Cureus
Part of SPRINGER NATURE

Open Access Original Article

Predictors and Extent of Human Immunodeficiency Virus (HIV)-Related Stigma Among Healthcare Workers in Surgical Settings in Khartoum, Sudan

Review began 04/24/2026
Review ended 11/08/2026
Published 11/18/2026

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DOI: 10.7759/cureus.119899

Najla Mohammed [1], Lama Mohamed [2], Omer Ahmed [3], Muaaz Ismaiel [4], Marwan K. Ahmed [5], Mwada Omer [6], Ragda Abdallah [7], Mohamed A. Abdelrahim [7], Abduraheem Farah [7], Mahil Abdalla [8]

1. Neurological Surgery, University of Khartoum, Khartoum, SDN 2. Internal Medicine, University of Medical Sciences and Technology, Khartoum, SDN 3. Physiology, St George's University, St George, GRD 4. Internal Medicine, University of Khartoum, Khartoum, SDN 5. Internal Medicine, Ascension Saint Joseph Hospital, Chicago, USA 6. Radiology, Sudan Medical Specialization Board, Khartoum, SDN 7. Anatomical Sciences, St. George's University School of Medicine, St George, GRD 8. Emergency Medicine, Hull University Teaching Hospitals, Hull, GBR

Corresponding author: Najla Mohammed, najlaa.basheer@gmail.com

Abstract

Background

Human immunodeficiency virus (HIV)-related stigma and discrimination in healthcare settings remain a major barrier to effective care delivery, especially in high-burden regions such as Sudan. Stigma reflects negative attitudes or avoidance of people living with HIV (PLHIV), while discrimination involves unjust actions directed against them.

Objective

This study examined the predictors and extent of HIV-related stigma and discrimination among surgical healthcare workers in Khartoum, Sudan.

Methods

A cross-sectional survey was conducted in three teaching hospitals and three antiretroviral therapy (ART) centres in Khartoum. A total of 371 surgical healthcare workers, including surgeons, nurses, and laboratory technicians, completed a validated questionnaire. Multiple linear regression was applied to identify predictors of stigma and discrimination.

Results

The mean stigma score for fear of HIV infection was 74.9%. Significant predictors of stigma included years of experience (p=0.003), gender (p=0.002), and HIV-related training (p=0.03). Discrimination was associated with lower perceived institutional support, weaker enforcement of institutional policies, stigmatizing opinions toward key populations, and fear of HIV infection in specific discrimination domains. Female staff reported higher stigma scores.

Conclusion

HIV-related stigma and discrimination remain prevalent among surgical healthcare workers in Khartoum. Targeted HIV-related training, stronger institutional support, and consistent enforcement of anti-discrimination policies may help reduce these barriers to effective care.

Categories: General Surgery, HIV/AIDS, Public Health
Keywords: discrimination, healthcare workers, hiv, stigma, sudan

Introduction

Human immunodeficiency virus (HIV)-related stigma remains a pervasive challenge in healthcare systems, particularly in countries with a high prevalence of the disease. Sub-Saharan Africa continues to carry the greatest burden, with an estimated 25.7 million people living with HIV (PLHIV) in 2022, representing about 67% of the global total [1]. In Sudan, stigma poses a substantial barrier to care, especially in surgical settings where the risk of occupational exposure is higher [2].

Stigma encompasses fear, negative attitudes, and avoidance of PLHIV, while discrimination refers to direct unfair treatment or denial of care. These behaviours are often rooted in misinformation, cultural norms, and inadequate training of healthcare professionals. Among surgical healthcare workers, such stigma can

compromise patient safety, discourage individuals from seeking testing or treatment, and ultimately hinder public health efforts to control the epidemic [3,4].

Previous studies show that stigma and discrimination from healthcare workers contribute to delayed care, poor treatment adherence, and worse health outcomes for PLHIV [5-7]. Addressing these barriers within surgical settings is therefore essential for both patient safety and disease control.

This study investigates predictors of HIV-related stigma and discrimination among surgical healthcare workers in Khartoum, Sudan. By identifying demographic and professional factors associated with stigma and quantifying their impact, the findings aim to guide targeted interventions such as training programs and institutional policy reinforcement. These results provide actionable insights for reducing stigma in surgical settings and improving HIV care delivery.

