
This is the **accepted version** of the journal article:

Aixut, Sandra [et al.]. «Sexual and reproductive health knowledge and behaviors and prevalence of sexually transmitted infections among adolescents and young adults from Angola». *Journal of public health*, Vol. 47 Núm. 3 (August 2025), p. e318-e328. DOI 10.1093/pubmed/fdaf054

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**Sexual and reproductive health knowledge and behaviors
and prevalence of sexually transmitted infections among
adolescents and young adults from Angola.**

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Keywords:	Sexual health, Public health, Sexual behaviour

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	Urban N = 976 (%)	Rural N = 424 (%)	p value
Age (years); Mean (SD)	20 (2.89)	18.2 (2.69)	< 0.001
Biological Sex, male	612 (62.7%)	239 (56.4%)	0.008
Gender identity (non-binary)	3 (0.3%)	4 (0.9%)	0.02
Civil status (married)	23 (2.4%)	11 (2.6%)	0.617
Having children	128 (13.1%)	52 (12.3%)	0.469
Education			
- None	4 (0.4%)	3 (0.7%)	< 0.001
- Primary	48 (4.9%)	18 (4.2%)	
- Secondary	733 (75.1%)	390 (92%)	
- Superior	189 (19.4%)	13 (3.1%)	
Current employment	263 (26.9%)	77 (18.2%)	< 0.001

Table 1. Baseline characteristics of the participants in urban and rural municipalities.

*Values are expressed as the number and percent and/or mean, $\pm$ SD unless otherwise specified.

Table 2. Variables associated to sexual and reproductive health knowledge

			Univariate		Multivariate	
	No knowledge (n = 582)	Adequate knowledge (n = 818)	OR (95% CI)	P value	OR (95% CI)	P value
Place of residence, urban	331 (56.9%)	645 (78.9%)	2.83 (2.24-3.57)	<0.001	1.52 (1.35-2.04)	0.005
Age (years) Mean (SD)	18.4 (±2.9)	20.2 (±2.8)	1.23 (1.18-1.28)	<0.001	1.14 (1.09-1.20)	< 0.001
Gender (male)	385 (66.2%)	471 (57.6%)	1.44 (1.15-1.79)	0.001	2.06 (1.57-2.71)	< 0.001
Having children	75 (12.9%)	195 (12.8%)	0.94 (0.70-1.27)	0.709		
Risky-sex behavior	193 (33.2%)	262 (32%)	1.05 (0.84-1.32)	0.656		
Education						
□ None	6 (1%)	1 (0.1%)	0.02 (0.00-0.20)	0.001	0.19 (0.14-2.58)	0.211
□ Primary	48 (8.2%)	18 (2.2%)	0.05 (0.03-0.10)	<0.001	0.14 (0.06-0.31)	<0.001
□ Secondary	502 (86.3%)	621 (75.9%)	0.17 (0.11-0.27)	<0.001	0.37 (0.23-0.60)	<0.001
□ Superior	25 (4.3%)	177 (21.1%)	REF (1)	-	REF (1)	-
Sources of information						
□ School	400 (88.7%)	727 (93.4%)	1.82 (1.21-2.73)	0.004	1.27 (0.79-2.02)	0.318
□ Mother	238 (42.8%)	432 (55.7%)	1.13 (0.89-1.42)	0.314		
□ Father	201 (44.6%)	325 (41.9%)	0.90 (0.71-1.13)	0.369		
□ Siblings	228 (50.6%)	379 (48.9%)	0.94 (0.74-1.18)	0.577		
□ Health prof.	189 (41.9%)	421 (54.3%)	1.65 (1.30-2.08)	<0.001	1.01 (0.76-1.34)	0.930
□ Friends	335 (74.3%)	625 (80.7%)	1.45 (1.10-1.91)	0.008	0.85 (0.61-1.21)	0.388
□ Television	314 (69.6%)	633 (81.8%)	1.96 (1.49-2.57)	<0.001	0.96 (0.67-1.38)	0.832
□ Journals/books	249 (55.2%)	568 (73.3%)	2.23 (1.74-2.84)	<0.001	1.37 (1.00-1.86)	0.049
□ Internet	258 (57.2%)	626 (80.9%)	3.16 (2.44-4.09)	<0.001	2.33 (1.69-3.21)	<0.001
□ Radio	236 (52.3%)	430 (55.5%)	1.13 (0.90-1.43)	0.285		

