

Knowledge and practice gaps despite favourable attitudes towards Kaposi sarcoma among people living with HIV in Tanzania

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Abstract

Purpose: Kaposi sarcoma (KS) remains a significant AIDS-defining malignancy in sub-Saharan Africa. In Tanzania, limited public awareness and persistent stigma hinder early diagnosis and treatment of KS. We assessed the influence of socio-demographics on knowledge, attitudes and practices (KAPs) related to KS among people living with HIV (PLWH) attending HIV care and treatment clinics (CTCs) in Tanzania.

Methods: A cross-sectional survey of 302 PLWH from 10 CTCs in Dar es Salaam [January–June, 2023] assessed socio-demographics and KAP among patients with KS using structured questionnaires. Descriptive statistics, bivariate analyses and multivariate linear regression were performed to identify factors associated with KAP outcomes.

Results: Among the 302 respondents with a median age of 41 (32–50) years, 203 (67.2%) were female, 182 (60.3%) were aged 35–49 years, 148 (59%) were married, 158 (52.3%) had primary education, and 189 (62.6%) earned <100,000 TZS monthly. KS knowledge was generally low (11.6%), with up to 208 (68.9%) being unaware of the disease; higher knowledge was associated with college education ($p < 0.001$), attending a lower-level facility ($p < 0.001$) and better income ($p = 0.02$). Positive attitudes (70%) were common among the college-educated ($p < 0.002$), but less common among PLWH at lower-level facilities ($p < 0.001$). Practices were poor (32.8%) but improved among married participants ($p = 0.046$). Knowledge weakly correlated with practice ($p = 0.13$; $p = 0.003$) and practice with attitude ($p = 0.20$; $p < 0.001$), with no knowledge–attitude correlation ($p = 0.087$; $p = 0.13$).

Conclusion: Despite positive attitudes towards KS, knowledge and practices among PLWH attending CTC in Tanzania remain poor. Targeted approaches that consider clients' demographics are needed to improve KS KAP.

Keywords: Kaposi sarcoma, HIV/AIDS, knowledge, attitudes and practices, Tanzania, cancer awareness.

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Introduction

Cancer is a growing global health challenge [1], with an estimated 20 million new cases and 9.7 million cancer-related deaths reported in 2022 [2]. Projections indicate that by 2030, 17 million cases of cancer will occur annually, with ~70% of these deaths occurring in low- and middle-income countries (LMICs) [2,3]. Among the various risk factors, HIV has been recognised as a significant contributor to the cancer burden, particularly through its association with AIDS-defining cancers such as Kaposi sarcoma (KS), non-Hodgkin lymphoma and cervical cancer [4,5]. In sub-Saharan Africa (SSA), where the prevalence of HIV remains high [6], these cancers are still major causes of illness and death among people living with HIV (PLWH) [7–10].

KS, caused by Kaposi sarcoma-associated herpesvirus (KSHV), is the most common cancer diagnosed among PLWH in Tanzania and other parts of SSA [10,11]. HIV-induced immunosuppression significantly increases susceptibility to KSHV infection and potentiates KS development [10,12]. Despite advances in HIV care, particularly the scale-up of antiretroviral therapy (ART), KS continues to pose a serious health burden [13–15]. In Tanzania, ~1,300 new KS cases were diagnosed in 2020 [16]. Alarming, 60%–82% of these cases are detected at an advanced stage as per the AIDS Clinical Trials Group staging system [17], even among PLWH who regularly visit care and treatment clinics (CTCs) for ART refills [18,19]. Advanced-stage diagnosis is often associated with poor treatment outcomes, high healthcare costs and increased mortality [20,21].

One of the critical barriers to improved outcomes in KS care is late presentation [22–24]. This pattern of late presentation is driven by a range of factors, including low awareness of KS symptoms, negative attitudes such as stigma, some poor practices such as reliance on traditional healers [25–27] and weak integration of cancer screening into HIV care services [28–30]. At the individual level, knowledge about KS among PLWH is limited [27,31]. Many are unaware that the etiologic agent of KS is a virus, KSHV. Infection by this virus is required for KS development, but not all infected individuals develop KS. In PLWH, HIV weakens the immune system in ways that enable cancers such as KS to develop more frequently [10,12]. Poor recognition of early KS symptoms leads to delayed diagnosis [27,31]. Studies in SSA have consistently reported low to moderate levels of KS knowledge among both the general population and PLWH, including those with high adherence to ART and HIV viral suppression [32,33]. This knowledge gap delays early detection and intervention, reducing the effectiveness of available treatment options [34].

In addition to knowledge barriers, negative attitudes such as KS-related stigma and poor practices play a significant role in late KS presentation [31,34]. KS often presents with visible skin lesions that are difficult to conceal; however, owing to associated stigma, fear and shame, some patients opt to isolate themselves from society, leading to late presentation [31]. The visible nature of KS lesions reinforces the stigma associated with HIV, further discouraging individuals from seeking timely medical care [27]. Negative attitudes, driven by misconceptions about the disease, contribute to psychological distress and the avoidance of health facilities [34].

In addition to knowledge and attitudes, practice-related behaviours also represent a critical but underexplored barrier to timely KS detection and care [27]. Studies in SSA report that many PLWH engage in health-seeking behaviours that delay formal care, including reliance on traditional healers and a reluctance to discuss symptoms with healthcare providers or family members. Such behaviours are often reinforced by stigma, limited access to KS-specific education [35] and cultural beliefs about illness and treatment [33]. For example, traditional beliefs may attribute visible skin changes to spiritual causes or witchcraft, delaying appropriate biomedical responses. Despite these challenges, there is limited research exploring how these poor practices vary across sociodemographic groups or how they can be effectively addressed within HIV care settings. Understanding these behavioural dimensions is essential for designing effective, context-specific interventions that go beyond awareness and address the behavioural gaps that prevent early KS diagnosis and care engagement.

While existing research has focused heavily on HIV/AIDS awareness, there is a critical gap in understanding how sociodemographic factors influence KS knowledge, attitudes and practice (KAP) among high-risk populations, especially in LMICs such as Tanzania. Addressing this gap is essential for informing targeted educational interventions, improving early detection and ultimately reducing the morbidity and mortality associated with KS. Therefore, this study was conducted to assess the current levels of KAP regarding KS among PLWH attending CTCs in Dar es Salaam, Tanzania, and to identify sociodemographic correlates that could inform targeted interventions.

