DOI: https://doi.org/10.54393/pjhs.v7i6.3017

PAKISTAN JOURNAL OF HEALTH SCIENCES
(LAHORE)
https://thejas.com.pk/index.php/pjhs
ISSN (E): 2790-9352, (P): 2790-9344
Volume 7, Issue 06 (June 2026)

Original Article

OPEN ACCESS

Frequency of Human Immunodeficiency Virus, Hepatitis B, and Hepatitis C Among Antenatal Women at a Tertiary Care Hospital

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ARTICLE INFO

Keywords:
Hepatitis B, Hepatitis C, Human Immunodeficiency virus, Antenatal Care

How to Cite:
Mallick, R., Baloch, F. N., Rashed, F., Nazir, N., Ismail, A., & Maryam, H. (2026). Frequency of Human Immunodeficiency Virus, Hepatitis B, and Hepatitis C Among Antenatal Women at a Tertiary Care Hospital: HIV, HBV, and HCV Prevalence in Antenatal Women. Pakistan Journal of Health Sciences, 7(6), 51-56. https://doi.org/10.54393/pjhs.v7i6.3017

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Received Date: 28th March, 2025
1st Revision Received: 18th December, 2025
2nd Revision Received: 16th February, 2026
3rd Revision Received: 12th March, 2026
Acceptance Date: 16th March, 2026
Published Date: 30th June, 2026

ABSTRACT

Human Immunodeficiency Virus (HIV), Hepatitis B (HBV), and Hepatitis C (HCV) are major blood-borne infections. In Pakistan, the prevalence of HCV is predicted to range from 8% to 15%, while the combined frequency of HBV and HCV affects 7.6% of the population. Prenatal HIV screening is recommended to prevent mother-to-child transmission. **Objectives:** This study aimed to determine the frequency of HIV, HBV, and HCV among antenatal patients at a tertiary healthcare facility. **Methods:** A descriptive cross-sectional study was carried out at the Civil Hospital Karachi Obstetrics and Gynecology unit 3 over 6 months, from October 7, 2022, to April 8, 2023. Pregnant women aged between 15-49 years, with a gestational age >20 weeks, presenting for routine antenatal care were enrolled using non probability consecutive sampling. All participants were screened for HIV, HBV, and HCV. Data were analyzed using SPSS version 25.0. **Results:** Among 187 women, the mean age was 32.29 ± 3.91 years, and the mean gestational age was 22.87 ± 1.34 weeks. The prevalence rates of HIV, HBV, and HCV were 13 (7%), 23 (12.3%), and 43 (23%), respectively. **Conclusions:** Among antenatal patients, the prevalence of HIV, HBV, and HCV was 13 (7%), 23 (12.3%), and 43 (23%), respectively. This underscores the need for regular screening during pregnancy. Regular screening during pregnancy is mandatory to prevent these infections from being transferred from the mother to the child.

INTRODUCTION

Infections caused by HIV, HBV, and HCV are major contributors leading to chronic viral infections, posing a significant public health burden worldwide. All share a common route of transmission by parenteral transmission [1-3]. Globally, around 248 million people are suffering from chronic HBV, while 150 million are affected by HCV, resulting in a mortality rate of 780,000 and 350,000 per year, for the first and second, respectively [1, 2]. These infections often coexist due to shared transmission routes, including parenteral, sexual, and perinatal, particularly among vulnerable populations [4]. HBV and HCV infections are most commonly found in territories of Asia and Africa, where healthcare services are limited, due to barriers including economic, geographic, and social [2, 5]. Studies have shown a global variation rate in viral hepatitis endemicity, with sub-Saharan Africa (SSA) identified as a high-endemic region [6]. Recent information from Somalia also indicates a high antibody positivity rate of HBV, HCV, and HIV among expectant mothers presenting to tertiary care hospitals, highlighting the fact that these infections are a persistent burden in low-resource settings [7]. As per the WHO Global Health, about 36.9 million people are affected with HIV, with more than 50% of these cases affecting women, and this results in perinatal transmission being the predominant route for HIV infection in children, as around 1.8 million children [2, 3]. Recent antenatal

