



Original Research Article

UNSAFE INJECTION PRACTICES AND THEIR ASSOCIATION WITH HIV TRANSMISSION IN PAKISTAN: A MULTICENTER CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Unsafe injection practices are an important source of blood-borne infection transmission and may contribute to the growing burden of HIV in Pakistan. The objective is to assess unsafe injection practices and their association with HIV transmission in Pakistan.

Materials and Methods: This was a multicenter cross-sectional study conducted at Tertiary Care Hospital in Islamabad, including 225 patients, from November 2024 to November 2025.

Results: The mean age of participants was 34.8 ± 11.2 years, and the mean number of injections received annually was 8.6 ± 3.4 . Unsafe injection practices were identified in 40.9% of participants, while reused syringe exposure was reported in 32.9% and injections from informal providers in 38.2%. Overall HIV positivity was 21.3%. HIV positivity was significantly higher among participants exposed to unsafe injection practices compared with the safe injection group (33.7% vs 12.8%; $p=0.001$). Reused syringe exposure (54.2% vs 27.1%; $p=0.001$), receiving more than five injections annually (79.2% vs 62.1%; $p=0.029$), informal provider exposure (50.0% vs 35.0%; $p=0.041$), and inadequate safety awareness (72.9% vs 55.9%; $p=0.038$) were significantly associated with HIV positivity.

Conclusion: Unsafe injection practices were significantly associated with HIV transmission and represent an important preventable risk factor. Strengthening injection safety measures, improving public awareness, and regulating unsafe healthcare practices may help reduce healthcare-associated HIV transmission.

Keywords: Unsafe injections, HIV transmission, syringe reuse, injection safety, Pakistan, cross-sectional study.

INTRODUCTION

Unsafe injection practices pose a significant global health burden and are a known source of transmission of blood-borne pathogens, most notably human immunodeficiency virus (HIV), hepatitis B virus and hepatitis C virus.^[1] These involve reuse of syringes, lack of sterilisation, sharing of injection equipment and unnecessary therapeutic injections without infection prevention and control.^[2] These are especially concerning in low- and middle-income

settings where regulations in health care and infection prevention may not be uniformly applied.^[3] Millions of injections are given globally each year, many of which are unnecessary or unsafe.^[4] According to the World Health Organization, unsafe injections are a major source of transmission of blood-borne pathogens, especially in low- and middle-income countries.^[5] Injections are also favoured over oral tablets in many countries, owing to misperceptions about effectiveness, also contributing to the risk of exposure.^[6] In recent years, Pakistan has seen a rise

in HIV cases, including outbreaks of health care-associated HIV, including unsafe injections.^[7] Numerous outbreaks, such as those in Sindh and elsewhere, have highlighted concerns about unsafe practices including reuse of syringes, inadequate infection control, and unsafe injection practices by unskilled providers.^[8] The outbreaks have drawn attention to unsafe injections as a potentially avoidable risk factor for HIV transmission.^[9]

Unsafe injections can occur in both formal and informal health care setting, and are affected by various factors such as provider training, availability of disposable syringes, regulation of injectable drug administration, and patient preference for injectable drugs.^[10] Furthermore, unsafe therapeutic injections, injections by informal providers, and unsafe practices of high-risk populations may all pose a risk for HIV transmission.^[11] Earlier studies have shown an association between unsafe injections and HIV infection, particularly when multiple exposures occur.^[12] Other research has demonstrated high frequency of therapeutic injections, reports of reused syringes, and receipt of injections from informal practitioners are associated with higher odds of HIV.^[13] These studies underline the importance of unsafe healthcare practices as a significant but often overlooked risk factor. Pakistan is an important setting with high injection frequency, variable infection control practices and rising rates of HIV.^[14] Although there is a growing concern, there is little multicenter data that assesses the association of unsafe injections with HIV transmission in the population.^[15] The prevalence and risk factors for unsafe injections, and its association with HIV, are crucial for developing prevention approaches.^[16]

Objective: To assess unsafe injection practices and their association with HIV transmission in Pakistan

MATERIALS AND METHODS

This was a multicenter cross-sectional study conducted at Tertiary Care Hospital in Islamabad from November 2024 to November 2025, including 225 patients.