Methods

Study design and setting

We conducted a cross-sectional study to assess KAP related to KS among PLWH attending CTCs in Dar es Salaam, Tanzania. Data collection took place over 6 months, from January 2023 to June 2023. The study sites included all five municipalities of Dar es Salaam: Kinondoni, Ilala, Temeke, Ubungo and Kigamboni, which were selected based on the presence of CTCs offering comprehensive care and treatment services to PLWH.

Study sites and sampling

In the first stage, we employed a multistage random sampling approach to identify the study sites [36,37]. All five municipalities were included as primary sampling units to ensure geographic representativeness across the study area [38]. Within each municipality, two CTCs were randomly selected via computer-generated random numbers. The selection of two clinics per municipality was intended to optimise within-municipality variation while remaining logistically feasible given the available time and resources. This strategy resulted in the sampling of a total of ten CTCs across the five municipalities.

In the second stage, we targeted all PLWH attending the CTCs within the selected municipalities. Given the lack of prior data on the proportion of PLWH with KS knowledge in Tanzania, we estimated this proportion at 25%. Using a 95% confidence interval ($Z = 1.96$) and a 0.05 margin of error (d), the minimum sample size required for the study was calculated as 288 participants using the Kish and Lisle formula (1965) [39].

As of our sample size estimate, we successfully recruited 302 participants. At each CTC location, participants were randomly recruited into the study and were asked to complete the survey during their regular clinic visits at their discretion. All participants consented to be included in the study, which involved PLWH aged 18 years and older who were attending the selected CTCs in Dar es Salaam.

Study instrument and KAP scoring

Data were collected via a paper-based, validated, structured self-administered questionnaire. To construct the outcome variables for KAP regarding KS, we selected a subset of items from the broader assessment tools used in the questionnaire. This selection was based on both conceptual relevance and the distribution of responses, a strategy recommended in KAP studies where awareness levels are low, and item performance may vary [40]. Specifically, we prioritised items that addressed the core concepts of KS awareness, transmission, symptoms, stigma and health-seeking behaviours. Items with high rates of missing data, excessive neutrality or limited discriminatory value were excluded to enhance the validity and interpretability of the classifications [40,41].

Statistical analysis

The completed questionnaires were first manually reviewed and verified by the research team and then sorted by a biostatistician to check for errors and completeness. The data were then entered into a Microsoft Excel spreadsheet via a double-entry method to minimise transcription errors and enhance accuracy. The cleaned dataset was subsequently imported into IBM SPSS Statistics version 27 for statistical analysis.

The Shapiro-Wilk test was used to assess the normality of the quantitative data. Continuous variables such as age, being non-normally distributed, were summarised using medians and interquartile ranges (IQRs). Categorical variables were summarised using frequencies and proportions. For comparisons, the Mann-Whitney U test was applied for nonparametric comparisons of medians. Where necessary, the variables were dichotomised into 'agree' or 'disagree' categories to facilitate the determination of predictors of poor knowledge.

Most items in the questionnaire included three response options: 'agree', 'unsure' and 'disagree'. For the knowledge and practice sections, a correct response was awarded one point, whereas an incorrect or unsure response was awarded 0 points. Unsure attracted 0 points in the knowledge and practice domains. For the attitude domain, responses were scored on a three-point Likert scale, with 'agree', 'unsure' and 'disagree' assigned values of three, two and one, respectively. For negatively worded items, scores were reverse-coded to maintain consistency. The composite scores were then converted into percentages.

The percentage scores were classified via modified Broom's cut-off points: $\geq 70\%$: high knowledge, positive attitude, or good practice; $50\% - 69\%$: moderate knowledge, neutral attitude or intermediate practice; and $< 50\%$: poor knowledge, negative attitude, or poor practice. The internal consistency of the attitude domain was evaluated via Cronbach's alpha, which measures how reliably the items within that domain assess the same concept.

The Spearman correlation coefficient test was administered to determine the correlations between knowledge and attitudes, knowledge and practices and attitudes and practices.

To simplify the determination of predictors of KAP domains, all multichotomous independent variables were converted into dichotomous variables. A Mann-Whitney test was used to determine predictors of KAP domains in the univariate analysis. To further examine the predictors of the KAP domains, multivariate linear regression models were fitted for each KAP domain. Variables with p values ≤ 0.2 in the bivariate analyses were entered into the multivariate linear regression models. A statistically significant difference between groups was determined at the 95% confidence level (p value < 0.05).

Results

Demographic characteristics

A total of 302 questionnaires were distributed in the study area. The recorded response rate was 100%. Most respondents were female (67.2%), with a median age of 41 (32–50) years. Most respondents were married (59%) and had a primary school education (52.3%). The majority of respondents (62.6%) had a monthly income of $< 100,000$ TZS, which is below the minimum wage according to Tanzania's Prime Minister's Office, Labor, Youth, Employment, and Persons with Disabilities 2025 Report. The respondents came from all five districts of Dar es Salaam (~20% per district). The demographic characteristics of the respondents are described in [Table 1](#).

Assessment of the participants' KS knowledge

[Table 2](#) shows that the respondents scored at a low mean level on all the questions in the knowledge domain. The most common response was unsure across all the questions in the KS knowledge domain, and ~68.9% of the respondents had never heard about KSHV ([Figure 1](#)). Awareness of the cancerous nature of the disease (20.5%), opportunistic profile (12.6%) and viral cause (8.9%) was poor. Knowledge of clinical signs such as skin (13.9%) and oral lesions (7.6%) was also limited. Misconceptions were common, although a minority correctly rejected false beliefs such as transmission via handshakes (9.6%), clothing (7.1%), mosquito bites (9.9%), witchcraft (12.6%) or shared toilets (10.9%).

Assessment of participants' attitudes towards KS

Items 7–9 were negatively worded items and, therefore, were reverse-coded to ensure consistency across all the items in the scale. The mean score across all items in the attitude domain towards KS indicated a positive attitude, except for the items assessing willingness to share eating utensils, whose score indicated a neutral attitude. The Cronbach's alpha was 0.7, indicating good internal consistency of the test items on the attitude domain towards KS ([Table 3](#)). Among the most important results concerning attitudes ([Figure 2](#)), 58.6% of the respondents agreed that they are susceptible to developing KS. In comparison, only 14.2% of the respondents reported that KS is a disease of prostitutes and men who have sex with men (MSM) ([Figure 2](#)).

Table 1. Demographic characteristics.