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studies conducted in Pakistan show regional variation in viral hepatitis prevalence. For example, Qureshi *et al.* reported HBV prevalence of 5% and HCV prevalence of 2% among pregnant women in Multan, Pakistan, in 2025, while Ehsan *et al.* reported comparable findings among women attending a military hospital in Hyderabad in 2020 [8, 9]. Previous national estimates from Pakistan's 2008 hepatitis survey indicated that HBsAg has a prevalence of approximately 2.5% and anti-HCV has a prevalence of about 5%, contributing a substantial burden of chronic liver viral infections in the affected population [10, 11]. Coinfection of HBV and HCV during pregnancy may lead to severe maternal complications and increase the likelihood of transmission from mother to the newborn, potentially leading to hepatitis in fetuses and neonates [3]. Assessing the seroprevalence of HBsAg and anti-HCV antibodies universally during pregnancy is important because identifying infected women during antenatal care allows timely interventions to prevent perinatal transmission of these infections in case of Hepatitis B infections [12]. As recommended in the evidence-based management guidelines, universal screening for hepatitis B during pregnancy and active and passive immunization of the newborn after delivery, preferably within the first 24 hours of life, significantly reduce the chances of mother-to-child transmission [13]. Current HIV diagnostic testing algorithms begin with a sensitive antigen–antibody combination assay, such as an ELISA-based test for HIV-1/2, with positive results confirmed using more specific assays to ensure correct diagnosis [14]. Universal HIV screening is recommended during pregnancy to identify infected women early and initiate antiretroviral therapy, which along with appropriate obstetric management such as planned cesarean section if viral load is high or CD4 count is low and avoidance of breastfeeding, can reduce perinatal transmission rates from as high as 15–45% in the absence of intervention to less than 1% with effective treatment and preventive measures [15].

Existing research studies, both nationally and internationally, have explored the development of HIV, HBV, and HCV infections in expectant mothers, and seroprevalence varies widely depending on geographic location, population risk groups, and exposure types. Early detection during antenatal care is very important, as it can prevent mother-to-child transmission, which further increases the occurrence of these infections in a vicious circle. Hence, antenatal screening is a golden opportunity to identify these infections in a population that could serve as a reservoir for future transmissions. Therefore, this study aimed to assess the seroprevalence of HIV, HBV, and HCV among expectant mothers presenting to antenatal clinics for check-ups and to determine the frequency of these infections among antenatal patients at a tertiary healthcare facility, to inform strategies for their prevention, screening, and management during pregnancy.

METHODS

This was a descriptive cross-sectional study and was initiated in the Department of Obstetrics and Gynecology, Unit 3, Civil Hospital Karachi, over six months, from October 7, 2022, to April 8, 2023. This study aimed to evaluate the proportion of individuals with hepatitis B, hepatitis C, and HIV infections in antenatal patients and to identify correlated risk factors. Pregnant females aged 15 to 49 years presenting with a gestational age of >20 weeks attending routine antenatal care were enrolled. Exclusion criteria included pregnant women unable to provide reliable data due to major disability or life-threatening illness, as well as patients with chronic liver disease or end-stage renal failure. The number of participants (187) was estimated using the WHO sample size calculator, with an estimated HBV prevalence of 8.5% based on previously reported seroprevalence among pregnant women in antenatal care settings, a margin of error of 4%, and a confidence level of 95%. Non-probability consecutive sampling was employed to select the study population [14]. Ethical approval was taken from the College of Physicians and Surgeons, Pakistan (CPSP Approval Letter No: CPSP/REU/OBG-2020-183-9946; dated October 7, 2022). Each participant provided informed consent before enrollment. Initial sociodemographic and medical information, including age, place of living, family monthly earnings, gestational age, parity, gravida, and associated risk factors (such as history of working in a healthcare institution, surgery, blood transfusion, tooth extraction, family history of HBV, HCV, or HIV, nose piercing, ear piercing, body tattooing, history of unsafe abortion, polygamous husband, and multiple sexual partners), were recorded. All participants were screened for HIV, HBV, and HCV infections in the central laboratory of Civil Hospital Karachi using standard, validated, commercially available kits. HIV screening was conducted using Abbott Determine and Immunocomplex II HIV 1&2, and reactive or indeterminate results were confirmed by indirect immunofluorescence (IIF) using kits supplied by the Oswaldo Cruz Foundation. HBV and HCV infections were identified using standard ELISA kits available in the hospital laboratory. Specific kit numbers were not recorded; however, all kits are routinely used for clinical diagnostics and are validated for hospital use.

