4. Prevalence HBsAg in umbilical cord blood (n=183)

Comment: The rate of positive HBsAg in infant cord blood was 25.1%.

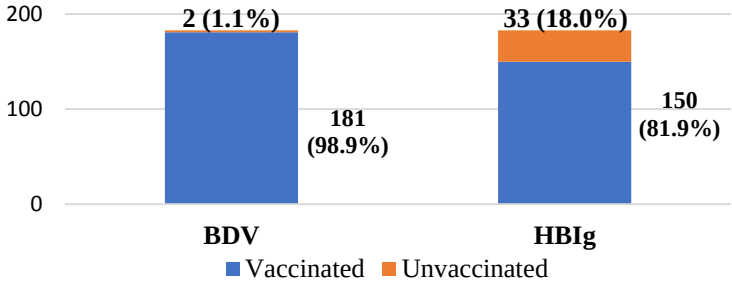

Chart 3.5. Rate of infants got vaccinated with BDV and HBIg vaccines (n=183)

Comment: 98.9% infants got vaccinated HepB new born shot and 81.9% infants got vaccinated HBIg

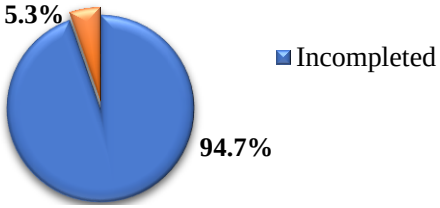

Chart 3.6. Vaccinated completion rate of HepB3 at 12 months (n=150)

Comment: At 12 months old, there are 94.7% infants completed three shots according to vaccination program.

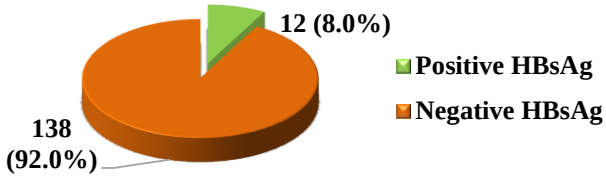

Chart 3.7. HBV transmission rate from mother to child 12 months after birth (n = 150)

Comment: Prevalance rate of MTCT during 12 months after birth was 8.0%.

Table 3.19. Evaluation of factors related to MTCT at 12 months (n=150)

Characteristics		Infants infected with HBV n(%)	OR[a] (95%CI)	aOR[b] (95%CI)	*p*[c]
HBeAg of the mother at delivery	(+) (-)	10 (34.5) 2 (1.7)	31.3 (6.4-154.1) ref.	65.8 (7.3 -594.1) ref.	< 0.001
Family member infected with HBV[d]	Yes No	5 (21.7) 7 (5.5)	4.8 (1.4 – 16.6) ref.	4.0 (0.7-23.4) ref.	0.12
HepB-BD	No Yes	1 (50.0) 11 (7.4)	12.5 (0.7 – 212.9) ref.	36.1 (0.9-1459.5) ref.	0.06
HBIg	No Yes	5 (18.5) 7 (5.7)	3.8 (1.1 – 12.9) ref.	3.4 [0.6- 9.9] ref.	0.18
HepB3	No Yes	2 (25.0) 10 (7.0)	4.4 (0.8 – 24.7) ref.	2.1 [0.1-31.2] ref.	0.59

(a: Unilateral analysis; b: Multivariate regression model; c: Likelihood-ratio test; d: including the husband)

Comment: Maternal HBeAg- positive status at birth is associated with HBsAg carrier status in 12-month-old infants (p < 0,001).

3.2. Result of preventive intervention

3.2.1. Intervention results for the mothers

Table 3.24. Intervention results on changing the mother's knowledge, attitude about Hepatitis B (n = 176)

Knowledge about HBV	Before intervention (%)	After intervention (%)	Differences (%)	EI* (%)	p**
Adequate knowledge	149 (84.7)	169 (96.0)	11.5	13.6	<0.001
Positive attitude	123 (69.9)	176 (100.0)	30.1	43.1	<0.001

*(*EI: Effective index; *: Mc Nemar)*

Comment: After intervention. the rate of the mother who have adequate knowledge and positive attitude about Hepatitis B both increases meaningfully (p<0.001). The efficiency index after intervention increases 13.6% - 43.1%.

