

Article

Bridging Knowledge–Practice Gaps in Syphilis Prevention: A Nationwide, Online Cross-Sectional Survey of Knowledge, Attitudes, Practices, and Policy Acceptance in Saudi Arabia

Hind Muteb Albadrani 

Department of Clinical Laboratory Sciences, College of Applied Medical Sciences, Imam Abdulrahman Bin Faisal University, Dammam, Eastern Province, Saudi Arabia; hmalbadrani@iau.edu.sa

Abstract

Introduction: Syphilis is a preventable sexually transmitted infection (STI) with severe health outcomes, yet it is not included in Saudi Arabia's national premarital and antenatal STI screening programs. This study assessed knowledge, attitudes, and practices (KAP) toward syphilis in Saudi Arabia and identified predictors of acceptance for including syphilis testing in such programs. **Methods:** A cross-sectional online survey was conducted among 935 participants aged ≥ 20 years. Data included sociodemographic characteristics and measures of KAP and screening acceptance. Continuous variables were summarized as medians (IQR) and categorical variables as frequencies and percentages, with bivariate and multivariate logistic regression used to identify predictors of screening acceptance. **Results:** Knowledge and preventive practices were low, while attitudes were predominantly neutral (median attitude score: 34 IQR 32–38). Although intentions for personal testing were low (17%), support for syphilis testing in premarital (60.8%) and antenatal (48.9%) programs was considerable. Employment in the health sector, older age, and positive attitudes predicted acceptance of screening policies. Knowledge and practice showed a weak correlation ($r = 0.14$), whereas knowledge and attitude were moderately correlated ($r = 0.55$). **Conclusion:** KAP toward syphilis is influenced by specific sociodemographic factors. Although acceptance of screening is high at the policy level, individual-level preventive behaviors remain low.

Keywords: syphilis; premarital screening; antenatal screening; sexually transmitted infection; public health



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1. Introduction

Syphilis is a major global public health concern, despite the availability of accurate diagnosis and effective treatment. It is an infectious disease caused by *Treponema pallidum* bacteria which progresses through a sequence of clinical stages, primary, secondary, latent, and tertiary, and can lead to serious complications in cases not treated [1]. The World Health Organization (WHO) estimates that approximately 8 million new syphilis infections occur globally each year among adults aged 15–49 years [1]. A major challenge is that most syphilis cases are asymptomatic, which results in hidden transmission in communities. The consequences are more severe in pregnancy because vertical transmission at any point may result in miscarriage, stillbirth, preterm birth, or congenital syphilis, which is a severe yet preventable condition [2,3]. According to international guidelines, such as those provided by WHO and the U.S. Centers for Disease Control and Prevention

(CDC), antenatal screening is one of the protective measures aimed at decreasing the risk of congenital syphilis in the newborn [4,5].

However, there are gaps in screening practices, and a lack of screening awareness is a major barrier that undermines prevention efforts in many countries around the world. A case study in Armenia demonstrated that congenital syphilis cases were the result of inconsistent antenatal screening practices and a lack of provider awareness, highlighting the significance of effective screening programs and community education [6]. In these cases, insufficient knowledge, stigma, and misconceptions about sexually transmitted infections (STIs) contribute to delayed syphilis detection globally and hinder prevention measures. Several international studies have reported persistent gaps in knowledge and preventive practices related to sexually transmitted infections across different populations [7–9]. Such patterns in various settings indicate the pervasiveness of knowledge gaps in STIs and their implications on prevention interventions.

Even though the National Healthy Marriage Program, a mandatory initiative of the Ministry of Health in Saudi Arabia since 2004, offers premarital screening for HIV infection, hepatitis B virus infection, hepatitis C virus infection, and hereditary diseases, syphilis is not yet included in routine premarital or antenatal screening [10,11]. This exclusion creates a major gap in early detection and population-level surveillance, as demonstrated by a hospital study in the Eastern Province of Saudi Arabia that reported a seropositivity rate of syphilis of 0.45% (54 of 11,832 screened cases) at a medical center [12]. These findings suggest that the low national reporting of syphilis infections is attributable to underdiagnosis and a lack of routine screening rather than a genuinely low disease burden. Although integrating syphilis screening into reproductive health services is essential, no published research in Saudi Arabia has assessed community-level knowledge, attitudes, and practices or screening acceptance. This represents a notable gap in the broad understanding of adult populations and their willingness to implement widespread syphilis screening interventions.

Considering the recent increase in syphilis cases worldwide [1,3,13], the current misunderstandings concerning STIs [5,6,14,15] and shifting population demographics and health trends in Saudi Arabia, it has become necessary to evaluate the level of awareness and acceptance of syphilis screening. The availability of accurate local data is essential in informing the population of national reproductive health programs, enhancing preventive efforts and ensuring that Saudi Arabia joins other nations that adhere to the global best practices in STI management. This cross-sectional study aimed to evaluate KAP toward syphilis among adults in Saudi Arabia and to identify predictors of acceptance for including syphilis testing within premarital and antenatal screening programs.

