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Exploring factors associated with primary healthcare providers' attitudes towards HIV services provision in Georgia

Tatia Maglaperidze[1,2†], Tamar Zurashvili[1,2*†], Jack DeHovitz[3], Nestani Tukvadze[4,5] and Mamuka Djibuti[2]

Abstract

Background Primary health care (PHC) providers play a key role in delivering essential care to people living with HIV (PLWH). In Georgia, as in the Eastern European and Central Asian (EECA) region, the HIV epidemic is associated with rising life expectancy and increasing chronic disease comorbidity among PLWH due to improved access to antiretroviral therapy (ART). These evolving dynamics call for a more inclusive approach to HIV care, addressing the diverse needs of those affected. Strengthening the capacity of PHC providers to deliver integrated care can enhance healthcare systems' responses to the epidemic and improve outcomes for PLWH in Georgia.

Methods This cross-sectional study assessed HIV-related knowledge, attitudes and practices and their association with the attitude towards HIV service provision among PHC providers in Georgia. Data were collected through structured interviews with PHC providers from various regions. Bivariate and multivariable ordinal logistic regression analysis were conducted.

Results The study included 256 participants with an average age of 55.4 years (SD = 10.3), predominantly female (96.1%), and from regions outside Tbilisi (94.5%). Majority of the participants demonstrated a lack of correct knowledge about HIV (82.0%) and ART (86.3%), almost 30% exhibited discriminatory belief regarding PLWH separation and more than half perceived health care providers to be at risk of acquiring HIV infection when caring for PLWH (55.1%). While 75.4% agreed or strongly agreed that PHC providers should provide care for HIV patients, 77.0% expressed willingness or strong willingness to do so. In the multivariable regression analysis, being located outside Tbilisi was associated with higher odds of a positive attitude towards HIV service provision (aOR = 6.22, 95% CI: 1.99–19.50). In contrast, respondents who were unsure or disagreed with the need to separate HIV-positive clients from those of unknown HIV status had significantly lower odds of a positive attitude towards HIV care provision (aOR = 0.14, 95% CI: 0.06–0.31 and aOR = 0.43, 95% CI: 0.22–0.86, respectively) compared to those who had such discriminatory belief.

†Tatia Maglaperidze and Tamar Zurashvili should be considered joint first author.

*Correspondence:
Tamar Zurashvili
tzurashvili@prah.ge

Full list of author information is available at the end of the article

Conclusion This study identified geographic location, discriminatory beliefs, and misperceptions about HIV transmission risk as key factors associated with PHC providers' attitudes towards HIV service provision. Addressing these through evidence-based interventions can foster more inclusive, effective HIV care in Georgia, supporting national targets and global best practices.

Keywords HIV, Primary healthcare, Stigma, HIV service integration, Georgia

Background

The global HIV/AIDS epidemic remains a significant public health challenge, with an estimated 39.9 million people living with HIV (PLWH) globally as of 2023 [1]. The 95–95–95 targets set for 2030 [2] are within reach - approximately 86% of PLWH worldwide knew their HIV status in 2023 [3]. Among them, approximately 89% of people were receiving antiretroviral therapy (ART), and 93% of people on treatment had a suppressed viral load [3]. Less favorable gains in the Eastern Europe and Central Asia (EECA) region highlight significant gaps in HIV testing and treatment access, with only 59% of PLHW knowing their status, 50% on treatment, and 42% achieving viral suppression [4]. Despite surpassing the regional average, with 86% of PLHW in Georgia knowing their status, 72% receiving ART, and 68% achieving viral suppression, the country still falls short of the 95-95-95 targets, particularly in ART coverage and viral suppression, highlighting the need for improved early diagnosis, timely linkage to care, and treatment adherence [5]. These gaps are exacerbated by Georgia's vertical model of HIV care, in which services are predominantly offered through specialized clinics and HIV preventive service delivery sites (predominantly at drug treatment facilities, Sexually Transmitted Infections (STI) and tuberculosis (TB) clinics, and antenatal care facilities), limiting opportunities to expanded HIV testing, including in Primary Health Care (PHC) [6]. Decentralized service delivery models, particularly HIV testing and linkage to care at PHC facilities, have demonstrated success in improving early diagnosis and timely treatment initiation for PLWH [7]. In line with this evidence, Georgia introduced an integrated screening program in 2018, providing free rapid testing for hepatitis C and HIV and screening for TB in PHC settings [8]. The World Health Organization highlighted the program's feasibility and potential impact in a 2021 report, noting that simultaneous testing in primary healthcare settings can effectively reduce the burden of these infectious diseases [8]. Initially piloted in the Samegrelo-Zemo Svaneti region and expanded nationwide by 2019, the program demonstrated success in improving early detection [9]. However, detailed analyses identifying specific facilitators and barriers to implementation have not been extensively documented.

