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PREVALENCE AND RISK FACTORS OF HBV, HCV, AND HIV INFECTIONS AMONG TRANSGENDER INDIVIDUALS IN MARDAN AND CHARSADDA DISTRICTS, PAKISTAN

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ABSTRACT

Transgender individuals face disproportionate health risks, particularly from sexually transmitted viral infections, due to unsafe sexual practices, injection drug use, and widespread social discrimination that limit their access to healthcare services. Despite being a highly vulnerable group, there is limited epidemiological data on the prevalence of hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV) among transgender populations in Pakistan. This cross-sectional study was conducted among 250 transgender participants aged 18–40 years (median age 19) residing in the Mardan and Charsadda districts of Khyber Pakhtunkhwa. Venous blood samples were collected in gel tubes and screened for HBsAg, anti-HCV, and anti-HIV using immune chromatographic tests (ICT), with positive cases confirmed through real-time polymerase chain reaction (PCR). Data were analyzed using SPSS version 26 to identify prevalence rates and associated risk factors. The results revealed that 1.6% of participants were positive for HBV, 5.2% for HCV, and 4.4% for HIV, with HIV showing the highest prevalence. The major risk factors associated with these infections were unsafe sexual activity,

previous blood transfusions, injection drug use, and low educational attainment. These findings demonstrate a concerning level of HIV and HCV prevalence in this community, highlighting the urgent need for awareness programs, preventive strategies, and equitable access to healthcare services. Addressing the health challenges faced by transgender populations is essential not only for their well-being but also for reducing the wider public health burden of viral infections in Pakistan.

Introduction

Hepatitis C virus (HCV), hepatitis B virus (HBV), and human immunodeficiency virus (HIV) are among the ten leading causes of fatal infectious diseases worldwide. Annually, about 2 million individuals die from acquired immunodeficiency syndrome (AIDS), more than 350,000 die from HCV-related diseases, and nearly 1 million deaths occur due to HBV infection[1]. The World Health Organization estimated that in 2015, around 71 million individuals were living with HCV infection, representing approximately 1% of the global population. HCV is highly endemic in Pakistan, with 6.8% of the general population infected [2]. The highest global prevalence is reported in Egypt, where more than 14% of the population is affected [3]. HBV causes an acute infectious disease of variable severity. It persists in about 95% of infants and in 2–10% of adults, leading to chronic liver disease, cirrhosis, hepatocellular carcinoma, and in some cases fulminant hepatitis [4]. In Pakistan, approximately 35–38% of people have been exposed to HBV, 4% are chronic carriers, and 32% have anti-HBs surface antibodies [5]. The highest number of HBsAg-positive individuals is reported in China (74 million), followed by India (17 million) and Nigeria (15 million) [6]. The key risk factors for Hepatitis B Virus are unhygienic and poor methods of surgeries, Use of unsterilized tools, tattooing, drug abuse, blood transfusion, working in healthcare locations, dialysis, sharing razors and toothbrushes, acupuncture and travel to HBV endemic countries [7].

Pakistan's first HIV positive case was associated with contaminated blood transfusion and was detected in 1987 [8]. Like many Asian countries, Pakistan faces an HIV epidemic; however, it is currently classified as a “country in transition,” where the epidemic is concentrated among very high-risk groups. According to NIH and NACP reports, the number of new AIDS cases has declined in the past five years [9]. An estimated 130,000 people in Pakistan are currently living with HIV, according to UNAIDS [10]. Transgender individuals represent one of the most socially and economically marginalized groups in South Asian society. They often face stigma, depression, and exclusion due to their gender identities, which may include male-to-female (MTF), female-to-male (FTM), or other gender-diverse identities [5]. The primary objective of this research was to investigate the prevalence of HBV, HCV, and HIV infections among transgender individuals in the districts of Mardan and Charsadda, Khyber Pakhtunkhwa (Pakistan). A secondary objective was to explore the association of unsafe sexual practices within this community with the occurrence of these infections.

