IJMS
Vol 51, No 1, January 2026

Original Article

Research Priorities for Human Immunodeficiency Virus and Acquired Immune Deficiency Syndrome in Iran: A Mixed-Methods Study Combining a Systematic Review and Delphi Consensus Approach

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Received: 31 October 2024
Revised: 18 January 2025
Accepted: 27 February 2025

What's Known

- HIV/AIDS continues to be a major public health challenge, particularly in low- and middle-income countries.
- Iran is experiencing a concentrated epidemic, requiring specifically tailored research and interventions.
- While key research areas, including prevention, treatment, epidemiology, and co-infections, are being studied, a comprehensive assessment of their quality and relevance is lacking.

What's New

- This study identified 11 key research areas and 60 specific sub-areas to guide targeted HIV/AIDS research in Iran.
- It emphasized the critical need to enhance the quality of studies, particularly in laboratory research and co-infections.
- HIV/AIDS research priorities in Iran were identified using a systematic review, a tailored research matrix, and a rigorous three-round Delphi consensus process involving national experts.

Abstract

Background: In 2022, human immunodeficiency virus (HIV) affected 39 million globally, with Iran experiencing a concentrated epidemic. This study aimed to identify and prioritize critical HIV/AIDS research areas to address existing gaps in the Iranian context.

Methods: Researchers at Isfahan University of Medical Sciences employed a three-phase approach between May 2018 and March 2023. The first phase involved developing an HIV research matrix tailored to international guidelines and the Iranian context. In the second phase, a systematic review of HIV-related studies in Iran was conducted following the PRISMA protocol to assess quality and relevance. The third phase utilized a three-round Delphi method to collect expert feedback, which was used to prioritize research areas based on their importance and feasibility.

Results: A systematic review of 6,310 sources yielded 745 documents for full-text analysis. Key research domains identified included prevention, diagnosis, care and treatment, epidemiology, and co-infections. Quantitative analysis indicated that 23% of studies focused on co-infections, while ethical issues were addressed in only 0.04%. Qualitative assessment revealed that 54% of reviewed studies were of low quality. Subsequent expert consultation and multi-criteria decision analysis ranked laboratory research and co-infections as the highest priorities. Specific sub-areas identified included molecular epidemiology and interventions addressing stigma and discrimination. Despite being highly cost-effective and urgently needed, research on stigma-related interventions exhibited a significant gap.

Conclusion: The study identified 11 main research areas and 60 sub-areas as priorities for HIV/AIDS research in Iran, highlighting the need for strategic funding and research planning. Ethical considerations and laboratory improvements are essential for enhancing public health outcomes and addressing emerging challenges in the HIV epidemic.

Please cite this article as: Aleebrahim F, Mahboobi M, Rezaee F, Nasirian M. Research Priorities for Human Immunodeficiency Virus and Acquired Immune Deficiency Syndrome in Iran: A Mixed-Methods Study Combining a Systematic Review and Delphi Consensus Approach. Iran J Med Sci. 2026;51(1):19-31. doi: 10.30476/ijms.2025.104577.3819.

Keywords ● HIV ● Acquired immune deficiency syndrome ● Health priorities ● Research ● Iran

Introduction

Human immunodeficiency virus (HIV), the causative agent of acquired immune deficiency syndrome (AIDS), has remained

one of the most critical global health challenges for the past four decades since its emergence.[1] According to the World Health Organization (WHO), approximately 39 million people were living with HIV in 2022, with 1.3 million new infections reported that year.[2] The infection has profoundly impacted millions of lives, contributing to poverty, homelessness, school dropout rates, discrimination, and loss of opportunities, with low- and middle-income countries being disproportionately affected. HIV has also impeded critical development goals, including poverty reduction, lower child mortality, improved maternal health, increasing access to primary education, and promoting equal rights for all.[3]

According to the latest available report from the Iranian Ministry of Health, as of June 2023, the national HIV electronic data system had registered a total of 46,320 HIV cases (82% men, 18% women) and 22,415 documented deaths.[4] Current evidence indicates that the HIV epidemic in Iran remains concentrated, with a prevalence of less than 1% in the general population.[5] However, without timely and effective interventions, the conditions are highly favorable for a broader spread of the virus.[6]

Despite the relatively low general prevalence, Iran faces unique challenges in HIV control. These challenges include persistent social stigmas surrounding HIV, inadequate access to harm reduction programs for people who inject drugs (PWID), a shift in transmission patterns from injection drug use to sexual transmission, and limited care availability for marginalized populations.[7-9] These challenges underscore the need for nuanced, contextualized research and targeted interventions to address the epidemic effectively.

As HIV infection spans various dimensions, from molecular to social and political, its control necessitates a comprehensive approach involving active collaboration among policymakers, healthcare providers, and researchers. Effective prevention and care for individuals living with HIV and AIDS requires an in-depth understanding of the epidemic's profile in each region,[10] which can only be obtained through rigorous and standardized research.[11] In Iran, this need is particularly critical due to unique challenges, including stigma, shifting transmission patterns, and inadequate access to harm reduction programs. Despite these pressing issues, a significant lack of data in the current literature hinders a comprehensive response, underscoring the urgent need for targeted research to inform evidence-based interventions.[12]

Health research is a cornerstone of public health advancement and the pursuit of equity, especially in low- and middle-income countries.[13] However, conducting research requires skilled personnel, substantial financial resources, and time. Given the scarcity of resources alongside extensive health needs, prioritizing research activities is crucial to ensure their optimal allocation.[14] Thus, prioritization is a key management process for enhancing the effectiveness and impact of health research.