While the success of antiretroviral therapy (ART) has dramatically increased life expectancy, the aging PLWH population now faces an escalating burden of noncommunicable diseases (NCDs), including cardiovascular disease, diabetes, and mental health disorders, which is the case globally, [10–12] as well as in Georgia [13]. These may result in the increased need and demand for PHC services among PLWH as the PHC framework can be applied to or adapted to other disease-specific responses, including those addressing NCDs [14].

From 2025 to 2026, Georgia plans the expansion of the PHC package of services to focus on managing people with HIV [15]. The aim of this study was to assess HIV-related knowledge, attitudes and practices among Georgian PHC providers, and to examine how these factors were associated with their attitude toward HIV service delivery as part of integrated primary care. This information is essential for identifying potential barriers and facilitators to integration efforts, as providers' knowledge and attitudes can strongly influence their acceptance of new responsibilities, the quality of patient care, and the success of integrating HIV services into PHC settings [16–19]. The results are expected to inform the identification of potential strategies to support the integration of HIV care into PHC settings in Georgia and the broader EECA region.

Methods

Study design and population

This cross-sectional study was nested within a larger mixed-methods study conducted among healthcare workers (including PHC doctors and nurses) that assessed HIV stigma and other barriers to COVID-19 vaccine uptake among Georgian PLWH across Georgia, including the capital, Tbilisi, along with five major regions, such as Kakheti, Imereti, Guria, Samegrelo, and Ajara [20]. The original study employed a purposive sampling to recruit participants identified by the Ministry of Health of Georgia (MoH), based on their professional roles (including primary care doctors, primary care nurses, infectious disease doctors, infectious disease nurses, COVID-19 vaccine providers, and healthcare facility managers), availability, and interest to participate in the study. Participants were recruited from relevant healthcare facilities including both primary and secondary healthcare facilities, located in the above mentioned regions.

Data collection

Data collection for the study was conducted by two interviewers between December 2021 and July 2022. Potential participants were initially approached by a representative of the MoH, who identified them based on their professional roles, availability and interest in participation and approached them at their respective health care facility. The MoH representative explained the aim and objectives of the study to the participants, obtained their preliminary verbal consent, and collected their contact information. Subsequently, the study interviewers contacted those who had agreed to participate to agree on the mode of the interview and to obtain formal written consent. The interviews were interviewer-administered and conducted via various online platforms, such as Zoom, WhatsApp, Viber, Skype, and phone calls, according to each participant's preferred mode of communication. Interviewers used a 35-item structured questionnaire (supplementary file 1) which was developed as part of a larger interview within the broader mixed-methods study. The part of the questionnaire relevant for PHC providers was developed by adapting selected items from the HIV/AIDS Tool Kit [21], which has been used in multiple programmatic settings [22]. Specifically, we included 11 items from the HIV Knowledge: transmission-related questions assessed knowledge of HIV acquisition through behaviors such as unprotected oral sex, sharing needles, and receiving unscreened blood, as well as common misconceptions (e.g., transmission via bathing, mosquito bites, or shared utensils), while prevention-related items covered strategies such as abstinence, consistent condom use, and sterile injection practices. We also included 4 items assessing ART-related knowledge (including beliefs about whether ART prolongs life, cures HIV, decreases HIV transmission, and causes side effects), and 4 items addressing attitudes toward HIV service provision (e.g., whether HIV-positive clients should be separated from clients of unknown HIV status, perceived risk of HIV transmission in clinical care, willingness to provide HIV care, and belief that primary care providers should care for HIV-positive clients). For our study, all items were translated into Georgian by bilingual experts and then back-translated into English to ensure accuracy and consistency. The items were reviewed by Georgian public health experts and HIV program specialists to ensure content relevance and face validity to the local context. In addition, the adapted tool was pilot tested with a small sample of healthcare providers (n = 5), not included in the final analysis), and minor adjustments were made based on their feedback to enhance clarity and contextual appropriateness. Participants received a 20 Georgian Lari (equivalent of 7$) incentive for completing the interview.

Measurements

The outcome variable, PHC providers' attitude toward HIV service provision, was assessed using the statement: "Primary care clinicians should take care of HIV patients." Participants responded on a five-point Likert scale: "Strongly disagree", "Disagree", "Uncertain", "Agree", and "Strongly agree". As no respondents selected "Strongly disagree", the outcome variable was treated as a four-point ordinal scale in the analysis, ranging from "Disagree" to "Strongly agree", to reflect increasing levels of agreement that primary care providers should provide care to HIV-positive patients.

