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Women Aged 15–49 Years Attending ANC and PMTCT Services in South
Sudan, 2023: A Cross-Sectional Study.**



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Knowledge, Awareness, and Practices: Impact on HIV Prevention Among Women Aged 15–49 Years Attending ANC and PMTCT Services in South Sudan, 2023: A Cross-Sectional Study.

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Abstract:

Purpose: This study assessed knowledge, awareness, and practices related to HIV transmission and prevention among reproductive-aged women attending antenatal care (ANC) clinics in South Sudan and examined associations with HIV status, HIV testing uptake, and socio-cultural barriers.

Methodology: A cross-sectional study was conducted in July 2023. Data were collected using a structured questionnaire administered to study participants, alongside laboratory testing to determine HIV status. Descriptive statistics were used to summarize participants' characteristics using frequencies and percentages. Multivariable logistic regression analysis was performed to identify factors independently associated with HIV infection, and results were presented as adjusted odds ratios (aORs) with 95% confidence intervals (CI) and p-values.

Findings: Although general awareness of HIV prevention was high, socio-cultural and gender-related barriers were common. Most participants 87.6% and HIV-positive women (96.3%) expressed positive beliefs about condom use; however, 70.8% reported that women should not use condoms without spousal consent. Stigmatizing attitudes were also prevalent, with over 70% believing that condom use promotes adolescent sexual activity, and only 38.2% supporting the right of HIV-positive women to marry. In multivariable analysis, knowledge that HIV can be transmitted through sexual intercourse was associated with higher HIV testing uptake (aOR: 3.77, 95% CI: 1.50–9.48; $p < 0.01$). Awareness of mother-to-child transmission during pregnancy was also strongly associated with HIV testing (aOR: 15.89, 95% CI: 2.21–114.09; $p = 0.006$), and knowledge of HIV transmission through breastfeeding increased the likelihood of HIV testing (aOR: 6.00, 95% CI: 1.02–35.31; $p = 0.048$).

Unique Contribution to Theory, Practice and Policy: We conclude that the high prevalence of HIV infection in South Sudan is associated with limited autonomy in condom use and persistent stigmatizing attitudes toward HIV-positive women. Knowledge of key HIV transmission routes—particularly sexual intercourse, transmission during pregnancy, and breastfeeding—was independently associated with increased HIV testing uptake. Culturally sensitive, gender-responsive interventions are needed to reduce stigma and strengthen women's reproductive decision-making power. Improving education on mother-to-child HIV transmission is essential to enhance HIV testing and prevention outcomes.

Keywords: *HIV Prevention; Reproductive-Aged Women; Antenatal Care; South Sudan; HIV Testing; Socio-Cultural Barriers.*

1. INTRODUCTION:

Human Immunodeficiency Virus (HIV) remains a major public health concern globally, with continued transmission and preventable HIV-related deaths despite progress in prevention and treatment. In 2022, an estimated 39.0 million people were living with HIV worldwide, with 1.3 million new infections and about 630,000 AIDS-related deaths, showing that significant prevention and treatment gaps still exist. These gaps are more pronounced in low-resource settings, where access to comprehensive HIV services may be limited and socio-cultural barriers reduce uptake of testing and prevention interventions (1, 2).

Sub-Saharan Africa continues to bear the highest HIV burden, contributing the largest share of global infections and deaths. Women and adolescent girls remain disproportionately affected due to a complex interaction of biological vulnerability and structural factors such as poverty, gender inequality, limited decision-making power, stigma, and gender-based violence (3,4). These determinants influence women's ability to access HIV information, adopt preventive behaviors, and utilize HIV services consistently, particularly during pregnancy and childbearing years.

South Sudan experiences a generalized HIV epidemic within a fragile health system that has been weakened by conflict, displacement, inadequate infrastructure, shortage of trained health workers, and weak health information systems. These conditions hinder effective delivery of HIV prevention, testing, and treatment services, especially in rural and conflict-affected areas (5). Although international partners support HIV programming, service coverage remains suboptimal, and many women remain underserved by prevention and treatment interventions (5,6).