Table 3.26. The HBV mother-to-child transmission preventive practice of the mother after intervention (n=176)

Practice	Number	Percent %
Hepatitis B testing during pregnancy	176	100.0
Complied with antiretroviral therapy.	173	98.3
Injected neonatal Hepatitis B within 24 hours	174	98.9
Injected HBIG for infant within 12 hours after birth	144	82.0
Reason of unvaccinated (n=32) - Unneccesary - Fear of unsafetiness - High cost	 3 10 19	 9.4 31.3 59.4
Injected 2 shots of Hepatitis B followed the vaccination program.	164	93.2
Average practice points: 4.70 (SD: 0.54; Min - Max: 3 - 5) **Right practice rate: 96.2%**		

Comment: After intervention. the rate of the chronic HBV infected mother whose has right practice of MTCT prevention was 96.2%.

3.2.2. Intervention outcomes on healthcare workers

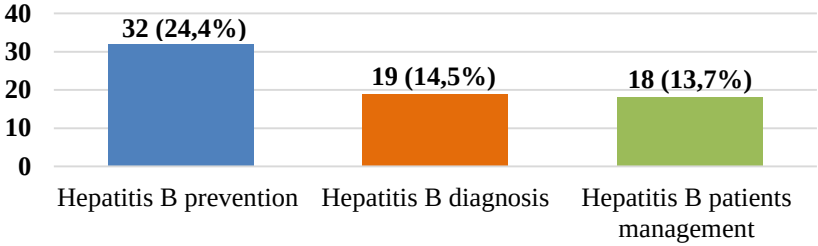

Chart 3.9. The participation rate of healthcare workers at HBV-related training courses during the past 2 years (n=131)

Comment: The rate of trained healthcare workers about HBV-related topics (prevention. diagnosis. and management) was low. below 25%.

Table 3.39. Intervention results on changing healthcare workers' KAP about Hepatitis B in pregnant women (n = 131)

KAP	Before intervention (%)	After intervention (%)	Differences (%)	EI %	p
Adequate knowledge	98 (74.8)	131 (100.0)	25.2	33.7	<0.001
Positive attitude	65 (49.6)	73 (55.7)	6.1	12.3	0.008
Good practice	67 (51.1)	75 (57.3)	6.2	12.1	0.008

(: Mc Nemar)*

Comment: After intervention. the average score of healthcare workers' knowledge. attitude about Hepatitis B in pregnant women both increased meaningfully (EI increased 13.5% and 14.6%; $p<0.05$). The average score of their practice increased but was not statistically meaningful with $p > 0.05$.

Chapter 4: DISCUSSION

4.1. Current status of mother-to-child HBV transmission and related factors of pregnancy women whose pregnancy examination and management taken at Haiphong OBGYN Hospital in 2017-2018.

4.1.1. HBV mother-to-child transmission rate.

Our research was conducted on 1721 first-month-pregnant-women who had examination and pregnancy management at Haiphong Obstetrics and Gynecology Hospital from October of 2017 to March of 2018. The rate of pregnant women with positive chronic HBsAg was 10.6% (183/1721 women). Although our findings showed the compatibility with the prevalence of HBV in pregnant women. however. this rate was significantly higher than threshold for high prevalence (8%) (Table 3.1). This rate indicated that in the country like Vietnam that has main transmission is mother-to-child. it is determined as the main cause of chronic HBV in children.

The rate of pregnant women who received preventive prescription of HBV MTCT (HBV – DNA concentration > 200.000 IU/ml) was 13.1%. All of these pregnant women participated in HBV MTCT prophylactic. In this study. there were 3/9 (33.3%) pregnant women were prescribed to treat chronic HBV but unparticipated. At the delivery time. 100% the mother participated in preventive treatment with the HBV – DNA concentration below 200.000 IU/ml. It's a meaningful finding in order to promote MTCT prevention in high prevalence country like Vietnam (Chart 3.2 – Table 3.2).

Infant characteristics of 183 children of 183 mother with CHB: Average birth weight was 3019 + 298.2 gram; the percentage of male and female were not significantly different (51.9% và 48.1%); the

percentage of vaginal delivery were higher than C-section (65.6% so với 34.4%) and almost 50.0% infants were exclusive breastfed (Table 3.4).

The HBsAg positive prevalence in cord blood was 25.1%. Our study result was higher than the rate of uterine infection in China in 2015. which was 6.3%. and in Australia in 2014 was 5.0%. in California in 2016 was 1.1% and in Thai Binh, Vietnam in 2011 was 21.7% (Chart 3.4).

