HIV Infection in Iran: An Update on Epidemiology, Testing and Gaps

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Abstract- The HIV epidemic continues to disproportionately affect young and active individuals in developing and low-income countries, including Iran. Among high-risk populations in Iran, HIV prevalence peaks at 3.5% among people who inject drugs and 2.5% among men who have sex with men. Despite progress in achieving the UNAIDS 95-95-95 targets for HIV diagnosis, treatment, and viral suppression, significant gaps remain in early detection and reaching vulnerable populations, including pre-exposure prophylaxis and targeted outreach to key populations. Education and awareness campaigns are crucial for preventing the spread of HIV, particularly among young people. However, there is a need to improve education and access to information and HIV services for key populations. Expanding HIV testing and counselling services is vital for early diagnosis and treatment. Addressing the issue of late diagnosis, which can negatively impact treatment outcomes and mortality rates, is essential. Integrating HIV services into primary healthcare can improve access and outcomes. A holistic and multi-sectoral approach, encompassing education, prevention, treatment, and care, is necessary to curb the spread of HIV and improve the quality of life for individuals affected by HIV infection in Iran.

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Introduction

Epidemic situation

According to global statistics, by 2023, 39.9 million people globally were living with human immunodeficiency virus (HIV), 1.3 million people became newly infected with HIV, 630000 people died from AIDS-related illnesses, and 30.7 million people were accessing antiretroviral therapy (1). Approximately 85.6 million people have become infected with HIV since the initiation of the HIV epidemic. 40.4 million people have died from AIDS-related illnesses since the start of the epidemic (1).

HIV is a prominent global public health threat for young and active people. Regrettably, the HIV pandemic still rages through the world, especially in developing and low-income countries. This warning is particularly critical for countries in the East Mediterranean Region , including Iran (2,3). The number of people living with HIV (PLWH) in Iran was estimated at 43,000 (Range: 30000-77000) in 2023, while out of this number, only about 24,000 people are diagnosed and registered, with about 19000 being undiagnosed and missed by the health system. Also, the estimated number of deaths due to AIDS was approximately 1900 in 2023 (4).

Since the detection of the first HIV case in 1986, Iran has faced a concentrated HIV epidemic among people who inject drugs (PWID), particularly since the 2000s. The government's response has primarily targeted this key population, which is predominantly young male

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drug users. Since the detection of the first case of HIV in Iran, among all of the detected cases, the most prevalent mode of transmission is the shared use of drug injection equipment among PWID, accounting for 58.1% of cases (5). For the same time period, transmission through sexual contact and mother-to-child transmission (MTCT) account for 23.9% and 1.7% of cases, respectively. In recent years, new HIV cases have been attributed to PWID (15.5%), sexual contact (54.2%), and MTCT (2.1%). Studies indicate a significant shift in HIV transmission methods over the past decade. Among all PLWH who are diagnosed and reported to the Ministry of Health per year, transmission through injection drug use (IDU) has decreased from 66.4% in 2010 to 15.5% in 2020 (5). Conversely, transmission through sexual contact has risen from 21.1% in 2010 to 54.2% in 2020. At the same time, the proportion of women has increased slowly in all registered cases, from 8.5% in 2010 to 19.1% in 2020 (2,5,6). Women face increased vulnerability to HIV infection due to several factors, including biological susceptibility, limited access to employment and education particularly in developing countries, lower knowledge and income levels and other socio-economic barriers. Additionally, gender-based prejudice contributes to this disparity, as societal focus often prioritizes men over women (5,7,8).