The independent variables included sex (male/female/other), age (calculated from the participant's year of birth), region (self-reported by participants), and provider type. The latter variable was used to restrict the analysis to PHC providers, specifically doctors and nurses with direct contact with patients.

HIV knowledge was assessed using 11 questions on HIV transmission and prevention. Participants answered whether specific scenarios (e.g., unprotected oral sex, sharing needles, unscreened blood transfusions) could result in HIV transmission and whether certain actions (e.g., abstaining from sex, using new needles, consistent condom use) could reduce the risk of HIV infection. Original responses included "True," "False," or "I'm not sure." For our analysis HIV knowledge was coded as "Have correct knowledge on HIV" if all 11 responses to the specified questions were correct, and as "Lacks correct knowledge on HIV" if at least one response was incorrect or uncertain.

ART knowledge was assessed using 4 questions about the benefits and limitations of antiretroviral therapy, including whether it helps people with HIV live longer, reduces transmission risk, cures HIV, or causes side effects. Original responses included "True," "False," or "I'm not sure." For our analysis ART knowledge was coded as "Have correct knowledge on ART" if all four responses were correct, and as "Lacks correct knowledge on ART" if at least one response was incorrect or uncertain.

A specific discriminatory belief supporting the separation of PLWH from others was assessed using the statement: "HIV-positive clients should be separated from clients of unknown HIV status to protect uninfected clients." Participants responded with "True," "False," or "I'm not sure." This item was intended to measure discriminatory attitude toward PLWH in service provision contexts.

Perceived risk of HIV infection among PHC providers was assessed using the question: "How likely is it that a healthcare provider will become infected with HIV by providing care to an HIV–positive client?" Responses included "Very likely," "Somewhat likely," ""I'm not sure," "Not very likely," and "Not likely at all."

Willingness to care for HIV patients was assessed using the statement: "I would like to take care of HIV patients while providing primary care." Participants responded with "Strongly disagree," "Disagree," "Uncertain," "Agree," or "Strongly agree."

HIV service provision practice was assessed through a series of questions regarding the types of services participants provided to PLWH. Participants were asked whether they have experience working with PLWH, whether they provide education services, testing and counseling services, referral to HIV treatment and care services, and HIV/AIDS treatment services. For each question, responses were "Yes" or "No."

Statistical analysis

The sample size calculation for the parent mixed-methods study was done using OpenEpi v 3.03 with a 5% margin of error and 95% CI, considering the estimated size of the target population and setting the response distribution to 50%. By this method, it was determined that the recommended sample size for the original study was 345 healthcare workers. However, as our analysis was restricted to PHC doctors and nurses only (who had direct contact with patients), it resulted in a relatively smaller sample of 256 PHC providers. We estimated post-hoc power using a Monte Carlo simulation (1,000 replications) in Stata [23, 24], based on the observed effect sizes and a significance threshold of $\alpha = 0.05$. The resulting estimated power was 99.4%, confirming that the sample size ($n = 256$) was adequate to detect moderate to large effects in the multivariable ordinal logistic regression model.

Descriptive statistics were computed to summarize participants' demographic characteristics and key variables. The outcome variable, PHC providers' attitude towards provision of HIV care was measured on a four-point Likert scale (from 1 = disagree that PHC providers should take care of HIV patients, to 4 = strongly agree) and treated as an ordinal variable. Bivariate ordinal logistic regression was conducted to examine the unadjusted associations between each explanatory variable and the level of agreement that primary care providers should provide care to HIV-positive patients. Multivariate ordinal logistic regression was employed to examine factors independently associated with the outcome variable. Sex, age, and professional category (doctor vs. nurse) were included in all models a priori as potential confounders, regardless of statistical significance. Additional variables were selected for inclusion in the model based on their statistical significance in the bivariate analysis (variables with p-values less than 0.05) and their relevance to the pre-specified hypotheses (e.g., the better ART knowledge the more positive attitude towards providing HIV care). Model building followed a forward selection approach, where predictors were added sequentially and retained based on theoretical importance and improvement in model fit, assessed using likelihood ratio tests and information criteria (AIC and BIC). The proportional odds assumption was assessed in preliminary models and was not violated. Adjusted odds ratios (aOR) with 95% confidence intervals (CI) were reported. The final model included sex, age, professional category, region, ART knowledge, attitudes toward separation of HIV patients, and perceived probability of healthcare worker infection. Statistical significance was set at $p < 0.05$. Statistical analysis was performed in Stata version 16 [25].