Variable		Frequency (%)
Sex	Male	99 (32.8)
	Female	203 (67.2)
Age (years)	Median (IQR)	41 (32–50)*
	<35	100 (33.1)
	35–49	182 (60.3)
	>50	20 (6.6)
Marital status	Married	148 (59.0)
	Single	154 (51.0)
District	Ilala	56 (18.5)
	Kinondoni	58 (19.2)
	Ubungo	63 (20.9)
	Temeke	57 (18.9)
	Kigamboni	68 (22.5)
Education level	Informal	33 (10.9)
	Primary	158 (52.3)
	Secondary	85 (28.1)
	College	26 (8.6)
Income level (TZS)	<100,000	189 (62.6)
	100,000–1,000,000	94 (31.1)
	>1,000,000	19 (6.3)

*Median (IQR = Interquartile Range)

Table 2. KS knowledge.

S/N	Description	Yes (%)	No (%)	Unsure (%)	Score (%)	Level of knowledge
1	Ever heard about KS?	94 (31.1)*	208(68.9)	0	31.1	Low
2	Is KS a type of cancer?	62 (20.5)*	16 (2.3)	5.3 (77.2)	20.5	Low
3	Is KS an opportunistic disease?	38 (12.6)*	228 (45.2)	167(33.0)	12.6	Low
4	Does a virus cause KS?	27 (8.9)*	13 (4.9)	282 (86.8)	8.9	Low
5	Does KS present with skin lesions?	42 (13.9)*	7 (2.3)	253 (83.8)	13.9	Low
6	Does KS cause oral lesions?	23 (7.6)*	11 (3.6)	268 (88.7)	7.6	Low
7	KSHV can be transmitted by sexual intercourse	17 (5.6)*	17 (5.6)	268 (88.7)	5.6	Low
8	KSHV can be transmitted from mother to child	24 (7.9)*	11 (3.6)	267 (88.4)	7.9	Low

Table 2. KS knowledge.

S/N	Description	Yes (%)	No (%)	Unsure (%)	Score (%)	Level of knowledge
19	KSHV can be transmitted by sharing a needle or syringe	23 (7.6)*	15 (5.0)	264 (87.4)	7.6	Low
10	KSHV can be transmitted by blood transfusion	24 (7.9)*	11(3.9)	267 (88.4)	7.9	Low
11	KSHV can be transmitted by handshaking	10 (3.9)	29(9.6) *	263 (87.1)	9.6	Low
12	KS can be transmitted by wearing the clothes of a person with KS.	17 (5.6)	22(7.1) *	263 (87.1)	7.1	Low
13	A mosquito bite can transmit KSHV.	4 (1.3)	30(9.9) *	268 (88.7)	9.9	Low
14	KSHV can be transmitted by witchcraft	4 (1.3)	38(12.6) *	260 (86.1)	12.6	Low
15	KSHV can be transmitted by sharing a toilet	5 (1.7)	33(10.9) *	264 (87.9)	10.9	Low

*Correct responses

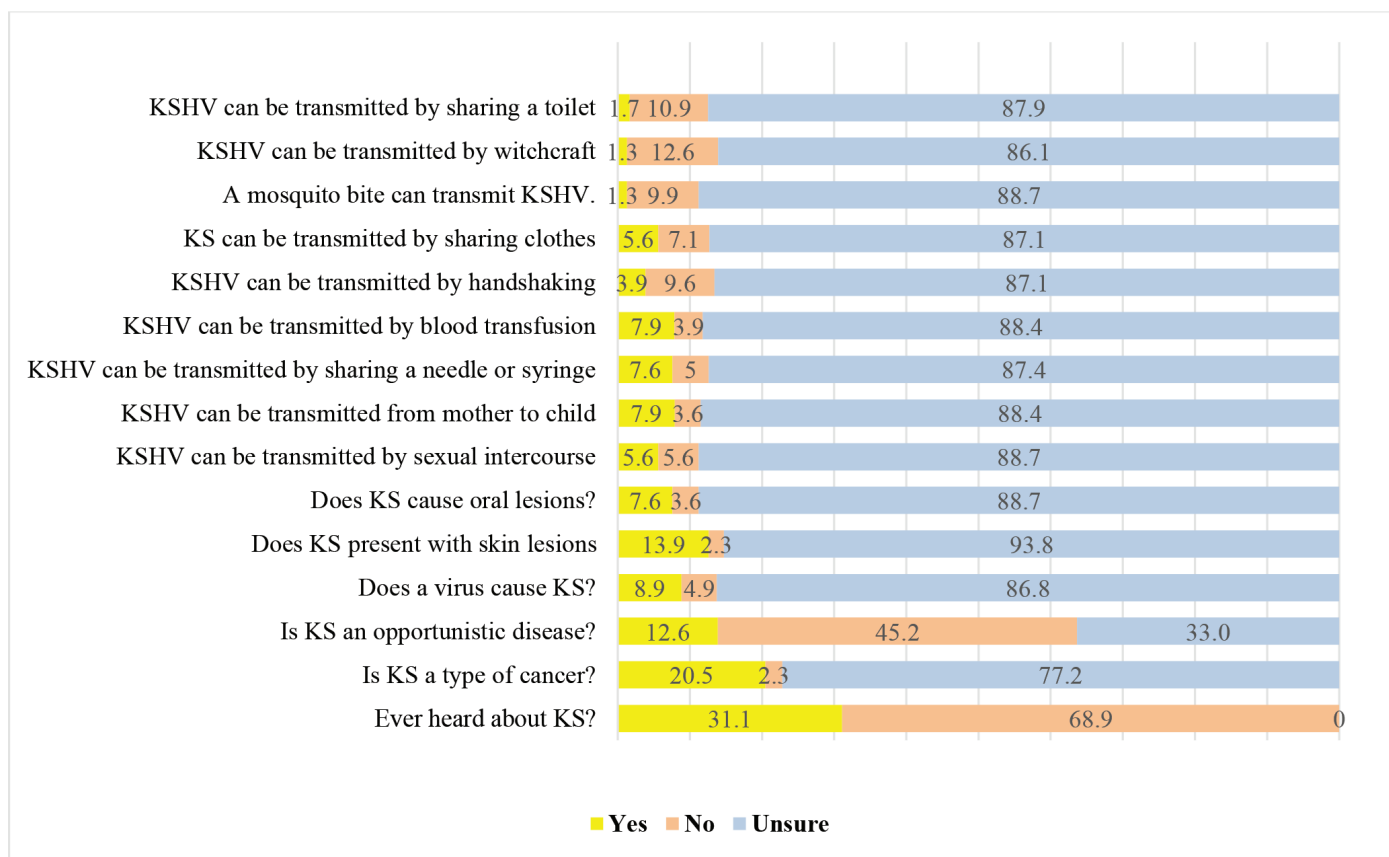


Figure 1. Response patterns to questions about KS knowledge.