Antenatal care (ANC) clinics and prevention of mother-to-child transmission (PMTCT) services provide a critical entry point for HIV prevention among women of reproductive age. ANC/PMTCT platforms enable early HIV testing, counseling, health education, initiation of ART for HIV-positive women, and interventions that reduce vertical transmission. However, the success of these services depends strongly on women's knowledge, awareness, and preventive practices, which directly influence timely ANC attendance, acceptance of HIV testing, adherence to ART, and uptake of PMTCT interventions (7,8).

Despite the strategic importance of ANC/PMTCT services in preventing new maternal infections and eliminating mother-to-child transmission, limited recent evidence exists in South Sudan describing HIV-related knowledge, awareness, and preventive practices among reproductive-aged women attending these services. Without such evidence, designing targeted interventions to address misconceptions, stigma, socio-cultural barriers, and behavioral risk factors remains difficult (9,10).

Therefore, this cross-sectional study conducted in 2023 seeks to answer the following research question: What are the levels of knowledge, awareness, and preventive practices regarding HIV transmission and prevention among women aged 15–49 years attending ANC and PMTCT

services in South Sudan? The findings will inform health education programs, strengthen HIV prevention strategies, improve HIV testing uptake and PMTCT services, and support national efforts to reduce HIV transmission and improve maternal and child health outcomes.

2. METHODS

Study Design: A cross-sectional, study was conducted to determine Knowledge, Awareness, and Practices Impact on HIV Prevention Among Women Aged 15–49 Years Attending ANC and PMTCT Services in South Sudan. The study was conducted in South Sudan, a low-income, conflict-affected country in sub-Saharan Africa with a fragile health system [11,12]. The country has an estimated population of approximately 11.7 million, with women comprising about 52% of the population [11,13]. Living conditions are characterized by widespread poverty, low access to safe water (<50%) and sanitation (<7%), and high levels of female illiteracy [12]. Data were collected in July 2023 from 21 selected health facilities across the country. These facilities were purposively selected based on their high patient volume and the availability of HIV testing services [12]. The facilities represented both urban and rural settings in the major regions of South Sudan [12,13].

Study Population: The study population consisted of pregnant women of reproductive age (15–49 years) who attended antenatal care (ANC) services at the selected health facilities during the study period. Women were eligible to inclusion if they were pregnant, within the reproductive age range, and had undergone HIV testing during their ANC visit. Facility ANC registers and prevention of Mother-to-child Transmission (PMTCT) records were used to identify and enumerate eligible participants. Women with incomplete records, missing HIV test results, or those outside the defined reproductive age range were excluded from the study. Eligible participants constituted the sampling frame from which study data were obtained. Within each facility, all eligible women who attended during the study period were consecutively recruited until the required sample size was achieved.

Data resource and measurement:

Data collection tool: data were collected using a structured questionnaire administered through face-to-face interviews and by reviewing laboratory records. The questionnaire was designed to collect socio-demographic, reproductive, and HIV-related information to address the study objectives of determine the factors associated with HIV infection, laboratory records were reviewed to determine the proportion of women living with HIV attending the selected health facilities.

Selection of PMTCT health facilities: The sample of the health Facilities which provided PMTCT require to collected data were determined by using Logistic Indicators Assessment Tool (LIAT) [15]. Out of 21 health facilities among 136 were selected to be included in study. Sample size of reproductive-age women (15–49 year) was determined using a non-probability cluster sampling.

Sample size: The required sample size was estimated assuming an HIV prevalence of 2.3% among pregnant women, with a margin of error of 1.15% and a 95% confidence level [16]. Using this assumption, the initial sample size was calculated to be 679. Since the total population of women attending the selected antenatal clinics was less than 10,000 (7,216), the sample size was adjusted for the finite population, resulting in a final sample size of 620 women of reproductive age (15–49 years).

