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ORIGINAL ARTICLE

The Prevalence of HCV and HBV Among Pregnant Women Attending Al-Galaa Maternity Hospital in Labor and Studying of HCV Vertical Transmission to the Infants

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Abstract

Background: ***Egypt recorded the highest HCV prevalence globally, and many national screening programs were done to evaluate the extent of the prevalence, which is estimated to be declining. HBV is also a challenging infection, but it was controlled by mass vaccination .***

Aim: ***To detect the prevalence of HCV and HBV infection among pregnant women coming into labour at Al-Galaa Maternity Hospital and also the vertical transmission rate of HCV and study the factors affecting it.***

Patients and Method: ***A prospective study was conducted in the period between July 2021 and January 2022 on 728 pregnant women at Al-Galaa Maternity Hospital in two stages: a cross-sectional study to identify the prevalence of HCV and HBV and a longitudinal study to assess the HCV vertical transmission rate.***

Results: ***The result showed that 2.61% of 728 pregnant women tested positive for HCV antibodies, and 1.24% tested positive for HBsAg. Additionally, vertical transmission could not be detected.***

Conclusion: ***These findings suggest that the prevalence of HCV and HBV is declining in Egypt, and the national campaigns contributed to controlling HCV prevalence.***

Keywords: hepatitis; pregnancy; vertical transmission; HCV; HBV

1. Introduction

Hepatitis C virus (HCV) and hepatitis B virus (HBV) infections are major global health problems that can lead to liver cirrhosis and liver cancer. Pregnant women are considered to be at high risk of transmitting these viruses to their infants. Therefore, understanding the prevalence of HBV and HCV among pregnant women is crucial for developing effective prevention and control strategies.[1]

In Egypt, hepatitis C virus (HCV) is one of the leading public health threats, with the highest prevalence in the world, according to the World Health Organization (WHO). Although the overall prevalence of the virus is expected to decrease in the near future, the clinical burden of chronic hepatitis is expected to increase significantly. The economic burden of the virus will continue to grow. Still, with the introduction of new, highly effective therapies, the total financial cost of HCV is expected to decrease significantly by 2030. [2]

Furthermore, 14.7 per cent of the population aged 15-59 years had active hepatitis in 2009, according to EIHS, and this percentage decreased to 7 per-cent in 2015, still significantly higher than the global average. In order to address this challenge, Egypt has developed a comprehensive national strategy for the control of HCV, which includes six key components: infection control, monitoring and surveillance, hepatitis B vaccination, improving blood safety health education for providers and communities care and treatment. [3]

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There has also been a decrease in the prevalence of hepatitis B in recent years. This is based on a cross-sectional analysis of data from the EHIS (Egyptian Health Issues Survey) in 2015, in which 16,004 participants were enrolled. The mean age of participants was 33.5 years (± 12.4), and the HBV prevalence was 1.52%.[4]

The HCV vertical transmission rate varies among different populations, and several studies have investigated the factors associated with HCV vertical transmission. Maternal viral load of HCV, delivery mode and the presence of HCV RNA in breast milk have been identified as significant predictors of HCV transmission to infants. In addition, maternal HIV co-infection, advanced maternal age, and prolonged rupture of membranes have been associated with an increased risk of HCV vertical transmission.[5]

Early identification of HCV-infected pregnant women and close monitoring of infants born to these women is crucial in the prevention and management of HCV vertical transmission. Antiviral therapy with direct-acting antiviral agents (DAAs) is highly effective in treating HCV in adults and children. However, the safety and efficacy of DAAs during pregnancy and in infants are still being studied. Egypt was the first country to negotiate an alternative price of DAAs and treated about one million of the population from 2015 to 2017.[6, 7]

HCV prevalence has been reported to be 4.6% after the completion of several national programs to control HCV infection in recent years. However, the data on HCV incidence after treatment with DAAs is not yet available. For example, HCC incidence was reported to be 29/1000 / year in patients with cirrhosis after DAAs drugs. Infiltrative patterns among patients with HCC after DAA drugs were also acknowledged to be high.[8]

The targets of our study were to detect the prevalence of HCV and HBV among pregnant women coming into labour at Al-Galaa Maternity Hospital and also the HCV vertical transmission rate.

