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# HEPATITIS B SURFACE ANTIGEN PREVALENCE IN PREGNANT WOMEN BEFORE AND AFTER NATIONALVACCINATIONS

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# РАСПРОСТРАНЕННОСТЬ ПОВЕРХНОСТНОГО АНТИГЕНА ГЕПАТИТА В У БЕРЕМЕННЫХ ЖЕНЩИН ДО И ПОСЛЕ НАЦИОНАЛЬНЫХ ВАКЦИНАЦИЙ

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**Abstract**

**Background**: Hepatitis B in pregnant mothers can pose a risk to both the mother and the baby. If left untreated or undiagnosed, hepatitis B can be passed from mother to child during childbirth, leading to chronic hepatitis B infection in the baby. However, with proper prenatal care, including testing and vaccination, the risk of transmission can be significantly reduced. This study investigates the hepatitis B surface antigen (HBsAg) prevalence in pregnant women before and after the start of the national hepatitis B vaccination plan.

**Methods**: This cross-sectional study was conducted on all pregnant mothers in Babol County who gave birth between 2018 and 2020. Then the mothers' information, including a history of vaccination, place of residence, and HBsAg status, was recorded and checked through the online system and their health records. The obtained data were analyzed using SPSS software version 22 and were displayed as frequency and percentage. Qualitative variables were analyzed with Chi-square tests. Finally, with the logistic regression model, we investigated the effect of variables on hepatitis. In all tests, P-value less than 0.05 is significant.

**Results**: The Prevalence of positive HBsAg among 11282 pregnant women in Babol city was 61 (0.5%). The prevalence rate among vaccinated and unvaccinated mothers was 8 (0.2%) and 53 (0.7%), respectively, and this difference was statistically significant (p=0.001). The Prevalence of positive HBsAg among city and village residents was 26 people (0.4%) and 35 people (0.7%), respectively, and this difference was not significant (p = 0.07). Also, rural (P=0.02, OR= 1.82, 95%CI: 1.08-302) and unvaccinated (P<0.001, OR= 3.79, 95%CI: 1.79- 8.01) mothers had a higher chance of contracting hepatitis B.

**Conclusion**: The results indicated that national hepatitis B vaccination in newborns has notably decreased infection rates in future childbearing women. Hepatitis B is a preventable disease through vaccination. The vaccine has demonstrated both safety and high immunogenicity. It is crucial to maintain the


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immunization of newborns and adhere to the screening guidelines for pregnant mothers as outlined in the national program.

**Keywords:** Hepatitis B Antigens, Pregnant women, Hepatitis B Vaccines, Prevalence, Immunity, Neonate.


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Введение: Гепатит В у беременных матерей может представлять риск как для матери, так и для ребенка. Если его не лечить или не диагностировать, вирус гепатита В (ВГВ) может передаваться от матери к ребенку во время родов, что приводит к хронической ВГВ-инфекции у ребенка. Однако при надлежащем дородовом уходе, включая тестирование и вакцинацию, риск передачи может быть значительно снижен. В приводимом исследовании изучается распространенность поверхностного антигена гепатита В (HBsAg) у беременных женщин до и после старта национального плана вакцинации против гепатита В.

Методы: Проведенное поперечное исследование включало всех беременных матерей в округе Баболь, которые родили в период с 2018 по 2020 год. Затем информация о матерях, включая историю вакцинации, место жительства и статус HBsAg, была записана и проверена через онлайн-систему и их медицинские карты. Полученные данные были проанализированы с помощью программного обеспечения SPSS версии 22 и представлены как частота и процентное содержание. Качественные переменные были проанализированы с помощью теста хи-квадрат. Наконец, с помощью модели логистической регрессии исследовалось влияние переменных на гепатит. Во всех тестах значение $P < 0,05$ принято, как статистически достоверное.

Результаты: Распространенность положительного HBsAg среди 11282 беременных женщин в городе Баболь составила 61 (0,5%). Показатель распространенности среди вакцинированных и невакцинированных матерей составил 8 (0,2%) и 53 (0,7%) соответственно, и эта разница была статистически значимой ($p = 0,001$). Распространенность положительного HBsAg теста среди жителей города и деревни составила 26 человек (0,4%) и 35 человек (0,7%) соответственно ($p = 0,07$). Кроме того, у сельских (P=0,02, ОШ=1,82, 95% ДИ: 1,08-302) и невакцинированных (P<0,001, ОШ=3,79, 95% ДИ: 1,79-8,01) матерей риск заражения гепатитом В был выше.


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Вывод: Результаты показали, что национальная вакцинация новорожденных от гепатита В значительно снизила уровень инфицирования у будущих матерей. Гепатит В является заболеванием, которое можно предотвратить с помощью вакцинации. Вакцина продемонстрировала как безопасность, так и высокую иммуногенность. Крайне важно поддерживать иммунизацию новорожденных и придерживаться рекомендаций по скринингу беременных матерей, отраженных в национальной программе.

**Ключевые слова:** антигены гепатита В, беременные женщины, вакцины против гепатита В, распространенность, иммунитет, новорожденные.


