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Hepatitis B and C Infections in Pregnant Women Undergoing Chorionic Villus Sampling in Pakistan (2023–2024)

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ABSTRACT

Pregnant women with high viral loads of HBV and HCV are at increased risk of vertical transmission and long-term complications. **Objectives:** To determine the disease burden of hepatitis B and C infections in pregnant women who underwent chorionic villus sampling (CVS). **Methods:** A comparative cross-sectional study was done in MINAR Cancer Hospital, Multan, from January 2023 to June 2024 for eighteen months using a non-probability purposive sampling technique. 1000 pregnant ladies who were scheduled for CVS were included after fulfilling the exclusion and inclusion criteria.Participants were divided into two age groups: 16–25 years and 26–50 years. Blood samples were taken and tested for HBV and HCV infections using commercial kits.The data were recorded and explored using SPSS version 24. **Results:** The participants had an average age of 27.78 ± 4.93 years (range: 16–46 years).HBV DNA was detected in 21 women (2.1%), while 66 (6.6%) tested positive for HCV RNA, leading to a total infection rate of 8.7%. Participants were divided into two age groups: 16–25 years (n=370) and 26–50 years (n=630). HBV infection rates were 1.6% and 2.38% in younger and older groups, respectively (P=0.418), while HCV infection rates were significantly higher in the older group (7.77% vs. 4.59%, p=0.04). **Conclusion:** It was concluded that the study highlights a significant prevalence of HBV and HCV infections in pregnant women undergoing CVS, emphasizing the need for routine screening and preventive strategies to reduce vertical transmission.

INTRODUCTION

The hepatitis B (HBV) and hepatitis C virus (HCV) are major global health concerns [1]. Viral hepatitis during pregnancy is commonly caused by HBV and HCV. It can vary from mild or asymptomatic to severe liver damage. The primary worry is the potential for maternal-to-child transmission [2]. Serious side effects from HBV include liver cancer and cirrhosis. Chronic HBV infection can also result in risks for both the mother and fetus [3]. During pregnancy, HCV increases the likelihood of low birth weight, preterm delivery, gestational diabetes, and, in rare cases, stillbirth [4]. Chorionic villus sampling (CVS), a prenatal diagnostic procedure, may potentially facilitate the transmission of these viruses [5]. Universal HBV screening during pregnancy is widely recommended, with many organizations also advising HCV screening [6]. Tenofovir is the preferred antiviral for managing chronic HBV during pregnancy. Alternatives like Lamivudine and Telbivudine are less commonly used due to concerns about efficacy [1]. HBV and HCV infection in pregnant female has also been examined in female with COVID-19 [7]. A total of 152 studies on HBV prevalence among pregnant women found a global pooled prevalence of 4.8% (3.8–5.8%). The Solomon

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Islands had the highest prevalence at 13.6%, while North America had the lowest at 0.6%. Low-income countries had the highest prevalence at 6.6%. HBV prevalence was highest in studies from 2001-2010 (8.7%) and lowest from 2011-2020 (4.8%). The highest prevalence was observed in women aged 21-30 (4.0%). For HCV, 58 studies reported a global prevalence of 1.0%. Sub-Saharan Africa had the highest prevalence at 3.7%, with the highest prevalence among women aged 21-30 (2.2%) [8].

Despite the importance of this issue, there is a paucity of research on hepatitis B and C infections in pregnant women undergoing CVS. The lack of data on the prevalence, transmission dynamics and outcomes of these infections in this population hinders the development of evidence-based guidelines for screening, diagnosis and management in women undergoing CVS. This study aims to illuminate the intersection of Hepatitis B and Hepatitis C and CVS in pregnant women, with the focus on the risks, consequences and potential interventions to enhance the maternal and child health outcomes in this vulnerable population

METHODS

It was a descriptive cross-sectional study done in MINAR Cancer Hospital, Multan, from January 2023 to June 2024 for eighteen months using a non-probability purposive sampling technique. The study was approved by MINAR Cancer Hospital's local ethical committee (Ref.No.M-3(13)/2018). Inclusion criteria were pregnant women who were willing to participate, with ages ranging from 16 to 46 years, undergoing chorionic villus sampling, primigravida and multigravida (upto 3) and singleton pregnancy at gestational age 10-14 weeks, assessed by ultrasound. Women with multiple pregnancies, Women with medical disorders like diabetes, Hypertension, hypothyroidism, Hyperthyroidism, bleeding disorders, history of preterm births, Ischemic heart disease, Valvular heart disease, and Malignancy were precluded from the study.A total of 1000 pregnant ladies were included.The formula used for sample size calculation was $n=Z^2 *p*q/d^2$, where Z=1.96(95% confidence interval), p=0.054(5.4% prevalence of hepatitis B in pregnant women presenting in first trimester; taken from previous study) [4]. q=1-p and d=1.4% (margin of error). Participants were divided into two age groups, 16-25 years and 26-50 years, because of different exposure risks and behaviours. Women in the younger age group might be more likely to have received the vaccination for hepatitis B, which could impact the prevalence rate.Hepatitis B surface antigen (HBs Ag) and Anti-HCV screening samples were collected for patients referred to the Punjab Thalassemia Prevention Program (PTPP) of Nishtar Hospital, Multan, for chorionic villus sampling. Blood samples were taken in K2-EDTA vials. Screening for hepatitis B and hepatitis C was performed through SD (Standard Diagnostics, South Korea) ICT screening kits. Antigen, antibody, and viral DNA detection by PCR were all part of the hepatitis B confirmatory tests, while antibody and viral RNA identification by PCR were part of the hepatitis C confirmatory tests. The data were recorded and explored using SPSS version 24. Descriptive statistics were used to summarize data. Frequencies and percentages were calculated for categorical variables like maternal age, gestational age at the time of CVS, parity, socio-economic status, level of education, occupation and hepatitis B and C infection in pregnant women undergoing CVS. Mean or median, with respective measures of dispersion, was calculated for quantitative variables like age. Effect modifiers like age, gestational age and parity were controlled by stratification. Post-stratification Chi-square test was applied to see their effect on the outcome. All tests were two-sided and judged statistically significant at $p<0.05$.