The Medical Commission conducted the first national health research prioritization in Iran between 1992 and 1994. Since 1995, this responsibility has been held by the Deputy of Research at the Ministry of Health and Medical Education.[15] A notable subsequent effort was a study led by Owlia and colleagues, which was conducted in collaboration with all medical universities and key stakeholders using the enhanced national health research strategy (ENHRS). This initiative identified national health research priorities through needs assessments at the university level, identifying HIV as a priority communicable disease.[16]

Another study by Haghdoust and colleagues in 2008 aimed to determine research priorities for HIV and AIDS. It highlighted key areas, including education, national-level management, estimating the size and prevalence of HIV among high-risk groups and the general population, and exploring innovative prevention methods.[17] Similarly, a 2014 systematic review of HIV-related studies in Iran, which searched national and international databases, emphasized prioritizing epidemiological research on high-risk groups.[18]

While these studies have provided valuable insights, they do not fully address the evolving dynamics of the HIV epidemic in Iran, such as the shift in transmission patterns and the needs of marginalized populations. Updated and targeted research prioritization is urgently required to address these gaps and to develop contextually relevant and effective interventions.[19]

This study aimed to identify and prioritize research needs in the field of HIV/AIDS in Iran. Despite the recognized importance of such research, prior studies have been limited, highlighting the urgent need to address gaps and establish priorities, particularly within the context of constrained resources. The main innovation of this study lay in its combined application of a systematic review and a three-stage Delphi method, aligned with a locally contextualized research matrix. Unlike previous studies that relied solely on expert opinions or single-method approaches, this study integrated quantitative evidence mapping with expert

consensus to identify research gaps and local priorities tailored to the Iranian context.

Materials and Methods

This study, conducted by epidemiologists at Isfahan University of Medical Sciences between May 2018 and March 2023, employed a multi-method approach to identify and prioritize HIV/AIDS research priorities in Iran. The methodology integrated a systematic review of peer-reviewed literature, a three-round Delphi technique to establish expert consensus, and expert consultations to gather practical insights from field practitioners.

Phase 1: Preparation of the HIV Research Matrix

The preparation of the HIV research matrix was conducted in two stages to ensure a comprehensive and contextualized framework for identifying research priorities in Iran. In the first stage, a structured search was performed in international databases to identify global and regional HIV research areas and sub-areas, including guidelines, protocols, and international reports. Recognized global resources were included to ensure alignment with evidence-based practices and internationally accepted standards. These resources included WHO guidelines, which provide a globally recognized framework for health policies and practices; UNAIDS reports, which serve as key references for coordinating the global HIV response; guidelines from the International AIDS Society (IAS) and the International Union against Sexually Transmitted Infections (IUSTI) for insights into clinical management. Furthermore, official resources from the Centers for Disease Control and Prevention (CDC) and various government portals were selected to reflect diverse national and regional HIV policies.

A broad search of peer-reviewed literature was conducted using major academic databases, including Medline, PubMed Central, Embase, the Cochrane Library, Scopus, Web of Science, Ovid, NICE, and SIGN. This comprehensive search ensured coverage of medical, pharmacological, clinical, and interdisciplinary studies, as well as evidence-based guidelines. A structured search strategy employed relevant keywords related to HIV/AIDS, interventions, services, and prioritization. The search process involved two components: a broad search of all areas of HIV research globally and a targeted search focused specifically on HIV research in Iran. The global search encompassed interventions, services, and prioritization, while the Iran-specific search concentrated on high-risk groups, behaviors, research methods, and surveillance.

The search process was conducted without time constraints to include both historical and recent studies. Two independent epidemiologists screened and reviewed the documents based on pre-defined inclusion and exclusion criteria. Any disagreements regarding document inclusion were resolved through discussion. If a consensus could not be reached, a third senior epidemiologist was consulted to make the final decision.

The inclusion criteria encompassed documents directly related to HIV/AIDS research, including guidelines, protocols, or strategic reports providing data on HIV research priorities in global settings. Study designs spanning clinical, social, and epidemiological research were included. Exclusion criteria involved removing duplicate records, inaccessible full-text documents, and publications unrelated to HIV research priorities. Non-English or non-Persian documents were also excluded after the initial screening.

Based on the extracted information, a multidimensional HIV research matrix was developed to detail global areas and sub-areas of HIV research.

In the second stage, the draft HIV research matrix was reviewed and refined during three expert meetings with HIV specialists and researchers. These sessions involved a detailed analysis of national-level documents, such as the national HIV program, strategic HIV reports, international expectations for Iran, priorities identified by the AIDS department, and inputs required for specific estimation models. Various aspects of the HIV research matrix were modified and contextualized to align with Iran's unique needs and challenges. This phase, which lasted from May 2018 to February 2020, resulted in a tailored HIV research matrix that integrated global best practices with national priorities and served as the foundation for subsequent phases of the study.

Phase 2: Mapping of Studies Conducted in Iran

In this phase, a structured review was conducted following the PRISMA protocol to examine all documents and studies related to HIV and high-risk groups in Iran, published up to March 2023. The review was performed by two HIV research experts who searched both domestic (SID, IranMedex, and Magiran) and international databases and search engines (PubMed, Scopus, Google Scholar, and Web of Science). Keywords were selected using MeSH and Emtree terms, and a comprehensive search strategy was developed (table 1).