Table 3. Participants' attitudes towards KS.

S/N	Description	Agree (%)	Unsure (%)	Disagree (%)	Percentage score (mean)	Attitude
1	Would you be willing to care for your relative with KS?	184 (60.9)*	76 (25.2)	42 (13.9)	82.3 (2.4)	Positive
2	Would you eat from the same bowl used by a person living with KS?	120 (39.7)*	16 (2.3)	89 (29.5)	69.6 (2.1)	Neutral
3	Would you drink from the same cup used by a person living with KS?	96 (31.8)*	82 (27.2)	124 (41.1)	63.6 (1.9)	Neutral
4	Can you buy from a shopkeeper who has KS?	150 (50.0)*	73 (24.2)	78 (25.8)	74.7 (2.2)	Positive
5	KS is a curable disease	119 (39.4)*	131 (43.4)	52 (17.2)	74.1 (2.2)	Positive
6	Any person, including me, can get KS	177 (58.6)*	91 (30.1)	34 (11.3)	82.5 (2.5)	Positive
7	KS is a disease of prostitutes/MSM	43 (14.2)	143 (47.4)	172 (57.0)*	74.7 (2.2)	Positive
8	KS is a disease of elderly people	17 (5.6)	113 (37.5)	267 (88.4)*	83.8 (2.5)	Positive
19	I would rather not know if I had KS	61 (20.2)	84 (27.8)	157 (52.0)*	77.3 (2.3)	Positive
10	Getting KS is a death sentence.	28 (9.3)	121 (40.1)	153 (50.7)*	80.1 (2.4)	Positive
11	Nothing much can be done for a KS patient	27 (8.9)	130 (43.0)	145 (48.0)*	79.7 (2.4)	Positive

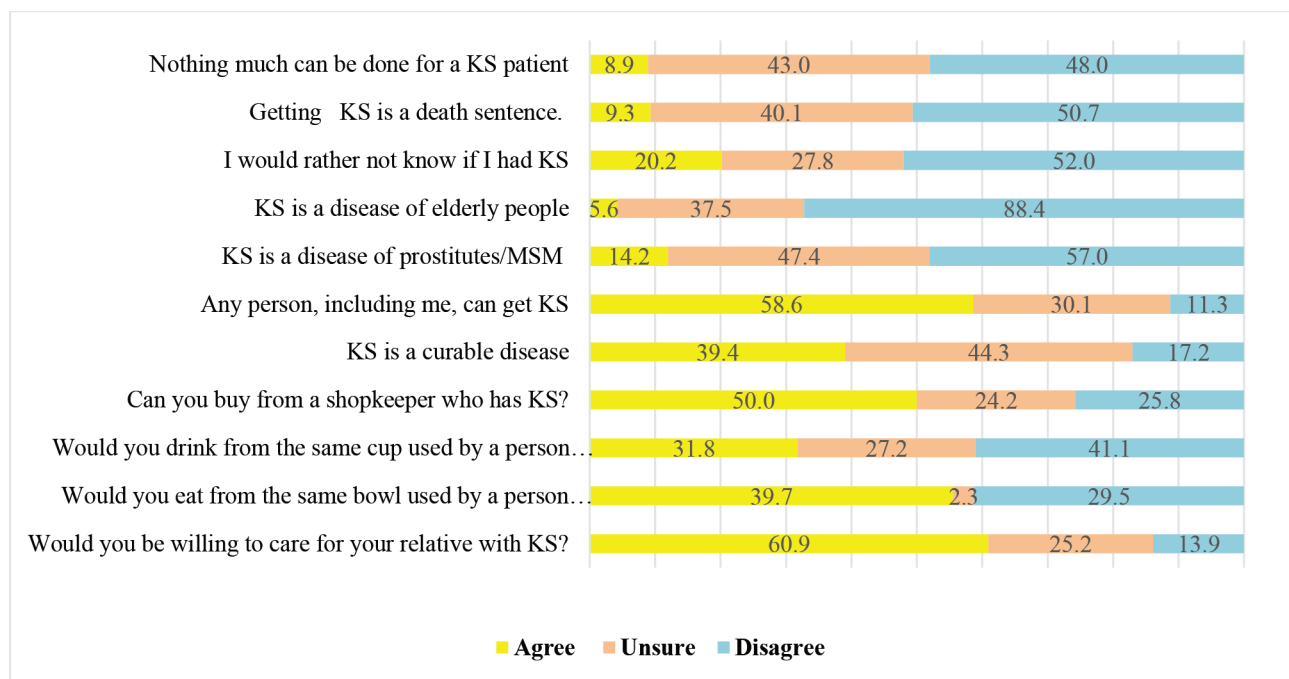


Figure 2. Response patterns to questions about attitudes towards KS.

Assessment of participants' Practices towards KS

The mean score for most items indicated poor practice, except for items one, two and six, which showed intermediate practice (Table 4). On the basis of the questions about the practices of the respondents regarding KS, ~37.4% of the respondents said they once visited a traditional healer. Nevertheless, 15.6% of the respondents agreed that traditional healers can cure KS. Only 20.5% of the respondents said that their mouth was examined, and only 17.5% of patients were asked to undress before skin examination during one of the clinic visits (Figure 3).

KAP domain scoring

The data were standardised on a 0–100 scale to evaluate respondents' performance across the KAP domain. The results indicated a low level of knowledge, with an overall score of 11.6%. In contrast, the attitude domain reflected a generally positive outlook, with an overall score of 70%. However, the practice domain was characterised by poor performance, with an overall score of 32.8% (Figure 4). These findings highlight a significant gap between knowledge and practice, despite a predominantly positive attitude (Table 5).

A significant majority of the respondents exhibited low levels of knowledge, accounting for 89.1% of the sample. Conversely, nearly half of the respondents (49.7%) demonstrated a positive attitude towards KS. However, the prevalence of poor practices was notably high, with 91.1% of respondents engaging in behaviours classified as inadequate (Figure 5).

Bivariate analysis of associations between sociodemographic factors and KAP domains

Bivariate associations between sociodemographic characteristics and KAP domains were assessed using the Mann–Whitney *U* test.

Knowledge score distributions differed significantly by facility level, education level, income and occupation. Higher-ranked knowledge scores were observed among respondents attending health centres or dispensaries compared with district hospitals ($p = 0.002$), those with college-level education compared with non-college education ($p < 0.001$), individuals earning >100,000 TZS compared with lower earners ($p = 0.02$) and non-peasants compared with peasants ($p = 0.01$). No significant associations were observed for age, sex, religion or marital status.