Ethical considerations

Ethical approval for the study was obtained from the Georgian National Centre for Disease Control and Public Health (certificate IRB00002150), ensuring that all research procedures adhered to national and international ethical standards. Strict measures were taken to protect the confidentiality and privacy of all participants. Informed consent was obtained from each participant prior to their inclusion in the study, with assurances that their data would be handled with the utmost care and used solely for research purposes. The study's ethical framework was designed to ensure that participants' rights and well-being were prioritized throughout the research process.

Results

The main characteristics of the study participants are summarized in Table 1. The sample consisted of 256 participants, with an average age of 55.4 years (SD = 10.3). The majority of participants were female ($n = 246$, 96.1%) and from the regions outside of Tbilisi ($n = 242$, 94.5%). The sample included both PHC doctors ($n = 152$, 59.4%) and nurses ($n = 104$, 40.6%).

Majority of the participants demonstrated a lack of correct knowledge about HIV ($n = 210$, 82.0%) and ART ($n = 221$, 86.3%), meaning they did not answer all 11 HIV or all 4 ART questions correctly. However, when broken down by individual items, the pattern was different: while most participants recognized well-known transmission routes and prevention methods, misconceptions remained common around oral sex, abstinence, and non-transmission routes such as mosquito bites or casual contact. Similarly, although most knew that ART helps people with HIV live longer, many incorrectly believed it can cure HIV or were unaware of its role in reducing transmission. When asked whether HIV-positive clients should be separated from clients of unknown HIV status in order to protect uninfected clients, 29.3% ($n = 75$) of respondents agreed with this discriminatory belief. An additional 28.5% ($n = 73$) were unsure, while only 42.2% ($n = 108$) rejected the need for separation. Nearly half of

Table 1 Sample characteristics ($n = 256$)

Socio-demographic characteristics		
Continuous Characteristics	**Mean**	**Standard Deviation (SD)**
Age	55.4	10.3
Categorical Characteristics	**N**	**%**
Sex		
Male	10	3.9
Female	246	96.1
Region		
Tbilisi (the capital)	14	5.5
Regions outside Tbilisi*	242	94.5
Provider type		
PCH doctor	152	59.4
PCH nurse	104	40.6
Knowledge, **Attitude and Practice**		
HIV knowledge (correct answers per each question)		
A person can become infected with HIV by:		
having unprotected oral sex	186	72.7
bathing in the same water as an HIV- positive person	167	65.5
sharing needles	229	89.5
receiving a blood transfusion that has not been screened for HIV	239	93.4
getting a mosquito bite	140	54.7
sharing silverware with an HIV-positive person	171	66.8
sharing razor blades that have not been disinfected	208	81.3
A person can reduce his or her risk of becoming infected with HIV if he/she:		
abstains from sexual intercourse	133	51.9
maintains a healthy diet	151	59.0
uses a new, unused needle for each injection	244	95.3
always uses a condom during sex	235	91.8
HIV knowledge (for all 11 questions)		
Lacks correct knowledge on HIV (at least one response was incorrect or uncertain)	210	82.0
Have correct knowledge on HIV (correctly answered all 11 questions)	46	18.0
ART knowledge (by each question asked)		
Antiretroviral therapy		
helps people living with HIV live longer	236	92.2
can cure an HIV–positive client	128	50.2
can decrease the risk of HIV transmission	136	53.1
frequently has side effects that make clients feel physically ill	115	44.9
ART knowledge (for all 4 questions)		
Lacks correct knowledge on ART (at least one response was incorrect or uncertain)	221	86.3
Have correct knowledge on ART (correctly answered all 4 questions)	35	13.7
HIV-positive clients should be separated from clients of unknown HIV status to protect uninfected clients		
True	75	29.3
I'm not sure	73	28.5
False	108	42.2
How likely is it that a health care provider will become infected with HIV by providing care to an HIV–positive client?		
Very likely	19	7.4
Somewhat likely	122	47.7
I'm not sure	29	11.3
Not very likely	52	20.3
Not likely at all	34	13.3
Primary care clinicians should take care of HIV patients		
Strongly disagree	0	0
Disagree	13	5.1
Uncertain	50	19.5

Table 1 (continued)

Socio-demographic characteristics		
Continuous Characteristics	**Mean**	**Standard Deviation (SD)**
Agree	144	56.3
Strongly agree	49	19.1
I would like to take care of HIV patients while providing primary care		
Strongly disagree	0	0
Disagree	20	7.8
Uncertain	39	15.2
Agree	146	57.1
Strongly agree	51	19.9
PHC providers provide education on HIV prevention	176	68.8
PHC providers provide testing and counseling services	56	21.9
PHC providers provide referral to HIV treatment and care service	33	12.9
PHC providers provide HIV/AIDS treatment services	0	0