The rate of infant who got vaccinated the HepB-BD in this study was 98.9% (181/183 children; 02 of them did not take the shot due to their signs of neonatal jaundice at that time) and the infant took got vaccinated HBIg within 12 hours after birth 82.0% (Chart 3.5). These results were higher than that of Duong Thi Hong's study (Yen Dung, Bac Giang); author Duong Anh Dung 's (Lang Son, 2015) and author Nguyen Thi Loan's (Quynh Nhai, Son La, 2019) which rate of HepB-BD were 59.1%; 26.0% và 70.0%. respectively. The reason for that high rate was because all 183 pregnant women participated in the longitudinal follow-up research received individually health education and interventions on careness, pregnancy management for the next trimester and hepatitis B vaccination after birth. These information was issued at 3 points of time: at the 7 months of pregnancy; after birth and 3 weeks after birth. There were 33/183 infants did not take vaccinated HBIg and the primary reason was because they must pay for the dose (about 2.1 million VND/dose); the second reason was the family concern about the safetiness of taking two doses within 24 hours and two infants were not eligible for HepB-BD, so they did not take HBIg either.

We assessed the continuous Hepatitis B vaccination of the subject by using questionnaire combined with review of the child's immunization records at the time of 12 months of age. The rate of children completing vaccination (exclude the neonatal shot) was 94.7% (Chart 3.6). in which the majority was vaccinated hepatitis B combined in the 5 in 1 package of the overall vaccination program at 2-3-4 months of age. Only few children took 6 in 1 vaccine package or serviced hepatitis B (because the serviced 5 in 1 package did not include hepatitis B). We noted the reason from the mothers whose child was not vaccinated on time. which are lack of vaccines (5.3%). the safetiness concern of the vaccines after the "adverse events after vaccination" in 2019. and some children were sick at the time of immunization schedule.

At 12 months of the subject's age. we lost track of 33 pairs of mother and child (7 pairs within the first 6 months and 26 pairs in the next 6 months). They could not be reached through phone number and home address. The HBV MTCT rate at 12 months of age in this study was 8.0% (Chart 3.7). Our result was lower than that in Chu Thi Thu Ha's (Hanoi, 2006). which was 35.6%. and Phi Duc Long (Thai Binh, 2011) was 21.7%. This difference can be explained as follow: firstly. the percentage of pregnant women with HBeAg (+) in our study was lower; secondly. the percentage of pregnant women got hepB vaccine was higher; and thirdly. 148/150 newborn in our study got vaccinated HepB within first 24 hours was high (98.7%); vaccinated HBIg was 82.0% and completing HepB immunization according to the national immunization program was 94.7%. Therefore. this vaccine coverage percentage was the consequence of the early screening the subject

pregnant women. provided essential information and multiple repetation to practice the MTCT prevention.

4.1.2. Factors related to MTCT of HBV

Analyzing the relationship between demographic factors. HBeAg (+) status; high HBV DNA concentration > 200.000 IU/ml. treatment status. delivery type. nursing condition. immunization status (neonatal HB. HBIg. HB series in immunization program). we noted that there were the relation between family history of HBV. including the father (OR=4.8; 95%CI: 1.4 - 16.6; p<0.05); HBIg immunization status after birth (OR: 3.8; 95%CI: 1.2 – 12.9; p < 0.05); the participation of the mother in the antiretroviral therapy (OR=24.4; 95%CI: 2.0- 296.2; p < 0.05) and positive HBeAg carrier status of the mother (OR=31.3; 95%CI: 6.4- 154.1; p < 0.001). It concluded that although the pregnant women received full information about HBV in pregnancy and MTCT. but with the paid HBIg. there were no guidelines for the HBV family member management and the HB antiretroviral therapy was only focused on the mother whose HBV-DNA concentration was high and ALT concentration was double the limit without consideration of positive HBeAg carry status in pregnant women would be the cause of HBV MTCT.

In reality. when running multivariate regression model. we noted the mother's HBeAg status was the single independent prognostic factor of HBV MTCT (OR=65.8; 95%CI: 7.3- 594.1; p<0.001) (Table 3.19).

4.2. Intervention outcomes of HBV MTCT prevention by health education to the mother and healthcare workers at Haiphong Obstetrics and Gynecology Hospital.