Inclusion Criteria

- Patients aged ≥ 18 years
- Individuals with history of receiving therapeutic injections within the preceding 12 months
- Individuals willing to provide history regarding injection practices and risk factors
- Patients providing informed consent

Exclusion Criteria

- Patients with incomplete exposure history
- Individuals unwilling to participate
- Patients with known congenital or vertically acquired HIV infection
- Patients with documented occupational needle-stick exposure
- Individuals with incomplete laboratory or clinical records

Data Collection: After institutional approval, data were collected using a structured proforma. Baseline variables included age, gender, educational status, socioeconomic status, frequency of injections received, type of healthcare provider (formal or informal), use of new or reused syringes, awareness regarding injection safety, and history of injections from unqualified practitioners. HIV status was documented through available laboratory records or confirmed testing as per study protocol. Potential associated risk factors including history of blood transfusion, invasive procedures, and other relevant exposures were also recorded. Unsafe injection practice was operationally defined as exposure to reused syringes, injections from unregulated providers, or receipt of unnecessary repeated therapeutic injections under unsafe conditions.

Statistical Analysis: Data were entered and analyzed using SPSS version 26.0. Continuous variables were expressed as mean \pm standard deviation, while categorical variables were presented as frequency and percentage. Associations between unsafe injection practices and HIV transmission were assessed using chi-square test. Stratification was performed for age, gender, frequency of injections, provider type, and awareness level to control for effect modifiers. Post-stratification chi-square test was applied, and a p-value ≤ 0.05 was considered statistically significant.

RESULTS

A total of 225 participants were included with a mean age of 34.8 ± 11.2 years, with most participants aged 31–45 years (42.7%), followed by 18–30 years (36.4%). Males constituted 58.7% of the study population. The mean number of injections received in the past year was 8.6 ± 3.4 , and 65.8% had received more than five injections annually. Exposure to informal providers was reported by 38.2%, reused syringe exposure by 32.9%, and 59.6% had inadequate awareness regarding injection safety, indicating a substantial burden of unsafe practices.

Table 1: Baseline Demographic and Exposure Characteristics (n = 225)

Variable	Category	Total n (%) / Mean \pm SD
Age (years)	Mean \pm SD	34.8 \pm 11.2
Age Group	18–30 years	82 (36.4%)
	31–45 years	96 (42.7%)
	>45 years	47 (20.9%)
Gender	Male	132 (58.7%)
	Female	93 (41.3%)
Education	No Formal Education	58 (25.8%)
	Primary–Secondary	104 (46.2%)
	Higher Education	63 (28.0%)

Socioeconomic Status	Low	117 (52.0%)
	Middle	79 (35.1%)
	High	29 (12.9%)
Injections Received in Past Year	Mean ± SD	8.6 ± 3.4
>5 Injections/Year	Yes	148 (65.8%)
Injection from Informal Providers	Yes	86 (38.2%)
History of Reused Syringe Exposure	Yes	74 (32.9%)
Awareness of Injection Safety	Adequate	91 (40.4%)
	Inadequate	134 (59.6%)

Unsafe injection practices were identified in 40.9% of participants, while 32.9% reported reused syringe exposure and 45.3% had a history of unnecessary repeated injections. Injections from unqualified providers were reported by 38.2%. Overall HIV positivity was 21.3% (48/225). Notably, HIV

positivity was markedly higher among participants exposed to unsafe injection practices (33.7%) compared to those with safe injection exposure (12.8%), suggesting a strong association between unsafe practices and HIV transmission.