* Kakheti, Imereti, Guria, Samegrelo, and Ajara

the respondents ($n = 122$, 47.7%) believed that it is "somewhat likely" that a healthcare provider could become infected with HIV while providing care to an HIV-positive client, and an additional 7.4% ($n = 19$) considered it "very likely". In contrast, only 20.3% ($n = 52$) responded that infection was "not very likely", and just 13.3% ($n = 34$) correctly recognized that it is "not likely at all". Additionally, most participants agreed ($n = 144$, 56.3%) or strongly agreed ($n = 49$, 19.1%) that PHC providers should take care for HIV patients, and a majority agreed ($n = 146$, 57.1%) or strongly agreed that ($n = 51$, 19.9%) they are willing to take care of HIV patients while providing primary care.

In terms of practice, the majority of participants did not provide testing and counseling services ($n = 200$, 78.1%) or referrals to HIV treatment ($n = 223$, 87.1%). However, many provided education on HIV prevention ($n = 177$, 68.6%). Notably, none of the participants provided HIV/AIDS treatment services.

Bivariate associations between socio-demographic, knowledge, attitude, and practice characteristics and primary care providers' attitude toward HIV service provision are summarized in Table 2. Three variables were significantly associated with the outcome variable. Primary care providers practicing outside of Tbilisi were significantly more likely to express stronger agreement that they should provide care to HIV patients compared to those based in Tbilisi (OR = 4.79; 95% CI: 1.60-14.33; $p = 0.005$). Compared to respondents who endorsed the discriminatory belief that HIV-positive clients should be separated from clients of unknown HIV status, those who were unsure had significantly lower odds of reporting higher levels of agreement that primary care clinicians should provide HIV care (OR = 0.11; 95% CI: 0.06–0.24; $p < 0.001$), and those who rejected this discriminatory belief similarly had lower odds of reporting higher levels of agreement that they should provide care to HIV patients (OR = 0.40; 95% CI: 0.22–0.74; $p = 0.004$). Perceived risk of HIV transmission was significantly associated with providers' attitude; compared to those who believed it is "very likely" that a healthcare provider could become infected with HIV by providing care to an HIV-positive client (high risk perception), respondents who believed it is "not likely at all" (no risk perception) had significantly higher odds of reporting higher levels of agreement that primary care clinicians should provide HIV care (OR = 3.76; 95% CI: 1.22–11.53; $p = 0.020$). In contrast, those who believed it is "not very likely" (low risk perception) had significantly lower odds of reporting higher levels of agreement (OR = 0.32; 95% CI: 0.11–0.91; $p = 0.033$).

In the multivariate ordinal logistic regression analysis (Table 3), two variables remained statistically significantly associated with the outcome variable. Respondents located in regions outside of Tbilisi had significantly higher odds of reporting higher levels of agreement that they should provide care to HIV patients compared to those based in the capital (aOR = 6.22; 95% CI: 1.99–19.50; $p = 0.002$). Compared to those who endorsed the statement that HIV-positive clients should be separated from clients of unknown HIV status to protect uninfected clients, respondents who were unsure (aOR = 0.14; 95% CI: 0.06–0.31; $p < 0.001$) and those who disagreed with this discriminatory belief (aOR = 0.43; 95% CI: 0.22–0.86; $p = 0.017$) had significantly lower odds of reporting higher levels of agreement that they should provide care to HIV patients.

Discussion

The findings of this study provide insight into certain factors shaping PHC providers' attitudes toward HIV service provision in Georgia. Notably, the belief that HIV-positive clients should be separated from clients of unknown status and the provider's region of practice

Table 2 Bivariate associations between socio-demographic, knowledge, attitude, and practice characteristics and primary care providers' attitudes toward HIV service provision