Body mass index (BMI) was calculated using the formula to divide weight in kilograms by the square of height in meters (kg/m^2). Data analysis was performed using SPSS version 25.0. Quantitative variables were presented as mean and standard deviation or median and interquartile range,

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based on the data's normality, which was assessed using the Shapiro-Wilk test. Qualitative variables were analyzed using frequency and percentage. Qualitative variables were analyzed using frequency and percentage. Participant characteristics and infection status were summarized using counts and percentages. No inferential statistical tests were performed, as the study was descriptive in nature.

RESULTS

Among the 187 women who participated in the study, the mean age was 32.29 ± 3.91 years. A total of 120 (64.2%) participants were aged 25–30 years, while 67 (35.8%) were between 31–40 years. The mean gestational age was 22.87 ± 1.34 weeks. Gestational age between 21+1 and 22+0 weeks was recorded in 117 (62.6%) women, whereas 70 (37.4%) were between 22+1 and 25+0 weeks. The average monthly family income was 65,417 ± 10,115 rupees; 108 (57.8%) participants reported an income between 52,000–65,000 rupees, and 79 (42.2%) reported 65,001–84,000 rupees. Urban residence was noted in 136 (72.7%) women, while 51 (27.3%) resided in rural areas. Illiteracy was observed in 56 (29.9%) participants. Regarding obstetric characteristics, 80 (42.8%) women were primiparous and 107 (57.2%) were multiparous (Table 1).

Table 1: Sociodemographic and Clinical Characteristics of Study Participants (n=187)

Variables	Category	n (%)
Age (Years)	25–30	120 (64.2%)
	31–40	67 (35.8%)
Gestational Age (Weeks)	21+1 – 22+0	117 (62.6%)
	22+1 – 25+0	70 (37.4%)
Family Income (PKR)	52,000 – 65,000	108 (57.8%)
	65,001 – 84,000	79 (42.2%)
Residence	Urban	136 (72.7%)
	Rural	51 (27.3%)
Education	Illiterate	56 (29.9%)
Parity	Primiparous	80 (42.8%)
	Multiparous	107 (57.2%)

Frequency of HIV was observed in 13 (7%), HBV in 23 (12.3%), and HCV in 43 (23%) women (Figure 1).

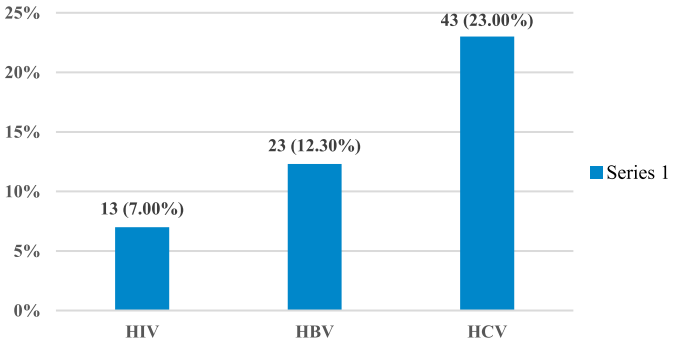

Figure 1: Prevalence of HIV, HBV, and HCV Among Antenatal Patients (n=187). Values Represent Number of Cases and Corresponding Percentages

Among all participants, 27 (14.4%) reported a history of working in a healthcare institute, 43 (23%) had a history of surgery, 19 (10.2%) had received a blood transfusion, 22 (11.8%) had a history of tooth extraction, 19 (10.2%) reported a family history of viral infections, 14 (7.5%) had nose piercings, 15 (8%) had ear piercings, and 10 (5.3%) had body tattoos. The characteristics among women who tested positive for HIV (n=13), HBV (n=23), and HCV (n=43). Frequencies and percentages are presented for each factor, and no inferential statistical tests were performed, as the study is descriptive in nature (Table 2).