**OR: Odds Ratio, CI: Confidence Interval

* Values are number and percent unless otherwise

Table 3. Variables associated to risky-sexual behavior

			Bivariate		Multivariate	
	No risky-sex behavior (n = 533)	Risky-sex behavior (n = 453)	OR (95%CI)	P value	OR (95% CI)	P value
Place of residence, urban	403 (75.6%)	334 (73.7%)	0.91 (0.68-1.22)	0.499	0.98 (0.70-1.39)	0.919
Age (years) Mean (SD)	20.3 (2.86)	20.2 (2.83)	0.99 (0.95-1.04)	0.759	1.01 (0.96-1.06)	0.694
Gender (male)	305 (57.2%)	360 (79.5%)	2.89 (2.17-3.85)	< 0.001	2.89 (2.13-3.92)	< 0.001
Education						
• None	2 (0.4%)	0 (0%)	0.00	0.999		
• Primary	28 (5.3%)	16 (3.5%)	0.84 (0.42-1.68)	0.630		
• Secondary	401 (75.2%)	368 (81.2%)	1.36 (0.97-1.90)	0.076	1.36 (0.96-1.93)	0.083
• Superior	102 (19.1%)	69 (15.2%)	REF (1.00)	-		
Any sexual health knowledge	479 (89.9%)	409 (90.3%)	0.95 (0.63-1.45)	0.827		
Sources of information						
• School	452 (94.0%)	367 (89.7%)	0.53 (0.34-0.92)	0.021	0.63 (0.37-1.06)	0.080
• Mother	262 (54.7%)	223 (54.5%)	0.99 (0.76-1.29)	0.959		
• Father	219 (45.7%)	179 (43.8%)	0.92 (0.71-1.20)	0.559		
• Siblings	248 (51.8%)	189 (46.2%)	0.80 (0.61-1.04)	0.098	0.88 (0.66-1.18)	0.398
• Health prof.	257 (53.7%)	203 (49.6%)	0.85 (0.65-1.11)	0.232		
• Friends	393 (82.0%)	307 (75.2%)	0.66 (0.48-0.92)	0.014	0.81 (0.55-1.20)	0.298
• Television	384 (80.3%)	309 (75.6%)	0.76 (0.55-1.04)	0.086	0.92 (0.62-1.36)	0.665
• Journals/books	342 (71.4%)	263 (64.3%)	0.72 (0.54-0.96)	0.024	1.11 (0.80-1.55)	0.558
• Internet	364 (76.0%)	295 (72.3%)	0.82 (0.61-1.11)	0.211		
• Radio	271 (56.6%)	229 (56.0%)	1.02 (0.78-1.34)	0.861		
Adequate sexual and reproductive health knowledge	335 (62.9%)	262 (57.8%)	0.81 (0.63-1.05)	0.109	0.92 (0.68-1.25)	0.599

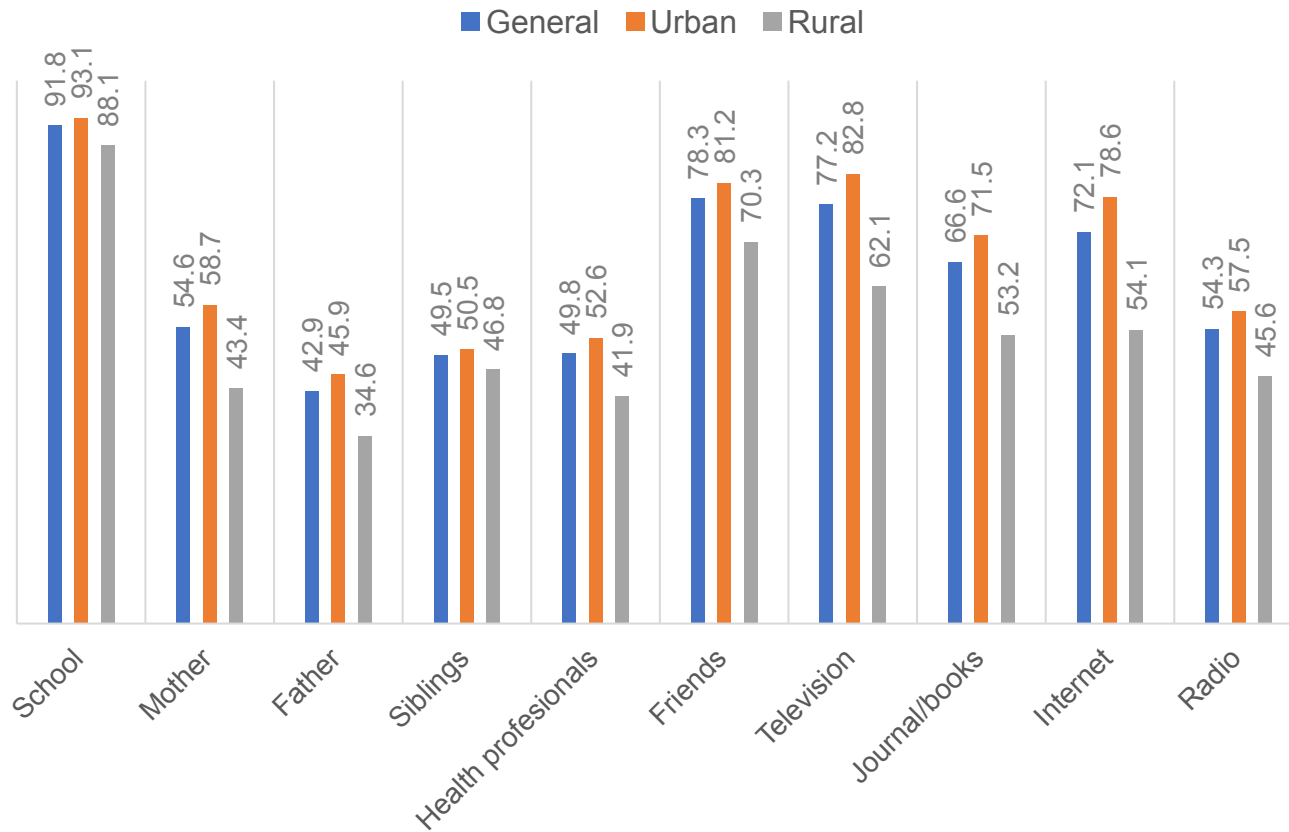
* We have excluded those who never had sex for the risky-sexual behavior analysis (total N = 1121)