Table 1: Search Keywords

Part A. Keywords used to prepare research matrix
HIV OR "Human Immunodeficiency Viruses " OR AIDS OR "Acquired Immunodeficiency Syndrome Virus")) AND (prevention OR prophylaxis OR "preventive therapy" OR control OR treatment OR Therapeutic OR Therapy OR education* OR Training OR Teaching OR testing OR Diagnoses OR Examinations OR coinfection OR "service delivery" OR political OR economic OR virology OR screening)) AND (Priorit* OR preference OR precedence
Part B. Keywords used for Iranian Study Mapping
(priority* OR preference OR precedence) AND (Sex worker OR FSW OR female sex worker OR male sex worker OR MSW) AND (Injection Drug User OR IDUs OR PWIDs) AND (Men who have Sex with Men OR MSM) AND (high-risk behaviors OR most at risk) AND (unsafe sex) AND (sexually transmitted infection OR sexually transmitted disease OR SID OR STD) AND (second generation surveillance)AND (Research OR Study OR investigation) AND (human immunodeficiency virus OR HIV OR AIDS OR Acquired immunodeficiency syndrome) NAD Iran*

A systematic approach was implemented to address potential disagreements during the review process. Following the initial screening and data extraction, any discrepancies regarding article selection or relevance were addressed through group discussions. If consensus could not be reached, an additional senior expert was consulted to make the final decision. This collaborative approach ensured the consistent application of inclusion criteria and upheld rigorous quality standards for the selected studies.

The inclusion criteria encompassed all epidemiological studies conducted in Iran after 1996, including cross-sectional, case-control, retrospective cohort, prospective cohort, clinical trials, systematic reviews, and molecular epidemiology studies. For prevalence studies, a clearly defined population was required; analytical studies were required to have defined exposures and outcomes. The abstracts and full texts of articles or reports, collected in the EndNote database, were reviewed for relevance to the study's purpose. Irrelevant records were excluded, while relevant ones proceeded to the subsequent quality assessment stage.

In the second stage, the quality of the selected studies was systematically evaluated. A scoring system was developed based on specific criteria. Studies were scored primarily according to their design and methodological rigor, with meta-analyses receiving the highest scores (up to 25 points) and case reports the lowest. The journal index was assessed using the impact factor (IF) and Quartile (Q) ranking, with the formula IF+(1/Q). Key methodological factors included adequate sample size, random sampling methods, unbiased data collection, and detailed descriptions of study location, timeframe, and analysis methods. Each study's total score was calculated as the sum of these categories. Based on their total scores, studies were categorized into one of three quality groups: low (scores from 1 to 9), moderate (scores from 9 to 15), or high (scores from 15 to 25). For example, a meta-analysis conducted with rigorous methodology and transparent reporting would typically score above 20 and be categorized as "high quality." In contrast, a small cross-sectional study with methodological limitations would likely score below 9 and fall into the "low quality" category. As per the reviewers' recommendations, we have entirely removed IF from our scoring method. The results were recalculated using a revised methodology that excludes IF. This adjustment did not significantly impact the ranking or prioritization outcomes in this study.

Critical metadata was extracted for each study, including title, year, geographical location, study type, demographic characteristics (age and sex), sample size, and sampling methods. The data were used to prepare a summary matrix displaying the distribution of studies across different quality categories, study types, and population characteristics. The summary matrix provided an analytical overview and facilitated the identification of gaps in HIV-related research across various regions and key populations in Iran.

Phase 3: Prioritization of Areas and Sub-Areas of HIV Research in Iran Using a Three-Stage Delphi Method

In this phase, a three-round Delphi method was employed to prioritize HIV research areas and sub-areas in Iran. A panel of 20 specialists with extensive experience in HIV research, planning, policymaking, and related fields was engaged. Initially, the specialists were presented with a research matrix—developed based on a mapping of studies in Iran—which included the number of studies in each sub-area, their quality scores, and the identified informational gaps.

In the first round of the Delphi process, participants were asked to score each research sub-area from 1 to 5 based on its importance, necessity, feasibility, cost-effectiveness, and alignment with Iran's fourth strategic HIV/AIDS plan. They also assessed the existing mapping results for each sub-area based on the given criteria. Additionally, participants provided suggestions on the proposed timeframe, scale

(university-based, multi-provincial, or national), study type, and urgency for research in each sub-area. The total score for each main research area was derived from the aggregate scores of its sub-areas, which were then used to develop a prioritization chart.

In the second round, the results of the first round, along with a scoring checklist, were emailed to the participants. They were asked to review the findings, reassign scores (1 to 5) for each sub-area, and submit their responses within two weeks. In the third and final round, the updated results and priorities from the second round were shared with the participants, who were then invited to provide final feedback within one week. Feedback from all three rounds was subsequently combined and analyzed to establish the final research priorities.

Experts were selected based on specific inclusion criteria, which required at least five years of active engagement in HIV-related research or policymaking. This experience was demonstrated through contributions to peer-reviewed literature or active participation in HIV programs. The panel represented diverse fields, including public health, epidemiology, clinical care, and sociology. Participants were identified through professional networks and recommendations from key individuals in the HIV field. Experts were excluded if they failed to meet the expertise criteria, submitted incomplete responses in consecutive rounds, or withdrew from the study.

Various tools were used during this phase to enhance the comprehensiveness of the research process. EndNote software (version X8, Clarivate Analytics, USA) was employed to systematically organize and manage literature during the structured review. Data extraction and analysis were conducted using Microsoft Excel (version 2019, Microsoft Corporation, USA), facilitating the systematic processing of numerical data and percentages. Focus group discussions utilized audio recordings and open-ended questionnaires to ensure robust qualitative data collection.