Table 2: Factors Related to HIV, Hepatitis B, and Hepatitis C Virus Infections (descriptive analysis only)

Variables	Total (n=187)	HIV Positive (n=13)	HBV Positive (n=23)	HCV Positive (n=43)
History of Working in a Healthcare Institute	27 (14.4%)	1 (7.7%)	9 (39.1%)	18 (41.9%)
History of Surgery	43 (23.0%)	5 (38.5%)	4 (17.4%)	18 (41.9%)
History of Blood Transfusion	19 (10.2%)	4 (30.8%)	9 (39.1%)	8 (18.6%)
History of Tooth Extraction	22 (11.8%)	2 (15.4%)	4 (17.4%)	0 (0%)
Family History of HIV, HBV, or HCV	19 (10.2%)	2 (15.4%)	0 (0%)	0 (0%)
Nose Piercing	14 (7.5%)	5 (38.5%)	5 (21.7%)	1 (2.3%)
Ear Piercing	15 (8.0%)	4 (30.8%)	4 (17.4%)	3 (7.0%)
Body Tattooing	10 (5.3%)	0 (0%)	3 (13.0%)	3 (7.0%)
History of Unsafe Abortion	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Polygamous Husband	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Multiple Sex Partners	0 (0%)	0 (0%)	0 (0%)	0 (0%)

DISCUSSION

The findings of this study focus on the occurrence and associated determinants for HIV, HBV, and HCV infection among antenatal clients presenting for routine checkups at a tertiary care hospital at their booking appointment. This highlights the importance of including thorough checks for these risk factors in routine antenatal care by the healthcare providers, allowing for early detection and appropriate interventional strategies to prevent mother-to-child transmission rates. Of 13 HIV positive cases, a history of working in a healthcare institute was observed in 7.7% women, a history of surgery in 38.5%, a previous blood transfusion history in 30.8%, a previous tooth extraction history in 15.4%, a family history 15.4%, nose piercing 38.5%, and ear piercing 30.8% women. Of 23 HBV positive cases, a history of working in a healthcare institute was observed in 39.1% women, a history of surgery in 17.4%, a history of blood transfusion in 39.1%, a history of tooth extraction in 17.4%, nose piercing 21.7%, ear piercing 17.4%, and body tattooing 13% women. Of 43 HCV positive cases, a history of working in a healthcare institute was observed in 41.9% women, a history of surgery in 41.9%, a