4.2.1. Intervention outcomes of maternal health education

The intervention by health education promoted the average scores of maternal knowledge. and attitude about HBV. After the intervention. the average knowledge score increased 1.38 points. EI was 15.9%; the average attitude score increased 0.87 points. EI was 27.0%. These changes were statistically meaningful with $p < 0.001$ (Table 3.25). This study results were compatible with that in other studies. health education for pregnant women in particular and women in their reproductive age in general was the ultimate way to promote the prevention of MTCT.

The subject's practice was assessed only once at 6 months after birth. At that time. the practice's assessment criterias were demonstrated via: Hepatitis B in pregnancy test; treatment participation; neonatal HB vaccine injection within 24 hours after birth; injected HBIg within 12 hours after birth with other HB shots in immunization program. The results showed that the average maternal practice score of MTCT prevention was 4.70 (Min - Max: 3 - 5). The percentage of the right practice was quite high (96.2%) (Table 3.26).

Therefore. if health education was implemented on time. on right subject. and systematically would have significant effectiveness in the MTCT prevention. According to WHO Asia Pacific Region. only 10% of Hepatitis B and C infected people were diagnosed and only 30% of them were under treatment. These evidences consolidated the role of expanding intervention model by simple health education and effectiveness on enhance maternal knowledge. attitude. and practice; extend to women in their productive age and targeting all people to facilitate the Hepatitis B elimination.

4.2.2. Health education intervention outcomes on healthcare workers.

Results showed that over the past 2 years. less than ¼ of all healthcare workers were trained about HBV intervention (24.4%); 14.5% were trained to diagnose HBV and 13.7% were trained about HBV patient management. (Chart 3.9).

At the first assessment. the healthcare workers in this study had a gap of knowledge (infected rate. consequence; Hepatitis B testing time for pregnant women; HBV prophylactic in the mother who had high HBV – DNA concentration) and were not interested in HBV in pregnant women. After the intervention by health education for the healthcare workers. the percentage of people who satisfied all categories of knowledge. attitude. and practice increased to statistical meaningful level ($p < 0.05$). EI reached 12.1 to 33.7% (Table 3.39).

It means that we need to put more effort in improving the practice of healthcare workers (HCW) about MTCT. Each HCW needs to aware of their important role in the preventive strategy. and not rely on only physician to discuss with pregnant patient about their condition and the proposal treatment for the mother with HBsAg. even if the consultation can be happened at any time and somewhere differ than the clinic. consultant centre or treatment institution. This is a great challenge in MTCT reduction to HBV elimination.

4.3. Limitation of the study

Firstly. this study was conducted in the urban area and the results might not reflect the nationwide scenario. because these women lived in one of the biggest cities of Vietnam. so they were more likely to approach the high quality healthcare system. and the ability to pay for the antiretroviral therapy during the pregnant check-up or HBIG

vaccination. Secondly. the number of infected newborns were low. which limited the ability of multivariate analysis that might have found many transmission's risk factors rather than maternal HBeAg conditions.

CONCLUSION

4.1. HBV MTCT status of pregnant women with CHB whose medical examination and pregnancy management took place at Haiphong OBGYN Hospital in from 2017 to 2020.

- The percentage of pregnant women with CHB was 10.6%.
- The percentage of of HBV MTCT in pregnant women with chronic HBV was 8.0%.
- In the multivariate regression model. the maternal HBeAg condition was related to the positive HBsAg carry in children at 12 months of age.

4.2. Intervention's outcomes of health education on the mother and healthcare workers (HCW).

4.2.1. *Intervention on the mother*

- After the intervention. the maternal knowledge and attitude about the HBV MTCT all increased to statistically meaningful (EI%: 25.5 to 40.7%).
- The precentage of maternal good practice was high: 100% the mother took Hepatitis B pregnancy test; 98.0% the mother complied with the treatment indications; 98.7% the mother let their babies take HepB-vaccine within 24 hours after birth; 82.0% the mother let their babies take HBIG within 12 hours after birth.

4.2.2. *Intervention on the healthcare workers.*

- After intervention. their knowledge. attitude. and practice about HBV MTCT increased to statistically meaningful with $p<0.05$. The EI increased from 12.1 đến 33.7%.

RECOMMENDATIONS

1. Early screening for pregnant women with HBsAg to make management plan and HBV MTCT preventive treatment.
2. Consultation and health education should be provided to pregnant women. especially the ones who received indication of antiretroviral therapy and carry positive HBeAg.
3. Training for OBGYN at all levels on the management and care procedures for prgnant women with chronic HBsAg in order to well control the MTCT of HBV.