

FREQUENCY AND DETERMINANTS OF HIV INFECTION AMONG PATIENTS ATTENDING DISTRICT HEADQUARTERS HOSPITAL, KOHAT: A CROSS-SECTIONAL STUDY FROM KOHAT DIVISION, KHYBER PAKHTUNKHWA, PAKISTAN

Ihsan Ullah ^{a*}, Shumaila Naz ^b, Ume Salma Liaquat ^b, Rabbiah Manzoor Malik ^{c,d}, Kiran Hadi ^b

^{a*}Department of Zoology, Government Degree College Gumbat, Kohat, Khyber Pakhtunkhwa, Pakistan, 26000.

^bDepartment of Biosciences, Quaid Campus, University of Wah, Wah Cantt, 47040, Pakistan.

^cDepartment of Biochemistry. Wah Medical College.

^dNational University of Medical Sciences Rawalpindi.

^{a*}ihsanmani85@gmail.com, ^bdr.shumaila.naz@uow.edu.pk, ^bdr.umesalma.liaquat@gmail.com,
^{c,d}rabbiahmanzoor@gmail.com, ^bkiranhadi0341@gmail.com

DOI: <https://doi.org/10.5281/zenodo.22932826>

Keywords

HIV; prevalence; Kohat division; Khyber Pakhtunkhwa; ICT; risk factor.

Article History

Received: 02 April 2026

Accepted: 12 May 2026

Published: 31 May 2026

Copyright @Author

Corresponding Author: *

Ihsan Ullah

Abstract

HIV infection is an emerging public health concern in Pakistan, driven by unsafe medical practices, blood transfusion, and high-risk behaviours. This study determined the frequency and demographic/behavioural determinants of HIV infection among patients attending DHQ Hospital Kohat and referred for HIV testing. Between September 2025 and April 2026, 750 individuals with clinical symptoms suggestive of HIV, referred by attending physicians, were screened using an Immunochromatographic (ICT) test kit; 72 (9.6%) tested positive. Prevalence was significantly higher in males (68.1%) than females (31.9%; $\chi^2=9.39$, $df=1$, $p=0.002$), and in rural (79.2%) versus urban residents (20.8%; $\chi^2=24.50$, $df=1$, $p<0.001$). The 21–40-year age group showed the highest prevalence (43.1%), followed by 41–60 years (27.8%), with a significant deviation from an even distribution across six age categories ($\chi^2=58.17$, $df=5$, $p<0.001$). Cases were distributed across Kohat (41.7%), Karak (30.6%), and Hangu (27.8%) districts, without significant inter-district variation ($\chi^2=2.33$, $df=2$, $p=0.311$). Structured interviews of the 72 positive cases (mean age 40 years) showed 80.6% were married ($\chi^2=26.89$, $df=1$, $p<0.001$) and 86.1% had no formal education ($\chi^2=90.58$, $df=2$, $p<0.001$). Heterosexual contact was the predominant transmission route (58.3%), significantly exceeding combined mother-to-child transmission, blood transfusion, and dental-procedure exposure ($\chi^2=75.00$, $df=3$, $p<0.001$); 23 of these cases involved contact with sex workers. No homosexual or transgender transmission was reported. Regarding addiction, oral snuff use was most common (31.9%), followed by smoking, hashish, and injection drug use, with significant variation across categories ($\chi^2=55.64$, $df=4$, $p<0.001$). These findings highlight a substantial, predominantly heterosexually and iatrogenically driven HIV burden in rural Kohat division, emphasizing the

need for expanded community-based screening, safe injection practices, and targeted awareness programmes.

1. Introduction

Human Immunodeficiency Virus (HIV) infection remains one of the most significant global public health challenges, progressively depleting the host immune system and, if untreated, culminating in Acquired Immunodeficiency Syndrome (AIDS). The virus is transmitted through infected blood, semen, vaginal fluids, and breast milk, and predominantly targets CD4⁺ T lymphocytes, macrophages, and dendritic cells, leading to progressive immune dysfunction^[1].