Variables: The study included HIV status as the dependent variable, categorized as positive coded 1 and negative 2. Independent variables were grouped into knowledge, attitudes, and practices (KAP). Knowledge variables included knowledge of HIV transmission routes (sexual intercourse, unsafe injections, contaminated blood transfusion, and mother-to-child transmission), knowledge of HIV prevention methods (condom use, abstinence, and safe injection practices), knowledge of PMTCT (during pregnancy, delivery, and breastfeeding), and general HIV awareness. Attitude variables included attitudes toward condom use (positive or negative), attitudes toward HIV testing (supportive or not supportive), attitudes toward PMTCT services (positive or negative), attitudes toward HIV-positive persons (including stigma, discrimination, marriage rights, and social inclusion), and gender norms such as spousal consent for condom use and women's autonomy. Practice variables included condom use (yes/no or consistent/inconsistent use), HIV testing behavior (ever tested or never tested), sexual risk behaviors (risky or non-risky), utilization of ANC and PMTCT services, and preventive behaviors such as safe sexual practices and avoidance of HIV exposure.

Statistical analysis: Data were entered, cleaned, and analyzed using IBM SPSS Statistics version 27. Descriptive statistics were used to summarize the study variables. Frequencies, percentages, means, and standard deviations were calculated, as appropriate, to describe the socio-demographic characteristics of the study population and levels of knowledge, awareness, and preventive practices regarding HIV transmission and prevention.

Binary logistic regression analysis was performed to examine the association between HIV status (dependent variable) and potential explanatory variables, including socio-demographic characteristics, knowledge of HIV transmission, knowledge of PMTCT, and preventive practices. Variables that were statistically significant in the bivariate analysis were entered into the multivariable logistic regression model to identify independent predictors of HIV infection. The results are presented as crude odds ratios (CORs) and adjusted odds ratios (AORs) with 95% confidence intervals (CIs). Statistical significance was determined using a two-sided p-value of < 0.05.

Ethical considerations: Ethical approval was obtained from the Research Ethics Committee of the Ministry of Health, Government of South Sudan, and the Ethical Committee of the State Ministry of Health of the Republic of South Sudan (Ethical Approval Number: MOH/RERB/P/18B MOH/RER/A/15B/2023). Permission to conduct the study was granted by the

relevant health authorities. All eligible participants were informed about the purpose, procedures, potential benefits, and potential risks of the study, and written informed consent was obtained prior to participation. Participation was entirely voluntary, and participants were informed of their right to decline or withdraw from the study at any time without any consequences. The confidentiality and anonymity of participants' information were strictly maintained throughout the study.

3. RESULTS

3.1. Socio-demographic Characteristics of the Study Participants: The study population was predominantly young, with 47.8% aged 18–24 years—an age group at elevated risk for HIV due to increased sexual activity and limited access to prevention services. In terms of residence, 53.7% of participants lived in rural areas, while 46.3% were from urban settings. Geographic analysis revealed regional disparities in HIV prevalence: Equatoria reported the highest prevalence (33.2%), followed by Upper Nile (31.7%) and Bahr el Ghazal (31.3%).

Educational attainment was generally low: 46.4% had no formal education or incomplete primary schooling, 26.6% had completed primary education, 24.4% had secondary education, and only 2.5% held a university degree. Employment status showed that 52.7% were unemployed, 34.9% were formally employed, and 12.4% were informally employed—highlighting economic vulnerability that may increase HIV risk.

Regarding marital status, 70.9% were married, 12.7% divorced or widowed, 11.9% never married, and 4.5% cohabiting. Notably, 49.0% of women married between ages 15–19, and 31.3% between 20–24 years, indicating high rates of early marriage—a factor linked to increased HIV vulnerability.

Wealth status revealed that 52.8% were classified as poor, 32.4% as middle-income, and 14.8% as rich. In terms of religion, the majority identified as Christian (88.9%), followed by Muslim (7.7%) and Traditional religions (3.4%), which may influence health-seeking behavior and perceptions of HIV prevention and care.