HIV prevalence varies among high-risk populations in Iran. A 2020 study of 2,663 PWID across the country estimated an HIV prevalence of approximately 3.5% (9) while the prevalence of this disease was reported to be 15.1% in a nationwide study conducted in 2010 (10). In contrast, a separate 2020 study of 9,912 non-injecting drug users (non-IDU) reported an HIV prevalence of 1.9% (11). Additionally, a nationwide study from the same year focusing on female sex workers (FSWs) found an HIV prevalence of 1.6% (12). In a previous study conducted by Khezri *et al*., the prevalence of HIV among FSWs in Iran was reported to be 4% in 2010 and 2.1% in 2015, indicating a decreasing trend in recent years (10). Additionally, according to the latest national report on HIV in Iran, the prevalence of the infection in the population of men who have sex with men (MSM) has been reported to be approximately 2.5% (11). In 2021, a study was conducted in the cities of Shiraz and Tehran on a sample of 127 transgender individuals, according to which the prevalence of HIV was approximately 1.6% (8). Furthermore, a study carried out in 2022 among prisoners in Iran revealed an HIV prevalence rate of 0.8% (13). The prevalence rate has decreased compared to previous years. In a study conducted by Shahesmaeili *et al*., on prisoners in Iran from 2010 to 2017, the prevalence of HIV was reported to be 2.1% in 2010, 1.7% in 2013, and 0.8% in 2017, respectively (14). Similarly, in a study conducted in Tehran on garbage collectors, the prevalence of HIV was found to be 0.8% (15) (Table 1).

Table 1. HIV prevalence among at-risk populations in Iran

Sample	Sample size	Location, year	Sampling method	HIV^+, n	HIV prevalence (%)	95% CI
PWIDs	2663	Iran, 2020 (16)	Respondent-driven sampling	95	3.5	2.9-4.3
Non IDUs	9912	Iran, 2020 (17)	Systematic review	188	1.9	0.9-3.1
FSW	1471	Iran, 2020 (9)	Simple random	24	1.6	0.8-2.3
MSM	80	Tehran, 2018 (11)	Convenient sampling	2	2.5	0.3-8.7
Transgenders	127	Shiraz and Tehran, 2021 (8)	Convenient sampling	2	1.6	0.2-5.6
Garbage collectors	132	Tehran (15)	Cluster sampling	1	0.8	0.02-4.2

PWID, people who inject drugs; IDU, injecting drug users; FSW, female sex workers; MSM, men who have sex with men

National response in brief

HIV prevention services

The 95-95-95 targets set by UNAIDS aim to advance the global response to HIV/AIDS. The first goal is to ensure that 95% of all PLWH are aware of their HIV status, highlighting the need for widespread testing and diagnosis. The second goal is to provide antiretroviral therapy (ART) to 95% of those who are diagnosed with HIV, emphasizing the importance of accessible and sustained treatment. The third goal is to achieve viral suppression in 95% of those receiving ART, critical for improving health outcomes and reducing transmission. Together, these targets are designed to enhance global health, improve individual well-being, and reduce the overall impact of HIV. According to the UNAIDS 95-95-95 targets, Iran achieved the third goal with 90.5% success and made relatively significant progress towards the second goal, reaching 71.5%. However, the latest

statistics indicate we have not achieved the first goal, with only 51.1% progress. Given this, it is essential to prioritize identifying individuals with HIV and expanding testing efforts. ART is available nationwide at specific public health centers, where all services are free. Currently, 71.5% of those who know their HIV status are receiving HIV treatment. However, there is a need to improve ART coverage, particularly among specific key populations. In 2023, among those on ART who underwent viral load testing, about 92% (17637 out of 19065) achieved viral suppression (2,5,6).

In 2018, Iran joined the Global Prevention Coalition and launched a prevention program aligned with its 5th National Strategic Plan (NSP) (Figure1). This program, initially scheduled for full implementation by 2024, has been extended by two years. It focuses on pre-exposure prophylaxis (PrEP), key populations (KPs), and condom programming for KPs. The National AIDS Council (NAC) oversees the program, and the supervising of the implementation of program (SIP) committee has been established to manage it through four working groups. The NSP includes strategies such as information, education, and communication campaigns, harm reduction for PWIDs, condom promotion, PrEP, diagnosis and treatment of sexually transmitted infections (STIs), and care for PLWH. In response to increasing restrictions on contraceptive access, free condoms are distributed among key populations in various locations, including clinics, drop-in centers (DICs), and prisons. Condoms are also available for purchase at pharmacies and retail outlets. While the private sector provides a broad range of condom options, the public sector primarily targets KPs for HIV prevention through condom distribution (2,5,6).