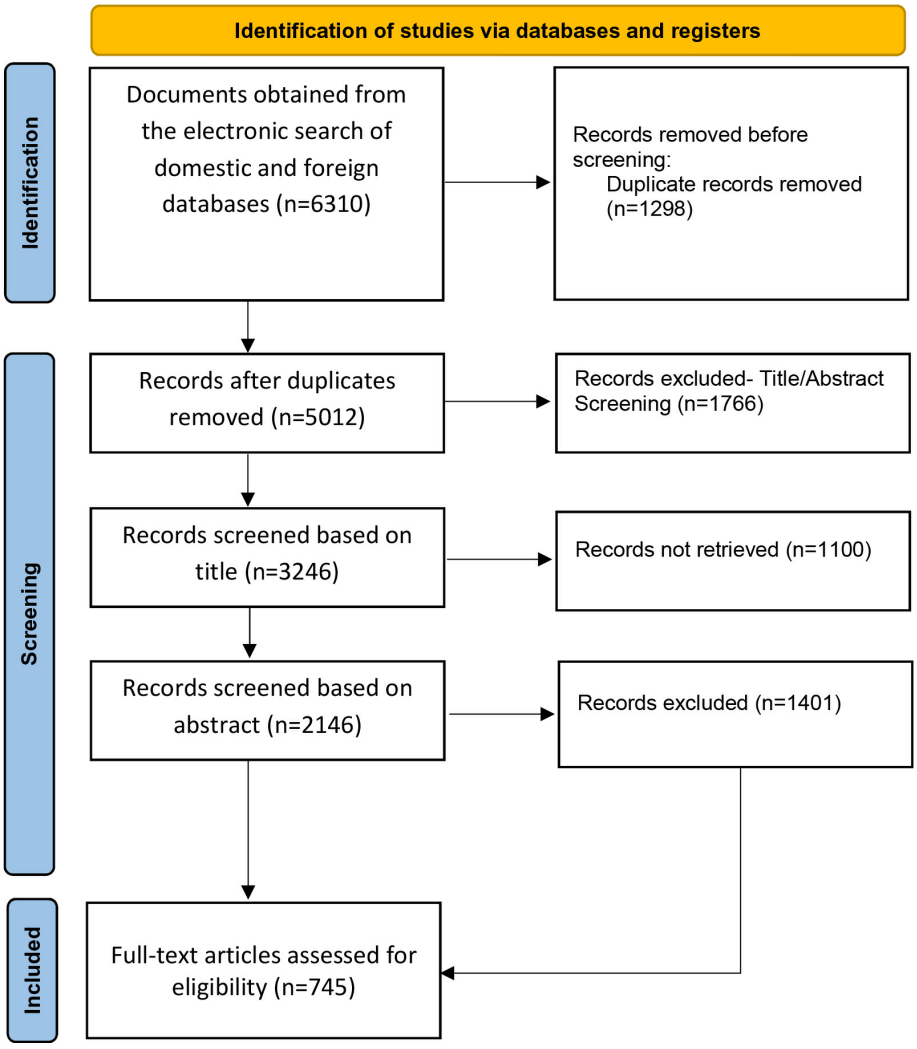

Figure 1: The PRISMA flow diagram used for study selection.

Microsoft Word software (version 2019, Microsoft Corporation, USA) was used to create tables and charts for clear visualization of findings. During the Delphi phase, an electronic questionnaire efficiently gathered insights from experts.

This multi-tool approach ensured a thorough and diverse data collection process, thereby enhancing the validity and reliability of the study's outcomes. By integrating qualitative feedback, quantitative scoring, and structured analysis, this phase established a comprehensive framework for identifying and prioritizing HIV research areas in Iran, aligning them with national objectives and addressing critical gaps.

Ethical approval for this study was obtained from Isfahan University of Medical Sciences (Approval code: IR.ARI.MUI.REC.1401.258.296140). All necessary permissions were secured and presented to the relevant authorities and participating experts before the commencement of the study. Researchers thoroughly explained the study's objectives to all participants to ensure a complete understanding of its purpose and scope. Informed consent was obtained from all experts, and participants were assured of their freedom to withdraw from the study at any stage without obligation.

Results

A total of 6,310 information sources related to HIV/AIDS in Iran and worldwide were initially identified and systematically screened. After excluding irrelevant and duplicate records, 745 sources were selected for full-text review (figure 1). This process identified 11 main research areas, including prevention, diagnosis, laboratory, care and treatment, care systems, epidemiology, co-infections, policy, ethics, social support, and stigma and discrimination.

Notably, co-infections represented the most frequent research topic (23%), while ethical issues were the least addressed (0.04%). In terms of quality, more than half of the studies were classified as low quality, with only a small proportion achieving high-quality status. Laboratory and social support studies contained the highest share of high-quality articles (table 2).

Based on expert consultations and prioritization criteria, laboratory research, especially in reference laboratory enhancement and molecular epidemiology, was identified as the highest priority. Co-infection management and diagnostic improvements were also highly ranked, whereas stigma and discrimination received the lowest priority across multiple criteria (table 2, figure 2).

Additional sub-areas of importance were identified within each main area. Key topics included behavioral interventions for prevention, blood screening in diagnostics, and quality of life in care and treatment. Other priorities included resource allocation in policy, the role of human rights in ethics, and patient support during prevention in the social support domain (table 3).