Table 1: Socio-demographic characteristics of women aged 15–49 years (N = 602) attending ANC and PMTCT services in selected health facilities in South Sudan, March–December 2023.

Variables		N (602)	(%)
Aged of women	below18	51	8.4
	18-24	288	47.8
	25-29	110	18.3
	30-34	80	13.3
	35-39	51	8.5
	40-45	22	3.7
Place of birth	Equatoria Region	200	33.2
	Bahr El Ghazal Region	188	31.3
	Upper Nile Region	191	31.7
	Other States	23	3.8
Place of residence	Rural	323	53.7
	Urban	279	46.3
Education attainment	No education	280	46.5
	Primary	160	26.6
	Secondary	147	24.4
	University and above	15	2.5
The current occupation of the respondents.	Not working	317	52.7
	Formal employment	210	34.9
	Non-formal employment	75	12.4
Marital status	Married	427	70.9
	Never marriage	72	11.9
	Divorced or widowed	76	12.7
	Cohabiting	27	4.5
The aged of respondent at first marriage	Under 15	35	5.8
	15-19	295	49.0
	20-24	188	31.3
	25-29	73	12.1
	above 30 year	11	1.8
Household Wealth	Poor	318	52.8
	Middle	195	32.4
	Rich	89	14.8
Religion	Christian	535	88.9
	Muslim	46	7.7
	Traditional	21	3.4

Notes: DCR= Demographic Breakdown of Respondents

3.2. knowledge of HIV among respondent women; General awareness of HIV was high among participants (93.3%); however, this was not associated with HIV status. Marked knowledge gaps were observed among HIV-positive women regarding sexual transmission, with 75% demonstrating poor knowledge compared with 25% who were aware of this mode of transmission. Similarly, 81.1% of HIV-positive respondents lacked knowledge that HIV can be transmitted through contaminated needles or sharp objects. Knowledge of unsafe blood transfusion as a mode of HIV transmission was also limited, with 81.5% of HIV-positive women unaware of this route, highlighting an important area of misinformation.

In contrast, knowledge of mother-to-child transmission during pregnancy, delivery, and breastfeeding was comparable across HIV status. Likewise, knowledge of condom use for HIV prevention was generally high (81.2%) and showed no meaningful difference by HIV status.

Overall, respondents demonstrated good knowledge of condom use (91.4%), including its role in preventing HIV and other sexually transmitted infections (76%), as well as its use during pregnancy (61.8%) and breastfeeding (57.3%). Nevertheless, HIV-positive women exhibited greater knowledge gaps, particularly regarding condom use during pregnancy (75% with poor knowledge) and breastfeeding (66.7% with poor knowledge), although these differences were not significant.

TABLE 2: Table 2: Knowledge of HIV among women aged 15–49 years (N = 602) attending ANC and PMTCT services in selected health facilities in South Sudan, March–December 2023.

Variable		HIV testing result		Total %	p-value
		Positive %	Negative %		
Knowledge of HIV (General)	Y	27(100)	565(98.3)	592(98.3)	<.489*
	N	0(0)	10(1.7)	10(1.7)	
Knowledge of HIV transmission through sexual intercourse	Y	6(25)	400(70.8)	406(67.5)	<.001**
	N	21(75)	165(29.2)	186(32.5)	
Knowledge of HIV transmission through drug injection or sharing contaminated items	Y	5(18.5)	395(69.9)	400(67.6)	<.004**
	N	22(81.5)	170(30.1)	192(32.4)	
Knowledge of HIV transmission through unsafe blood transfusion	Y	5(18.5)	400(70.8)	405(68.4)	<.001**
	N	22(81.5)	165(30.1)	187(31.6)	
Knowledge of HIV transmission from mother to child during pregnancy	Y	8(29.6)	399(70.6)	407(68.8)	<.001**
	N	19(70.3)	166(29.4)	185(31.2)	
Knowledge of HIV transmission to a child during delivery	Y	7(25.9)	422(74.7)	429(72.5)	<.001**
	N	20(74.1)	143(25.3)	163(27.5)	
Knowledge of HIV transmission through breastfeeding	Y	5(18.5)	418(73.9)	423(69.4)	<.001**
	N	22(81.5)	147(26.1)	169(30.6)	
Knowledge that condoms prevent HIV transmission	Y	26(96.3)	457(80.8)	483(81.2)	<.105*
	N	1(3.7)	109(19.2)	112(18.8)	
Knowledge about protective condom use	Y	24(88.9)	526(91.5)	550(91.4)	<.690*
	N	3(11.1)	49(8.5)	52(8.6)	
Knowledge that condoms reduce risk of HIV/STIs	Y	13(54.1)	405(77.0)	418(76.0)	<.035*
	N	11(45.9)	121(23.0)	132(24)	
Knowledge that condoms reduce HIV risk during pregnancy	Y	6(25)	334(98.2)	340(61.8)	<.001**
	N	18(75)	192(91.4)	210(38.2)	
Knowledge that condoms reduce HIV risk during breastfeeding	Y	8(33.3)	307(97.5)	315(57.3)	<.010*
	N	16(66.7)	219(93.2)	235(42.7)	