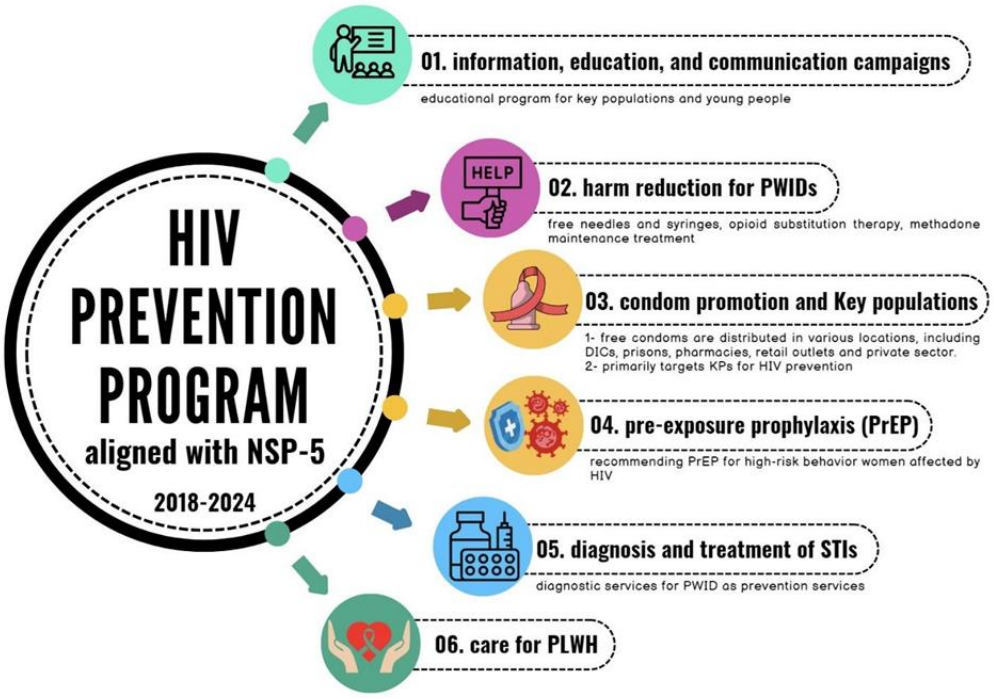

Figure 1. HIV prevention strategies in Iran (2,5)

Furthermore, The National AIDS Programme (NAP) also deployed four mobile units to provide services to these women, distributing condoms among them. Despite national guidelines recommending PrEP for these women, coverage remains low. A total of 7,990,000 free needles and syringes were distributed among PWID in 2019, opioid substitution therapy (OST) was accessible to PWID at over 8000 centers, which supervised by medical sciences universities, the Welfare Organization (W.O.), or prison organizations (P.O.). Additionally, by December 2019, 62743 out of 187373 prisoners were receiving OST. Approximately 750000 drug users have received MMT encompassing 25000 PWID. Also, PWID received HIV prevention services, including diagnostic services. Despite these efforts, there is a need to scale up interventions. The WO has provided HIV prevention services for transgender individuals and some guidelines developed

for MSM. These guidelines include recommendations for HIV pre-exposure prophylaxis (PrEP) (2,5). though only a limited number were provided in 2022.

Information and education

The few studies on the knowledge, attitudes, beliefs, and behaviors about the sexual reproductive health of Iranian youth have demonstrated poor knowledge about reproductive health (12,18,19). It is up to health researchers to distinguish the need for reproductive health promotion and to plan and fulfill the necessary educational programs that include the prevention of STIs/HIV and unwanted pregnancies.