Table 4. KS practices.

S/N	Description	Yes (%)	Unsure (%)	No (%)	Score (%)	Practice
1	Ever visited a traditional healer?	113 (37.4)	3 (1.0)	186 (61.6)*	61.6	Intermediate
2	Ever visited a traditional healer for any health-related issues in the past year?	51 (16.9)	84 (27.8)	167 (55.3)*	55.3	Intermediate
3	Are traditional healers able to treat skin lesions?	47 (15.6)	106 (35.1)	149 (49.3)*	49.3	Poor
4	Has the mouth ever been examined?	62 (20.5) *	16 (5.3)	224 (74.2)	20.5	Poor
5	Skin examined after unclothing?	54 (17.9) *	4 (1.3)	244 (80.8)	17.9	Poor
6	Refused to care for a person with KS?	3 (1.0)	144 (47.7)	155 (51.3)*	51.3	Intermediate
7	Have you ever discussed KS with a partner or spouse?	8 (2.6)*	125 (41.4)	169 (56.0)	2.6	Poor
8	Ever discussed KS-related issues with other community members	11 (3.6)*	47 (15.6)	244 (80.8)	3.6	Poor

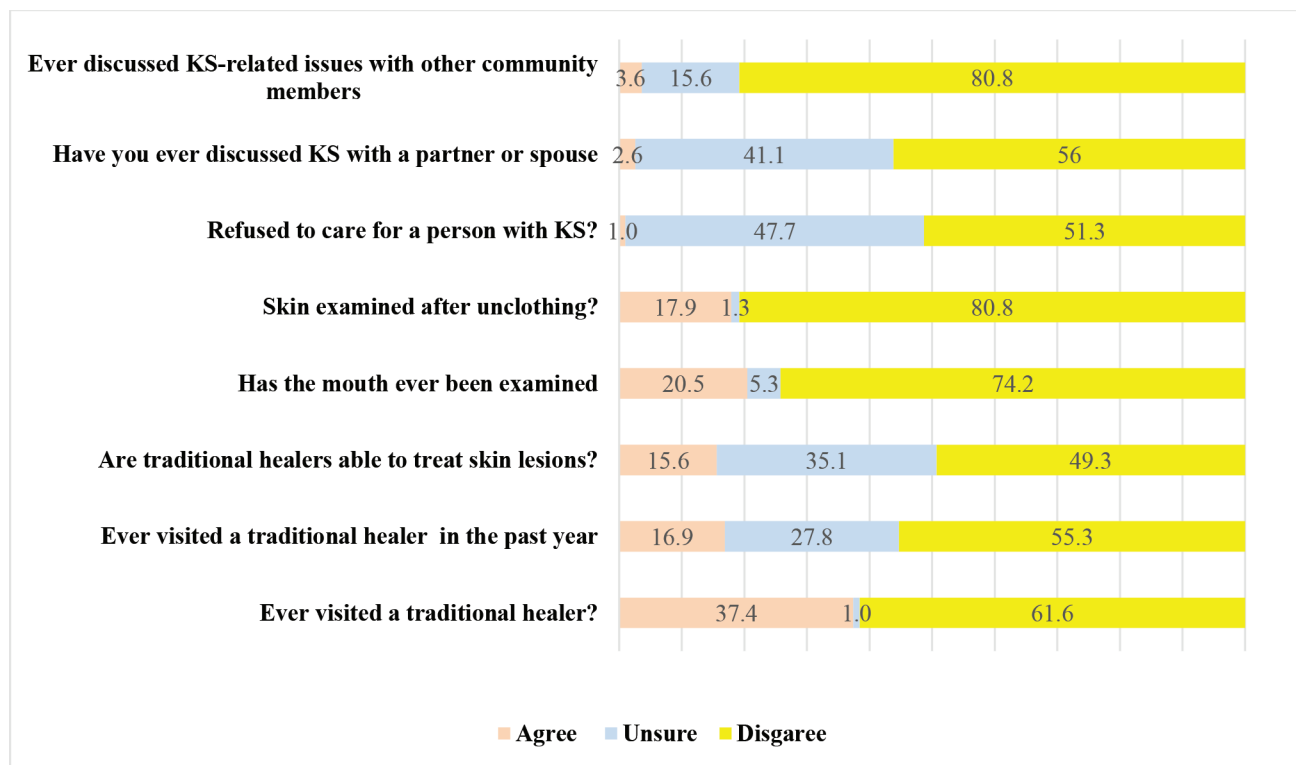


Figure 3. Response patterns to questions about KS practices.

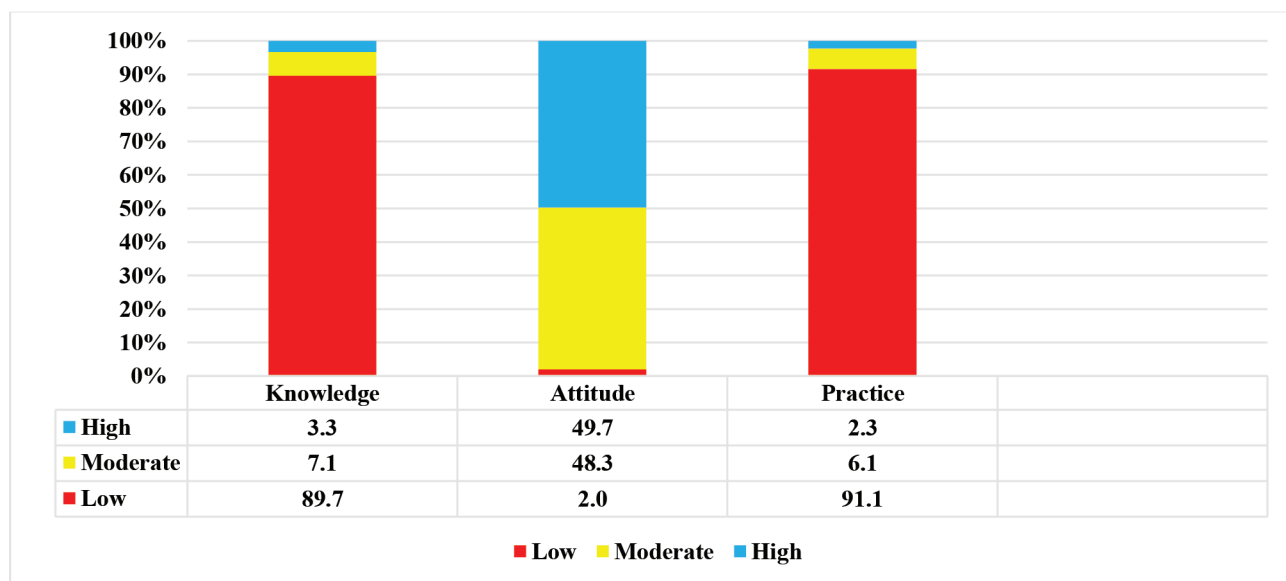


Figure 4. Categories of the KAP domains.