2. Patients and methods

This prospective study was conducted between July 2021 and January 2022 on 728 pregnant women (The sample size was set at a minimum of 662 participants) at Al-Galaa Maternity Hospital in two stages. The first stage was a cross-sectional study to detect the prevalence of HCV and HBV among pregnant women coming into labour through July 2021. The second stage was a longitudinal study to assess the rate of HCV vertical transmission after six months of labour.

The study included full-term pregnant women, confirmed by gestational age of more than 37 weeks or by ultrasound, regardless of their parity. They were also required to be experiencing actual labour pains and cervical dilatation and have one a live baby that was not distressed according to reactive CTG. However, pregnant women with a history of hepatitis, jaundice, intrauterine fetal death, preterm labour, multifetal pregnancy or congenital anomalies were excluded from the study. Patients provided informed consent before being included in the study.

Examination and investigations: all participants underwent a general examination, assessment of vital signs, and abdominal examination to estimate the fundal level of the uterus and to auscultate fetal heart sounds. An obstetric ultrasound was done to assess pregnancy, and venous blood samples were obtained from all participants for routine investigations and serological tests for HCV and HBV. The results of these investigations were used to assess the overall health status of the participants and underlying medical conditions that may affect pregnancy outcomes.

HCV and HBV testing for mothers: A venous blood sample was collected from all pregnant women to screen HCV antibodies and HBsAg using standard serological assays. Women who tested positive for HCV antibodies underwent a quantitative polymerase chain reaction (PCR). Quantitative PCR is a susceptible and specific molecular technique that can detect the presence of HCV RNA in the blood.

Infant Testing: For infants born to mothers who tested positive for HCV RNA by PCR, venous blood samples were collected six months after delivery to test HCV antibodies and quantitative PCR. HCV antibodies can persist in the baby's blood for several months after birth, even if the baby is not infected with HCV. Therefore, the quantitative PCR test helped confirm whether the baby had an active HCV infection.

2.1.Statistical analysis: The minimum appropriate sample size for the prevalence of HCV infection among parturient women at El Galaa Hospital was calculated. Using the generic Z test, the sample size was set at a minimum of 662 participants to achieve 99.9% power, with the alpha error set at 0.05 and the prevalence error margin set at 10%. StatCalc, Epi Info version 7 for MS Windows, and Centers for Disease Control and Prevention (CDC), USA, were used to calculate the sample size.

The data were fed into the computer and analyzed with the IBM SPSS software package version 20.0. IBM Corporation, Armonk, New York. The Kolmogorov-Smirnov test was used to confirm the normality of the variable distribution. In contrast, the Paired t-test was used to compare two periods for normally distributed quantitative variables. ANOVA with repeated measures was

used to compare the different studied periods for normally distributed quantitative variables, followed by the Post Hoc test (Bonferroni adjusted) for pairwise comparison. The Pearson coefficient determines the relationship between two normally distributed quantitative variables. The significance of the obtained results was determined at a 5% level.

3. Results

The study included a total of 728 pregnant women, with 27.4 years as an average age (standard deviation of 6.64 years). Out of the total study population, 94.78% (690) reported no history of blood transfusion, while 5.22% (38) reported having received blood transfusion. In terms of mode of delivery, 40.66% (294) of the women delivered through normal vaginal delivery (NVD), while 59.34% (432) had cesarean section delivery.

Table 1. Results of HCV Abs , HCV PCR and HBsAg testing for study population.

	HCV AB	HCV PCR	HBSAG
POSITIVE	19 (2.6%)	16 (2.2%)	9 (1.24%)
NEGATIVE	709	3	719
TOTAL	728	19	728

According Table 1, the HCV and HBV prevalence among the study population, 2.61% (19) of the participants tested positive for HCV antibodies, while 1.24% (9) tested positive for HBV antibodies. The majority of the participants tested negative for both HCV and HBV antibodies, with 97.39% (709) testing negative for HCV and 98.76% (719) testing negative for HBV.