Although Pakistan has historically been classified as a low-HIV-prevalence country, with national HIV prevalence among adults remaining below 0.1%^[2], the epidemiological situation has deteriorated markedly over the past decade. According to World Health Organization (WHO) and Joint United Nations Programme on HIV/AIDS (UNAIDS) estimates, new HIV infections in the country have risen sharply, from an estimated 16,000 in 2010 to approximately 48,000 in 2024, a 200% increase over 15 years that has made Pakistan one of the fastest-growing HIV epidemics in the WHO Eastern Mediterranean Region^[3], while only around one-fifth of people living with HIV are aware of their status, and fewer still are on treatment or virally suppressed^[3]. Pakistan's geographic position among high-burden neighbouring countries, combined with widespread unsafe healthcare practices, low literacy, and social stigma limiting disclosure and testing uptake, has created conditions favourable for an expanding, and increasingly under-recognized, epidemic.

Pakistan has registered several major localized HIV outbreaks since 2018, most notably the 2019 Larkana/Ratodero outbreak in Sindh province^[4,5], in which unsafe injection practices, reuse of syringes, poor infection control, and unregulated blood transfusion services were identified as the principal drivers^[6,7], disproportionately affecting young children^[4,7]. A systematic review of HIV outbreaks reported in Pakistan between 2000 and 2019 found that iatrogenic transmission from unsafe healthcare practices was the primary or a

contributing factor in five of seven documented outbreaks^[6], and unsafe medical injections remain a recognized and persistent driver of bloodborne virus transmission in the country^[8]. These outbreaks have highlighted how healthcare-associated transmission, rather than classical high-risk-group transmission alone, has become an important route of HIV spread in the country, a pattern that has since also been reported to be emerging in Punjab and Khyber Pakhtunkhwa^[6]. Within Khyber Pakhtunkhwa (KP) specifically, a case-control study conducted at Hayatabad Medical Complex, Peshawar identified spousal HIV status, tattooing, migration, injection drug use, therapeutic injections, history of blood transfusion, male gender, and employment status as significant risk factors for HIV-1 infection in the provincial population^[9]. However, district- and division-level data describing the burden and demographic distribution of HIV infection in more peripheral parts of KP, such as Kohat division, remain comparatively limited, despite the region's largely rural population and reliance on local healthcare facilities where infection control standards may be inconsistent.

Given this gap, the present study was undertaken to determine the frequency of HIV infection among symptomatic patients referred for testing at DHQ Hospital Kohat, and to characterize the gender-wise, location-wise, age-wise, and district-wise distribution of positive cases across Kohat division, together with an exploration of transmission routes and associated risk behaviours through structured patient interviews. Statistical (chi-square) testing was applied to determine whether the observed distributions differed significantly from what would be expected by chance. Such baseline data are essential to guide targeted screening, prevention, and public health response strategies in this part of Khyber Pakhtunkhwa.

2. Materials and Methods

2.1 Study Area and Design

This cross-sectional study was conducted at the District Headquarters (DHQ) Hospital, Kohat, which serves as a major referral healthcare facility for Kohat division, comprising Kohat, Hangu, and Karak districts, Khyber Pakhtunkhwa, Pakistan.

2.2 Study Duration and Sample Collection

The study was carried out over an eight-month period, from September 2025 to April 2026. A total of 750 patients presenting with clinical symptoms suggestive of HIV infection, and referred by attending physicians for HIV testing, were enrolled. Venous blood samples were collected from each participant under aseptic conditions following informed consent. [Note: specify sample volume, anticoagulant used, and ethical approval/consent details for your institution.]

2.3 Screening for HIV

All blood samples were screened for HIV antibodies using a commercial Immunochromatographic (ICT) test kit, following the manufacturer's instructions. Results were interpreted as positive or negative based on the appearance of test and control lines on the strip. [Note: specify the exact ICT kit name/manufacturer used, and whether reactive samples were confirmed by a second assay such as ELISA or Western blot, which is recommended for diagnostic confirmation.]

2.4 Questionnaire-Based Interview

All patients confirmed positive for HIV were subsequently interviewed using a structured questionnaire designed to collect demographic information (age, gender, area of residence, marital status, education level) as well as data on

probable route of transmission (heterosexual contact, mother-to-child transmission, blood transfusion, dental procedures, injection drug use) and history of addiction (oral snuff, hashish, smoking, injectable drug use).

2.5 Data Analysis

Data were entered in Microsoft Excel and analysed using descriptive statistics. Frequencies and percentages were calculated for gender, area of residence, age group, and district-wise distribution of HIV-positive cases, as well as for questionnaire-derived variables including marital status, education, transmission route, and addiction history. For each categorical variable, a Pearson chi-square (χ^2) goodness-of-fit test was used to assess whether the observed distribution of cases across categories differed significantly from an equal (chance) distribution across those categories. A p-value < 0.05 was considered statistically significant.