Table 5. The number of questions, range score and level of KAPs.

Variable	Number of questions	Range of scores	Total score (%) (Mean $\pm$ SD)	Level (%) (N = 302)		
				Low (<50%)	Moderate (50%–70%)	High (>70%)
Knowledge	15	0–100	11.6 $\pm$ 22.9	89.7	7.1	3.3
Attitude	11	0–100	69.8 $\pm$ 11.5	2.0	48.3	49.7
Practice	8	0–100	32.8 $\pm$ 19.1	91.1	6.6	2.3

Attitude scores were significantly associated with age, facility level and education level. Respondents older than 41 years had higher-ranked attitude scores than younger respondents ($p = 0.03$). Higher-ranked attitude scores were also observed among respondents attending district hospitals compared with lower-level facilities ($p < 0.001$) and those with college-level education compared with non-college education ($p < 0.001$). Other variables were not significantly associated with attitude scores.

Practice scores differed significantly only by marital status, with married respondents demonstrating higher-ranked practice scores than never-married respondents ($p = 0.04$). No other sociodemographic variables were significantly associated with practice scores (Table 6).

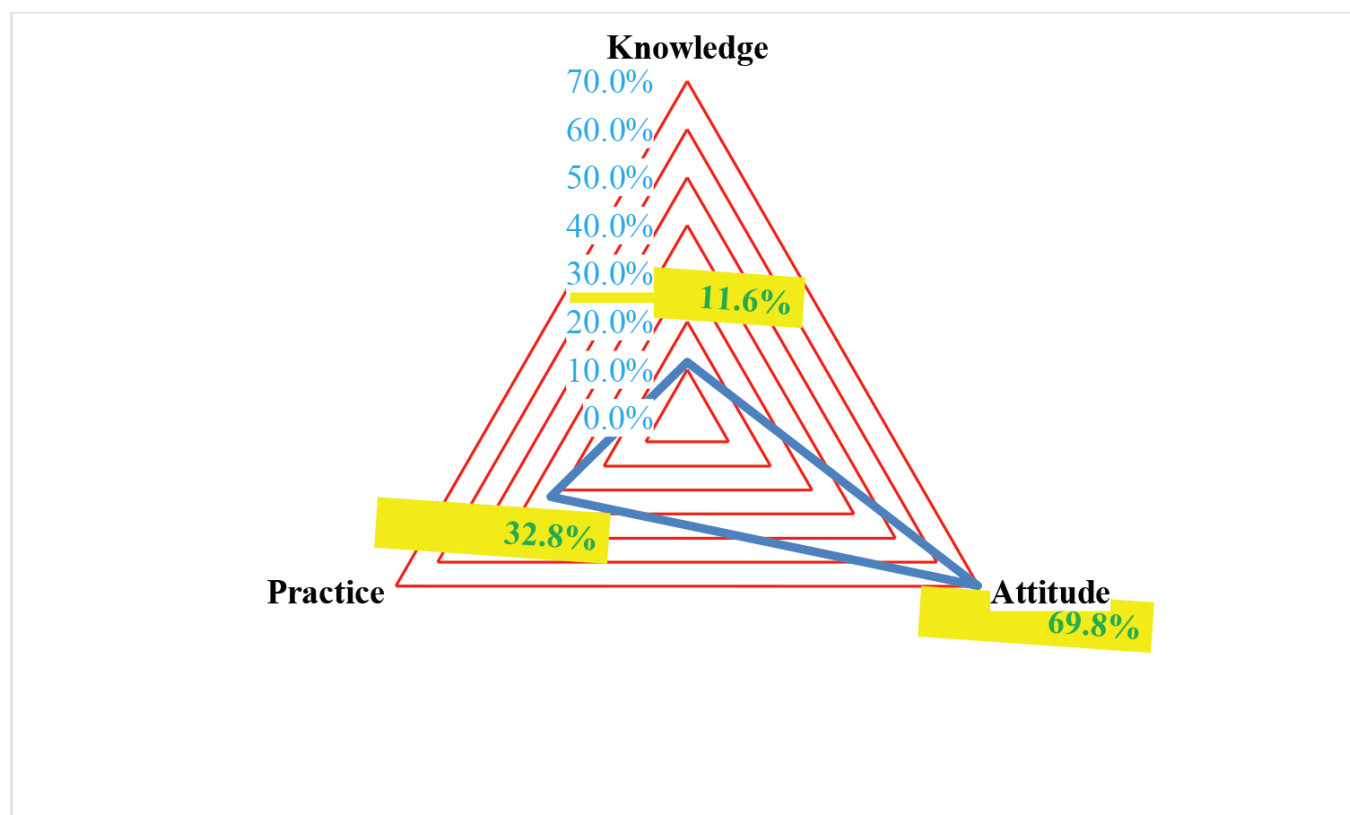


Figure 5. Radar plot summarising the mean overall score on all the KAP domains.

Table 6. Bivariate analysis of associations between sociodemographic factors and KAP domains.

Variable		n	Knowledge		Attitudes		Practices	
			Mean rank	p value	Mean rank	p value	Mean rank	p value
Age				0.24		0.03		0.17
	≤41 years	154	156		161		158	
	>41 years	148	146		140		144	
Sex				0.77		0.13		0.59
	Male	99	149		140		147	
	Female	203	152		156		153	
Facility level				0.002		<0.001		0.18
	District	71	127		196		139	
	Below District	231	158		137		155	
Religion				0.24		0.68		0.49
	Muslims	149	146		153		154	
	Christians	153	156		149		148	
Marital status				0.11		0.12		0.04
	Married	148	158		159		161	
	Never married	154	144		143		141	
Education level				<0.001		<0.001		0.06
	College	26	201		211		181	
	Noncollege	276	146		145		148	
Income level				0.02		0.15		0.33
	<100,000	189	143		145		147	
	>100,000	113	164		160		157	
Occupation				0.01		0.05		0.27
	Peasants	43	125		175		138	
	Nonpeasants	259	155		147		153	

Mann-Whitney test

I. Multivariate analysis of predictors of KAP domains

The results of the regression analyses revealed several significant predictors across the different KAP domains. Facility level ($b = 9.9$, $p < 0.001$) and education level ($b = -23.2$, $p < 0.001$) were significant predictors of knowledge. Facility level ($b = -6.7$, $p < 0.001$), education level ($b = -7.2$, $p = 0.002$) and occupation type ($b = -4.8$, $p = 0.009$) were significant predictors of attitude. Marital status ($b = -4.4$, $p = 0.046$) was the only predictor of practice (Table 7).