A study revealed that university students in Qazvin had an average knowledge score of 55% on contraception, 57% on STIs, and 54% on HIV prevention methods. Engineering, science, and humanities students had significantly less knowledge than medical students. These findings are consistent with other smaller studies on reproductive health in Iran (19). The study also identified a weak but significant positive correlation between parents' education and family socio-economic status with students' knowledge of reproductive health, highlighting the impact of social and economic factors on promoting reproductive health (19-21). However, it appears that further efforts are necessary. As suggested by others, this education should be tailored to students' gender and field of study, focusing on enhancing non-medical students' knowledge.

Additionally, greater emphasis should be placed on family planning methods for males and the prevention of STIs, HIV, and AIDS. The educational needs of young people should not be overlooked. Research indicates that reproductive health programs that solely promote abstinence are not always practical. For sexually active youth, these programs should include additional health messages that address a broader range of reproductive health topics to ensure more comprehensive education and support (19,22,23). Encouraging contraceptive use among sexually active youth may be beneficial, possibly due to their higher levels of education. However, global statistics indicate that only 17% of sexually active youth are currently using contraceptives (5).

Educational programs should go beyond providing information and focus on developing life skills and improving young people's capacity to manage risks effectively (self-efficacy). When applying the health belief model, most Iranian students viewed unhealthy reproductive health behaviors among youth as severe risks to their well-being. However, they also believed young people could not protect themselves from these risks (20,24).

Gaps

HIV testing

Expanding the availability and use of HIV testing and counselling services is a crucial step towards ensuring access to essential services and interventions for the prevention, treatment and care of PLWH. HIV testing and counselling is a critical component of the 5th National Strategic Plan (NSP 5th). It emphasizes the importance of providing HIV testing with confidentiality, informed consent, counselling, accurate results, and appropriate services. For these groups, the preferred approach is opt-out provider-initiated testing. Voluntary counselling and testing (VCT) centers are available to all individuals upon request, typically provided through triangular clinics (VCT centers). Triangular clinics serve as the primary healthcare centers for PLWH. Their objectives include educating affected communities about HIV/AIDS and drug use, training clinic staff on HIV/AIDS and drug use-related issues, offering harm reduction services to individuals at risk and enhancing the well-being and self-sufficiency of those affected by HIV/AIDS (25).

The algorithm for detecting HIV cases involves an initial HIV rapid test or immunoassay followed by two sequential confirmatory immunoassays. In 2019, over 1,200,000 rapid HIV tests were administered at publicly funded facilities, encompassing governmental and non-governmental centers. The country aimed to rise the number to two million tests. Between November 11 and December 11, 2021, the NAP implemented a nationwide HIV testing campaign. Despite the rise in testing rates among specific key populations, and in high-prevalence areas, there remains a need to enhance coverage among at-risk groups. In 2022, 23305 PLHIV out of an estimated 45632 were aware of their HIV status, representing about 52% achievement of the first 95 in the 95*95*95 target (2,6) (Figure 2).

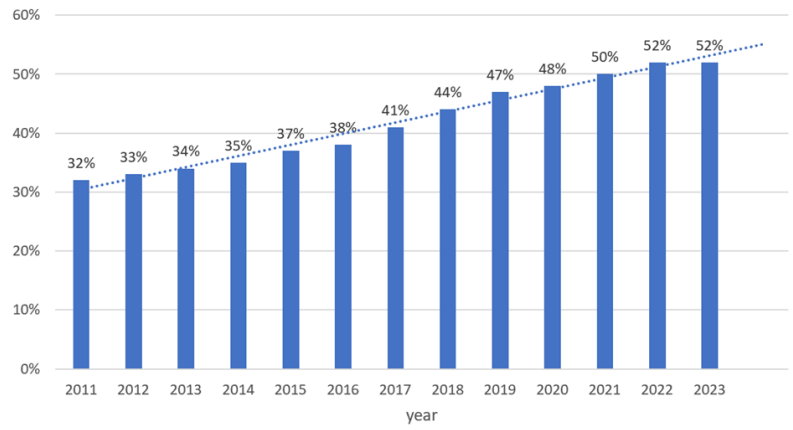

Figure 2. The percentage of identified PLWH out of the estimated PLWH (6)

Both government and non-governmental facilities now fulfill harm reduction programs. A program known as a best practice is the triangular clinic, which integrates services for the treatment and prevention of STIs, IDU and HIV/AIDS (5,6).