STI RDT testing	Urban N = 976	Rural N = 424	p value
HIV antibodies	2 (0.2%)	3 (0.7%)	p = 0.167
HBsAg	134 (13.8%)	56 (13.2%)	p = 0.784
HCV antibodies	2 (0.2%)	2 (0.5%)	p = 0.589
T. pallidum antibodies	11 (1.1%)	9 (2.1%)	p = 0.147
Physical exam	Urban N = 28	Rural N = 41	
Abnormal discharge (urethral or vaginal)	7 (25%)	13 (0.9%)	p = 0.546
Ulcers	1 (3.6%)	0	p = 0.406
Adenopathies (inguinal)	2 (7.1%)	4 (9.8%)	p = 1.000
Condyloma	0	1 (2.4%)	p = 1.000

Table 4. Seroprevalence of the four screened STIs and clinical findings among youth from urban and rural areas.

*Values are expressed as the number and percent.

Percentage of young people who responded that reported having knowledge of sexual and reproductive health from different information sources



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Sexual and reproductive health knowledge and behaviors and prevalence of sexually transmitted infections among adolescents and young adults from Angola.

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Abstract

Background and objective

There is little information on sexual and reproductive health knowledge and practices in Angola and no data on the prevalence of sexually transmitted infections. The objective of this study was to assess the SRH knowledge (SRHK) and behaviors, and estimate the prevalence of four STIs

among adolescents and young adults from 4 municipalities in Benguela province, Angola prior to an educational intervention.

Material and methods

We performed a cross-sectional study to assess SRH knowledge and sexual behavior using a structured questionnaire among adolescents and young adults aged 15 to 25 years old from two urban and two rural municipalities of Benguela province. We also evaluated the prevalence of HIV, HCV, HBV and Syphilis using rapid tests.

Results

A total of 1400 youths were included in the study. Overall, 818 (58.4%) participants had adequate SRH knowledge. Urban origin [OR 1.52, 95% CI 1.35-2.04], older age [OR 1.14, 95% CI 1.09-1.20], being female [OR 2.06, 95%CI 1.57-2.71] and having journals and internet as the main sources of information [OR 1.37, 95% CI 1.00-1.86 and OR 2.33, 95% CI 1.69-3.21 respectively] were significantly associated to a good SRHK in the multivariate analysis . Four hundred and fifty-three [45.9% of those who have had sexual intercourse (n=986)] reported risky sexual behavior. We observed that risky sexual behavior was associated with male gender (OR 2.89 95% CI 2.13-3.92, p<0.001). Prevalence of STI was: 5 (0.35%) for HIV, 190 (13.6%) for HBV, 4 (0.3%) for HCV and 20 (1.4%) for syphilis.

Conclusion

SRHK was higher than expected although in-depth knowledge was uncommon, especially in women from rural areas with lack of access to journals or the internet. Unsafe sexual behavior was widespread among our sample. Prevalence of HBV was higher than expected. Sexual education campaigns using both digital and non-digital approaches should be focused on reaching the young population dispersed in rural areas where internet connection is difficult and should be accompanied by HBV vaccination promotion.

Keywords

Sexual and reproductive health knowledge

Sexually transmitted infections

Adolescents and young adults

Youth empowerment

STI prevalence

Implications and contributions: Adolescents and young adults are a vulnerable population regarding sexual and reproductive health. This cross-sectional study aims to assess the baseline knowledge and behaviors and prevalence of sexually transmitted infections among the young population of Benguela province (Angola) prior to the design and implementation of an educational intervention. These findings underscore the necessity of targeted educational campaigns that consider local contexts, ensuring both digital and traditional communication methods reach underserved populations effectively.

Introduction

A good sexual and reproductive health (SRH) is defined as the state of complete physical, mental and social well-being in all matters relating to sexuality and the reproductive system. Sexual and reproductive health and rights (SRHR) are fundamental to people's health and survival, to economic development and to the wellbeing of humanity. United Nations Sustainable Development Goals (UNSDG) include specific targets related to SRHR, and a clear statement to be included as an essential part of universal health coverage [1].

Adolescents and young adults represent a vulnerable population regarding SRH [2] and are at greater risk of contracting sexually transmitted infections (STIs) due to many behavioral, social and biological aspects [3,4]. STIs are among the most common acute clinical conditions worldwide especially in many low- and middle-income countries (LMICs) [5-7]. Data about the incidence and prevalence of STIs among adolescents and young adults in most sub-Saharan African (SAA) countries is scarce. Moreover, there is a lack of comprehensive sexual education and limited availability of contraceptives in many of these countries [8].