The scatterplot analysis indicated that the relationships between various domains of knowledge, attitudes and practices are linear, which justifies the use of the Spearman correlation test (Figure 6). The results of the Spearman correlation analysis indicate a statistically significant, albeit weak, positive correlation between knowledge and practice ($\rho = 0.13$, $p = 0.003$), as well as between practice and attitude ($\rho = 0.20$, $p < 0.001$). Conversely, no significant correlation was observed between knowledge and attitude ($\rho = 0.087$, $p = 0.13$).

Table 7. Multivariate analysis of predictors of KAP domains.

Variable	Knowledge			Attitude			Practice		
	b	SE	p value	b	SE	p value	b	SE	p value
Intercept	28.2	13.3	0.03	106.4	6.9	<0.001	48.3	8.9	<0.001
Age	-	-	-	-1.9	1.3	0.13	-2.4	2.2	0.29
Sex	-	-	-	1.9	1.4	0.15	-	-	-
Facility	9.9	2.9	<0.001	-6.7	1.5	<0.001*	3.9	2.6	0.13
Marital status	-0.7	2.5	0.76	-1.3	1.3	0.32	-4.4	2.2	0.046*
Education level	-23.2	0.6	<0.001	-7.2	2.3	0.002*	-6.4	3.9	0.11
Income level	3.8	2.7	0.16	1.0	1.4	0.44	-	-	-
Occupation	3.2	3.6	0.36	-4.8	1.8	0.009*	-	-	-

Multivariate linear regression

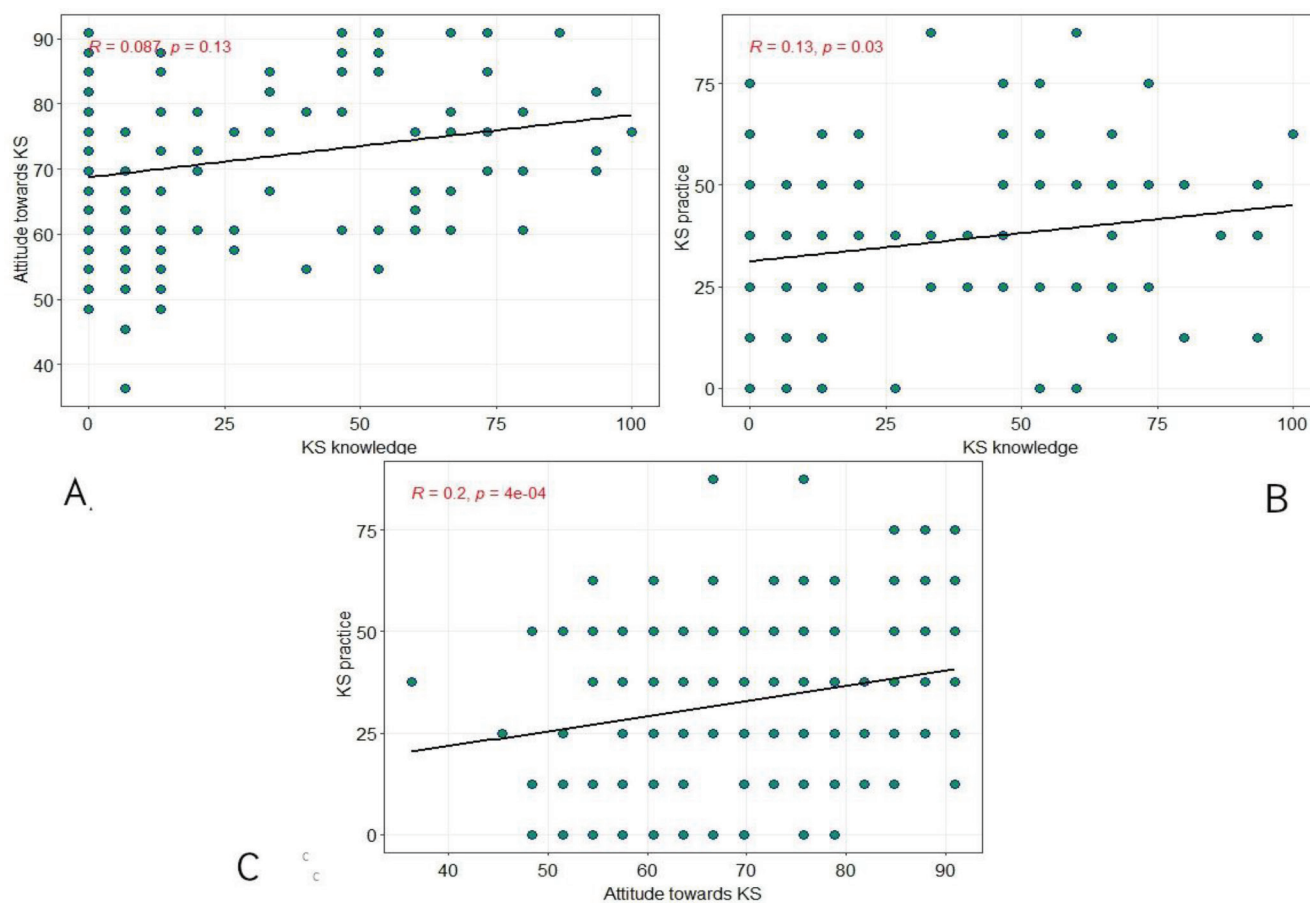


Figure 6. Scatterplot for KAP domains.

Discussion

This study assessed the sociodemographic correlates of KAP regarding KS among PLWH attending the CTC in Dar es Salaam, Tanzania. The results revealed marked disparities in KS-related awareness and behaviour across educational levels, occupations, genders and income groups, with broader implications for stigma. Because over three-quarters of documented PLWH in Tanzania are women, our cohort had a higher proportion of female participants (67.2%). This observation may also be attributed to the higher HIV prevalence among women in Tanzania [42], potentially leading to a larger representation of women in studies focusing on PLWH.