DOI: https://doi.org/10.54393/pjhs.v7i6.3017

history of blood transfusion in 18.6%, nose piercing 2.3%, ear piercing 7%, and body tattooing 7% women. A study by Roble et al. found that 8.5% of expectant women seeking antenatal care in Jigjiga, Ethiopia, tested positive for HBsAg [16]. Significant contributing factors for HBV infection included a history of surgery (AOR=3.41, 95% CI: 1.26–9.24), history of HBV infection in the family (AOR=4.96, 95% CI: 2.11–10.60), sharing sharp objects (AOR=2.78, 95% CI: 1.13–6.83), and engagement in multiple sexual encounters (AOR=6.12, 95% CI: 2.12–17.64). A study conducted in Enugu, Nigeria, reported that 12.4% of antenatal clients were seropositive for HIV, 3.4% for hepatitis B virus (HBV), 2.6% for hepatitis C virus (HCV), and 0.08% for syphilis. The co-infection rates were 0.24% for HIV/HBV and 0.16% for HIV/HCV. This study observed no cases of concurrent infection with both hepatitis B and C viruses within the HIV-positive and HIV-negative antenatal population [17]. Studies from Sub-Saharan Africa show that HIV and hepatitis infections remain a significant concern among pregnant women. In Luanda, Angola, HIV and HBV were found to be common, with rates influenced by social and obstetric factors [18]. In Yirgalem Hospital, Ethiopia, HBV prevalence was linked to surgery, family history, and exposure to sharp objects [19]. Similarly, research conducted in Zambia shows varying HIV rates among young women, reflecting differences in behavior, socio-economic status, and healthcare access as important determinants [20]. These observations highlight the importance of universal antenatal screening and careful risk management to prevent infections in both mothers and babies. One of the studies showed that the occurrence of anti-HIV antibodies was found to be 13.4%, which is comparable to findings from studies conducted in Ethiopia (10.1%), Zambia (11.3%), and the Democratic Republic of Congo (11%) [21]. However, these numbers are higher than those reported in the research conducted in Nigeria (6.1%) and Cameroon (5.1%) [22, 23]. In Tanzania, the prevalence ranged between 5.1% and 5.6% among expectant women [24, 25]. In Latin America, HIV prevalence among expectant mothers is generally below 1% in countries such as Brazil, while in several Caribbean countries, including the Dominican Republic, HIV prevalence among pregnant women has been reported to reach or exceed 2%, reflecting regional differences in epidemic dynamics [26, 27]. In India, earlier reports indicated antenatal HIV prevalence around 0.88% in specific regions, while more recent hospital-based surveillance from western India reported a prevalence of 0.22% among expectant mothers, reflecting declining trends in HIV among antenatal populations [28]. A study reported that infectious diseases such as HIV, HBV, and syphilis are a societal health burden among expectant mothers, which highlights the need to strengthen biomedical interventions. Understanding the demographic and behavioral factors that contribute to the emergence of infectious agents is essential for reducing planning costs, controlling the spread of infectious diseases, preventing vertical transmission, and mitigating negative outcomes in neonates [2]. A recent systematic review and meta-analysis reported the worldwide pooled prevalence of HIV, HBV, HCV, and syphilis among expectant mothers to be 2.9% (95% CI: 2.4–3.4%), 4.8% (95% CI: 3.8–5.8%), 1.0% (95% CI: 0.8–1.3%), and 0.8% (95% CI: 0.7–0.9%), respectively. In financially constrained nations, the combined prevalence of these infections exceeds the global average, with HIV at 5.2% (1.6–10.5%), HBV at 6.6% (5.4–7.9%), HCV at 2.7% (1.6–4.1%), and syphilis at 3.3% (2.2–4.6%). In lower-middle-income countries, the pooled prevalence rates exceed global averages, with HIV at 2.9% (0.8–6.1%), HBV at 4.9% (3.8–6.1%), HCV at 2.3% (1.2–3.6%), and syphilis at 1.5% (1.0–2.2%). The author asserts that the frequency of these infections is significantly higher among pregnant women in resource-limited environments. Assessing the applicability and practicality of existing global guidelines for preventing perinatal transmission of these infections in countries with lower-middle-income status is crucial. This evaluation should include an assessment of timely access to both screening and therapeutic interventions. Another systematic review and meta-analysis reported that, among maternal–neonatal pairs with single infection, the combined perinatal infection transfer rates were 2.74% for HIV and 55.49% for hepatitis B virus, respectively. There is no available information on the perinatal transfer rate of the hepatitis C virus in cases of single infection, nor on the transmission rates of HIV, hepatitis B virus, and hepatitis C virus among maternal–neonatal pairs with double or triple infections [29].

Certain limitations should be considered when interpreting the results of this study. The comparatively small sample size of 187 women may limit the generalizability of the conclusion. Additionally, given that this study was conducted at a single center, the results may not fully reflect the broader population trends. The cross-sectional design allows a snapshot, but a more comprehensive understanding is needed through longitudinal studies, exploring trends in infections and associated factors over the course of pregnancy. Despite these limitations, one of the strengths of this research is its relevance to maternal healthcare practices and the prevention of mother-to-child transmission rates. The identified risk factors provide insights for healthcare practitioners, highlighting the importance of action points, including counseling and interventions. Furthermore, research in the future could be

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strengthened by including larger and more diverse samples, encompassing various socio-economic backgrounds and geographical locations, to give more generalized results. Longitudinal studies can provide a dynamic perspective on infection trends during pregnancy, while interventional studies can be conducted to evaluate the effectiveness of preventive measures in reducing transmission rates. While this study contributes valuable insights, ongoing research should be carried out for a more comprehensive understanding and the development of evidence-based strategies in maternal healthcare.

CONCLUSIONS

The frequency of HIV was observed in 7%, HBV in 12.3%, and HCV in 23% women. The history of nose piercing, ear piercing, blood transfusion, and body tattooing was observed among women with these infections.

Authors' Contribution

Conceptualization: RM
Methodology: FR, HM
Formal analysis: FNB, NN, AI
Writing and Drafting: FNB
Review and Editing: RM, FNB, FR, NN, AI, HM

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.

Source of Funding

The authors received no financial support for the research, authorship and/or publication of this article.

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