The scoring and prioritization of areas and sub-areas were based on six key criteria: importance, necessity, feasibility of implementation, cost-effectiveness, alignment with the strategic objectives of the HIV/AIDS program, and the mapping of existing studies. Epidemiology research received the highest score for importance. Social support research scored highest for necessity and feasibility, while social support and stigma, and discrimination received the highest scores for cost-effectiveness. Experts also identified social support as the area with the highest alignment with the strategic objectives of the HIV/AIDS program, despite it having the lowest number of studies conducted in Iran (figure 3).

Table 2: Mapping HIV/AIDS study quality and focus areas

Area/Domain	Quality			Total n (%)
	Low n (%)	Medium n (%)	High n (%)	
Prevention	115 (55.2)	85 (40.8)	8 (3.8)	208 (18.8)
Diagnosis	40 (52.6)	30 (39.4)	6 (7.8)	76 (6.8)
Laboratory	67 (59.2)	35 (30.9)	11 (9.7)	113 (10.2)
Care and treatment	90 (54.8)	64 (39.0)	10 (6.0)	164 (14.8)
Surveillance	17 (77.2)	4 (18.1)	1 (4.5)	22 (1.9)
Epidemiology	101 (51.2)	90 (45.6)	6 (3.0)	197 (17.8)
Co-infection/Co-morbidity	121 (47.2)	118 (46.0)	17 (6.6)	256 (23.2)
Policy	17 (85.0)	3 (15.0)	0	20 (1.8)
Ethics	4 (80.0)	1 (20.0)	0	5 (0.04)
Social support	10 (47.6)	9 (42.8)	*2 (9.5)*	21 (1.9)
Stigma and discrimination	14 (66.6)	6 (28.5)	1 (4.7)	21 (1.9)
Total	596 (54.0)	445 (40.4)	62 (5.6)	1103 (100)

Articles were classified as low, medium, or high quality based on their quality assessment scores.

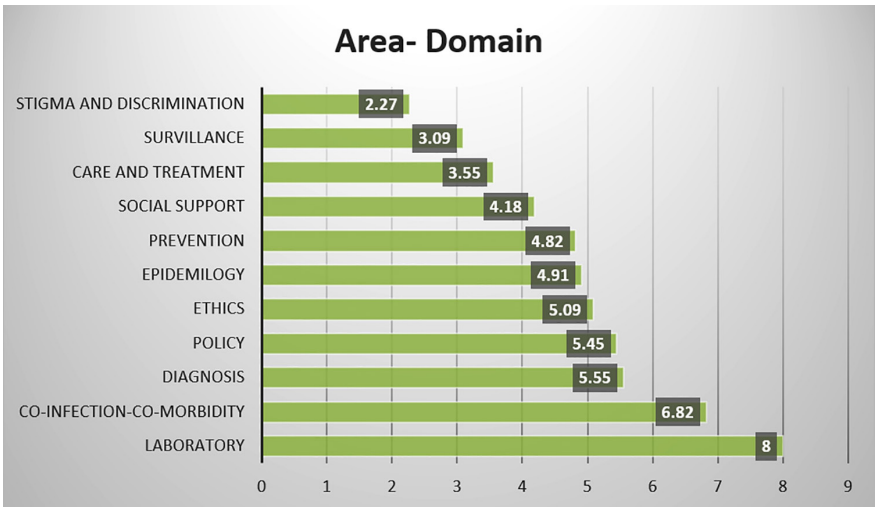

Figure 2: The distribution of studies across research areas is shown as a percentage. The chart shows the percentage of studies conducted in each research area related to HIV/AIDS. These areas include prevention, diagnosis, treatment, epidemiology, co-infections, and other related fields, based on the analysis of articles reviewed in the systematic review study.