Gender inequality further exacerbates this situation for adolescent girls and young women. Globally, approximately 1 in 3 women between the ages of 15 and 49 years old, and 1 in 10 under the age of 20 years old have experienced physical and/or sexual violence [9]. In SSA, early pregnancies and unsafe abortions are still common, and complications during the pregnancy and the childbirth continue to be a leading cause of death among young girls [9]. Moreover, lack of access to contraceptives and comprehensive sexual education exacerbates gender inequality by interrupting their education, limiting their career opportunities and perpetuating the cycle of poverty. [10]. Furthermore, girls and young women aged 15 to 24 years are twice as likely to be living with HIV than young boys [11].

Raising awareness of condom use, encouraging STIs testing, recommending voluntary medical male circumcision and acting against the triple elimination of mother-to-child transmission are some of the priority actions proposed by World Health Organization (WHO) specially among

adolescents and young people [9,12]. Moreover, promoting gender equality, and removing social stigma and discrimination based on gender or sexual orientation, are key to improving SRH. Educational interventions should be the cornerstone to ensure SRHR. However, there is mixing evidence on the positive and lasting impact of these actions, which might be related to different methodologies and duration [13-15]. Furthermore, evidence from behavioral interventions highlights that strategies aimed at promoting SRHR must be context-specific, as approaches that prove effective in one setting may not necessarily yield the same outcomes in another. Sociocultural norms, access to healthcare services, educational background, and community perceptions significantly influence the success of such interventions. Therefore, prior to the implementation of any SRHR initiative, it is essential to conduct a comprehensive baseline assessment to evaluate the specific needs, knowledge gaps, and existing barriers within the target population. Understanding the local context and engaging with the communities involved are fundamental steps to ensuring that interventions are tailored appropriately and maximize their impact. [16]. This is particularly relevant given the disparities in sexual and reproductive health (SRH) knowledge and behaviors observed in different local contexts.

This study is framed within the FUTURO project (Innovative tools for the empowerment and education of the youth in sexual and reproductive health policies) [17] funded by the EU, which aims to improve the knowledge and practices in SRH of young people in two municipalities of the province of Benguela: Cubal and Lobito. For the elaboration of the campaign we considered it necessary to know the knowledge and practices of young people, in order to focus the actions more precisely. Our hypothesis was that SHK would be different in urban and rural areas and that there would be some variables associated with a higher risk behavior. Differences in SRHR knowledge and STI prevalence based on locality have been widely documented, primarily due to disparities in access to information. Studies in various African countries

have shown that rural areas often face significant barriers, including limited or no internet access, stronger cultural taboos, and more conservative social norms that restrict discussions on sexual health, thereby reducing information accessibility. In contrast, urban areas generally provide greater exposure to educational resources, media, and healthcare services, facilitating better SRHR awareness [18,19].

Given these disparities, we hypothesized that rural participants would have lower SRHR knowledge and face greater barriers in accessing sexual health services.

Thus, the aim of this study was to assess the baseline knowledge and behaviors about SRH among adolescents and young adults of Benguela province (Angola) and to estimate the prevalence of four STIs (HIV, syphilis, HBV and HCV) prior to an educational campaign.

Material and methods

Study design and setting

We performed a cross-sectional study to assess SRH knowledge (SRHK), sexual behavior, and prevalence of HIV, Syphilis and hepatitis B and C among adolescents and young adults aged 15 to 25 years from 4 municipalities of Benguela province, Angola: two urban areas (Benguela and Lobito) and two rural ones (Cubal and Caimbambo). This study was conducted during May and June 2021. Cubal and Lobito are the intervention municipalities of the FUTURO project. Since the final objective of the FUTURO project is to assess the impact of an educational campaign, we also considered including two municipalities to be used as controls, one rural (Caimbambo) and one urban (Benguela), in order to see the differences between intervention and control municipalities at the end of the project.

During the previous months, we carried out several meetings with municipal and provincial governments, public-health authorities and local non-governmental organizations to inform about the study, to create spaces for carrying out the evaluation and to help publicize the study among young people.

Participation was free. All people from 15 to 25 years old were offered to participate in the study. A written consent form was signed by all participants before starting with the questionnaire.

Sexual and reproductive health questionnaire.

Participants were asked to fill a structured and self-administered questionnaire with 45 questions regarding the following subjects: sociodemographic variables, general sexual health, HIV and other STI, family planning, gender equality and sexual behavior. The questions were obtained from validated questionnaires from WHO and Public Health Agency of Catalonia [20,21]. The questionnaire was first reviewed by a group of STIs experts from Hospital Vall Hebron, Barcelona, Spain and by the personnel of three local NGOs participating in the FUTURO project. Before the study, the questionnaire was performed to 60 youth working in the FUTURO project to ensure an accurate understanding.

In case of comprehension difficulties, a facilitator from the FUTURO project helped to understand the specific question. Scoring was done as follows: 1 point was given for each correct answer and 0 point for each incorrect or “not known” answer. The highest possible score was 25 points and we considered ≥ 17 points (more than 2/3 of correct answers) as the cut-off value for an “adequate” knowledge about SRH. Each topic of the questionnaire was also evaluated separately (Sexual health, HIV and other STI, family planning, and gender equality). Knowledge of each of the topics was considered adequate if 2/3 of the corresponding questions had been answered correctly. Risky sexual behavior was defined as having multiple sexual partners (>1 in the last 12 months), multiple sex partners at once, sex under the effect of drugs or alcohol, not using condom in sporadic sex, exchange for money sex, men who has sex with men (MSM) and participants who reported history of STIs.