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## 1 Introduction

The World Health Organization (WHO) predicted that in 2019, 296 million people were infected with chronic hepatitis B, and 1.5 million new cases were registered yearly (21). Viral hepatitis is also estimated to cause 1.34 million deaths annually, 96% of which are caused by long-term consequences and chronicity. Viral hepatitis is also estimated to cause 1.34 million deaths annually, 96% of which are caused by long-term consequences and chronicity (22, 17). The prevalence rate of HBV among pregnant Iranian mothers is between 0.35 and 6.5%, which is essential considering horizontal and vertical transmission from mother to baby (22, 6). According to previous studies, children born to infected mothers have between a 70 and 90 percent chance of being infected with HBV before birth (4).

HBV vaccine was created in 1980, and in 1991, according to the recommendation of the World Health Organization, all countries, especially countries with endemic areas of this disease, included the hepatitis B vaccine in their routine newborn immunization program. This action led to a significant reduction in disease incidence (18, 13). HBV Vaccination has been routinely performed for infants and high-risk groups since 1993 and for adults since 2007. It is believed that this vaccination changes the epidemiological pattern of HBV infection, especially in children and adolescents, and these effects are now seen in young Iranians. Continuous monitoring of this infection and risk factors is essential for better health planning (10). Since 2007, vaccination was also carried out in Iran for adolescents under 18 years of age (18). Recombinant hepatitis B vaccines are available to applicants free of charge in primary care centers (16). Despite receiving it, 5-20% vaccine failure has been reported among individuals with varying levels of response or non-response to HBV vaccination (11).

Studies have shown that various factors such as the type of vaccine, vaccination time, genetic background, age, weight, smoking, and alcohol consumption can be involved in the effectiveness of the hepatitis B vaccine (1,7,9). Considering the importance of this issue, in the present study, we try to investigate the Prevalence of


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hepatitis B surface antigen as a parameter to evaluate the vaccine's effectiveness in pregnant women.

## 2 **Method**

### **Study design and setting**

This cross-sectional study was conducted on all women who gave birth in urban and rural centers of Babol County during 2018-2020. The ethical code has approved this study:

IR.MUBABOL.HRI.REC.1398.325 in Babol University of Medical Sciences.

### **Participants and variables**

The inclusion criteria included all women who gave birth in Babol County from 3/21/2018 to 3/19/2020. The exclusion criteria included the lack of sufficient information about the items in the checklist and delivery at home and outside health centers.

After receiving the code of ethics by referring to the online system for registering the births of pregnant mothers during the mentioned years, we prepared a pre-arranged checklist for all urban and rural centers of Babol County. We collected the necessary information, which included vaccination history, place of residence, and HBsAg.

It is worth mentioning that the national vaccination plan for hepatitis B started in Iran at the beginning of April 1993, and it was mandatory for all babies born after this date. Therefore, all mothers born after 3/21/1993 were vaccinated, and mothers born before this date were unvaccinated.

### **Statistical analysis**

The obtained data were analyzed using SPSS software version 22 and were displayed as frequency and percentage. Qualitative variables were analyzed with Chi-square tests. Finally, with the logistic regression model, we investigated the effect of variables on hepatitis. In all tests, P-value less than 0.05 is significant.

## 3 **Results**


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In this study, 11282 pregnant women gave birth in two years in urban and rural centers of Babol city. Considering that hepatitis B vaccination started at the beginning of April 1993, all mothers born after this year were considered vaccinated, which was nearly a third of our samples. Among vaccinated mothers, eight people (0.2%), and among unvaccinated mothers, 53 people (0.7%) were HBsAg positive. The difference between these groups is statistically significant (P=0.001). Nevertheless, in the investigation of the correlation between the place of residence and HBsAg, it was found that 26 (0.4%) of the urban mother and 35 (0.7%) of the rural mother were positive for HBsAg, and this difference was not statistically significant (P=0.07) (Table1).

Next, the variables of vaccination history and residence were entered separately in the logistic regression model using the Enter method. Being rural and not having a vaccination history significantly predict HBV contacting (Table 2).

## 4 **Discussion**

In the present study, less than one percent of the mothers who gave birth had positive HBsAg. The frequency of HBsAg varies in different parts of the world. The highest prevalence rates in the Western Pacific and Africa were 6.2% and 6.1% of the population, respectively, but the Eastern Mediterranean, Southeast Asia, and Europe had lower prevalence rates In Iran, different studies have reported different frequencies, from 2.2 to 3 percent of hepatitis B, and according to the reports of these studies, Golestan province has the highest prevalence rate. Kermanshah, Kurdistan, and Mazandaran provinces have the lowest Prevalence of hepatitis B, respectively (16, 15, 12). During the last two decades, there has been an epidemiological shift among pregnant women, especially in Mazandaran province. The first epidemiological report of HBV infection among pregnant women in Mazandaran province was conducted in 2008 among 1219 pregnant women who had been referred to 27 hospitals in 14 cities of Mazandaran province in 2000-2001 (2). In Bayani et al.'s study, only 2 cases (0.18%) of 1065 pregnant women were positive


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for HBsAg (5). In our study, the Prevalence of HBV is almost the same to this study. Also, in another study in 2017, the prevalence rate of hepatitis B among pregnant women in Mazandaran province was reported as 0.47% (3), which comparison of these results shows that the rate of hepatitis B among pregnant women in Babol is low.