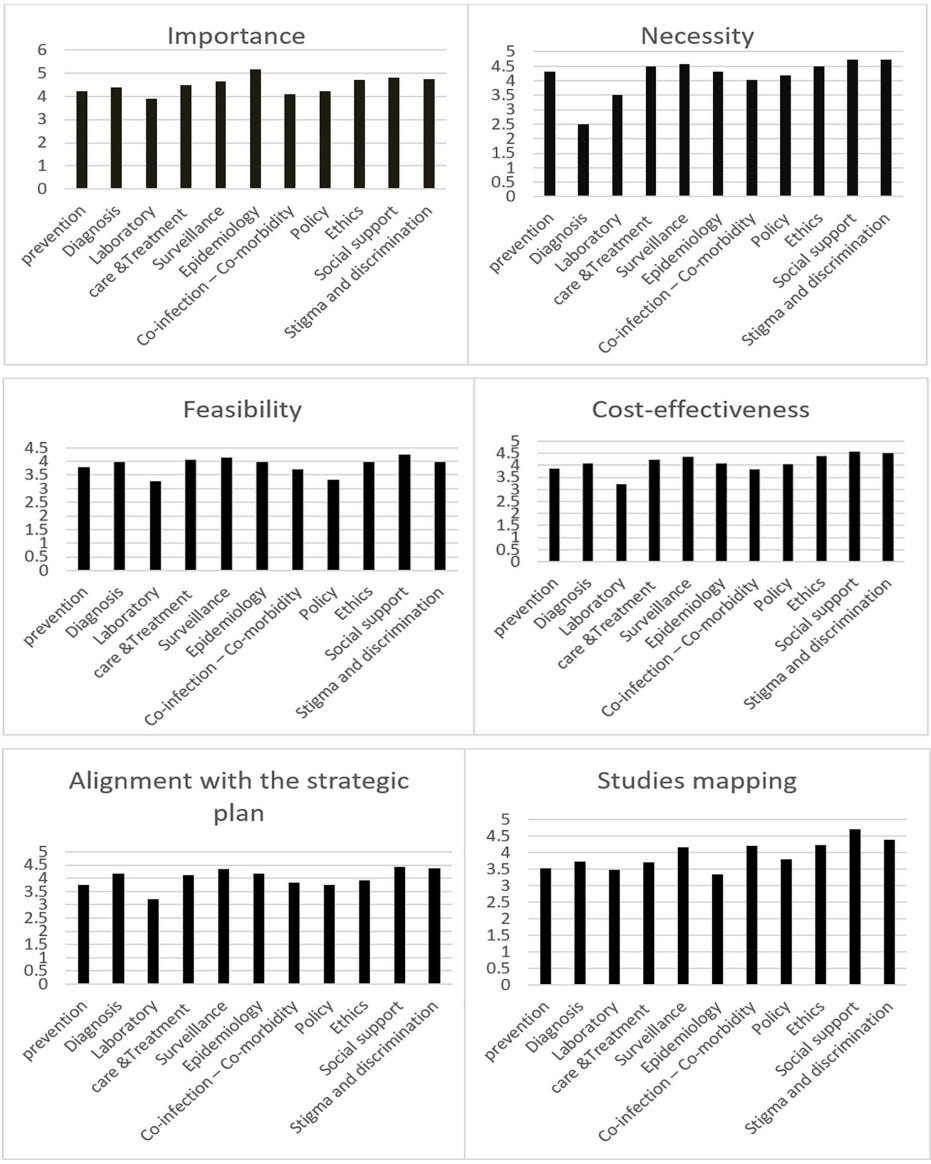

Figure 3: This chart ranks HIV/AIDS research domains in Iran by priority, based on criteria including importance, necessity, feasibility, cost-effectiveness, and strategic alignment.

Table 3: Mean and rank of sub-areas and main area

Area/ Domain	Subdomain/Subject	Subject mean score	Subdomain mean score	Overall subdomain rank	Overall domain rank
Prevention	Vaccination	3.85	2.73	10	7
	PrEP (pre-exposure prophylaxis)		3.70	18	
	PEP (post-exposure prophylaxis)		4.05	27	
	PMTCT		4.46	42	
	Condom use		4.22	39	
	Alcohol abuse		3.54	6	
	Substance use/medication-assisted treatment/needle and syringe program		4.57	43	
	Education		4.12	24	
	Interaction of behavior and biomedical prevention		3.35	5	
	Mental health		3.77	25	
Diagnosis	Testing	4.12	4.34	47	3
	Blood screening		3.84	12	
	Delay in HIV diagnosis		4.18	28	
Laboratory	Diagnostic test performance	3.45	3.67	9	1
	Basic virology and immunology		2.87	3	
	Strengthening reference laboratories		3.59	2	
Care and treatment	ART linkage and initiation	4.17	4.75	58	9
	ART outcome and adverse effects		4.51	55	
	ART retention (adherence, cessation)		4.66	60	
	Survival of the patient		3.98	34	
	Positive prevention (care, treatment, support); other health services; service priorities and unmet service needs		4.01	26	
	Psychological factors, psychological and other non-ART interventions		3.76	31	
	Quality of life, aging, and disability		3.61	13	
	Treatment process (chain and supply management)		4.09	20	
Surveillance	Surveillance system features	4.35	4.50	45	10
	Service delivery (prevention, testing, counseling, and treatment)		4.34	46	
	Sentinel site		3.97	23	
	STI/STD surveillance		4.32	41	
	Drug resistance		3.94	21	
	National guidelines		4.40	56	
	Registration system and reporting		4.62	44	
	M and E		4.73	51	
Epidemiology	Molecular epidemiology	4.17	3.54	1	6
	Estimations (incidence, prevalence, burden of HIV), determination (HIV distribution, pattern, and modes of transmission), and determining factors (risk behaviors, …), geographical epidemiology		4.36	38	
	Bio-behavioural surveys		4.55	53	
	Mortality of AIDS (rates, pattern, distribution, …)		4.26	33	
	Mapping and estimation (size and network) of the key population		4.41	50	
	Modeling (HIV estimation and projection, effects of prevention)		4.23	36	
	KAP study		3.81	21	
Co-infection-Co-Morbidity	Co-infection with TB	3.89	4.36	47	2
	Co-infection with STIs		4.26	29	
	Co-infection with hepatitis		4.29	37	
	Cardiovascular complications		3.33	4	
	Other co-infections		3.02	7	

Policy	Crimination laws	4.01	3.95	19	4
	Assessing the impact of AIDS AIDS-related policies for the future; policy analysis (context, process, stakeholder); public opinion about domestic policies		4.15	32	
	The role of the government organization, decision-making		3.84	15	
	Integration of HIV services into to PHC System		4.17	30	
	Advocacy		3.78	22	
	NGOs		4.11	17	
	Community participation		4.62	52	
	Inequities in service delivery among key populations and PLHIV		3.97	11	
	Determine the resources required for research.		3.43	8	
	Economic issues (prevention, care and treatment, research)		4.02	14	
Ethics	Human rights	4.28	4.32	35	5
	Barriers to sexual health intervention		4.25	40	
Social support	Social supports in care	4.38	4.28	49	8
	Social supports in prevention		4.46	48	
Stigma and discrimination	Causes of stigma and discrimination	4.46	4.38	57	11
	Stigma and discrimination in high-risk/vulnerable populations		4.52	59	
	Stigma and discrimination against patients		4.47	54	

PHC: Primary health care; PMTCT: Prevention of mother-to-child transmission; HIV: Human immunodeficiency virus; ART: Antiretroviral therapy; STI/STD: Sexually transmitted infections, sexually transmitted disease; M and E: Monitoring and evaluation; KAP: Knowledge, attitude, and practices; TB: Tuberculosis; STIs: Sexually transmitted infections.