The detailed description of the questionnaire, the scoring system and the questionnaire can be found in annex A and B.

Sexual transmitted infections screening

All participants were screened for HIV (Alere Determine HIV 1/2, Abbott), HBV (HBsAg, Nantong diagnosis Biotechnology), HCV (antibodies against HCV, Nantong diagnosis Biotechnology) and Syphilis (Treponema pallidum antibodies, Nantong diagnosis Biotechnology) using rapid diagnostic test (RDT) in capillary blood samples. Moreover, participants were asked about ongoing symptoms suggestive of STIs. In case of reporting symptoms, a medical examination was offered. All participants with a positive and indeterminate RDT and those who had a pathological physical exam or symptoms of an STI were counseled and referred to the corresponding health areas for further evaluation. Screening for these 4 STIs was chosen based on the availability of a low-cost rapid test in the country.

Sample size calculation

Sample calculation was performed based on the global aim of FUTURO project, which is to increase SRHK by 20% on young people from Benguela province. Since there is no data available on SRHK in Angola, the sample size was calculated based on data from other sub-Saharan Africa countries [22]. We assumed that 40% of the interviewed youth would have a good SRHK. Considering an alpha risk of 0.05 and a power of 80%, we estimated that we would need to enroll 1400 participants in order to detect an improvement of 20% in SRHK after the 4 years intervention. "The total sample size was proportionally distributed across municipalities based on data from the 2014 Angolan census. Additionally, we considered that 18% of the Angolan population falls within the 15–25 age range. Consequently, we enrolled 605 individuals (43.2%) from Benguela, 371 (26.5%) from Lobito, 329 (23.5%) from Cubal, and 95 (6.8%) from Caimbambo. This distribution closely reflects the relative population sizes of these municipalities, ensuring that our sample is representative of the demographic structure in the study areas.

Data management and statistical analysis

Qualitative variables were represented as absolute numbers and percentages, and quantitative variables as mean and standard deviation or median and interquartile range, depending on whether the variable had a normal distribution. The normal distribution of quantitative variables was tested through the Shapiro–Wilk test. For bivariate analysis, chi-square or Fisher test was used to compare qualitative variables, and T test or Mann-Whitney tests depending on the normality of the variable to compare quantitative variables. We performed bivariate analysis to identify variables associated with SRHK and to sexually risky behaviors as independent variables. Variables with a p-value < 0.20 in the bivariate analysis and variables considered *a priori* to be clinically important, were included in the multivariate logistic regression analysis. A p-value < 0.05 was considered statistically significant. The RedCap software [23] was used for data storage and IBM SPSS, 26 (SPSS Inc., Armonk, NY, USA) for the subsequent analysis.

Results

Sociodemographic characteristics

A total of 1400 adolescents and young adults participated in the study, 424 (30.3%) from rural and 976 (69.7%) from urban municipalities. Mean (SD) age was 19.5 (±2.9) years and 856 (61.1%) were men. Sociodemographic variables differed between rural and urban areas as shown in Table 1.

Sexual and reproductive health knowledge

Overall, 1226 (87.6%) reported having any SRHK and the main sources of information were school in 1125 (91.8%), friends in 960 (78.3%), television in 947 (77.2%) and internet in 884 (72.1%). Most people in urban areas referred to having any SRHK (92.1% vs. 77.1%, p<0.001) and sources of information varied according to the place of residence. This information is summarized in Figure 1.

Globally, 818 (58.4%) participants had adequate knowledge about SRH. Regarding specific subjects, 357 (25.5%) individuals had good knowledge on general sexual health, 961 (68.6%) people reported good knowledge regarding HIV and other STI, 528 (37.7%) people had good knowledge about gender equity and 710 (50.7%) persons knew 3 or more contraceptive methods. Urban origin [OR 1.52, 95% CI 1.35-2.04], older age [OR 1.14, 95% CI 1.09-1.20], being female [OR 2.06, 95%CI 1.57-2.71] and having journals and internet as the main sources of information [OR 1.37, 95% CI 1.00-1.86 and OR 2.33, 95% CI 1.69-3.21 respectively] were significantly associated to a good SRHK in the multivariate analysis . We observed that people with no education, primary education or secondary education were more likely to have less sexual knowledge compared with superior education [OR 0.19 (95% CI 0.14-2.58); OR 0.14 (95% CI 0.06-0.31) and OR 0.37 (95% CI 0.23-0.60) respectively]. Table 2 summarizes the variables associated with a good knowledge of SRH.

Sexual behavior

Overall, 986 (70.4%) participants reported having had sexual intercourse. Mean age of first sexual relationship was 15.9 (± 2.7). Four-hundred and fifty-three (45.9%) participants reported risky sexual behavior during the last year. A total of 252 (18%) participants had been tested for HIV previously. In the multivariate analysis, we observed that risky sexual behavior was associated with male gender (OR 2.89 95% CI 2.13-3.92, $p < 0.001$) as seen in table 3. No significant differences were observed between urban and rural municipalities regarding risky sexual behavior.