Notes: Y= Yes, N= No, *Significance level= $p < 0.05$; **highly significant= $p < 0.001$

3.3. Social and cultural beliefs on condom use and attitudes toward HIV-positive women

Overall, most respondents (87.6%) expressed positive beliefs regarding condom use for HIV prevention, with an even higher proportion among HIV-positive women (96.3%). Despite this generally favorable attitude, important sociocultural constraints were evident. A majority (70.8%) believed that women should not use condoms without their husband's consent, a view also reported by 57.7% of HIV-positive women, indicating persistent limitations on women's reproductive autonomy.

The belief that condom use encourages adolescent sexual activity was widely held (73.9% in the general population and 57.7% among HIV-positive respondents), reflecting ongoing community stigma toward sexual and reproductive health education. Attitudes toward condom use before marriage were mixed, with 59.9% in support and 40.1% in opposition; among HIV-positive women, responses were evenly divided (50% in favor and 50% opposed).

In addition, 67.8% of HIV-positive women and 59.9% of the general population endorsed beliefs aligned with restrictive sociocultural norms discouraging condom use. These patterns suggest that deeply rooted cultural and gender norms continue to influence perceptions of HIV prevention.

Regarding attitudes toward HIV-positive women, 70.5% of respondents supported their right to study or teach, although 29.5% expressed discriminatory views. Among HIV-positive respondents, most supported this right, yet 37.1% still reported stigma-related reservations.

Only 38.2% of the general population supported marriage for HIV-positive women, while 61.8% opposed it due to perceived transmission risks. Notably, 55.6% of HIV-positive women themselves believed that HIV-positive women should not marry, indicating internalized stigma.

Support for economic participation was relatively high, with 71.3% agreeing that HIV-positive women should be allowed to sell goods in markets; however, 28.7% still held exclusionary views. Among HIV-positive respondents, 74.1% supported market participation, while 25.9% did not.

Regarding isolation, 67.4% of respondents rejected the idea that HIV-positive women should be isolated at home or in healthcare settings, although 32.6% supported it. Among HIV-positive respondents, 81.5% opposed isolation, while 18.5% still endorsed it.

These findings indicate that, although no statistically significant associations were observed with HIV status, restrictive cultural beliefs and stigma remain prevalent and may negatively influence HIV prevention behaviors, mental health, and uptake of PMTCT services.