This analysis highlighted the need for targeted research in laboratory sciences and co-infections as top priorities, while also revealing significant gaps in ethics, social support, and stigma-related studies. The findings emphasized the importance of aligning research efforts with strategic objectives to address critical gaps in HIV/AIDS management effectively.

Discussion

Based on the results, 11 main areas and 60 sub-areas were identified as research priorities for HIV/AIDS in Iran. Analysis revealed a disproportionate focus, with HIV-related co-infections representing the majority of existing studies, while ethical issues were markedly neglected. A qualitative assessment found that over half (54%) of the reviewed studies were of low quality, with only 5% classified as high-quality. The identified research priorities encompassed laboratory studies, co-infections, diagnosis, policy, ethics, epidemiology, prevention, social support, care, surveillance, stigma, and discrimination. Key high-priority sub-areas included molecular epidemiology, strengthening reference laboratories, and research in virology and basic immunology. The identification of these priorities is critical for the strategic allocation of limited resources and for guiding future scientific inquiry. As in other regions, defining these key research areas is essential to inform evidence-based public health policies and clinical interventions in Iran.[20]

Previous studies on HIV/AIDS research prioritization in Iran are limited. A seminal study by Haghdoost and colleagues identified four primary priority areas: preventive activities (2/43), national and provincial planning (4/25), HIV burden estimation (9/20), and fundamental research (5/10). Key sub-priorities included education (5/52), national-level macro management (8/31), assessing prevalence among high-risk groups (5/59), and exploring new prevention methods (7/66).[17] Notable differences exist between these earlier findings and those of the present study. For instance, while prevention research was the second most documented topic after co-infections in our analysis, it was ranked only seventh in overall priority. This discrepancy might be attributed to methodological differences. The present study employed a mixed-methods approach incorporating systematic reviews and expert consensus, whereas the prior study relied solely on expert opinions gathered through a limited questionnaire.

The field of epidemiology plays a crucial role in evaluating various aspects of HIV/AIDS and provides valuable insights for research, development, management, and strategic planning. Research in this area is significant for identifying both current and future risk factors. Among the 60 sub-disciplines, molecular epidemiology is one of the most important, although previous studies emphasized the need for estimating the incidence and prevalence of HIV/AIDS.[17, 21]

Within the laboratory field, “strengthening

reference laboratories" has been identified as a key priority requiring increased attention. Enhancing laboratory capacity could improve diagnostic accuracy and establish a robust laboratory infrastructure, which is fundamental for the health sector. Furthermore, advanced laboratory studies that employed genetic analyses, immunological assessments, and viral load testing can elucidate molecular processes in HIV-infected patients, facilitating better predictions of treatment responses. Techniques, such as flow cytometry and RT-PCR, provide critical insights into the effects of HIV on the immune system and the progression of the disease in individuals with HIV and co-infections.[19] Conversely, some research highlighted the need to improve laboratory processes and reduce errors. Addressing these challenges in greater detail could lead to better strategies for enhancing laboratory efficiency, which would ultimately improve health services.

In the field of co-infections, cardiovascular diseases and other complex conditions associated with HIV/AIDS were prioritized, followed by infectious diseases such as hepatitis and tuberculosis. A study by Dousti and others in 2016, which used a structured review method to determine HIV/AIDS research priorities in Iran, revealed a limited number of studies on co-infections such as hepatitis B, hepatitis C, and tuberculosis. Research on drug user groups was also less common than studies on other high-risk populations. Consequently, co-infections, particularly hepatitis and tuberculosis, were identified as specific research priorities.[12]

Given the increasing prevalence of cardiovascular diseases in Iran, a trend that mirrors global patterns, innovative strategies are required to prevent them in individuals with HIV/AIDS. As experts have emphasized, further research is essential to confirm or refute hypotheses in this area. Such studies could lead to the identification of more precise and compatible treatment strategies for managing simultaneous infections. Furthermore, laboratory research on immune cells and immune responses in patients with HIV and co-infections could deepen our understanding of immune-viral interactions and contribute to developing more targeted treatments for these individuals.

The results of this study indicated a shift in prevention efforts from solely focusing on education to emphasizing the interaction between behavior and biomedical prevention strategies.[22] While previous studies highlighted the importance of education in HIV prevention, the focus on cultural change and social behavior modification, as shown in this study, offered the potential to enhance the effectiveness of prevention programs. This integrated approach could have a more significant impact on preventing HIV transmission and improving public health outcomes.[23]

In the area of HIV care and treatment, the study highlighted that issues related to aging and disability had the most significant impact on the quality of life of people living with HIV. This finding underscored the need for programs and policies that address quality of life, aging, and disability management. However, most existing research in this area concentrated on the biomedical effects of HIV, with less attention paid to these psychosocial and quality-of-life issues.[24]

In Iran, economic challenges and sanctions significantly limit the resources, making strategic financial allocation for HIV research critical.[20] Proper funding is essential to upgrade research infrastructure and enable advanced studies through improved laboratory technologies, data analytics, and clinical trial resources. Such advancements are necessary to generate reliable data for evidence-based policymaking. With sufficient financial support, Iranian researchers could innovate in diagnostics, drug development, and prevention strategies, fostering self-reliance in public health. A transparent and equitable allocation process is essential to prevent resource wastage and ensure provincial and local institutions have equal access to funding, thereby promoting regional expertise. Well-funded research not only improves the quality of life for people living with HIV but also reduces long-term healthcare costs through effective prevention and treatment strategies.