3. Results

Of the 750 symptomatic patients screened for HIV at DHQ Hospital Kohat between September 2025 and April 2026, 72 (9.6%) tested positive using the ICT test.

3.1 Gender-wise Prevalence

Of the 72 HIV-positive cases, 49 (68.1%) were male and 23 (31.9%) were female. A chi-square goodness-of-fit test confirmed that this distribution differed significantly from an equal (50:50) split ($\chi^2 = 9.39$, $df = 1$, $p = 0.002$), indicating a statistically significant, and not merely descriptive, higher prevalence of HIV among males compared with females in the study population (Table 1).

Table 1. Gender-wise distribution of HIV-positive cases among study participants (N = 72)

Gender	n	%
Male	49	68.1
Female	23	31.9
Total	72	100.0

$\chi^2 = 9.39$, $df = 1$, $p = 0.002$ (significant at $p < 0.05$; test compares observed frequencies with an expected equal distribution).

3.2 Location-wise Prevalence

Location-wise analysis showed that 57 (79.2%) positive cases resided in rural areas, while 15 (20.8%) were from urban areas. This distribution differed significantly from an equal split ($\chi^2 =$

24.50, $df = 1$, $p < 0.001$), confirming a substantially and significantly higher burden of HIV infection among the rural population of Kohat division (Table 2).

Table 2. Location-wise distribution of HIV-positive cases among study participants (N = 72)

Area	n	%
Urban	15	20.8
Rural	57	79.2
Total	72	100.0

$\chi^2 = 24.50$, $df = 1$, $p < 0.001$ (significant at $p < 0.05$).

3.3 Age-wise Prevalence

Age-wise distribution of positive cases showed that the highest frequency occurred in the 21–40 year age group (31 cases, 43.1%), followed by the 41–60 year group (20 cases, 27.8%). The 11–20 and 61–80 year groups each accounted for 10 cases (13.9%), while only 1 case (1.4%) was recorded in the 1–10 year age group, and no cases were

recorded in the 81–100 year age group. The overall distribution across the six age categories differed significantly from an equal distribution ($\chi^2 = 58.17$, $df = 5$, $p < 0.001$), confirming that HIV-positive cases were not evenly distributed across the age range and were significantly concentrated among sexually and occupationally active adults (Table 3).

Table 3. Age-wise distribution of HIV-positive cases among study participants (N = 72)

Age group (years)	n	%
1–10	1	1.4
11–20	10	13.9
21–40	31	43.1
41–60	20	27.8
61–80	10	13.9
81–100	0	0.0
Total	72	100.0

$\chi^2 = 58.17$, $df = 5$, $p < 0.001$ (significant at $p < 0.05$). Note: age categories are of unequal width (10, 10, 20, 20, 20, and 20 years, respectively); the chi-square test evaluates whether observed frequencies differ from an equal distribution across the six pre-defined categories and should be interpreted with this caveat.

3.4 District-wise Prevalence in Kohat Division

Among the three districts comprising Kohat division, Kohat district recorded the highest number of positive cases (30, 41.7%), followed by Karak district (22, 30.6%) and Hangu district (20, 27.8%). Unlike the other variables examined, the

district-wise distribution did not differ significantly from an equal distribution ($\chi^2 = 2.33$, $df = 2$, $p = 0.311$), indicating that the burden of HIV infection was broadly comparable across the three districts of Kohat division once accounted for by chance (Table 4).

Table 4. District-wise distribution of HIV-positive cases in Kohat division (N = 72)

District	n	%
Kohat	30	41.7
Karak	22	30.6

District	n	%
Hangu	20	27.8
Total	72	100.0

$\chi^2 = 2.33$, $df = 2$, $p = 0.311$ (not significant at $p < 0.05$).

3.5 Questionnaire-Based Findings

Structured interviews were conducted with all 72 HIV-positive patients. The mean age of participants was 40 years.

Regarding marital status, 58 patients (80.6%) were married, while 14 (19.4%) were unmarried (10 males, 4 females); this distribution differed significantly from an equal split ($\chi^2 = 26.89$, $df = 1$, $p < 0.001$) (Table 5).

Table 5. Marital status of HIV-positive patients (N = 72)

Marital status	n	%
Married	58	80.6
Unmarried	14	19.4
Total	72	100.0

$\chi^2 = 26.89$, $df = 1$, $p < 0.001$ (significant at $p < 0.05$).