Characteristics	Primary care clinicians should take care of HIV patients				OR	95% CI	*p*- value
	Disagree	Uncertain	Agree	Strongly agree			
Mean Age (SD)	55.0 (8.7)	55.5 (8.8)	57.1 (10.9)	52.0 (9.7)	0.98	0.96–1.01	0.276
Sex							
Male	0 (0)	3 (30.0)	5 (50.0)	2 (20.0)	Ref		
Female	13 (5.3)	47 (19.1)	139 (56.5)	47 (19.1)	1.08	0.32–3.65	0.892
Region							
Tbilisi	5 (35.7)	1 (7.1)	8 (57.1)	0 (0)	Ref		
Regions	8 (3.3)	49 (20.3)	135 (56.2)	49 (20.3)	**4.79**	**1.60-14.33**	**0.005**
Provider type							
PCH doctor	8 (5.3)	33 (21.7)	83 (54.6)	28 (18.4)	Ref		
PCH nurse	5 (4.81)	17 (16.3)	61 (58.6)	21 (21.0)	1.24	0.76–2.01	0.376
HIV knowledge							
Lacks correct knowledge on HIV	10 (4.8)	41 (19.5)	122 (58.1)	37 (17.6)	Ref		
Have correct knowledge on HIV	3 (6.5)	9 (19.6)	22 (47.8)	12 (26.1)	1.20	0.63–2.25	0.577
ART knowledge							
Lacks correct knowledge on ART	13 (5.9)	45 (20.4)	120 (54.3)	43 (19.5)	Ref		
Have correct knowledge on ART	0 (0)	5 (14.3)	24 (68.6)	6 (17.1)	1.35	0.69–2.63	0.370
HIV-positive clients should be separated from clients of unknown HIV status to protect uninfected clients							
True	5 (6.7)	9 (12.0)	29 (38.7)	32 (42.7)	Ref		
I'm not sure	6 (8.2)	28 (38.4)	35 (48.0)	4 (5.4)	**0.11**	**0.60 – 0.24**	**< 0.001**
False	2 (1.9)	13 (12.0)	80 (74.1)	13 (12.0)	**0.40**	**0.22–0.74**	**0.004**
How likely is it that a health care provider will become infected with HIV by providing care to an HIV–positive client?							
Very likely	0 (0)	3 (15.8)	13 (68.4)	3 (15.8)	Ref		
Somewhat likely	4 (3.3)	18 (14.7)	78 (63.9)	22 (18.0)	0.98	0.38–2.49	0.965
I'm not sure	4 (13.8)	6 (20.7)	18 (62.1)	1 (3.4)	0.35	0.11–1.08	0.069
Not very likely	1 (2.9)	4 (11.8)	11 (32.3)	18 (52.9)	**0.32**	**0.11–0.91**	**0.033**
Not likely at all	4 (7.7)	19 (36.5)	24 (46.1)	5 (9.6)	**3.76**	**1.22–11.53**	**0.020**
Provide education services on HIV							
No	6 (7.5)	16 (20.0)	49 (61.2)	9 (11.3)	Ref		
Yes	7 (4.0)	34 (19.3)	95 (54.0)	40 (22.7)	1.59	0.95–2.65	0.072
Provide Testing and Counseling services							
No	13 (6.5)	41 (20.5)	104 (50.0)	42 (21.0)	Ref		
Yes	0 (0)	9 (16.1)	40 (71.4)	7 (12.5)	1.12	0.64–1.95	0.670
Provide Referral to HIV treatment and care service							
No	11 (4.9)	41 (18.4)	124 (55.6)	47 (21.1)	Ref		
Yes	2 (6.1)	9 (27.3)	20 (60.6)	2 (6.1)	0.51	0.26–1.01	0.053

were the only variables significantly associated with positive attitude towards HIV service provision among PHC providers. Although causality cannot be inferred due to the study's cross-sectional design, these findings highlight key considerations for efforts to expand HIV service delivery through Georgia's PHC system.

We found alarmingly low levels of correct knowledge, specifically 82% of PHC providers in Georgia lacked accurate HIV knowledge, and 86% had incorrect ART knowledge. HIV care remains highly centralized in Georgia, with PHC providers primarily limited to screening and referrals—a practice that was also uncommon among our participants. Notably, although comprehensive care was rare, nearly 70% reported providing HIV prevention education, underscoring that while education is central to their role, it is undermined by limited accurate knowledge, highlighting a critical need for targeted training and capacity-building. This aligns with findings from across EECA, where significant gaps in HIV transmission and prevention knowledge persist among healthcare workers in the region [26]. It is noteworthy that ART knowledge was not significantly associated with attitudes toward HIV service provision in our study. While knowledge about HIV and/or ART is often assumed to reduce stigma and improve providers' attitude towards PLWH, evidence from other settings shows that providers may have good knowledge yet still hold negative or biased attitudes toward HIV care [27–29], suggesting that attitudes might be shaped by factors other than knowledge. In Georgia, where HIV care is historically separated from

Table 3 Logistic regression analysis of factors associated with positive attitude toward HIV service provision