The field of ethics, particularly concerning human rights, remains crucial for a comprehensive HIV response. A review of over 31,000 HIV-related articles and reports published between 2003 and 2015 found that 83% demonstrated a positive impact from human rights interventions. These studies often incorporated principles such as non-discrimination and accountability to improve access and acceptability concerning the right to health.[25] Human rights interventions play a pivotal role in addressing key gaps in HIV prevention and care and should form an integral part of the research framework. This study emphasized the importance of developing standardized indicators to advance human rights in HIV research.

This study is the first in Iran to combine a comprehensive systematic review with a nationally adapted multi-criteria research matrix and a rigorous multi-round Delphi process. This novel approach prioritized HIV/AIDS research in alignment with policy objectives, ensuring the results were both

evidence-based and context-specific.

This study contributed significantly to HIV/AIDS research in Iran by employing a systematic review of extensive existing literature, expert consultations, and the Delphi method to prioritize research areas, all while carefully considering Iran's specific context. The findings highlighted the necessity for a comprehensive and transparent protocol to guide research activities, ensuring they align with the country's needs. Policymakers and stakeholders must focus on managing HIV programs by ensuring adequate research budgets and rigorous methodological evaluations. Collaboration with UNAIDS and the Ministry of Health is essential to define research priorities, including study frequency, target populations, and province-specific focus areas. A nationwide program led by the Ministry of Health should be developed and implemented to achieve these goals.

This study aimed to inform strategic planning, resource allocation, and policymaking by identifying critical areas requiring immediate attention and providing evidence-based recommendations. It also highlighted the importance of revisiting and updating research priorities every 2–3 years to ensure their continued relevance. The resulting framework provided a clear roadmap for targeted research and effective interventions to improve HIV/AIDS management in Iran.

However, the findings of this study should be interpreted within the context of several limitations. The reliance on published literature and excluding gray literature or documents in languages other than English and Persian might have introduced bias.

Additionally, the inclusion of studies with varying levels of quality—54% of which were categorized as low quality—could affect the comprehensiveness of the findings. Despite efforts to evaluate the adequacy of sample sizes in the included studies, the lack of detailed reporting and transparency in some articles limited our ability to reproduce and validate comprehensive statistical calculations for sample size sufficiency. Addressing this limitation in future research by employing more explicit criteria and consulting with statistical experts is essential for improving this process.

An additional limitation was the initial use of a journal's impact factor (IF) as part of the quality scoring framework, as IF reflects a journal's subject area rather than the intrinsic quality of an individual study. Although additional metrics such as quartile rankings (Q) were incorporated to balance this effect, valuable reviewer feedback prompted us to exclude IF from our scoring system. Notably, this change did not significantly affect the principal findings, the classification of study quality, or the overall research priorities identified, and it ultimately improved the methodological rigor and validity of our recommendations.

Finally, the postponement of planned focus group discussions with HIV experts due to the COVID-19 pandemic limited the methodological scope of the study. The reliance on the chosen prioritization framework might have also introduced publication and selection biases, which could have been minimized by employing a validated and universally recognized framework.

Conclusion

This study addressed critical gaps in HIV/AIDS research in Iran by providing actionable insights for policymakers and researchers. It highlighted the urgent need to prioritize neglected areas, such as ethical considerations, stigma reduction, and social support mechanisms, which have historically received minimal focus. Policymakers are encouraged to establish dedicated funding streams to address these priorities, promote multidisciplinary research collaborations that include community stakeholders, and implement regular reassessments of research priorities to adapt to evolving epidemiological trends.

Moreover, translating research findings into evidence-based public health policies can significantly enhance prevention efforts, improve treatment equity, and optimize the management of co-infections. Such targeted interventions will not only bridge existing gaps but also establish a sustainable and adaptive framework for HIV research and policymaking in Iran, ultimately improving health outcomes and advancing the national response to HIV/AIDS.

Acknowledgment

The authors would like to extend their gratitude to Isfahan University of Medical Sciences, particularly the Department of Epidemiology, for their invaluable research design and methodology expertise. We were also grateful to the AIDS and Infectious Diseases Office of the Ministry of Health and Medical Education for their critical insights and valuable data contributions. Special appreciation is extended to the panel of experts, researchers, practitioners, and community stakeholders who participated in the Delphi process, providing enriching discussions and practical feedback. Their collective efforts were instrumental in advancing this study and addressing key priorities in HIV/AIDS research in Iran.

Authors' Contribution

F.A: Data gathering and drafting the manuscript; M.M: Study concept and reviewing the manuscript; F.R: Data analysis, interpretation and reviewing the manuscript; M.N: Study concept, study design, data analysis, interpretation, and reviewing critically; All authors have read and approved the final manuscript and agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Declaration of AI

The authors declare that no AI tools were used in the preparation of this manuscript.

Conflict of Interest: None declared.

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