Materials And Methods

Study design and setting

A cross-sectional, facility-based study was conducted in three major teaching hospitals in Khartoum State, Sudan: Ibrahim Malik Teaching Hospital, Bahri Teaching Hospital, and Omdurman Teaching Hospital. These hospitals were selected because of their large patient populations, workforce capacity, and experience in providing care to patients living with HIV. Each hospital had an inpatient capacity exceeding 500 beds and employed more than 500 healthcare workers.

Study population and sampling

The study population consisted of healthcare professionals involved in direct patient care at the selected hospitals.

The sample size was calculated using Cochran's formula for estimating a population proportion, with a 95% confidence level, a 5% margin of error, and an assumed prevalence of 50%, as no previous estimates of HIV-related stigma among healthcare workers in Sudan were available. This yielded an initial sample size of approximately 384 participants. A total of 371 valid questionnaires were obtained, corresponding to a response rate of 96.6%.

The required sample was allocated proportionally across the three hospitals according to their healthcare workforce. As complete lists of individual staff members were unavailable, departments were selected purposively, and healthcare workers were approached during their working shifts. Recruitment continued until the required number of participants was reached at each hospital.

Inclusion Criteria

Healthcare professionals who were currently employed at the selected hospitals, had direct patient contact, and agreed to participate voluntarily were eligible for inclusion. These included doctors, nurses, midwives, laboratory technicians, and pharmacists.

Exclusion Criteria

Staff members without regular direct patient contact, including administrative and accounting personnel.

Data collection tool

Stigma and discrimination were assessed using a standardized questionnaire adapted from the Measuring HIV Stigma and Discrimination Among Health Facility Staff: Standardized Brief Questionnaire, developed through a global collaboration led by Nyblade et al. [3]. This validated instrument has been widely used to assess stigma and discriminatory attitudes among healthcare workers in clinical settings. This is a publicly available questionnaire in an open-access article and evaluates multiple domains of stigma, including fear of HIV infection, use of unnecessary precautions, secondary stigma, observed stigma, institutional policies, and attitudes toward people living with HIV and key populations. The tool was adapted to suit the Sudanese healthcare context while preserving the conceptual framework of the original instrument.

Data collection procedure

Surveys were distributed during work shifts by trained field staff. Participation was voluntary and anonymous, and completed questionnaires were returned in sealed envelopes. Participants were informed of the study objectives and assured of confidentiality.

Statistical analysis

Data were entered into SPSS version 20 (IBM Corp., Armonk, USA) for analysis. Descriptive statistics were

used to summarise demographic characteristics and stigma scores. Multiple linear regression was applied to identify predictors of stigma and discrimination, with independent variables including gender, profession, years of experience, and prior HIV-related training. Statistical significance was set at $p<0.05$.

Ethical considerations

Ethical approval for this study was granted by the National Research Health Ethics Committee (NRHEC) - Ministry of Health, Khartoum, Sudan. Omdurman Voluntary Counselling and Testing (VCT) & Antiretroviral Therapy (ART) Centre, Bahri (Khartoum North) Teaching Hospital VCT/ART Services Centre, Omdurman Military Hospital VCT/ART Services Centre, Khartoum Teaching Hospital, Bahri (Khartoum North) Teaching Hospital, and Omdurman Teaching Hospital accepted the decision of the NRHEC. The study adhered to both national and international ethical standards.

Results

Participant characteristics

A total of 371 surgical healthcare workers participated in the study, with a response rate of 96.6%. The mean age was 39.3 years. Most participants were female (68.7%) and surgeons (54.4%). Nearly four out of five (79.8%) had fewer than five years of work experience, and only 18.6% had prior HIV specialty experience.

Stigma scores

The mean stigma score for fear of HIV infection was 74.9%, reflecting high levels of concern among participants. The use of extra infection precautions scored 68.6%, while secondary stigma and health facility policies scored 55.4% and 53.0%, respectively. Observed stigma was reported at 47.9%. Attitudes toward PLHIV scored 44.3%, and toward key populations 33.6%.

Predictors of stigma

The significant predictors of stigma, as demonstrated by the fear of HIV infection, were: more years of experience ($p=0.003$, $p<0.05$), female gender ($p=0.002$, $p<0.05$), and being trained on topics related to HIV stigma and discrimination ($p=0.03$, $p<0.05$). A one-year increase in work experience also reduced the stigma scores measured by this scale by an average of 0.36 units. A unit increment in training on topics related to HIV stigma and discrimination also decreased the stigma score measured by the fear of HIV infection by an average of 0.12 units (Table *1*).