With respect to education, 7 patients (9.7%) had primary-level education, 3 (4.2%) had middle-level education, and the remaining 62 (86.1%) were

uneducated; this distribution differed significantly from an equal distribution ($\chi^2 = 90.58$, $df = 2$, $p < 0.001$) (Table 6).

Table 6. Educational status of HIV-positive patients (N = 72)

Education	n	%
Primary	7	9.7
Middle	3	4.2
Uneducated	62	86.1
Total	72	100.0

$\chi^2 = 90.58$, $df = 2$, $p < 0.001$ (significant at $p < 0.05$).

Regarding probable route of transmission, heterosexual contact was reported by 42 patients (58.3%), of whom 23 reported contact with sex workers, 14 reported husband-to-wife transmission, and 2 reported wife-to-husband transmission. Mother-to-child transmission (MTCT) accounted for 5 cases (6.9%), a history of blood transfusion was reported in 6 cases (8.3%), and a history of dental procedures prior to diagnosis in 3 cases (4.2%). Among the four

mutually exclusive major transmission categories reported (heterosexual contact, MTCT, blood transfusion, and dental procedure; $n = 56$), the distribution differed significantly from an equal distribution ($\chi^2 = 75.00$, $df = 3$, $p < 0.001$), confirming heterosexual contact as the significantly predominant reported route. No case of homosexual or transgender transmission was reported in this cohort (Table 7).

Table 7. Probable Route of Transmission Among HIV-Positive Patients (N = 72)

Transmission Route	n	% of Total (N=72)
Heterosexual contact	42	58.3
– Sex workers	23	31.9
– Husband to wife	14	19.4
– Wife to husband	2	2.8
– Unspecified/other heterosexual	3	4.2
Mother-to-child transmission	5	6.9
Blood transfusion	6	8.3
Dental procedure	3	4.2
Not specified / other	16	22.2
Total	72	100.0

Note: The heterosexual contact subtotal (42) reflects the sum of sex worker (23), husband-to-wife (14), wife-to-husband (2), and unspecified/other (3) contact cases.

$\chi^2 = 75.00$, $df = 3$, $p < 0.001$ (significant at $p < 0.05$), calculated across the four mutually exclusive major categories (heterosexual contact, MTCT, blood transfusion, dental procedure; $n = 56$); indented rows are non-independent subsets of the heterosexual-contact category and are excluded from the test. Sixteen patients (22.2%) did not report a specific probable transmission route in the original dataset and are not included in the statistical comparison.

With regard to addiction history, oral snuff use was reported by 23 patients (31.9%), smoking by 8 (11.1%), hashish use by 4 (5.5%), and injection drug use (IDU) by 2 (2.7%); the remaining 35 patients (48.6%) reported no history of addiction.

The distribution across addiction categories (including “none”) differed significantly from an equal distribution ($\chi^2 = 55.64$, $df = 4$, $p < 0.001$) (Table 8).

Table 8. Addiction history among HIV-positive patients (N = 72)

Addiction history	n	%
Oral snuff	23	31.9
Smoking	8	11.1
Hashish	4	5.5
Injection drug use (IDU)	2	2.7
None	35	48.6
Total	72	100.0

$\chi^2 = 55.64$, $df = 4$, $p < 0.001$ (significant at $p < 0.05$).

4. Discussion

The present study recorded an HIV positivity rate of 9.6% (72/750) among symptomatic patients referred for testing at DHQ Hospital Kohat,

reflecting a substantial burden of infection in a clinically selected, symptomatic population rather than the general community. This figure is considerably higher than national community-

level HIV prevalence estimates, which remain below 0.1% among adults aged 15–49 years^[2], a difference that is expected given that the study population was pre-selected on the basis of clinical suspicion and physician referral rather than random general-population screening.

The male predominance observed in this study (68.1% male versus 31.9% female) was statistically significant ($\chi^2 = 9.39$, $df = 1$, $p = 0.002$) and is consistent with the broader pattern reported in HIV epidemiology in Pakistan, where a KP-based case-control study similarly identified male gender as a significant risk factor for HIV-1 infection^[9], alongside spousal HIV status, injection drug use, tattooing, and history of therapeutic injections or blood transfusion^[9]. The higher male burden may be linked to greater engagement in reported risk behaviours such as extramarital heterosexual contact and substance use, as reflected in the questionnaire findings of the present study, where the majority of male infections were associated with heterosexual contact, including contact with sex workers.