Table 2: Frequency of Unsafe Injection Practices and HIV Status

Variable	Category	n (%)
Unsafe Injection Practice	Present	92 (40.9%)
	Absent	133 (59.1%)
Reused Syringe Exposure	Present	74 (32.9%)
Unnecessary Repeated Injections	Present	102 (45.3%)
Injection from Unqualified Provider	Present	86 (38.2%)
HIV Positive	Yes	48 (21.3%)
	No	177 (78.7%)
HIV Positive among Unsafe Injection Group	Yes	31 (33.7%)
HIV Positive among Safe Injection Group	Yes	17 (12.8%)

Several factors showed significant association with HIV positivity. Reused syringe exposure was more common among HIV-positive participants (54.2% vs 27.1%, $p=0.001$). Similarly, exposure to informal providers (50.0% vs 35.0%, $p=0.041$), receiving more than five injections annually (79.2% vs 62.1%,

$p=0.029$), inadequate safety awareness (72.9% vs 55.9%, $p=0.038$), blood transfusion history (29.2% vs 15.3%, $p=0.031$), and invasive procedures (37.5% vs 22.0%, $p=0.027$) were all significantly associated with HIV transmission.

Table 3: Factors Associated with HIV Transmission

Variable	Category	HIV Positive (n=48)	HIV Negative (n=177)	P-value
Reused Syringe Exposure	Yes	26 (54.2%)	48 (27.1%)	0.001
	No	22 (45.8%)	129 (72.9%)	0.001
Injection from Informal Provider	Yes	24 (50.0%)	62 (35.0%)	0.041
>5 Injections/Year	Yes	38 (79.2%)	110 (62.1%)	0.029
Inadequate Safety Awareness	Yes	35 (72.9%)	99 (55.9%)	0.038
Blood Transfusion History	Yes	14 (29.2%)	27 (15.3%)	0.031
Invasive Procedure History	Yes	18 (37.5%)	39 (22.0%)	0.027

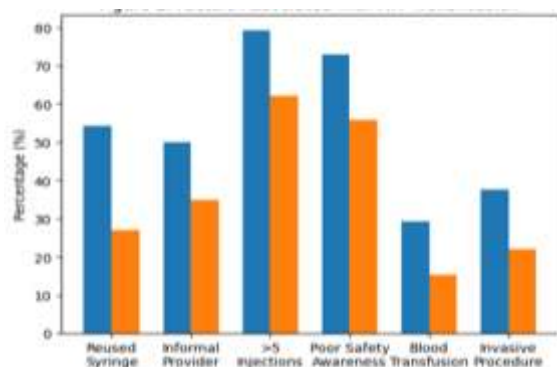


Figure 1: Association of Unsafe Injection-Related Risk Factors with HIV Transmission

Participants in the unsafe injection group had a higher mean number of injections per year (10.2 ± 3.6 vs 7.1 ± 2.4 ; $p<0.001$) and significantly higher HIV positivity (33.7% vs 12.8%; $p=0.001$). Exposure to informal providers (56.5% vs 25.6%; $p=0.002$) and inadequate safety awareness (72.8% vs 50.4%; $p=0.006$) were also significantly greater in the unsafe injection group. Although blood transfusion and invasive procedure history were more frequent in the unsafe group, these differences were not statistically significant.

Table 4: Multivariable-Style Comparative Risk Profile for Unsafe Injection Exposure and HIV

Risk Indicator	Unsafe Injection Group (n=92)	Safe Injection Group (n=133)	P-value
Mean Injections/Year	10.2 ± 3.6	7.1 ± 2.4	<0.001
HIV Positivity	31 (33.7%)	17 (12.8%)	0.001
Reused Syringe Exposure	74 (80.4%)	0 (0.0%)	<0.001

Informal Provider Exposure	52 (56.5%)	34 (25.6%)	0.002
Inadequate Safety Awareness	67 (72.8%)	67 (50.4%)	0.006
Blood Transfusion History	21 (22.8%)	20 (15.0%)	0.148
Invasive Procedure History	29 (31.5%)	28 (21.1%)	0.081