TABLE 3: Social and cultural beliefs on condom use and attitudes toward HIV-positive women among women aged 15–49 years (N = 602) attending ANC and PMTCT services in selected health facilities in South Sudan, March–December 2023,

Variables		HIV testing result		Total (%)	p-value
		Positive (%)	Negative (%)		
General belief in protective condom use	Y	26(96.3)	502(95.1)	528(87.6)	<.164*
	N	1(3.7)	74(98.7)	75(12.4)	
Belief: Women should not use condoms without husband's consent	Y	15(57.7)	359(95.9)	374(70.8)	<.131*
	N	11(42.3)	143(92.9)	154(29.2)	
Belief: Condoms promote sexual intercourse among adolescents	Y	15(57.7)	375(96.2)	390(73.9)	<.054*
	N	11(42.3)	127(92.1)	138(26.1)	
Belief: Male and female condoms should only be used before marriage	Y	13(50)	299(95.8)	312(59.9)	<.603*
	N	13(50)	203(93.9)	216(40.1)	
Belief: Condom use aligns with sociocultural norms	Y	13(50)	345(96.4)	358(67.8)	<.047*
	N	13(50)	157(92.4)	170(32.2)	
Belief: People with HIV should not be allowed to study or teach at school	Y	10(37.1)	169(94.4)	179(29.7)	<.396*
	N	17(62.9)	406(95.9)	423(70.3)	
Belief: People with HIV should not be allowed to marry to prevent HIV transmission	Y	12(44.4)	218(94.9)	230(38.2)	<.111*
	N	15(55.6)	357(95.9)	372(61.8)	
Belief: People with HIV should not be allowed to sell goods or products in the market	Y	7(25.9)	166(95.9)	173(28.7)	<.751*
	N	20(74.1)	409(95.3)	429(71.3)	
Belief: People with HIV should be isolated at home or in hospital to avoid stigma or transmission	Y	5(18.5)	191(97.4)	196(32.6)	<.114*
	N	22(81.5)	384(94.6)	406(67.4)	

Notes: Y= Yes. N= No, *Significance level= $p < 0.05$; **highly significant= $p < 0.001$

3.4. Factors Associated with knowledge of respondents on HIV transmission methods.

Overall, knowledge of HIV transmission methods demonstrated inconsistent associations with the outcome. While certain knowledge factors were statistically significant, others were not.

Knowledge of HIV transmission through sexual intercourse with an infected person showed a strong and statistically significant association with the outcome. Respondents who knew this mode

of transmission were 3.77 times more likely to exhibit the outcome compared to those who did not possess this knowledge (OR = 3.770; 95% CI: 1.499–9.481; $p < 0.01$).

In contrast, respondents who knew that HIV can be transmitted through injection drug use or sharing contaminated sharp objects were 3.80 times more likely to report the outcome (OR = 3.800; 95% CI: 0.793–12.099), though this association was not statistically significant.

Regarding knowledge of transmission through unsafe blood transfusions, the analysis did not reveal a statistically significant association with the outcome (OR = 2.233; 95% CI: 0.793–6.285; $p = 0.128$). Although the biological plausibility of this transmission route is well-established, the absence of a significant relationship may be due to low public awareness, underreporting, or limited variation in responses. Furthermore, persistent challenges in blood screening practices in many low- and middle-income countries may affect both the perceived and actual risk.

The paper reveals a strong and statistically significant association between knowledge of HIV transmission during pregnancy and the outcome. Respondents who are aware that HIV can be transmitted to their child during pregnancy are approximately 15.9 times more likely to undergo HIV testing compared to those who are not aware (AOR = 15.894; 95% CI: 2.214–114.089; $p = 0.006$).

In contrast, knowledge about HIV transmission during delivery was not significantly associated with the outcome. While the adjusted odds ratio indicates a 1.576 times higher likelihood of HIV testing among those aware of this transmission route (AOR = 1.576; 95% CI: 0.566–4.389), the association was not statistically significant ($p = 0.384$).

However, knowledge of HIV transmission through breastfeeding showed a statistically significant association with HIV testing. Respondents who knew that HIV can be transmitted via breastfeeding were nearly six times more likely to be tested for HIV than those who lacked this knowledge (AOR = 5.995; 95% CI: 1.018–35.312; $p = 0.048$).

Table 4: knowledge of HIV transmission methods among women aged 15–49 years (N = 602) attending ANC and PMTCT services in selected health facilities in South Sudan, March–December 2023.