Table 2. Demographic Data distribution

	HCV AB	HBSAG	P VALUE	STATISTICALLY SIGNIFICANT		
	N=19	N=9				
AGE (27.4)	32.89±4.76	34.11±5.73	0.5895		N.S	
URBAN OR RURAL		6 (31.58%)		4(44.44%)	0.507	N.S
URBAN (468)		13 (68.42%)		5(55.56%)		
RURAL (260)						
BLOOD TRANSFUSION						
NO	16 (84.21%)	6 (66.67%)	0.2907		N.S	
YES	3 (15.79%)	3 (33.33%)				
MODE OF DELIVERY						
NVD	6 (31.58%)	4 (44.44%)	0.507		N.S	
CESAREAN SECTION	13 (68.42%)	5 (55.56%)				

STATISTICAL TEST USED: CHI-SQUARE TEST

P-VALUE≤0.05 CONSIDERED STATISTICALLY SIGNIFICANT (95% CONFIDENCE INTERVAL).

This table provides some information on mode of delivery, 6 (31.58%) of the participants who were positive for HCV antibodies had a normal vaginal delivery (NVD), while 13 (68.42%) had a cesarean section delivery. For participants who were positive for HBsAg, 4 (44.44%) had NVD, while 5 (55.56%) had a cesarean section delivery.

Table 3. Viral load and Breast feeding among the women who tested positive for HCV AB .

	HCV AB
	N=19
BREAST FEEDING	
UNKNOWN (DISCONTINUED FOLLOW UP)	12(63.15%)
POSITIVE	7(36.84%)
HCV PCR	
NEGATIVE MOTHERS	3(15.79%)
POSITIVE MOTHERS	16(84.21%)
HCV AB FOR INFANTS (AFTER 6 MONTHS)	
NOT DONE (NEGATIVE PCR RESULT FOR MOTHERS)	3(15.79%)
LOST (DISCONTINUED FOLLOW UP)	6(31.58%)
NEGATIVE	7(36.84%)
WITHDREW CONSENT	2(10.53%)
DIED	1(5.26%)
HCV PCR FOR INFANTS (AFTER 6 MONTHS)	
NOT DONE (NEGATIVE PCR RESULT FOR MOTHERS)	3(15.79%)
LOST (DISCONTINUED FOLLOW UP)	6(31.58%)
UNDETECTABLE	7(36.84%)
WITHDREW CONSENT	2(10.53%)
DIED	1(5.26%)

According to the table, considering HCV vertical transmission , among the 19 infants born to mothers with HCV antibodies in serum, 7 of them were informed to be breastfed. And results of testing after 6 months, HCV PCR was not done for 3 infants due to negative PCR testing for mothers, while 6 discontinued follow up, 2 withdrew the consent, one infant died, and 7 infants tested negative.

4. Discussion

Several studies have investigated the HCV and HBV prevalence among pregnant in Egypt, and factors such as geographic location, socioeconomic status, and healthcare access may impact the prevalence of HCV and HBV among pregnant women in Egypt.

Our study also found that the prevalence between pregnant women in Al-Galaa hospital demonstrated declining prevalence as 2.61% were positive for HCV antibodies and 1.24% were positive for HBsAg. The low prevalence rate in our study could be justified as prevalence decreased through the last two decades due to the new era of effective medications for HCV, such as direct-acting antiviral agents (DAAs).

These findings are consistent with a study by the Egyptian Ministry of Health. In. In the last campaign, 2018-2019, the prevalence rate among women who tested positive for HCV antibodies in Cairo was 2.3%, and among men, it was 3.8%. Our study was conducted in communities with a lower prevalence rate of HCV than in rural areas. The study population was young, with an average of 27.4 years, and the prevalence was low in young age groups. Pregnant women with a history of hepatitis were excluded from our study, so all these factors contributed to decreasing the prevalence rate of HCV in the survey.[9]

Another study reported results very similar to ours, involving 3836 pregnant women. During the third trimester or just before delivery, 80 pregnant women (2.08%) tested positive for HCV infection. Positive HCV antibodies, on the other hand, were found in 99 pregnant women (2.6%).[10]

When analyzing our study population to urban and rural, 64.29% (468) were from urban areas, while 35.71% (260) were from rural areas. The prevalence among the rural populations for HCV was 5%, while for HBV was 1.9%; however, the prevalence among the urban population in our study for HCV was 1.28% and 0.85%.