Methodology

This cross-sectional study was carried out from June to October 2024 to assess the prevalence of HBV, HCV, and HIV among transgender individuals living in the districts of Mardan and Charsadda, Khyber Pakhtunkhwa, Pakistan. Informed written consent was obtained from all participants, and their test results were kept strictly confidential. Each participant was also

provided with guidance on preventing the spread of these infections and referred to the nearest healthcare facility for further screening when required. The study population included male-to-female (MTF) transgender individuals, while female-to-male (FTM) transgenders, gender queer individuals, and those involved in prostitution were excluded. The required sample size was calculated using an online sample size calculator (https://www.calculator.net/sample-size-calculator.html), which gave a target of 250 participants. For each participant, 5 mL of venous blood was drawn using a sterile syringe and transferred into BD Vacutainer® serum separator tubes (SST; yellow-top, containing gel and clot activator). The samples were stored under controlled laboratory conditions until further processing. After clot formation, the tubes were centrifuged at 1000 rpm for 10 minutes to separate the serum, which was then stored at −20 °C until testing. Serum samples were initially screened for hepatitis B surface antigen (HBsAg), anti-HCV antibodies, and anti-HIV antibodies using immune chromatographic test (ICT) strips. All positive cases were further confirmed by real-time polymerase chain reaction (PCR). Statistical analysis was performed using SPSS version 26 to generate descriptive statistics.

Results

A total of 250 transgender individuals from the districts of Mardan and Charsadda, Khyber Pakhtunkhwa, aged between 18 and 40 years, were enrolled in this study. The prevalence of HBV, HCV, and HIV was analyzed in relation to potential risk factors, including family history, history of blood transfusion, sexual behavior, injection drug use, surgical procedures, and body piercing for jewelry. HBV and HCV infections were more common among participants with a history of blood transfusion, drug use, unsafe sexual practices, surgical interventions, and body piercing. In contrast, HIV infection was primarily associated with unsafe sexual activities and body piercing.

Age-wise Prevalence of HBV, HCV, and HIV in the Transgender Population

A total of 250 transgender individuals aged 18–40 years from Mardan and Charsadda districts were tested for HBV, HCV, and HIV using the ICT method, with positive results confirmed by real-time PCR. Of these, four (1.6%) were positive for HBV, thirteen (5.2%) for HCV, and eleven (4.4%) for HIV. The highest prevalence of infections was observed among participants aged 20–30 years. The distribution of these infections across age groups is shown in Figure 1.

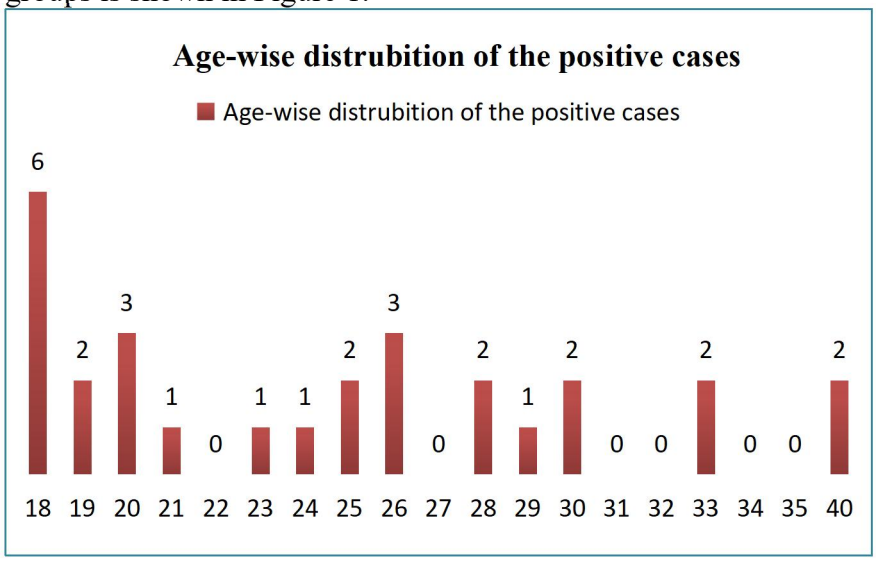

Figure 1: Age-wise Prevalence of HBV, HCV, and HIV in the Transgender Population.

HBV, HCV and Anti-HIV distribution in study population

Using the immune chromatographic technique (ICT), 250 male-to-female (MTF) transgender individuals were screened for HBV, HCV, and HIV. Among them, four (1.6%) tested positive for HBV, with the highest vulnerability observed in participants aged 20 years and above compared to those over 40 years. For HCV, thirteen (5.2%) participants were found positive, and all were confirmed by real-time PCR; the highest prevalence was recorded among those aged 20–30 years. Screening for HIV showed that 239 participants were negative, while eleven (4.4%) tested positive. Overall, HIV was more prevalent than both HBV and HCV in the study population (Figure 2).