2. Materials and Methods

2.1. Study Participants

This cross-sectional survey included adults aged ≥ 20 years residing in the Kingdom of Saudi Arabia (KSA). A total of 935 participants were recruited from five major regions (Eastern, Western, Central, Southern, and Northern). Individuals aged < 20 years, non-Saudi residents, and those who did not complete the questionnaires were excluded. Epi Info Version 7.2.5 (CDC, Atlanta, GA, USA) was used to calculate the minimum required sample size. Assuming a 95% confidence level, an expected prevalence of sufficient knowledge of 50% (the most conservative estimate), and a margin of error of 5%, the required minimum sample size was 385 participants. The sample size ($n = 935$) obtained was above this value, which provided adequate statistical power to perform subgroup and regression analyses.

2.2. Data Collection

Data collection was conducted between October 2025 and January 2026 through an online survey distributed across social media channels, such as WhatsApp, Twitter, and Telegram. The snowball sampling technique was employed, where selected respondents were asked to send the survey link to other people with the same eligibility criteria (Saudi residents aged ≥ 20 years). This approach allowed access to a wider and more diverse range of participants. Although the snowball sampling approach enabled a broad geographic reach, it may introduce selection bias toward more educated or digitally engaged individuals. In this study, a relatively high proportion of participants had a bachelor's degree or higher, which may influence the generalizability of the findings, particularly in relation to knowledge and awareness measures.

2.3. Questionnaire Development and Reliability

This study developed a de novo context-specific questionnaire to measure the level of syphilis KAPs and acceptance of screening among adults in Saudi Arabia. The questionnaire items were developed based on WHO and CDC guidelines, as well as previously published KAP studies on sexually transmitted infections. An initial pool of items was generated and subsequently reviewed by a panel of 3 experts in public health and infectious diseases to assess content relevance, clarity, and cultural appropriateness. The questionnaire was administered in both Arabic and English. The instrument was originally developed in English and translated into Arabic, with both versions reviewed to ensure linguistic accuracy and conceptual equivalence. For consistency, the English version is provided in the Supplementary Materials. The questionnaire was pilot tested among 30 participants to assess clarity and comprehension. Based on the pilot feedback, minor revisions and rewording were made to improve readability. Analysis of the pilot results showed that the internal consistency of all domains was high, with a Cronbach's alpha of 0.941 for knowledge, 0.857 for attitudes, and 0.837 for practices, indicating excellent to good reliability. It should be noted that Cronbach's alpha was used to assess internal consistency, which reflects reliability but does not represent full psychometric validation. The Supplementary Materials provide the full questionnaire items used to assess each domain, supporting transparency and reproducibility of the measurement approach. All the participants agreed to complete the survey through electronic informed consent. The Institutional Review Board (IRB) of the Imam Abdulrahman Bin Faisal University (IRB-2025-03-0606) approved this study, and all procedures followed the principles of the Declaration of Helsinki.

2.4. Evaluation of the Saudi Arabian Population's Knowledge Toward Syphilis

The questionnaire had 22 items under the knowledge domain, resulting in a maximum potential score of 22 points. These items assessed participants' understanding of syphilis in relation to its symptoms, modes of transmission, complications, prevention, and risk factors. The questions items provided in Supplementary S1A.

Each correct response was assigned a score of 1, whereas incorrect and "Don't know" responses were scored as 0. Higher scores indicate greater knowledge of syphilis.

2.5. Assessment of Public Attitudes Toward Syphilis in Saudi Arabia

The attitude domain comprised 11 items designed to evaluate participants' perceptions of syphilis severity, the importance of testing, preventive behaviors, and acceptance of integrating syphilis screening into premarital and antenatal programs. The items were provided in Supplementary S1B.

Responses were rated on a 5-point Likert scale (strongly agree, agree, neutral, disagree, and strongly disagree). Responses indicating positive attitudes were scored higher

(5 = strongly agree to 1 = strongly disagree), which created a potential total attitude score of 11–55, with higher scores indicating more positive attitudes towards syphilis prevention and screening. In addition to attitudinal items, participants were asked to identify their main source of information about syphilis, which included the following options: healthcare provider, internet or social media, family and friends, school or university, religious leader, or other. This informational item was not scored numerically but was analyzed descriptively to better understand the communication channels relevant to syphilis awareness.

2.6. Assessment of the Practices of the Public in Saudi Arabia Regarding Syphilis

The practice domain consisted of 12 items designed to evaluate participants' engagement in behaviors related to syphilis prevention, testing, premarital screening, antenatal care, and health-seeking actions. The items were provided in Supplementary S1C.

Female participants were also asked about their current or previous pregnancies to assess antenatal care-related screening practices. All practice items were coded dichotomously, with "Yes" = 1 and "No" = 0. Pregnancy-related items included an additional option, "Not applicable," which was excluded from the scoring and analyzed separately. The total score ranged from 0 to 12, with higher scores indicating more support for positive syphilis-related preventive and health-seeking behaviors.