RESULTS

A total of 1000 pregnant women whose ages ranged from 16 to 46 years were included. There were two age groups in the data: 370 female aged 1-25 (Group 1) and 630 female aged 26-50 (Group 2). The mean age of Group 1 was 22.81 ± 1.98 years, and Group 2 was 30.70 ± 3.64 years.Out of 1000 women, 913 (91.3%) were found negative for viral infections (hepatitis B and C virus). 21 (2.1%) were found positive for HBs Ag, and 66 (6.65%) were positive for Anti-HCV. All cases remained positive after ELISA testing for both viruses. In group 1, 6 (1.6%) had hepatitis B, and 17 (4.59%) cases were having hepatitis C. In Group 2, there were 49 (7.77%) Hepatitis C positive cases and 15 (2.38%) Hepatitis B positive cases. All the other socio-demographic variables are mentioned (Table 1).

Table 1: Socio-Demographic Variables among the Participants

Variables	Categories	Group 1	Group 2
Gestational Age at the Time of CVS	10-12 Weeks	75 (20.2%)	195 (30.9%)
	13-14 Weeks	295 (79.8%)	435 (69%)
Parity	<3	16 (4.3%)	188 (29.8%)
	>3	354 (95.7%)	442 (70.2%)
Level of Education	1st-5th Standard	284 (76.8%)	295 (46.8%)
	5th-10th Standard	49 (13.2%)	300 (47.6%)
	>10th Standard	37 (10%)	35 (5.6%%)
Residential Status	Rural	250 (67.6%)	467 (74.1%)
	Urban	120 (32.4%)	163 (25.9%)
Socioeconomic Status (Monthly Family Income)	<Rs.15,000	208 (56.2%)	267 (42.4%)
	Rs. 15,000-30,000	143 (38.6%)	300 (47.6%)
	>Rs.30,000	19 (5.1%)	63 (10%)

Patients with HBS/HCV aged 16-25 are analyzed (Figure 1).

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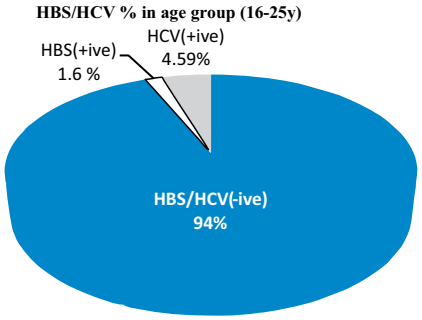

Figure 1: HBV and HCV Infections in Pregnant Women Aged 16-25 Years

Patients with HBS/HCV aged 26-50 are analyzed (Figure 2).

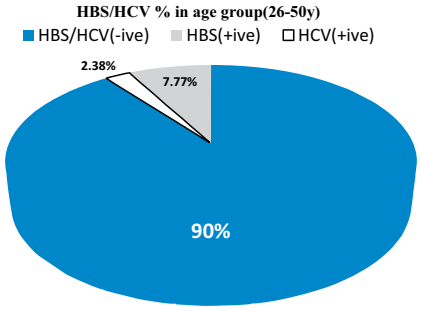

Figure 2: HBV and HCV Infections in Pregnant Women Aged 26–50 Years

There was an increased frequency of hepatitis C in group 2 (7.77%) as compared to Group 1, where the frequency was 4.59%. The frequency of Hepatitis B was also increased in Group 2. The chi-square test was applied, and a comparison of different variables was done. In doing a comparison of the frequency of hepatitis C between both groups, it was found that there was a statistically significant variance (p=0.040) while HBV infection did not reveal any significant variance (p=0.418) between the two groups (Table 2).