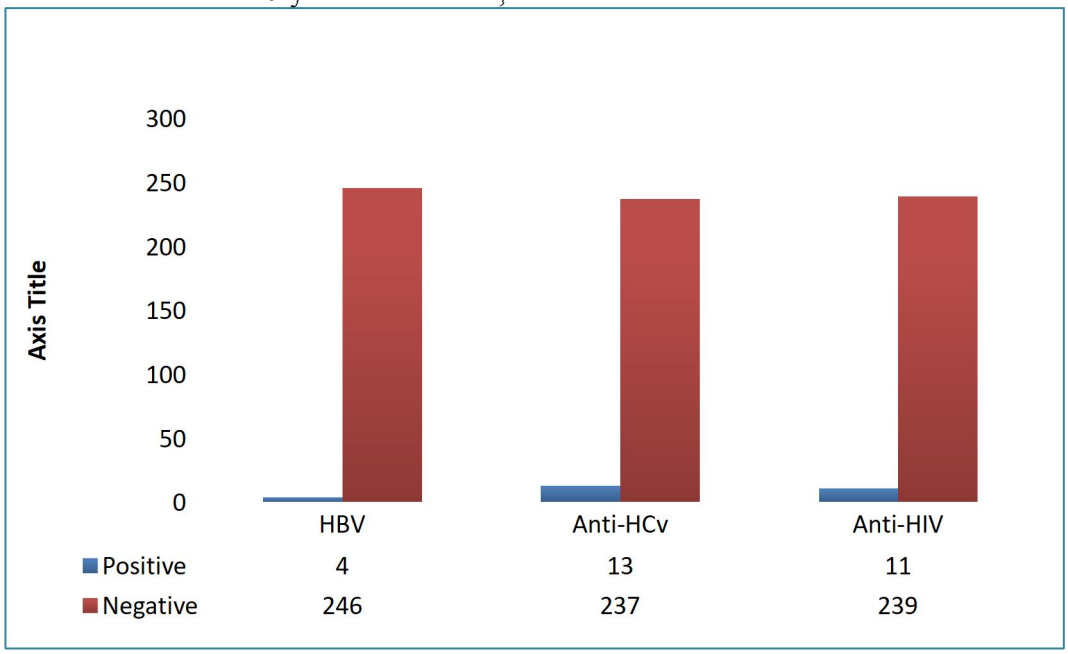

Figure.2 HBV, HCV and Anti-HIV distribution in study population

Associational Study of HBV infection and associated risk factors

An association was examined between HBV infection and potential risk factors. Weak correlations were observed with blood transfusion ($r = 0.18$), organ piercing ($r = 0.049$), sexual behavior ($r = 0.13$), surgical procedures ($r = 0.40$), injection drug use ($r = 0.30$), and family history ($r = 0.15$). Statistically significant associations were found for blood transfusion ($p = 0.02$), injection drug use ($p = 0.01$), and surgical procedures ($p < 0.001$). In contrast, family history, sexual behavior, and organ piercing showed no significant association, with p-values greater than 0.05 (table 1).

Table.1 Chi square test of HBV infection and associated risk factors

Factors	Hepatitis B Negative	Hepatitis B positive	Pearson Correlation	Chi-Squared Test (*P*-value)
Blood Transfusion	28 (85%)	5 (15%)	0.18	0.02
Organ piercing	44 (92%)	4 (8%)	0.049	0.61
Sexual Behaviour	75 (95%)	4 (5%)	0.13	0.14
Surgical Procedure	12 (71%)	5 (29%)	0.40	0.00
Drug Injected	35 (85%)	6 (15%)	0.30	0.01
Family History	10 (83%)	2 (17%)	0.15	0.16

HCV infection and associated risk factors

An association between HCV infection and potential risk factors was also analyzed. Weak correlations were observed with blood transfusion (r = 0.02), family history (r = 0.20), surgical procedures (r = 0.02), and organ piercing (r = 0.03), while no correlation was found with injection drug use (r = 0.00) or sexual behaviour (r = 0.00). Among these factors, only family history showed a statistically significant association with HCV infection (p = 0.03), whereas all other associations were statistically insignificant (Table 2).