Predictor	Fear of HIV infection				Health facility policies				Opinions about PLHIV & key populations			
	Std ß	Sig	95%CI for B		Std ß	Sig	95%CI for B		Std ß	Sig	95%CI for B	
			Lower bound	Upper bound			Lower bound	Upper bound			Lower bound	Upper bound
Years of experiences	-0.363	0.003*	-0.118	-0.023	-0.211	0.093	-0.058	0.004	-0.260	0.040*	-0.052	-0.001
profession	0.030	0.565	-0.054	0.098	-0.144	0.006*	-0.121	-0.021	-0.017	0.748	-0.048	0.034
age	0.197	0.110	-0.008	0.078	0.207	0.099	-0.005	0.053	0.156	0.217	-0.009	0.038
gender	0.161	0.002*	0.141	0.602	0.108	0.037*	0.010	0.316	0.010	0.853	-0.113	0.137
HIV case load	-0.004	0.936	-0.033	0.031	0.062	0.232	-0.008	0.034	-0.079	0.120	-0.030	0.004
Previous experience in HIV specialty clinic	-0.075	0.151	-0.488	0.075	0.081	0.129	-0.042	0.332	0.055	0.289	-0.068	0.228
Lack of Training on topics related	0.119	0.031*	0.030	0.630	0.073	0.192	-0.067	0.331	0.263	0.001*	0.228	0.543

TABLE 1: Predictors of stigma measured by immediate actionable causes in relation to measuring stigma and discrimination in health care settings, Khartoum, 2022. (n=371)

*significant at 0.05 level. Negative values of std β (standardized beta) show that the corresponding factors are negative predictors of stigma and discrimination, whereas the positive values indicate that the factors are positive predictors. HIV: human immunodeficiency virus; PLHIV: people living with HIV; CI: confidence interval.

On the other hand, being a doctor as a profession (p=0.006, p<0.05) and being female in gender (p=0.037, p<0.05) were significant predictors of stigma score measured by perception of institutional policies. Doctors as Healthcare providers had an average of 0.14 units lower stigma scores when compared to the other profession (Table *1*).

The lack of training on topics related to stigma and discrimination (p=0.04, p<0.01) and more years of experience (p=0.000, p<0.05) were significant predictors of stigma and discrimination measured by opinions towards PLHIV and Key populations. On average, the stigma scores of healthcare providers who admitted a lack of training on topics related to stigma and discrimination were 0.26 units higher when compared to the scores of those healthcare providers who claimed to be trained. In addition, a one-year increase in work experience also reduced the stigma scores measured by this scale by an average of 0.26 units (Table *1*).

Predictors of discrimination

Stigmatizing opinions toward PLHIV and key populations (p=0.037, p<0.05), the lower perception of supply and policy-related institutional support (p=0.025, p<0.05), and the lower perception of enforcement of related institutional policies and protocols (p=0.005, p<0.05) were significant predictors of discrimination measured by observed discriminatory attitudes. A unit increment in the perception of supply and policy-related institutional support and a unit increment in the perception of enforcement of institutional protocol reduced discrimination measured by observed enacted stigma by an average of 0.19 and 0.25, respectively. Healthcare providers having stigmatizing opinions towards PLHIV and key populations had an average of 0.15 units higher stigma scores when compared to healthcare providers who did not have those stigmatizing opinions (Table *2*).

Predictor	Observed stigma				Self-reported use of extra infection precautions				Secondary stigma			
	Std ß	Sig	95%CI for B		Std ß	Sig	95%CI for B		Std ß	Sig	95%CI for B	
			Lower bound	Upper bound			Lower bound	Upper bound			Lower bound	Upper bound
Lack of Training on topics related	0.072	0.354	-0.182	0.507	0.054	0.325	-0.067	0.202	-0.028	0.606	-0.463	0.271
Fear of HIV infection	0.100	0.179	-0.040	0.216	0.154	0.004*	0.022	0.116	0.140	0.008*	0.046	0.302
Health facility policies	0.189	0.025*	0.028	0.412	-0.013	0.813	-0.083	0.065	-0.026	0.633	-0.251	0.152
Opinions about PLHIV	0.079	0.334	-0.118	0.346	0.023	0.684	-0.074	0.113	-0.213	0.001*	-0.756	-0.245
Opinions about key populations	0.152	0.037*	0.011	0.355	0.080	0.132	-0.015	0.115	0.007	0.888	-0.165	0.190
Enforcement of institutional policies	-0.249	0.005*	-0.574	-0.104	0.099	0.079	-0.009	0.162	0.090	0.110	-0.043	0.424

TABLE 2: Predictors of discrimination measured by enacted stigma in relation to measuring stigma and discrimination in health care settings, Khartoum, 2022. (n=371)

* significant at 0.05 level. Negative values of std β (standardized beta) show that the corresponding factors are negative predictors of stigma and discrimination, whereas positive values indicate that the factors are positive predictors. CI: confidence interval; HIV: human immunodeficiency virus; PLHIV: people living with HIV.