Prevalence of sexual transmitted infections

Five (0.35%) participants were positive for HIV antibodies (4 women), 190 (13.6%) tested positive for HBsAg, being more men than women (67.9% vs. 32.1%, $p = 0.040$). Four (0.3%) were positive for HCV antibodies and 20 (1.4%) for *Treponema pallidum* antibodies. Sixty-nine (4.9%)

participants reported some symptoms or lesions in the genital area. During the physical examination, 20 (28.9%) of them presented abnormal discharge, 1 (1.4%) had genital ulcers, 6 (8.7%) had inguinal adenopathies and 1 (1.4%) had genital condylomas. Table 4 shows the prevalence of STIs and clinical findings among youth from urban and rural areas.

Discussion

In our cross sectional study regarding sexual knowledge and behaviors of young people in Benguela province, we observed that less than 60% of the participants had an adequate SRHK and almost 50% reported risky sexual behavior. Sexual knowledge was significantly higher in urban municipalities, among older participants, and among those who used the internet or journals as sources of information. Our findings confirm our hypothesis that SRHK varies based on locality, with urban participants demonstrating better knowledge and access to information, aligning with prior studies on SRH disparities.

Although older age and urban setting have been consistently found to be associated with a better SRHK [22,24,25], recent reports suggest that urban-rural stratification could be too simplistic as the poor people from urban areas have equally poor indicators than their rural counterparts [26]. In our case, we believe that the older age and a greater percentage of participants with higher education (19% vs 3%) found in the urban municipalities might also explain the relationship with a better SRHK [22]. However, we found that fewer young people from rural areas had access to any source of sexual health information, with particularly limited access to the internet, journals, books, and television. These conditions likely contribute to the lower levels of knowledge observed in rural participants.

Regarding sources of sexual information, there is growing evidence suggesting the utility of new technologies and social media to provide SRH education [27-29]. Nevertheless, the availability

of internet connection is not good in many areas of Angola, being worse in rural areas. Moreover, the cost of the internet is high, so a constant source of information through the internet can only be afforded by people with greater purchasing power, leaving out people with scarce economic resources. Therefore, other sources of information such as school, television or radio should be also used when designing educational campaigns.

Moreover, we found that being female was associated with better SRHK, and, consistent with previous studies, SRHK was not necessarily linked to safer sexual practices [30,31]. Given that no significant differences in educational level were observed between men and women in our sample, other factors may explain this gender difference in SRHK. One possible explanation is that women may be more exposed to sexual and reproductive health information through healthcare visits, maternal health programs, or targeted community interventions. Additionally, gendered social norms could influence information-seeking behaviors, with women potentially being more proactive in accessing SRH knowledge or being more receptive to discussions on the topic. Future qualitative studies would be valuable in exploring the social and structural factors contributing to these gender differences and their implications for sexual health education and interventions.

We observed lower knowledge on gender equality and family planning issues compared to knowledge of HIV and other STIs. Reports from an observational study including more than 7600 adolescents aged 10-19 years from seven African countries found similar results regarding questions related to HIV [22]. In contrast, our results are better than those reported in a systematic review assessing the knowledge gaps of STIs among 5900 adolescents and young adults from 35 African countries [32]. Despite detecting a good knowledge about HIV, less than 37% pregnant women in Angola are tested for HIV [33] as recommended by the WHO [34]. Moreover, stigma related with STI and HIV infections is still high. Knowledge about sources of infection and HIV treatment must be strengthened in order to end with stigma and discrimination [35].

A high percentage of the participants were sexually active and the mean age of the first sexual intercourse was slightly earlier than reports from other South African countries [22]. Increased risky sexual behavior among adolescents and young adults is a worldwide concern. In our sample, reported risky sexual behavior was high (46%) although probably related to the broad definition used [36-38].

Despite contraceptive methods that are supposed to be free-of-charge, Angola is listed among the countries with the highest fertility rates. Although the projections show a downward trend [39], it is relevant that only 50% of the sexually active participants reported using contraceptives. Surprisingly, almost 20% reported having economic difficulties in purchasing condoms. This might be related to several reasons: a lack of awareness of its free availability, a low percentage of family-planning adherence, or that in reality, even if they are free of charge, the availability of condoms on a daily basis is scarce. Moreover, approximately 25% of the participants believed that contraception is only a woman's duty. Approximately 18% of the respondents had been previously pregnant with a high percentage of early pregnancies which contributes to gender inequalities. In addition, 32% of those with a previous pregnancy reported at least one abortion, which was significantly higher in urban areas and in line with regional estimates [40]. Angola has restricted laws regarding this procedure and therefore we assume that a higher percentage of those pregnancy-losses could be voluntary and probably performed under unsafe conditions. Unsafe abortion is still a leading cause of death among young girls and should be a priority to end with it.

Regarding STIs screening, we observed a low prevalence of HIV, HCV and Syphilis and a high prevalence of HBV. Our results are in line with national estimates for HIV prevalence among people younger than 20 years (<1%) [33]. Although not statistically significant, 4 of the 5 cases detected were females, supporting the fact that young girls

are especially vulnerable to HIV [11]. Regarding HCV, the few cases detected are most likely related to unsafe blood transfusion or other medical procedures [41]. Syphilis prevalence was lower than the few available data from the country [42] and unfortunately, we could not assess the percentage of active infection. On the contrary, our results support the hyper-endemicity of HBV infection. It is likely that most of those infections had been due to early-horizontal transmission rather than sexually transmitted. Although recent estimates show a downward trend of HBV infection among children below 5 years [43], it is probably insufficient to achieve the goals of chronic viral hepatitis elimination [6].