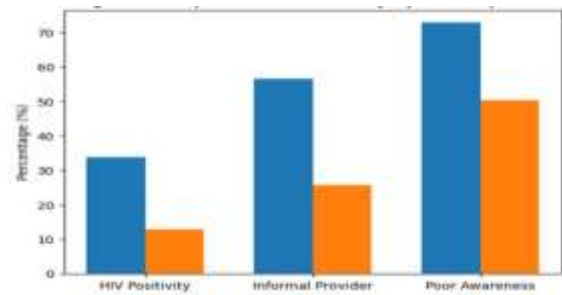


Figure 2. Comparative Risk Profile of Participants with Unsafe Versus Safe Injection Exposure

DISCUSSION

This study assessed the extent of unsafe injection practices, and their role in HIV transmission, among 225 participants in a multi-site cross-sectional study. Many participants were exposed to unsafe injection practices, including reuse of injection equipment (32.9%), informal provider injections (38.2%) and unnecessary repeated injections (45.3%). Moreover, 40.9% were exposed to unsafe injection practice, a high level of preventable exposure.^[17] This study's notable finding was the significantly greater proportion of HIV-positive participants from the unsafe injection group compared with the safe injection group (33.7% vs 12.8%; $p=0.001$). This finding suggests a significant link between unsafe injection practice and HIV. This observation is consistent with other studies that have found reuse of injection equipment and unsafe therapeutic injections are key factors in the transmission of blood-borne infections, including HIV.^[18] Exposure to reused syringes was a significant factor, with 54.2% of HIV-positive participants and 27.1% of HIV-negative participants ($p=0.001$) reporting reuse. Similarly, participants who received more than five injections per year had a higher prevalence of HIV (79.2% vs 62.1%; $p=0.029$), suggesting multiple exposures may pose a cumulative risk. Other studies have also shown that receiving frequent injections and reuse of syringes are associated with an increased risk of HIV acquisition, especially where infection control is poor.^[19] Participants in the study were also significantly more likely to be HIV-positive if they had been exposed to unregulated or unqualified providers (50.0% vs 35.0%; $p=0.041$), or had poor knowledge of injection safety (72.9% vs 55.9%; $p=0.038$). These results indicate that both provider and patient factors play a role in risk. Other studies have also identified unsafe and unregulated health practices, lack of training among providers, and lack of public awareness in contributing to unsafe injections.^[20]

Other significant factors included history of blood transfusion (29.2% vs 15.3%; $p=0.031$) and invasive

procedures (37.5% vs 22.0%; $p=0.027$), though this suggests that other health care-related exposures may also play a role in HIV transmission. Other studies have also highlighted multifactorial transmission, with unsafe injections combined with other exposures.^[21] Risk profiling also supported this conclusion. The unsafe injection group showed a higher mean number of injections per year (10.2 ± 3.6 vs 7.1 ± 2.4 ; $p<0.001$), higher exposure to unqualified providers (56.5% vs 25.6%; $p=0.002$) and higher inadequate safety awareness (72.8% vs 50.4%; $p=0.006$). This may reflect the co-existence of risky behaviours. Other studies have also found unsafe injection practices to be associated with other systemic and behavioral risks.^[22] This study's results are relevant for public health in countries like Pakistan where injection drug use is prevalent and outbreaks have been reported due to unsafe practices. The HIV positivity rate (21.3%) seen in this population and its strong association with unsafe exposures highlight the need to prioritise infection prevention, safe injection practices and regulation of informal health-care providers. Other studies also recommend interventions aimed at syringe safety, provider and community education.^[23] In summary, the current study shows unsafe injection practices are strongly linked to HIV transmission and are a potential risk factor. These results are supported by existing research and suggest the need for strategies to prevent HIV transmission in health care settings.

CONCLUSION

It is concluded that unsafe injection practices were significantly associated with HIV transmission in this study, with higher HIV positivity observed among participants exposed to unsafe injections compared to safe injection practices (33.7% vs 12.8%). Reused syringe exposure, frequent injections, use of informal providers, and inadequate awareness regarding injection safety were important associated risk factors. Blood transfusion history and invasive procedures also contributed to increased risk. Participants exposed to unsafe injection practices demonstrated a higher-risk profile, including greater injection frequency (10.2 ± 3.6 vs 7.1 ± 2.4) and greater exposure to unsafe providers.

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