Positive attitude toward HIV service provision				
Variable	**Category**	**aOR**	**95% CI**	***p*-value**
Age	Continuous variable	0.98	0.96–1.01	0.381
Sex	Male	Ref		
	Female	1.38	0.42–4.56	0.592
Provider type	PHC doctor	Ref		
	PHC nurse	1.11	0.66–1.88	0.677
Region	Tbilisi (the capital)	Ref		
	Regions outside Tbilisi*	**6.22**	**1.99–19.50**	**0.002**
ART knowledge	Lacks correct knowledge on ART	Ref		
	Have correct knowledge on ART	1.17	0.54–2.53	0.683
HIV-positive clients should be separated from clients of unknown HIV status to protect uninfected clients	True	Ref		
	I am not sure	**0.14**	**0.06–0.31**	**< 0.001**
	False	**0.43**	**0.22–0.86**	**0.017**
How likely is it that a health care provider will become infected with HIV by providing care to an HIV–positive client?	Very likely	Ref		
	Somewhat likely	1.09	0.39–3.07	0.863
	I'm not sure	0.94	0.25–3.41	0.927
	Not very likely	0.43	0.14–1.32	0.143
	Not likely at all	3.09	0.93–10.21	0.064

* Kakheti, Imereti, Guria, Samegrelo, and Ajara

primary care, even knowledgeable providers may not see HIV service provision as part of their role. At the same time, it is encouraging that more than three quarters of respondents agreed or strongly agreed that PHC providers should provide care for PLWH (75.4%) and that they themselves would be willing to do so (77.0%). This suggests that despite the observed gaps in HIV knowledge and system preparedness, many providers are willing to engage in HIV care, and targeted education and training can further increase their involvement in HIV care.

We found that practicing outside of Tbilisi, the capital of Georgia, was significantly associated with reporting higher levels of agreement that PHC providers should care for PLWH in both bivariate and multivariable analyses. This may reflect that regional PHC professionals, often serving as rural doctors and nurses, develop closer patient relationships and manage broader health issues in the absence of specialists. In addition, rural PHC providers may take into consideration the substantial travel time and costs their patients face when accessing HIV services, which in Georgia are largely centralized and available only in major cities. Similar barriers have been documented in other settings, where long travel distances hinder timely access to services for rural PLWH [30]. Such integrated roles may strengthen provider comfort in offering HIV care. At the same time, this finding should be interpreted with caution given the wide confidence interval of the estimate and the small comparison group, which limits the reliability of the association. It is also possible that the observed effect reflects broader urban–rural or health system differences related to the capital city context rather than geographic location alone. While evidence from the EECA and globally is limited on this point, some studies suggest that rural physicians are less willing or less comfortable providing HIV care [31, 32], but would be willing if supported by specialist backup, enhanced community and social services, and additional training [32].

An unexpected finding was that providers who rejected a discriminatory belief that HIV-positive clients should be separated from others had lower odds of reporting higher levels of agreement that primary care clinicians should provide HIV care. This pattern may reflect underlying system-capacity concerns rather than pro-separation stigma per se. In settings like Georgia with limited infection-prevention infrastructure, high patient volumes, and constrained training and compensation, being in favor of "separation" can index a preference for specialized or segregated service delivery (e.g., dedicated rooms for PLWH) as a perceived prerequisite for safe and effective HIV care provided at primary care setting. In this sense, respondents who endorsed separation may paradoxically have appeared more supportive of providing HIV care because they assumed such care would occur under specialized conditions perceived as safer. Conversely, respondents who reject separation may still view current primary care capacity as insufficient, and thus hesitate to support HIV service provision at PHC. This counterintuitive association should be interpreted cautiously given potential residual confounding by workload, staffing, training, and facility resources. Though literature directly supporting our finding is scarce, evidence indicates that primary care clinicians require additional training, reduced workload, and adequate compensation

to engage in HIV care [33]. Future research should consider whether these factors influence primary care providers' attitude toward HIV care provision.

Risk perception defined as a provider's belief about the likelihood of contracting HIV through patient care was not statistically significantly associated with reporting higher levels of agreement that primary care clinicians should provide HIV care in the multivariable model. However, in the bivariate analysis, providers who perceived no risk were more likely to report higher levels of agreement that PHC providers should deliver HIV care. This finding is consistent with established behavioral theory, which suggest that perceived personal risk is associated with the willingness to engage in a given behavior [34]. Similar trends have been documented in other counties in EECA region, where inflated or inaccurate risk perceptions among healthcare providers have been shown to hinder their involvement in HIV-related service delivery [35, 36].

The findings highlight the need for targeted training programs to address critical knowledge gaps related to HIV prevention and treatment among PHC providers in Georgia. Strengthening providers' foundational knowledge is essential, particularly given their existing role in prevention education. In parallel, efforts to integrate HIV care into primary care must also address stigma and HIV infection control in healthcare settings. Evidence-based anti-stigma interventions and infection control strategies can help ensure that non-discriminatory attitudes translate into active engagement in HIV service provision. Together, these efforts can support the development of a more informed and stigma-free PHC workforce capable of contributing meaningfully to the HIV response in Georgia.