Where injecting drug use is feeding the spread of HIV, there is still a window of opportunity to stop new infections. Drawing from experiences in Iran and other international contexts, there is a critical need to expand harm reduction interventions using best practices and innovative approaches. Involving civil society and fostering collaboration with local NGOs are crucial to success. Strong political commitment and increased investment in evidence-based, effective interventions are essential to prevent a major HIV outbreak in the region. Numerous stakeholders, including law enforcement agencies, social health organizations, and the education, health, and judiciary sectors, have significant roles to play in implementing comprehensive harm reduction programs. Prisons, in particular, can play a vital role in curbing the spread of HIV in closed settings and in providing support to those reintegrating into the community. Additionally, faith-based organizations and religious leaders are well-positioned to address the stigma that undermines efforts to scale up these interventions (5).

One of the target groups for testing and consultation is pregnant individuals. It is estimated that about 614 pregnant women are living with HIV in Iran, among whom 114 (18.6%) receive antiretroviral treatment to prevent vertical transmission in 2023 (4,2). The recommended method for these groups involves provider-initiated testing and counselling (PITC) with an opt-out option. In 2017, a core service was introduced to deliver HIV testing and counseling to pregnant women in high-risk zones using the PITC approach. Thanks to significant results, from May 2018, this plan expanded nationwide, with Prevention of Mother to Child Transmissions (PMTCT) being integrated into primary health care (PHC). In the past year, following the integration of HIV testing into PHC, NAP has attempted to connect the AIDS Registry System with the Integrated Health System (SIB) software. Currently, HIV testing is registered in SIB, and there are hopes that other care and treatment aspects for women living with HIV will soon be included to enhance the continuum of HIV services. Many pregnant women receive their antenatal care in the private sector. NAP is actively exploring ways to strengthen public-private linkages in this field, aiming to eliminate MTCT of HIV in the medium term (4,2).

Lack of education in at-risk and public places

Young people constitute a particularly vulnerable group due to factors such as limited knowledge, unprotected sex, and multiple sexual partners. Current research consistently highlights prevention and education as the most effective strategies to combat the spread of these diseases (26).

One significant educational gap in Iran is the lack of adequate HIV/AIDS education within school and university curricula. Comparative studies across various societies reveal disparities in youth knowledge of HIV/AIDS, influenced by socio-economic, religious, political, and parental factors. Incorporating HIV/AIDS awareness-raising activities, such as brief tutorials, discussions, conferences, workshops, and symposia, into educational curricula is recommended to address these knowledge gaps (26).

Recent studies in Iran indicate a shift in the primary mode of HIV transmission from injection drug use to sexual contact. In addition to possible decreases in new

cases of individuals who inject drugs due to harm reduction services in community and prison settings, the other factors contributing to this shift include the proliferation of synthetic drugs that do not require needle sharing and an increase in unprotected sexual intercourse, potentially linked to rising age at marriage and socio-economic factors. Additionally, the influence of the internet, social media, and satellite television on youth culture has played a role (27). These findings underscore the critical need for comprehensive sexuality education programs among young people. Enhancing knowledge about HIV transmission modes can significantly contribute to reducing the incidence of new infections (27).

The internet and digital media serve as significant sources of HIV information, but the prevalence of misinformation within these platforms presents a substantial obstacle to effective HIV prevention and education. Therefore, a strategic approach to disseminating accurate scientific information through digital channels is necessary (27).