Table.2 Chi square test of HCV infection and associated risk factors

Factors	Hepatitis C Negative	Hepatitis C positive	Pearson Correlation	Chi-Squared Test (*P*-value)
Blood Transfusion	31 (94%)	2 (6%)	0.02	0.73
Drug Injected	39 (95%)	2 (5%)	-0.00	0.96
Family History	10 (83%)	2 (7%)	0.20	0.04
Surgical Procedure	16 (94%)	1 (6%)	0.02	0.85
Sexual Behaviour	75 (95%)	4 (5%)	0.00	0.95
Organ piercing	45 (93%)	3 (7%)	0.03	0.58

Moreover, three individuals had both HBV and HCV positive while two individuals had HBV and HIV infection.

HIV Infection and Associated Risk Factors

The analysis of HIV infection in relation to potential risk factors showed significant associations with all variables studied. HIV prevalence was higher among participants with a history of blood transfusion, injection drug use, unsafe sexual behavior, surgical procedures, organ piercing, and family history of infection. Statistical analysis confirmed that all these factors were significantly associated with HIV infection ($p < 0.05$), indicating that multiple overlapping risk factors contribute to the spread of HIV in this population

Discussion

Pakistan, as a developing country, faces multiple challenges, including financial, social, and public health issues. Among these, sexually transmitted diseases (STDs) remain a significant concern. Unfortunately, there is limited epidemiological data on the prevalence of hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV) among transgender sex workers in Pakistan. Transgender women are generally assigned male at birth but may identify as female or transsexual, reflecting diverse gender identities. A lack of government attention, combined with discrimination in both private and public healthcare sectors, has contributed to the spread of viral infections in this marginalized community. Unemployment and social exclusion often push transgender individuals into unsafe sex work as a means of livelihood. Unprotected anal intercourse, client-based sexual activity, and drug abuse have been shown to significantly increase the risk of acquiring sexually transmitted viral infections. Moreover, some evidence suggests that certain transgender individuals engage in sexual activity as a means of reinforcing their gender identity [11]. Transphobia is defined as social prejudice and stigma directed toward transgender individuals is frequently encountered within families, communities, and society at large, further exacerbating their vulnerability [12]. In the present study, we investigated behavioral and health-related parameters contributing to the prevalence of HBV, HCV, and HIV

among transgender individuals in Mardan and Charsadda. The overall prevalence was 1.6% for HBV, 5.2% for HCV, and 4.4% for HIV. Interestingly, HIV was more prevalent than HBV in this population, reflecting the increasing public health threat of HIV among high-risk groups in Pakistan. During interviews, only nine participants admitted to sex work as their main occupation, while most identified as dancers. However, their community leader (Guru) confirmed that up to 90% were involved in sexual activity, suggesting underreporting due to stigma. The highest prevalence of infection was observed among middle-aged transgender individuals, who are likely more exposed to multiple risk behaviors. Additional risk factors were also noted. Many participants reported shaving at home, often sharing razors and scissors, which raises concerns about potential transmission of bloodborne infections due to poor sterilization practices. A history of blood transfusion was also reported by several participants, highlighting the ongoing risk of transfusion-associated infections in Pakistan. Condom use was investigated as a preventive factor; however, only a minority reported regular use. Many explained that clients resisted condom use, which further increases their vulnerability to sexually transmitted viral diseases (STVDs). From a public health perspective, these findings underscore the urgent need for targeted interventions. The healthcare system should focus on improving the living conditions of transgender communities, ensuring free and routine medical check-ups, and promoting safe sexual practices through awareness programs. Statistical analysis from this study confirmed that factors such as age, shaving practices, and blood transfusion history were associated with infection rates, suggesting areas for intervention. The strength of this study lies in being the first to assess the combined prevalence of HBV, HCV, and HIV among transgender individuals in Mardan and Charsadda. Another strength is that positive cases were confirmed using polymerase chain reaction (PCR), ensuring diagnostic accuracy. However, the study has certain limitations, including a relatively small sample size, as many transgender individuals were reluctant to participate. Additionally, only male-to-female transgender individuals were included, whereas future studies should also examine transgender men and other gender-diverse groups. Finally, due to resource constraints, screening was performed using ICT methods, which, while practical, are less sensitive than advanced serological or molecular techniques.

Conclusion

The prevalence of HBV, HCV, and HIV among transgender individuals in Mardan and Charsadda districts highlights a growing public health concern. Immediate protective measures are required to prevent further spread of these infections. Factors such as illiteracy, lack of awareness, social discrimination, and inadequate access to healthcare services contribute significantly to the persistence of these diseases within this marginalized community. Targeted interventions, routine screening, and educational programs are urgently needed to reduce the burden of sexually transmitted viral infections among transgender populations and to safeguard the wider community.

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