While this study provides significant insights, it is not without limitations. The use of a non-random sampling approach may have introduced selection bias, as participants who agreed to take part might have held more favorable views toward HIV care. The cross-sectional design precludes causal inferences, and the reliance on self-reported data may introduce social desirability bias. This bias could lead healthcare workers to report more favorable attitudes than they actually hold, especially in the context of sensitive topics like HIV care. Furthermore, although selected items, such as HIV and ART knowledge questions were adapted from the HIV/AIDS Tool Kit [21], which has been used in multiple programmatic settings [22], no published psychometric validation has been reported in Georgian. This limits the ability to assess the reliability and construct validity of the measures used. Finally, although the proportion of missing data across key variables was minimal and listwise deletion was applied, we acknowledge that not addressing missing data through imputation represents a methodological limitation that may have affected the multivariate model estimates. Future research should consider longitudinal studies to explore the impact of targeted interventions on PHC providers' attitudes and practices over time. Such studies would allow for more robust conclusions regarding causality and the sustainability of any changes observed. Qualitative studies are also recommended to explore the deeper contextual and structural factors shaping providers' attitudes, as well as to better understand potential sources of stigma or reluctance to provide HIV care that may not be fully captured through quantitative measures.

Conclusion

This study highlights some key factors that influence positive attitudes towards HIV service provision among PHC providers. These include geographic location, discriminatory belief towards PLWH and misperceptions about the risk of contracting HIV when working with patients. Further research is needed to better understand a true nature of these associations as well as to uncover other potential factors. Enhancing infection control by implementing relevant evidence-based interventions can empower PHC providers to provide a more inclusive and effective HIV care in Georgia, aligned with national goals and global best practices and standards.

Abbreviations

ART	Antiretroviral Therapy
CI	Confidence Interval
EECA	Eastern Europe and Central Asia
HIV	Human Immunodeficiency Virus
NCD	Non-Communicable Disease
OR	Odds Ratio
PHC	Primary Health Care
PLWH	People Living with HIV
SD	Standard Deviation
STI	Sexually Transmitted Infections
TB	Tuberculosis
UNAIDS	Joint United Nations Programme on HIV/AIDS
WHO	World Health Organization

Supplementary Information

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Supplementary Material 1

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Author contributions

Planning the structure and methodology of the study- Tatia Maglaperidze, Tamar Zurashvili, Mamuka DjibutiData Acquisition: Tamar Zurashvili, Mamuka Djibuti Data Analysis: Tatia Maglaperidze, Tamar Zurashvili, Mamuka Djibuti Data Interpretation: Tatia Maglaperidze, Tamar Zurashvili, Mamuka Djibuti Writing the Manuscript: Tatia Maglaperidze, Tamar Zurashvili Revising the

Manuscript: Tamar Zurashvili, Mamuka Djibuti, Jack DeHovitz, Nestani Tukvadze.

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Data availability
The data that support the findings of this study are available from Partnership for Research and Action for Health (PRAH), but restrictions apply to the availability of these data. While the dataset is not publicly available due to sensitivity concerns, de-identified data can be shared upon reasonable request and with the permission of PRAH by emailing to corresponding author.

Declarations

Ethical approval
This study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. Ethical approval for the study was obtained from the Institutional Review Board (IRB) of the National Center for Disease Control and Public Health of Georgia (IRB# 2025-007). The IRB reviewed and approved the study protocol titled *"Improving HIV/HCV/TB Integrated Screening Among High-Risk Populations at Primary Healthcare Facilities in Georgia."* The approval is valid from February 7, 2025, to February 7, 2026. All necessary precautions were taken to ensure the confidentiality and well-being of participants. Informed consent was obtained from all participants prior to their inclusion in the study.

Consent for publication
Not applicable. This study does not include any individual-level identifying images or personal or clinical details of participants that compromise anonymity.

Competing interests
The authors declare no competing interests.

Author details
[1]Faculty of Medicine, Ivane Javakhishvili Tbilisi State University, Tbilisi, Georgia
[2]Partnership for Research and Action for Health, Tbilisi, Georgia
[3]Department of Medicine, SUNY Downstate Health Sciences University, Brooklyn, New York, USA
[4]Scientific Research Unit, National Center for Tuberculosis and Lung Diseases, Tbilisi, Georgia
[5]Department of Medicine, Swiss Tropical and Public Health Institute, Allschwil, Switzerland

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