A critical issue in the Iranian context is the inadequate training of medical students in HIV/AIDS, which limits the development of empathetic and non-judgmental attitudes toward individuals living with HIV. The attitudes of medical students towards individuals with HIV/AIDS can have significant implications for patient care. Negative attitudes can lead to social stigma, discrimination in service delivery, poor quality of care, and increased treatment costs. However, the extensive training and exposure to HIV/AIDS cases that medical students receive during their educational courses present an opportunity to cultivate a positive and compassionate approach towards all patients, regardless of their health status (26).

Given the barriers to HIV testing, particularly among PWID, the expansion of HIV self-testing (HIVST) presents a promising approach to increase case detection. A 2020 study in Iran revealed a high level of interest among PWID in utilizing HIVST, indicating a potential for widespread adoption. However, a significant barrier remains in terms of awareness of HIVST. Consequently, a critical gap in HIV case detection lies in the lack of public education and awareness campaigns. Implementing comprehensive health education programs can effectively address this gap and promote the uptake of HIVST (28). The World Health Organization (WHO) has advocated for HIV self-testing as an effective strategy to bridge the gap in HIV diagnosis, which remains significant in the Islamic Republic of Iran. A study aimed to evaluate the feasibility and acceptability of HIV self-testing among high-risk populations. Findings indicated that HIV self-testing is both practical and well-received by female sex workers, men who have sex with men, and transgender individuals and their partners, particularly when accompanied by appropriate training and support (29).

The fear of stigmatization, social exclusion, and the loss of close relationships have resulted in low rates of HIV disclosure in Iran. Educational programs designed to promote understanding and acceptance of individuals living with HIV can contribute to reducing stigma and improving quality of life. HIV notification is a process whereby individuals living with HIV are made aware of their diagnosis and encouraged to notify their social contacts, especially sexual and injecting partners. While Iranian national guidelines address HIV notification, they lack practical training modules for lay healthcare providers to implement these services effectively. Developing and monitoring the impact of such training modules is crucial for optimizing HIV diagnosis services (30).

Diagnosis

Delayed HIV diagnosis can severely impact the effectiveness of antiretroviral therapy, accelerate disease progression, and increase mortality risk. Additionally, it presents a serious public health risk by facilitating the transmission of the virus (31).

A cohort study conducted in Iran, with data collected up to 2016, found that 58.2% of HIV diagnoses were late. Significant risk factors for delayed diagnosis included being over 50 years of age and co-infection with tuberculosis. An analysis spanning 19 years, concluding in 2019, revealed that 52.8% of HIV patients were late presenters, with advanced age, male gender, and lower education levels identified as significant risk factors (32).

A separate cohort study from Shiraz, Iran, covering data up to 2018, reported an even higher rate of late diagnosis at 75.3%. Factors contributing to this delay included older age at the time of diagnosis, concurrent hepatitis C virus (HCV) infection, and living outside the city. Interestingly, homemakers were found to have a lower likelihood of late diagnosis (33).

The high prevalence of late HIV diagnoses has been a significant problem in recent years (6,32), which requires improvement. Although precise prevalence data is limited and controversial, the COVID-19 pandemic may have contributed to further delays in diagnosis. Nevertheless, there have been significant efforts in recent years to promote early HIV detection.

Response to HIV testing gaps

Service decentralization and HIV testing scale-up

To help the health system in the Islamic Republic of Iran achieve the 95-95-95 targets for HIV services, various models of differentiated HIV service delivery have been defined and tested, including community outreach services for individuals living with HIV/AIDS. Notably, at least 10% of people on antiretroviral treatment have accessed these differentiated services outside traditional triangular clinics (29).

HIV remains one of the leading infectious causes of adult mortality in many countries, yet its prevention and care are still not prioritized within PHC. Effective measures are needed to ensure that preventive, diagnostic, and therapeutic interventions are accessible to those affected. One key strategy is the integration of HIV/AIDS services into PHC, which can help decentralize care and expand access. As HIV has transitioned into a chronic condition, adopting an integrated approach to its management within PHC is essential for effective long-term care. Various factors determine whether an integrated HIV/AIDS program is beneficial or not. Accurate government monitoring, community participation, and skilled personnel significantly impact the program's success (34). Planning for HIV-related interventions depends on the prevalence of HIV in the country or even different provinces and in areas with higher prevalence, more services should be provided in clinics (35,36).