Also, the results are consistent with our study conducted by Safar et al. in 2014 on the youth of the eastern region of Mazandaran (14), in which 224 people (39.47%) among 510 young people had anti-HBS positive. However, no results of positive HBsAg and symptomatic hepatitis were seen. Based on this study, neonatal HBV provides long-term protection and is very effective in reducing the rate of chronic HBV infection among vaccinated young people in Iran. In the current study, eight people (0.2%) were positive for HBsAg, possibly due to vaccine failure due to age (13). Also, Gil Klinger et al.'s study has shown that following anti-HBS-Ab vaccination, it gradually decreased, and only one-third of the population maintained a protective level after 15 years, which can be a justification for the positivity of HBsAg in the vaccinated mothers in the present study (8).

According to the findings of our study, a significant relationship was found between the place of living or HBV vaccination history and HBsAg positivity. Also, Not having a history of vaccination and being rural were independent predictors of HBV infection. National hepatitis B vaccination was effective in reducing HBsAg infection in reproductive age. Our study shows that its Prevalence has increased significantly, which calls for further investigation to find appropriate causes and preventative measures. our finding is consistent with the study conducted by Staneva Tsankova et al. in 2016 among pregnant women in the Varna region of Bulgaria. Data analysis showed that rural residence was one of the critical risk factors for hepatitis B in pregnant women compared to urban residents (19). Also, the study by Feng Wang et al. in 2019 showed that the Prevalence of positive HBsAg was 1.2% in urban areas and 2.4% in rural areas (20). Also, this study showed that the HBsAg


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positive Prevalence in both urban and rural populations decreased significantly over time from 2002 to 2015, which is consistent with our study.

## 5 **Conclusion**

According to our results, the Prevalence of hepatitis B among pregnant women vaccinated at birth was significantly lower than among unvaccinated mothers, which indicated the effectiveness of the national hepatitis B vaccination plan among the general population, especially pregnant mothers. Also, two of the most crucial risk factors for HBV infection are being rural and not having a vaccination history.

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## **Availability of data and materials**

All relevant data are within the paper however, any question or other file data is required you can contact us using the email address, upon reasonable request.

## **Declarations**

## **Ethics approval**

This study is approved under the ethical approval code of IR.MUBABOL.HRI.REC.1398.325

## **Consent for publication**

The authors declare that they have no competing interests.

## **Authors' Contribution**

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**All authors read and approved the final manuscript.**

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## ТАБЛИЦЫ

**Table 1.** Frequency of demographic information of pregnant women and their relationship with HBsAg.

| **Variables** | | **Frequency (%)** N=11282 | **HBsAg** | | **P-value*** |
|---|---|---|---|---|---|
| | | | **Positive** N= 61 | **Negative** N= 11221 | |
| Place of living | Urban | 3071 (53.8) | 26 (42.6) | 6045 (53.8) | 0.001 |
| | Rural | 5211 (46.2) | 35 (57.4) | 5176 (46.2) | |
| HBV Vaccination history | yes | 3852 (34.1) | 8 (13.1) | 3844 (34.2) | 0.07 |
| | no | 7430 (65.9) | 53 (86.9) | 7377 (65.8) | |

**Notes:** *Independent T-test.


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**Table 2.** Logistic regression to calculate predictive variables in hepatitis B Variables.

| Variables | OR | 95% CI | P-value |
|---|---|---|---|
| Place of living (rural) | 1.82 | 1.08 – 3.02 | 0.02 |
| HBV Vaccination history (no) | 3.79 | 1.79 – 8.01 | <0.001 |

**Notes:** *Independent T-test;

OR; Odds Ratio, CI; Confidence Interval.


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**Блок 3. Метаданные статьи**

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# РАСПРОСТРАНЕННОСТЬ ПОВЕРХНОСТНОГО АНТИГЕНА ГЕПАТИТА В У БЕРЕМЕННЫХ ЖЕНЩИН ДО И ПОСЛЕ НАЦИОНАЛЬНОЙ ВАКЦИНАЦИИ

**Сокращенное название статьи для верхнего колонтитула:**

HEPATITIS B SURFACE ANTIGEN PREVALENCE IN PREGNANT WOMEN

РАСПРОСТРАНЕННОСТЬ ПОВЕРХНОСТНОГО АНТИГЕНА ГЕПАТИТА В У БЕРЕМЕННЫХ ЖЕНЩИН

**Keywords:** Hepatitis B Antigens, Pregnant women, Hepatitis B Vaccines, Prevalence, Immunity, Neonate.

**Ключевые слова:** антигены гепатита В, беременные женщины, вакцины против гепатита В, распространенность, иммунитет, новорожденные.

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