On the other hand, healthcare providers with a higher level of fear of HIV infection had an average of 0.15 units higher stigma scores when compared to those healthcare providers showing less fear of HIV infection; the fear indicator was a significant predictor of the extra precaution scale to measure the discrimination (Table *2*).

Agreement with stigmatizing opinions toward HIV patients (p=0.000, p<0.05) and the fear of HIV infection (p=0.008, p<0.05) were significant predictors of discrimination measured by secondary stigma anticipated by the health care workers. On average, healthcare providers who showed a high fear profile of contracting HIV in the work settings had 0.14 units higher stigma scores when compared to those healthcare providers who claimed no fear. A one-unit increase in opinions towards HIV infected patients reduced discrimination scores measured by secondary stigma by an average of 0.21 units (Table *2*).

Discussion

Overview of findings

This study demonstrated that HIV-related stigma and discrimination remain prevalent among surgical healthcare workers in Khartoum, Sudan. Fear of infection and unnecessary precautions were the most prominent stigma dimensions. Female staff, those with less professional experience, and those without prior HIV-related training reported significantly higher stigma and discrimination scores. Positive perceptions of institutional policies were associated with lower discriminatory behaviour. These findings suggest that stigma in surgical settings is shaped by both individual concerns and the institutional environment in which care is delivered. The high score for fear of infection, together with the high score for extra infection precautions, indicates that concern about occupational exposure remains a central pathway through which stigma is expressed in practice [3,4].

Comparison with global literature

Our findings are consistent with international evidence that stigma among healthcare workers is a persistent barrier to HIV care. The Joint United Nations Programme on HIV/AIDS (UNAIDS) has identified stigma and discrimination as major obstacles to achieving global HIV targets [8]. Similar to studies in South Africa and other sub-Saharan countries, fear of occupational exposure was strongly associated with negative attitudes toward people living with HIV (PLHIV) [3]. This fear is often rooted in inadequate training and limited institutional support. The regression models in the present study further support this interpretation, as fear of HIV infection was significantly associated with the use of unnecessary precautions, suggesting that fear is

not only an attitude but also a driver of observable discriminatory practice. In surgical settings, where concern about exposure to blood and body fluids may be greater, this relationship may be especially important because it can translate into avoidant behaviour, visible differential treatment, or excessive precautionary measures that stigmatize patients. [3-6,9]

Role of training and institutional support

Training reduced stigma scores significantly, supporting previous systematic reviews showing education improves healthcare worker attitudes [4-6]. Institutional policy support also reduced discrimination, consistent with global studies showing that visible leadership and enforcement reduce stigma [8]. The present study also showed that greater professional experience and HIV-related training were associated with lower fear-based stigma, while lack of training was associated with higher stigma scores in relation to attitudes toward PLHIV and key populations. This strengthens the interpretation that training is not only generally beneficial, but may specifically reduce fear-driven stigma and value-based stigma. Educational interventions that address HIV transmission, universal precautions, patient rights, and stigma toward key populations may therefore be particularly relevant in this setting [3-6,10].

Institutional factors were also important in shaping stigma and discrimination. Lower perceived institutional support and weaker enforcement of relevant policies were associated with higher discriminatory attitudes, suggesting that stigma is influenced not only by individual beliefs but also by the broader workplace environment. In the present study, observed stigma was linked to health facility policies, opinions toward key populations, and enforcement of institutional policies, which underscores the practical importance of supportive systems within the workplace. These findings highlight the importance of clear protocols, adequate support systems, and consistent enforcement of anti-discrimination standards across surgical care settings [3,8-11].

The discrimination models also suggest that stigma operates through multiple related pathways. In the present study, fear of HIV infection predicted self-reported use of extra infection precautions and secondary stigma, while stigmatizing opinions toward PLHIV and key populations were associated with higher discriminatory attitudes in specific domains. This indicates that fear-based stigma and attitude-based stigma may reinforce one another in routine clinical care. In practical terms, a healthcare worker who fears infection and also holds negative views toward PLHIV or key populations may be more likely to engage in avoidant or differential behaviour. This reinforces the need for interventions that address both technical knowledge and underlying attitudes [3-7].