Our study has several limitations: First, the gender imbalance and the lack of socioeconomic status evaluation which has prevented us to include it as a relevant cofactor to assess SRHK. In addition, we were unable to evaluate the prevalence of major curable STIs as *Chlamydia trachomatis* or *Neisseria gonorrhoeae* due to the low budget and technical limitations. As a counterpart, this is the first data released regarding SRHK and sexual behavior exclusively among adolescents and young adults from Angola and will be used to lay the groundwork and to measure the impact of our intervention.

On the other hand, qualitative studies would be needed to understand the underlying reason why gender is a determining factor when it comes to having better knowledge of SRH, in which the male gender is favored. And finally, we should focus on the reasons why having better knowledge of SRH does not always equate to safe sexual practices. Only in this way will we be able to design real impact educational interventions to improve knowledge of sexual and reproductive health and sexual practices among young people.

In conclusion, we found a higher SRHK than expected but in-depth knowledge was uncommon, especially in women from rural areas with no access to journals nor internet. Half of the participants reported risky sexual behavior, we detected a huge lack of family planning

counseling and rates of early pregnancies and abortion were high. Our findings are in line with the most worrying SRH issues found in LMICs [2] and reinforces the need for a project like FUTURO.

Abbreviations

- SRH:** Sexual and Reproductive Health
- SRHR:** Sexual and Reproductive Health and Rights
- STIs:** Sexually Transmitted Infections
- HIV-AIDS:** Human Immunodeficiency Virus – Acquired Human Immunodeficiency Syndrome
- HCV:** Hepatitis C Virus
- HBV:** Hepatitis B Virus
- SRHK:** Sexual and Reproductive Health Knowledge
- UNSDG:** United Nations Sustainable Development Goals
- LMICs:** Low- and Middle-Income Countries
- SAA:** Sub-Saharan Africa
- WHO:** World Health Organization
- NGOs:** Non-Governmental Organizations
- RDT:** Rapid Diagnostic Tests
- MINSA:** Ministério da Saúde de Angola
- MTCT:** Mother-To-Child Transmission
- IQR:** Interquartile Range
- OR:** Odds Ratio
- MSM:** Men who have Sex with Men

Statements and Declarations

Ethical statement: The study was designed, implemented and reported in accordance with the Declaration of Helsinki, Good Clinical Practice guidelines and was approved by the ethics

committee of the health ministry of the Republic of Angola (MINSA) (nº14/2021). Participation was voluntary and written informed consent was requested for study inclusion.

Availability of data and materials: Raw data were generated at Hospital Vall Hebron. Derived data supporting the findings of this study are available from the corresponding author [J.MC] on request.

Conflict of interest: The authors have no competing interests to declare that are relevant to the content of this article.

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Figure 1. Sources of information on SRH used by adolescents and young adults.

	Urban N = 976 (%)	Rural N = 424 (%)	p value
Age (years); Mean (SD)	20 (2.89)	18.2 (2.69)	< 0.001
Biological Sex, male	612 (62.7%)	239 (56.4%)	0.008
Gender identity (non-binary)	3 (0.3%)	4 (0.9%)	0.02
Civil status (married)	23 (2.4%)	11 (2.6%)	0.617
Having children	128 (13.1%)	52 (12.3%)	0.469
Education			
- None	4 (0.4%)	3 (0.7%)	< 0.001
- Primary	48 (4.9%)	18 (4.2%)	
- Secondary	733 (75.1%)	390 (92%)	
- Superior	189 (19.4%)	13 (3.1%)	
Current employment	263 (26.9%)	77 (18.2%)	< 0.001

Table 1. Baseline characteristics of the participants in urban and rural municipalities.

*Values are expressed as the number and percent and/or mean, ± SD unless otherwise specified.