The markedly higher, and statistically significant, prevalence in rural areas (79.2%; $\chi^2 = 24.50$, $df = 1$, $p < 0.001$) compared with urban areas (20.8%) observed here is noteworthy and may reflect a combination of factors, including comparatively limited access to properly regulated healthcare facilities and safe injection practices in rural settings, lower health literacy and awareness regarding HIV transmission and prevention, and greater reliance on informal or unregulated healthcare providers. This pattern parallels national experience, where major HIV outbreaks associated with unsafe injection practices, poor infection control, and unregulated blood transfusion services^[6,8], most notably the 2019 Ratodero outbreak in Sindh^[4,5,7], disproportionately affected under-resourced and rural or peri-urban communities.

The predominance of the 21–40 year age group (43.1%) among positive cases in this study, part of an overall age distribution that differed significantly from chance ($\chi^2 = 58.17$, $df = 5$, $p < 0.001$), aligns with the expected age distribution of sexually and occupationally active adults, who are more likely to engage in the heterosexual contact

identified here as the leading reported transmission route. The relatively high frequency also recorded in the 41–60 year group (27.8%) may reflect a combination of heterosexual transmission within marriage (husband-to-wife transmission was reported in 14 cases) and possible healthcare-associated exposure through therapeutic injections or transfusions received over a longer clinical history.

Heterosexual contact emerged as the significantly dominant reported transmission route (58.3%; $\chi^2 = 75.00$, $df = 3$, $p < 0.001$ across the major reported categories), with a substantial proportion linked to contact with sex workers, followed by transmission within marriage. This is broadly consistent with regional evidence indicating that, while Pakistan's HIV epidemic has historically been concentrated among key populations such as people who inject drugs^[10], an increasing proportion of transmission is now occurring through heterosexual and iatrogenic (healthcare-associated) routes, including unsafe therapeutic injections and blood transfusion^[6,7,8], mirroring the pattern of MTCT, transfusion-associated, and injection-associated cases identified in the present cohort. The absence of reported homosexual or transgender transmission in this study most likely reflects substantial underreporting due to social stigma and criminalization of such behaviours in the local cultural context, rather than a true absence of such transmission routes.

The distribution of cases across Kohat division did not differ significantly by district ($\chi^2 = 2.33$, $df = 2$, $p = 0.311$), with Kohat district itself recording the highest number of cases, followed by Karak and then Hangu. This most likely reflects both population size and the fact that DHQ Hospital Kohat, as the primary referral centre, draws patients preferentially from its home district, while patients from more distant districts such as Hangu may be underrepresented due to referral or access barriers, rather than a true underlying difference in district-level risk. Overall, this study adds important division-level HIV surveillance data for a part of Khyber Pakhtunkhwa that has previously been underrepresented in the published literature, complementing the existing provincial risk-factor data from Peshawar-based studies^[9].

The predominance of married status (80.6%; $\chi^2 = 26.89$, $df = 1$, $p < 0.001$) and low educational attainment (86.1% uneducated; $\chi^2 = 90.58$, $df = 2$, $p < 0.001$) among positive cases further supports a picture of HIV transmission concentrated within marital and low-literacy contexts in this rural population, where reduced awareness of transmission risk and limited negotiating power around safer healthcare and sexual practices may compound exposure.

This study has several limitations. As a hospital-based, symptomatic-referral sample, the findings cannot be generalized to estimate true community-level HIV prevalence in Kohat division. Screening relied on a single ICT rapid test without a confirmatory assay (e.g., ELISA or Western blot), which, while operationally practical, carries some risk of false-positive results and would benefit from confirmatory testing in future work^[8]. Additionally, transmission route and addiction history data were self-reported, which may be subject to recall or social-desirability bias, particularly given the sensitivity and stigma surrounding these topics in the local context, and 16 patients (22.2%) did not report a specific transmission route, limiting the completeness of the transmission-route analysis. Finally, the chi-square tests reported here assess whether observed frequencies differ from an equal distribution within each variable rather than testing associations between variables (e.g., gender by transmission route), which future studies with larger samples should examine using cross-tabulation and multivariable analysis.