The benefits of integrated programs implemented in some countries include increased access to HIV testing, control of HIV transmission through the population, raising awareness of preventive measures among people, increased provision of diagnostic and therapeutic services, and better follow-up care (34). Numerous studies have emphasized the significance and need for integrating HIV/AIDS and STI programs into PHC (36,37). Incorporating HIV and STI care and treatment into family planning services can enhance patient satisfaction, improve service accessibility, and decrease HIV-related stigma in clinics. Therefore, integrating HIV/AIDS programs into PHC has proven to be the most effective approach for controlling and preventing HIV infections (36-38).

Furthermore, the integration approach enables the public sector of the PHC system to screen more individuals for HIV, initiate patients on ART more rapidly and effectively, decrease loss-to-follow-up (LTFU) rates, and achieve broader geographic coverage for HIV care (39). Integrating HIV management with health centers, aiming to decentralize the management of HIV patients from hospital-based settings to the primary care level, would enhance the quality of care for HIV patients. For example, in the integrated program implemented in Malaysia, a range of actions is conducted, such as risk assessment, HIV testing, counselling, medical examination, treatment, patient follow-up, and home visits by trained personnel (40).

Integrated HIV-related interventions also face numerous challenges, including increasing the financial resources needed and straining the fragile healthcare system of developing countries. However, limited data confirm this issue; in some cases, it has even improved primary healthcare services (41,42).

In some developing countries, it is believed that involving volunteers in integrated programs is highly beneficial. These individuals can receive extensive training and then be deployed to communities and households to increase public awareness, provide the necessary education, and reduce the stigma of HIV/AIDS. They can also encourage individuals engaging in high-risk behaviors to visit PHC centers (34,38). The healthcare system in some countries like Brazil is based on decentralization. The government has expanded HIV clinics nationwide and supports the delivery of HIV services in PHC centers through task-shifting (including nurse-initiated) and community support. Providing HIV testing in PHC units is feasible and can enhance disease control within the local community, mainly targeting individuals at higher risk (34,40).

In conclusion, a range of evidence demonstrates the positive effects of integrated services on client satisfaction, improved access to component services, and reduced HIV stigma. Moreover, these services are cost-effective. Most importantly, in developing countries, the most effective approach to delivering HIV prevention programs is by deploying trained volunteers (43).

The high stigma associated with HIV in Iranian society may hinder the integration of HIV testing, care, and treatment into the PHC system. However, currently, to bridge the gap between estimated and reported cases of HIV, HIV testing can be expanded to locations with higher frequencies of high-risk behaviors, such as addiction treatment camps, substance use centers, shelters, halfway houses, rehabilitation centers, military bases, women's and maternity clinics, schools, and universities (6,43).

In conclusion, the ongoing challenges of HIV prevention, diagnosis, and treatment underscore the need for more comprehensive, targeted interventions within

public health systems. Despite progress in expanding harm reduction services, addressing late diagnoses, and promoting early detection, significant gaps remain in reaching vulnerable populations and ensuring timely access to care. While HIV testing has been provided in some of the settings, including in DICs, prisons, and facilities providing services to key populations, the integration of HIV services into primary health care is critical for decentralizing and improving service delivery, particularly as HIV becomes a chronic condition. Moreover, tailored educational programs and harm reduction strategies must continue to evolve, reflecting the diverse needs of populations at risk, including youth, key populations, and those in closed settings such as prisons. Collaborative efforts across sectors, from civil society to faith-based organizations, are vital to combating stigma and promoting evidence-based interventions. As countries, including Iran, scale up their response to HIV, a holistic and multi-sectoral approach is necessary to curb the spread of the virus and improve the quality of life for those living with HIV.

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