Variables	B	Sig.	Exp(B)	95% C.I. for EXP(B)	
				Lower	Upper
Through sexual intercourse with infected person with HIV R.C (2= no) 1 = yes	1.327	0.005	3.770	1.499	9.481
Through injection drug or sharing contaminate object with blood of infected person R.C (2= no) 1 = yes	1.335	0.024	3.800	0.793	12.099
Through unsafe blood transfusion of infected person with HIV R.C (2= no) 1 = yes	0.803	0.128	2.233	0.793	6.285
Knowledge of respondents about Transmit HIV to their child during pregnancy R.C (2= No) 1=Yes	2.766	0.006	15.894	2.214	114.089
Knowledge of respondents about Transmit HIV to Child During the Delivery R.C (2= No) 1=Yes	0.455	0.384	1.576	0.566	4.389
Knowledge of respondents about Transmit HIV to Child During Breastfeeding R.C (2= No) 1=Yes	1.791	0.048	5.995	1.018	35.312

Notes: RC = Reference category; Sig. = Significant; CI = Confidence Interval

3.5. Factors Associated with Knowledge of PMTCT: Respondents who reported using condoms were less likely to experience the outcome compared to those who did not use condoms (AHR = 0.257), indicating a 74.3% reduction in risk. However, this association was not statistically significant (95% CI: 0.054–1.217; $p = 0.087$).

Abstinence from sexual intercourse with individuals infected with sexually transmitted infections (STIs), such as syphilis, showed a positive but non-significant association with the outcome. Respondents who reported this behavior were 1.384 times more likely to experience the outcome (95% CI: 0.517–3.704; $p = 0.517$).

Avoidance of sharing contaminated objects such as needles or sharp instruments had a negligible effect on the outcome. Those who reported this practice were slightly less likely to experience the outcome (AHR = 0.961; 95% CI: 0.320–2.885; $p = 0.944$), and the association was not significant.

Knowledge that condom use reduces the risk of HIV infection was associated with a reduced hazard of infection (HR = 0.324; 90% CI: 0.605–0.923), although this finding was not statistically significant.

Knowledge that condom use reduces the risk of mother-to-child transmission during pregnancy showed a positive but non-significant association with the outcome (AHR = 1.487; 95% CI: 0.564–3.919).

Similarly, knowledge that condom use reduces HIV transmission during breastfeeding was associated with a slightly higher, but non-significant, risk of infection (AHR = 1.128; 95% CI: 0.428–2.976).

TABLE 5: Knowledge of PMTCT among women aged 15–49 years (N = 206) attending ANC and PMTCT services in selected health facilities in South Sudan, March–December 2023.

Variables (Method of prevention of HIV)	B	Sig.	Exp(B)	95% EXP(B) Lower	C.I. for Upper
Male and female condom used to prevent infection and transmission of HIV/AIDS R. C (2 = No) 1 = Yes	-1.357	0.087	0.257	0.054	1.217
Abstain from sexual intercourse with individual infected with STI (Syphilis) R. C (2 = No) 1 = Yes	0.325	0.517	1.384	0.517	3.704
Avoid sharing HIV-positive persons care items that were contaminated with blood e.g. (razors, toothbrushes). R. C (2 = No) 1 = Yes	-0.040	0.944	0.961	0.320	2.885
protective condom reduces the risk of HIV/AIDS and STI R. C (2 = No) 1 = Yes	-0.602	0.219	0.324	0.605	0.923
protective condom reduces the risk of HIV transmission during the pregnancy R. C (2 = No) 1 = Yes	0.397	0.422	1.487	0.564	3.919
Protective condom reduces the risk of HIV transmission during breastfeeding. R. C (2 = No) 1 = Yes	0.120	0.808	1.128	0.428	2.976

Notes: RC = Reference category; Sig. = Significant; CI = Confidence Interval.