			Univariate		Multivariate	
	No knowledge (n = 582)	Adequate knowledge (n = 818)	OR (95% CI)	P value	OR (95% CI)	P value
Place of residence, urban	331 (56.9%)	645 (78.9%)	2.83 (2.24-3.57)	<0.001	1.52 (1.35-2.04)	0.005
Age (years) Mean (SD)	18.4 (±2.9)	20.2 (±2.8)	1.23 (1.18-1.28)	<0.001	1.14 (1.09-1.20)	< 0.001
Gender (male)	385 (66.2%)	471 (57.6%)	1.44 (1.15-1.79)	0.001	2.06 (1.57-2.71)	< 0.001
Having children	75 (12.9%)	195 (12.8%)	0.94 (0.70-1.27)	0.709		
Risky-sex behavior	193 (33.2%)	262 (32%)	1.05 (0.84-1.32)	0.656		
Education						
• None	6 (1%)	1 (0.1%)	0.02 (0.00-0.20)	0.001	0.19 (0.14-2.58)	0.211
• Primary	48 (8.2%)	18 (2.2%)	0.05 (0.03-0.10)	<0.001	0.14 (0.06-0.31)	<0.001
• Secondary	502 (86.3%)	621 (75.9%)	0.17 (0.11-0.27)	<0.001	0.37 (0.23-0.60)	<0.001
• Superior	25 (4.3%)	177 (21.1%)	REF (1)	-	REF (1)	-
Sources of information						
• School	400 (88.7%)	727 (93.4%)	1.82 (1.21-2.73)	0.004	1.27 (0.79-2.02)	0.318
• Mother	238 (42.8%)	432 (55.7%)	1.13 (0.89-1.42)	0.314		
• Father	201 (44.6%)	325 (41.9%)	0.90 (0.71-1.13)	0.369		
• Siblings	228 (50.6%)	379 (48.9%)	0.94 (0.74-1.18)	0.577		
• Health prof.	189 (41.9%)	421 (54.3%)	1.65 (1.30-2.08)	<0.001	1.01 (0.76-1.34)	0.930
• Friends	335 (74.3%)	625 (80.7%)	1.45 (1.10-1.91)	0.008	0.85 (0.61-1.21)	0.388
• Television	314 (69.6%)	633 (81.8%)	1.96 (1.49-2.57)	<0.001	0.96 (0.67-1.38)	0.832
• Journals/books	249 (55.2%)	568 (73.3%)	2.23 (1.74-2.84)	<0.001	1.37 (1.00-1.86)	0.049
• Internet	258 (57.2%)	626 (80.9%)	3.16 (2.44-4.09)	<0.001	2.33 (1.69-3.21)	<0.001
• Radio	236 (52.3%)	430 (55.5%)	1.13 (0.90-1.43)	0.285		

Table 2. Variables associated to sexual and reproductive health knowledge

			Bivariate		Multivariate	
	No risky-sex behavior (n = 533)	Risky-sex behavior (n = 453)	OR (95%CI)	P value	OR (95% CI)	P value
Place of residence, urban	403 (75.6%)	334 (73.7%)	0.91 (0.68-1.22)	0.499	0.98 (0.70-1.39)	0.919
Age (years) Mean (SD)	20.3 (2.86)	20.2 (2.83)	0.99 (0.95-1.04)	0.759	1.01 (0.96-1.06)	0.694
Gender (male)	305 (57.2%)	360 (79.5%)	2.89 (2.17-3.85)	< 0.001	2.89 (2.13-3.92)	< 0.001
Education						
• None	2 (0.4%)	0 (0%)	0.00	0.999		
• Primary	28 (5.3%)	16 (3.5%)	0.84 (0.42-1.68)	0.630		
• Secondary	401 (75.2%)	368 (81.2%)	1.36 (0.97-1.90)	0.076	1.36 (0.96-1.93)	0.083
• Superior	102 (19.1%)	69 (15.2%)	REF (1.00)	-		
Any sexual health knowledge	479 (89.9%)	409 (90.3%)	0.95 (0.63-1.45)	0.827		
Sources of information						
• School	452 (94.0%)	367 (89.7%)	0.53 (0.34-0.92)	0.021	0.63 (0.37-1.06)	0.080
• Mother	262 (54.7%)	223 (54.5%)	0.99 (0.76-1.29)	0.959		
• Father	219 (45.7%)	179 (43.8%)	0.92 (0.71-1.20)	0.559		
• Siblings	248 (51.8%)	189 (46.2%)	0.80 (0.61-1.04)	0.098	0.88 (0.66-1.18)	0.398
• Health prof.	257 (53.7%)	203 (49.6%)	0.85 (0.65-1.11)	0.232		
• Friends	393 (82.0%)	307 (75.2%)	0.66 (0.48-0.92)	0.014	0.81 (0.55-1.20)	0.298
• Television	384 (80.3%)	309 (75.6%)	0.76 (0.55-1.04)	0.086	0.92 (0.62-1.36)	0.665
• Journals/books	342 (71.4%)	263 (64.3%)	0.72 (0.54-0.96)	0.024	1.11 (0.80-1.55)	0.558
• Internet	364 (76.0%)	295 (72.3%)	0.82 (0.61-1.11)	0.211		
• Radio	271 (56.6%)	229 (56.0%)	1.02 (0.78-1.34)	0.861		
Adequate sexual and reproductive health knowledge	335 (62.9%)	262 (57.8%)	0.81 (0.63-1.05)	0.109	0.92 (0.68-1.25)	0.599

Table 3. Variables associated to risky-sexual behavior

* We have excluded those who never had sex for the risky-sexual behavior analysis (total N = 1121)

STI RDT testing	Urban N = 976	Rural N = 424	p value
HIV antibodies	2 (0.2%)	3 (0.7%)	p = 0.167
HBsAg	134 (13.8%)	56 (13.2%)	p = 0.784
HCV antibodies	2 (0.2%)	2 (0.5%)	p = 0.589
T. pallidum antibodies	11 (1.1%)	9 (2.1%)	p = 0.147
Physical exam	Urban N = 28	Rural N = 41	
Abnormal discharge (urethral or vaginal)	7 (25%)	13 (0.9%)	p = 0.546
Ulcers	1 (3.6%)	0	p = 0.406
Adenopathies (inguinal)	2 (7.1%)	4 (9.8%)	p = 1.000
Condyloma	0	1 (2.4%)	p = 1.000

Table 4. Seroprevalence of the four screened STIs and clinical findings among youth from urban and rural areas.

*Values are expressed as the number and percent.