Impact of professional experience

Longer experience correlated with reduced stigma, echoing findings that clinical exposure decreases fear and negative attitudes [7]. This underscores the need for mentorship and training for junior staff. The regression results also suggest that increasing professional experience was associated with lower stigma scores in fear-related and attitude-related domains, supporting the idea that familiarity with clinical care, infection prevention, and patient interaction may reduce uncertainty and stigmatizing responses over time. This makes mentorship particularly important for early-career staff working in surgical settings [4-7].

Implications for policy and practice

Training, policy enforcement, and institutional support should be integrated into HIV care strategies in Sudan, aligned with World Health Organization (WHO) and UNAIDS global recommendations [8,10,12]. The present findings suggest that interventions should not focus on training alone. A combined approach is likely to be more effective, including regular stigma-reduction training, reinforcement of universal precautions, adequate protective supplies, clear anti-discrimination policies, and visible enforcement of professional standards. Such measures may help reduce fear of occupational exposure, decrease unnecessary precautions, and promote more equitable care for PLHIV in surgical settings [3-6,8-10].

Strengths and limitations

The study is strengthened by its relatively large, diverse sample of surgical healthcare workers across multiple hospitals and ART centres. The use of a validated stigma survey tool enhances the reliability of findings. However, limitations include reliance on self-reported measures, which may introduce social desirability bias. Additionally, the cross-sectional design limits causal inferences. Longitudinal studies could provide further insight into changes in stigma levels over time. The findings may also have limited generalizability to healthcare workers in nonsurgical settings, as stigma-related attitudes and practices may differ by specialty and workplace context. Another strength is that stigma was assessed across several related domains rather than as a single outcome, allowing the study to capture different expressions of stigma and discrimination, including fear, attitudes, extra precautions, and observed workplace behaviour.

Conclusions

Despite decades of global advocacy, HIV-related stigma continues to challenge healthcare delivery in Sudan. This study found that stigma among surgical healthcare workers was most strongly reflected in fear of HIV

infection, highlighting ongoing concerns about occupational exposure and infection risk. Higher levels of stigma were also observed among female staff, less experienced workers, and those lacking prior HIV-related training, suggesting important targets for future intervention. These findings support the urgent need for training, mentorship, and institutional support to reduce stigma, improve the quality of surgical care provided to PLHIV, and contribute to broader efforts to end the HIV epidemic.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

Concept and design: Najla Mohammed, Mahil Abdalla, Muaaz Ismaiel, Marwan K. Ahmed, Omer Ahmed, Mwada Omer, Mohamed A. Abdelrahim, Lama Mohamed, Abduraheem Farah

Acquisition, analysis, or interpretation of data: Najla Mohammed, Mahil Abdalla, Ragda Abdallah, Omer Ahmed, Lama Mohamed

Drafting of the manuscript: Najla Mohammed, Mahil Abdalla, Marwan K. Ahmed, Mwada Omer, Mohamed A. Abdelrahim, Lama Mohamed, Abduraheem Farah

Critical review of the manuscript for important intellectual content: Najla Mohammed, Mahil Abdalla, Ragda Abdallah, Muaaz Ismaiel, Marwan K. Ahmed, Omer Ahmed, Lama Mohamed

Supervision: Najla Mohammed, Mahil Abdalla, Lama Mohamed

Disclosures

Human subjects: Informed consent for treatment and open access publication was obtained or waived by all participants in this study. National Research Health Ethics Committee (NRHEC) - Ministry of Health, Khartoum, Sudan issued approval MOH/KS/GDTM/39/B. We hereby inform you that the General Directorate of Therapeutic Medicine - The Planning and Training Unit has approved the topic proposed by Dr. Najla Mohammed for research titled: " Predictors and Extent of HIV-related Stigma among Healthcare Workers in Surgical Settings in Khartoum, Sudan". The National Research Health Ethics Committee (NRHEC) - Ministry of Health, Khartoum, Sudan has approved this study, and the approval number is MOH/KS/GDTM/39/B. **Animal subjects:** All authors have confirmed that this study did not involve animal subjects or tissue. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

Acknowledgements

Najla Mohammmed and Lama Mohamed contributed equally to the work and should be considered co-first authors.

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