5. Conclusion

This study identified a considerable and statistically significant burden of HIV infection (9.6%) among symptomatic patients referred for testing at DHQ Hospital Kohat, with infection disproportionately, and significantly, affecting males, rural residents, and adults in the 21–40 year age group. Heterosexual contact, including contact with sex workers and transmission within marriage, was the predominant reported transmission route, with a notable additional contribution from healthcare-associated exposures such as blood transfusion and dental procedures.

These findings highlight the urgent need for expanded, decentralized HIV screening services in rural parts of Kohat division, strengthened infection control and injection safety standards in local healthcare facilities, and targeted community awareness programmes addressing heterosexual and marital transmission. Larger, confirmatory, and genotypically characterized studies are recommended to further clarify transmission dynamics and inform the regional public health response.

Author contributions

Conceptualization: Ihsan Ullah **Project administration:** Ihsan Ullah, Shumaila Naz **Supervision:** Ihsan Ullah, Shumaila Naz **Formal analysis:** Ihsan Ullah, Shumaila Naz, Ume Salma Liaqat, Rabbiah Manzoor Malik, Kiran Hadi, **Investigation and Methodology:** Ihsan Ullah, Ume Salma Liaqat, Rabbiah Manzoor Malik, Kiran Hadi. **Writing original draft:** Ihsan Ullah. **Writing and Reviewing:** Shumaila Naz, Ume Salma Liaqat, Rabbiah Manzoor Malik, Kiran Hadi **Data curation:** Ihsan Ullah, Shumaila Naz, Rabbiah Manzoor Malik **Validation:** Ihsan Ullah, Ume Salma Liaqat, Kiran Hadi.

The author has read and agreed to the published version of the manuscript.

Funding

No specific grant was awarded to this research by funding agencies in the public, commercial, or not-for-profit sectors.

Institutional Review Board statement

This study was reviewed and approved by the Institutional Ethical/Bioethics Research Committee, and was conducted in accordance with the ethical standards set forth therein.

Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Acknowledgments

The author is thankful to the Principal, Government Degree College Gumbat, Kohat, for providing institutional support and necessary facilities to carry out this research. The author also acknowledges the administration of DHQ Hospital KDA Kohat for their valuable support,

cooperation, and facilitation during the data collection process.

Declaration of Competing Interest

The author declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Conflict of Interest

The author declares no conflict of interest.

REFERENCES

- Yousaf MZ, Zia S, Babar ME, Ashfaq UA. The epidemic of HIV/AIDS in developing countries; the current scenario in Pakistan. *Virol J.* 2011;8:401.
- World Bank. Prevalence of HIV, total (% of population ages 15–49) – Pakistan. World Bank Open Data, based on UNAIDS estimates; 2025.
- World Health Organization, UNAIDS. HIV infections rise in Pakistan; WHO and UNAIDS call to action. WHO Regional Office for the Eastern Mediterranean; 1 December 2025.
- Nasir K, Todd CS, Ahmed A, Ahmed S, Zafar S. Notes from the Field: Pediatric HIV Outbreak in Ratodero, Pakistan – April 2019–April 2020. *MMWR Morb Mortal Wkly Rep.* 2021;70(42):1478-1479.
- World Health Organization. Description of the situation: HIV outbreak, Larkana district, Sindh province, Pakistan. *WHO Disease Outbreak News.* 2019.
- Rabold EM, Ali H, Fernandez D, Knuth M, Schenkel K, Asghar RJ, Baig MA, Shaikh S, Morgan O. Systematic review of reported HIV outbreaks, Pakistan, 2000–2019. *Emerg Infect Dis.* 2021;27(4):1039-1047.
- Mir F, Nathwani AA, Simms V, et al. Factors associated with HIV infection among children in Larkana District, Pakistan: a matched case-control study. *Lancet HIV.* 2021;8(6):e342-e352.
- Altaf A, Shah SA. Pakistan's unsafe medical injections and the enduring public health crisis. *Pak J Med Sci.* 2025;41(12):3323-3325.
- Haider J, Lutfullah G, Rehman I ur, Khattak I. Identification of risk factors for human immunodeficiency virus-1 infection in Khyber Pakhtunkhwa population: A case control study. *Pak J Med Sci.* 2019;35(5):1258-1263.
- Bergstrom A, Achakzai B, Furqan S, ul Haq M, Khan R, Saba M. Drug-related HIV epidemic in Pakistan: a review of current situation and response and the way forward beyond 2015. *Harm Reduct J.* 2015;12:43.