4. DISCUSSION:

Despite high levels of HIV prevention awareness—87.6% of respondents and 96.3% of HIV-positive women expressing positive attitudes toward condom use—substantial gender-related barriers remain. A large proportion (70.8%) believed that women should not use condoms without their husband's consent, highlighting persistent challenges to women's reproductive autonomy (17,18). In addition, stigma surrounding condom use remains widespread, with 73.9% of respondents and 57.7% of HIV-positive women believing that condom use encourages adolescent sexual activity. Restrictive beliefs about condom use were also common among HIV-positive women (67.8%), reflecting persistent sociocultural barriers to HIV prevention (19,20).

Attitudes toward HIV-positive women further demonstrated the persistence of stigma. Only 38.2% of respondents supported the right of HIV-positive women to marry, while more than half (55.6%) of HIV-positive women themselves opposed marriage for HIV-positive women, suggesting internalized stigma (21). Although most respondents supported the participation of HIV-positive women in economic activities, exclusionary attitudes remained prevalent (22). These findings indicate that cultural norms, gender inequalities, and HIV-related stigma continue to undermine HIV prevention efforts, including PMTCT services (23,18).

Knowledge of sexual transmission and mother-to-child transmission through pregnancy and breastfeeding was associated with greater HIV awareness and preventive behavior, emphasizing the importance of comprehensive HIV education (17,22,24,27,29). However, important knowledge gaps persisted regarding HIV transmission through unsafe injections and contaminated blood transfusions, indicating the need for strengthened health education on all modes of HIV transmission (18,25).

The observed association between knowledge and condom use with reduced HIV risk is consistent with previous studies by UNAIDS, WHO, and Weller and Davis-Beaty, which have demonstrated the effectiveness of condoms in preventing HIV transmission (17,18,30). Nevertheless, these studies also emphasize that knowledge alone is insufficient to ensure consistent condom use because social and cultural barriers often limit women's ability to negotiate safer sexual practices. Similar observations have been reported by Akwara et al. and Bajunirwe and Muzoora, who found that awareness does not always translate into protective behaviors because of stigma, unequal gender relations, and limited decision-making power within relationships (28,31). Collectively, these findings highlight the need for interventions that address both knowledge gaps and the underlying social and cultural factors that influence HIV prevention behaviors.

5. CONCLUSION

This study highlights a gap between HIV knowledge and preventive practices among women, particularly in condom use and HIV testing. Despite generally high awareness of HIV prevention and PMTCT, socio-cultural norms, gender inequality, and stigma—such as the need for spousal

consent for condom use—continue to limit women’s autonomy and reduce the effectiveness of prevention efforts. Knowledge of key transmission routes, including sexual intercourse, pregnancy, and breastfeeding, is associated with higher HIV testing uptake, although gaps remain in other areas. Overall, the findings emphasize that improving HIV outcomes requires not only increasing knowledge but also addressing underlying social and cultural barriers.

6. RECOMMENDATION:

Based on the study findings, HIV prevention programs should prioritize gender equality, women's empowerment, stigma reduction, and comprehensive HIV education. Accessible and confidential HIV testing should be strengthened, particularly within ANC and PMTCT services. A multisectoral and culturally sensitive approach, including meaningful male involvement, is recommended to improve HIV prevention and testing outcomes. The study contributes evidence on the relationship between HIV-related knowledge, gender norms, socio-cultural barriers, and HIV testing among women attending ANC and PMTCT services in South Sudan. Our findings support gender-responsive HIV policies, strengthen the integration of HIV education and testing into maternal health services, and provide practical guidance for culturally sensitive interventions aimed at reducing stigma and improving women's access to HIV prevention and testing services.

7. COMPETING INTERESTS: The authors declare no competing interest.

8. AUTHORS’ CONTRIBUTIONS:

Samuel John Aban Yor: Conceptualized and designed the study; developed the methodology; collected, curated, and analyzed the data; interpreted the results; prepared the figures and tables; drafted the original manuscript; revised the manuscript; and approved the final version.

Kamal Elbassir Mohamed Ali: Supervised the study; contributed to the study design and interpretation of the findings; critically reviewed and edited the manuscript; and approved the final version.

Both authors read and approved the final manuscript and agreed to be accountable for all aspects of the work

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