A study for the distribution of infection showed that HBV prevalence in the population was 1.4%. These findings demonstrated that, in contrast to HCV, which is most prevalent in rural Lower Egypt, HBV infections were predominantly localized to urban areas of Upper Egypt.[11]

When studying factors affecting prevalence, our data shows the relationship between HCV and HBV infections and two factors: blood transfusion and surgical history. The data indicates that out of 19 participants who tested positive for HCV antibodies, 16 (84.21%) reported no history of blood transfusion, while 3 (15.79%) reported having received blood transfusion. Similarly, out of 9 participants who tested positive for HBV antibodies, 6 (66.67%) reported no history of blood transfusion, while 3 (33.33%) reported having received blood transfusion.

A study done in Nigeria reported a link between blood transfusion history and increased HCV and HBV infection in pregnant women.[12]

Our study indicates that out of 19 participants who tested positive for HCV antibodies, 3 (15.79%) reported no medical or surgical history. In contrast, the remaining participants reported various medical and surgical histories such as cesarean section, cholecystectomy, hernia, appendectomy, and orthopaedic surgery. Similarly, out of 9 participants who tested positive for HBsAg, 3 (33.33%) reported no medical or surgical history. In contrast, the remaining participants reported various medical and surgical histories such as cesarean section, cholecystectomy, appendectomy, tonsillectomy, and breast lumpectomy.

One study conducted in China aimed to study the association between medical and surgical history and the risk of HBV infection in pregnant women. The study found that having a history of blood transfusion, tonsillectomy, and tattooing were linked to an increased HBV infection risk.[13]

Regarding the vertical transmission of HCV from infected mothers to infants, our study could not detect vertical infection for infants (7 infants out of 16 tested for HCV PCR) born to HCV viremic mothers after six months of birth. This finding was obtained from testing of 7 infants, which was not enough sample to estimate an accurate percentage for transmission as six infants were lost from the study follow-up, 2 mothers withdrew their consent, and one infant died. Another study found HCV positivity by ELISA and PCR in 10 of 80 neonates (12.5%) during the first 24 hours after delivery, confirming intrauterine HCV transmission. [10]

In terms of factors affecting vertical transmission of HCV, our study could not detect whether viral load and mode of delivery were significant risk factors for vertical transmission of HCV from infected mothers to infants. It may be justified by the study's small sample size and the low prevalence rate of HCV among pregnant women in the study sample. Also, 5 of the 7 examined infants for vertical transmission; their mothers had delivered by cesarean section, and all of them had low viral load, and those two factors are critical in vertical transmission.

Regarding mode of delivery, 6 (31.58%) of the participants who were positive for HCV antibodies had a standard vaginal delivery (NVD), while 13 (68.42%) had a cesarean section delivery. For participants who were positive for HBV antibodies, 4 (44.44%) had NVD, while 5 (55.56%) had a cesarean section delivery.

The data from other studies suggest a potential relationship between HCV and HBV infections among pregnant women and factors such as viral load, breastfeeding and mode of delivery.

A study proved that cesarean section delivery decreases the rate of vertical transmission to neonates; however, cesarean section delivery as a surgical intervention is a significant source of HCV transmission among Egyptian pregnant women.[10]

Regarding vertical transmission of HCV, a study conducted in Italy found a direct correlation between the likelihood of vertical transmission and the mother's viral load; the higher the viral burden, the higher the chance of infection for the offspring. Measurements that increase Maternal-foetal blood transfusion as amniocentesis are known to be associated with an increased risk for HCV transmission. [14]

It has been established the most significant factor influencing the risk of vertical

transmission is maternal HIV co-infection. Although it is not proven if breastfeeding is responsible for vertical transmission or not, there is no consensus that breastfeeding should be avoided in mothers with HCV.[14]

Finally, these studies suggest maternal HCV viral load and HCV AB are crucial factors in HCV vertical transmission. Therefore, monitoring these factors during pregnancy and after delivery is essential in managing HCV in mothers and their infants.

5. *Conclusion*

The study sample detected the mean age as 27.4 years; 64% were Urban, while 36% were Rural. The prevalence of HCV in the studied sample was 2.6% for HCV antibodies, and 2.2% tested positive for HCV PCR, while the prevalence of HBV in the studied sample was 1.24%. Prevalence of Hepatitis C has decreased in Egypt over the decades from 12% in 1996 to 9.8% in 2008 and 4.4% in 2015, while the recent prevalence of HCV, according to the national screening program 2018-2019, revealed that 4.61% tested positive for HCV antibodies of about 48 millions of population through Egypt shared in the campaign. Finally, vertical transmission couldn't be detected in the study sample.

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