Table 2: HBV and HCV Infections in Pregnant Women Presenting for CVS

Outcomes	Group 1 (16-25 years)	Group 2 (26-50 years)	p-Value
Hepatitis B Positive	6 (1.6%)	15 (2.38%)	0.418
Hepatitis C Positive	17 (4.59%)	49 (7.77%)	0.040

The stratification of the frequency of hepatitis C by demographics is shown. There was a statistically significant variance while comparing the level of education with hepatitis C prevalence between both groups (p=0.030) (Table 3)

Table 3: Stratification of Hepatitis C with Regards to Socio-Demographic Variables

Variables	Categories	Hepatitis C	Group 1	Group 2	p-Value
Age Groups	–	Yes	17	49	0.040
		No	353	581	
Parity	<3	Yes	13	116	0.344
		No	3	72	
	>3	Yes	208	191	0.135
		No	146	251	
Level of Education	Matric	Yes	65	8	0.030
		No	219	287	
	Graduation	Yes	3	258	0.336
		No	46	42	
	Masters	Yes	4	1	0.382
		No	33	34	

DISCUSSION

Many researchers have investigated the frequency and risk factors of hepatitis B and C virus infections in pregnant women. This study examined these infections within a more targeted cohort in our research, which included 1,000 pregnant women who had chorionic villus sampling after dividing them into two age groups. The study compared the prevalence of hepatitis B and hepatitis C in both groups. Notably, the study concluded that Hepatitis B and C were more prevalent in older women presenting for CVS. This could be due to increased lifetime exposure in older women and vaccination for hepatitis B in younger female. Furthermore, current study concluded that there was a significant association between education level and hepatitis C frequency, as education may influence awareness about prevention, mode of transmission and early detection. Our findings highlighted the varying prevalence rates of HBV and HCV in pregnant women with different demographics. Present finding has important implications for screening policies among women undergoing CVS. A large-scale study conducted in China analyzed data from over 4 million pregnant women across 20 provinces. The findings revealed that HBV infection was significantly linked to a history of abortion and prior hospitalizations requiring intravenous medication [9]. According to this study, there is an importance of examining both clinical and demographic factors for a better understanding of the transmission dynamics of HBV and HCV in the pregnant population. In Italy, a study tested 6,896 pregnant women for HBV and HCV from 2016 to 2019. The infection rate was higher in foreign women (2.1% for HBs Ag and 0.7% for HCV). Although Italy is among high-income countries, but results are close to our study, possibly because most of the foreign women belong to low or middle-income countries [10]. In another study, where the sample size was close to our study, among 966 pregnant women, 96.7% underwent prenatal HBs Ag screening in the first trimester, with a 2% positive rate, and women over 25 years were at greater risk of HBs Ag positivity, close to our results. All infants born to HBs Ag-positive mothers received the hepatitis B vaccine and hepatitis B immunoglobulin. These findings emphasize the importance of universal HBS Ag screening and standardizing post-exposure prophylaxis to reduce perinatal disease transmission [11]. In a systematic review of 31 studies involving 33,967 pregnant women in Africa.

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The pooled prevalence of HBV was reported as 6.77% [12]. This is because most low-income countries are in Africa. There is an urgent need for improved surveillance and targeted interventions in these countries.In Spain, among 21,870 women screened for HBV (prevalence: 0.42%) and 7,659 for HCV (prevalence: 0.26%), lower than our results [13].A study done among pregnant female in Northern Ethiopia showed that 8.1% of women were HBs Ag positive and 3.2% were anti-HCV positive [14]. In the UK, estimates of chronic hepatitis B prevalence ranged from 0.27% to 0.73%, while more recent data reported~0.05% prevalence, attributed to under-reporting in vulnerable groups [15].In the previous literature, researchers looked at how invasive testing performed during pregnancy and delivery affected the likelihood of hepatitis B virus (HBV) transmission from mother to child (MTCT).Amniocentesis is generally considered safe for pregnant women; however, it may raise the risk of MTCT for women with positive HBs Ag status [16].Moreover, another study showed no risk of MTCT in infants of women undergoing amniocentesis, if infants received standard immunoprophylaxis [17, 18].No conclusive results have been drawn from data collected from other methods, including intrapartum testing, cordocentesis, or chorionic villus sampling (CVS) [19].A review of 50 international clinical guidelines revealed a lack of clear recommendations for managing HBV in pregnant women undergoing these procedures, with notable inconsistencies among existing guidelines.This underscores the need for standardized clinical guidance and further research [20].

The study's single-center design and specific cohort (women undergoing CVS) may limit the generalizability of findings to the broader pregnant population. Additionally, potential confounding factors such as vaccination status, prior exposures, and socioeconomic variables were not fully controlled. Future multicenter studies with broader populations and detailed risk factor assessment are needed to better inform screening and prevention strategies for HBV and HCV in pregnancy.

CONCLUSIONS

It was concluded that the study highlights the importance of considering age and education level when screening for viral hepatitis in CVS patients as these factors affect the incidence.The study will raise awareness about regular antenatal screening programs for viral infections specially in women undergoing CVS. It will also contribute to improve public health policies.

Authors' Contribution

Conceptualization: SP
Methodology: SP, BK, AA
Formal analysis: RS
Writing and Drafting: SP, BK, AA, TR, RM
Review and Editing: SP, BK, AA, TR, RS, RM

All authors approved the final manuscript and take responsibility for the integrity of the work

Conflicts of Interest

All the authors declare no conflict of interest.

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