Consistent with previous findings from Fisher *et al* and Phipps *et al* [20,43], participants' education was reported as a key determinant of KS knowledge and attitudes. The participants with a college or university education presented the highest levels of knowledge and positive attitudes towards KS, positioning them as proxies for participant insight in the context of HIV care. This aligns with Collier *et al* [31] and Laker-Oketta *et al* [35], who reported that individuals' knowledge gaps are major contributors to delayed KS diagnosis and management in SSA, suggesting the need to leverage educated clients as peer health educators. However, these findings should be interpreted in the context of those we studied: PLWH presenting to CTCs. Besides formal education, these individuals receive ongoing health education and counselling targeted to HIV-related conditions like KS, which may have increased lay knowledge about KSHV compared to the general population. Future studies can investigate the relationship between CTC-based health education practices and KSHV knowledge, with differential impact across educational levels.

Facility level also significantly predicted KS knowledge and attitudes, with participants attending health centres and dispensaries demonstrating greater knowledge and more positive attitudes than those at district hospitals did. Perhaps decentralised healthcare services to lower facilities may offer better opportunities for patient education or community engagement than larger district hospitals do, potentially due to differences in patient-provider interactions or resource allocation [44,45]. Higher-level health services are often limited by patient-provider interactions [46]. Tailoring interventions by facility type could enhance KS-related health communication strategies and optimise reach.

Although income was not a significant predictor in multivariate models, its bivariate association with KS knowledge highlights socioeconomic status as a potential barrier to accessing accurate health information, with lower income possibly limiting engagement with health services and exposure to educational campaigns, underscoring the need for equity-focused messaging and targeted outreach to vulnerable populations [47].

The stigma operationalised here as a limitation in KS-related health-seeking practices remains a central challenge. Our study revealed poor practice scores among peasants and unemployed participants, mirroring Collier *et al*'s [31] qualitative findings, where stigma surrounding HIV and cancer hindered timely KS care. Jedy-Agba *et al* [34] similarly reported that many PLWH in Nigeria viewed cancer as incurable and fatal, with little knowledge of HIV-associated malignancies. These findings suggest that reduced practices may reflect internalised stigma, fear or fatalism. Interestingly, our study revealed that participants with informal education were more likely to practice well with KS-affected individuals than were those with primary education. This may reflect the influence of informal community-level knowledge or experiential learning that is not captured in formal education metrics.

In our analysis, marital status was significantly correlated with KS-related practices, as married participants presented better practice scores, likely reflecting the positive influence of social support networks and caregiving roles inherent in marital relationships that facilitate improved health-seeking behaviours and care adherence [48,49]. These findings suggest that future interventions should incorporate family and partner involvement to strengthen KS education and management efforts within the broader social context.

Gender dynamics were also notable; women had significantly more favourable attitudes than men did, although this did not translate into better practices in the adjusted models. This finding may reflect cultural perceptions of caregiving or health-seeking, aligning with observations from other regional studies that report gendered differences in cancer-related awareness (e.g. with cervical cancer dominating female-related health narratives) [50].

While our study did not evaluate the impact of interventions, prior work has shown that community-based educational strategies have encouraged progress in addressing knowledge and awareness gaps around KS [51]. Educational initiatives, such as video-based modules and KS survivor testimonials, have been shown to improve awareness and encourage proactive health-seeking behaviours among PLWH [22,27].

Peer navigation programmes, where KS survivors mentor others, have been particularly effective [27]. These interventions not only enhance knowledge but also help dispel persistent myths, reduce stigma and improve engagement with care by offering both emotional reassurance and practical guidance [44, 52]. Such multifaceted approaches underscore the importance of community-driven, context-specific strategies in addressing KS-related barriers to care.

One of the possible limitations of our study is the linguistic context in which it was conducted. The term 'KS' lacks a widely recognised or commonly used translation in Swahili, which may have hindered participants' understanding of the survey items, especially among those with lower levels of formal education [53]. Consequently, some respondents might have been unfamiliar with the term 'KS' despite possibly having encountered or experienced its symptoms [54]. Public health messaging should incorporate locally appropriate translations or culturally resonant descriptors to improve disease recognition and communication effectiveness.

Together, our results underscore the need for targeted health education efforts that consider educational level, occupational background, gender and linguistic accessibility. Tailoring public health messaging to these sociodemographic realities may improve KS KAP and the early detection and management of KS among PLWH populations in Tanzania and similar settings. Future research should also investigate KS-related knowledge, attitudes and practices among healthcare practitioners, as a comprehensive perspective of provider and patient perceptions may yield insights on factors associated with KS prevention, early detection or management.

Conclusion

Our study highlights the dual burden of low knowledge and bad practices as barriers to effective KS care among PLWH. Education remains a powerful enabler of knowledge and attitude change, but addressing stigma, particularly among lower-income and less educated groups, requires targeted community engagement, provider training and culturally responsive communication strategies. Interventions must focus not only on increasing knowledge but also on reducing fear, enhancing the visibility of treatment success and building health system accountability for KS management within HIV care frameworks.

List of abbreviations

ACTG, AIDS Clinical Trials Group; ; ART, Antiretroviral therapy; CI, Confidence interval; CTC, Care and treatment clinic; HIV, Human immunodeficiency virus; KAP, Knowledge, attitudes and practices; KS, Kaposi sarcoma; KSHV, Kaposi sarcoma-associated herpesvirus; LMICs, Low- and middle-income countries; NIMR, National Institute of Medical Research; ORCI, Ocean Road Cancer Institute; PLWH, People living with HIV; ; SSA, Sub-Saharan Africa; TZS, Tanzanian Shillings; WHO, World Health Organization.

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Author contributions

Conception and Design: Z.E., E.L. and S.J.L. Administrative Support: Z. E, S.J.L. and J. M. Collection and assembly of data: Z.E., J. R. N. and F. T. Data analysis and interpretation: Z.E., H.S.N., C.J. M., E.L., C.W., J.M. and S.J.L. Manuscript writing: Z.E., E.L. and S.J.L. Final approval of Manuscript: All authors. Accountable for all aspects of the work: All authors.

Conflicts of interest

The authors declare that they have no conflicts of interest.

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Ethics approval and consent to participate

The study was approved by the Institutional Review Board of the National Institute of Medical Research (NIMR) with reference number NIMR/HQ/R.8a/Vol. IX/3750. The study was planned and conducted in accordance with the ethical principles outlined in the 1964 Declaration of Helsinki and its 2008 revision, as permission was obtained from the relevant administrative authorities at each CTC site before data collection. All participants were informed of the study purpose, the voluntary nature of their participation and their right to confidentiality. Informed consent was obtained from all participants before they completed the survey. The participants were assured that their responses would remain anonymous and that the data would be used solely for research purposes; no incentives were provided for participation.

Availability of supporting data

Available upon request.

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