2.7. Statistical Analysis

Data analysis was performed using the R software (version 4.2.2). Continuous variables were evaluated based on normality and summarized as medians and interquartile ranges (IQR). Categorical variables were described as frequencies and percentages. Sociodemographic information was collected as self-reported data. Age was considered a continuous variable. Sex was defined as male or female. Education was dichotomized as below bachelor's degree versus equal to or higher than bachelor's degree. Occupations were classified into health and non-health sectors. These classifications were used consistently in the descriptive, comparative, and regression analyses.

Knowledge was assessed using 22 items (score range 0–22) and categorized as poor (<50% correct responses; <11), moderate (50–75% correct responses; 11–16), or adequate ($\geq 75\%$ correct responses; ≥ 17), consistent with commonly used approaches in KAP research. Attitude was assessed using 11 items on a Likert scale (score range 11–55) and classified as negative (<26), neutral (26–37), or positive (≥ 38) based on the scale midpoint and upper score distribution to reflect clearly favorable attitudes. For the analysis of policy acceptance, responses to the relevant attitude items (Items A3 and A4) were derived from a five-point Likert scale and subsequently dichotomized. "Agree" and "strongly agree" responses were classified as support, while "neutral," "disagree," and "strongly disagree" responses were classified as not support. Practice was assessed using 12 items (score range: 0–12) and categorized as poor (<8) or good (≥ 8), corresponding to the adoption of at least two-thirds of the recommended practices. Regression analyses were conducted using dichotomized outcomes based on predefined thresholds to enhance interpretability and allow for clear comparison of key outcome categories. Adequate knowledge ($\geq 75\%$ correct responses), positive attitude (scores ≥ 38), and good practice (scores ≥ 8) were coded as 1, while lower categories were coded as 0. These categorizations were defined a priori to enhance interpretability; however, the potential loss of information associated with dichotomization of continuous scores is acknowledged.

Bivariate comparisons of continuous outcomes (knowledge, attitude, and practice scores) across demographic groups were conducted using the Mann–Whitney U test. Associations between categorical variables and KAP levels were examined using Fisher's exact test when appropriate. Spearman's correlation coefficients were used to evaluate

the strength of the relationship among knowledge, attitude, and practice scores. Binary logistic regression models were constructed to identify independent predictors of (1) adequate knowledge, (2) positive attitudes, and (3) good practices. The covariates entered into the multivariate models included age, sex, educational level, and occupation. Two additional logistic regression models were developed to identify the predictors of acceptance of adding syphilis testing to (a) premarital and (b) antenatal screening programs. These models included knowledge, attitude, and practice scores as continuous predictors along with relevant demographic variables such as pregnancy history (for antenatal acceptance) and prior premarital screening. All results were reported as odds ratios (ORs) with 95% confidence intervals (CIs). The *p*-value was considered statistically significant at a value of <0.05 .

3. Results

3.1. Participant Characteristics

There were 935 participants. Participants were recruited from all five main regions of Saudi Arabia (Eastern, Western, Central, Northern, and Southern), providing broad geographic coverage. The median age was 32 years (IQR: 29–37) and 55.6% of the population was female. Most respondents were married (91.6%) and resided across all regions, with the Eastern (24.8%) and Central (20.6%) regions being the most represented. The level of education was high with 63.2% holding a bachelor's degree and 20.1% having a postgraduate level qualification. Almost 39% were employed in the health sector and 38% in non-health sectors. The percentage of female respondents who were or had been pregnant was 49.1% (Table 1).

Table 1. Demographic characteristics of all included participants.

Variable	Level	Overall (<i>n</i> = 935)
Age (years) (median [IQR])		32.0 [29.00, 37.0]
Gender (%)	Female	520 (55.6)
	Male	415 (44.4)
Region of residence (%)	Central	193 (20.6)
	Eastern	232 (24.8)
	Northern	133 (14.2)
	Southern	193 (20.6)
	Western	184 (19.7)
Marital status (%)	Divorced	14 (1.5)
	Married	856 (91.6)
	Single	57 (6.1)
	Widowed	8 (0.9)
Education level (%)	Bachelor's	591 (63.2)
	Diploma	145 (15.5)
	Highschool	9 (1.0)
	Less than high school	2 (0.2)
	Postgraduate studies	188 (20.1)

Table 1. *Cont.*

Variable	Level	Overall (<i>n</i> = 935)
Occupation (%)	Health sector	364 (38.9)
	Non-health sector	358 (38.3)
	Retired	43 (4.6)
	Student	27 (2.9)
	Unemployed	143 (15.3)
Currently pregnant or ever been pregnant (%)	No	70 (7.5)
	Not applicable	406 (43.4)
	Yes	459 (49.1)

3.2. Knowledge About Syphilis

In general, knowledge about syphilis was limited. The median knowledge score was 12 (IQR: 6–15); only 19.1% of the respondents had a sufficient level of knowledge, and 42.5% fell into the poor category. Although 81.4% of respondents had heard of syphilis and 73.6% identified it correctly as being contagious, understanding of its clinical features was unevenly spread. Correct recognition of clinical features varied, with 61% identifying painless sores, 50.2% identifying rashes, and 54.3% identifying wart-like lesions. There were widespread misconceptions, with only 10.3% of people accurately recognizing that syphilis is not caught as a result of casual contact and 26.7% incorrectly believing that prior infection confers immunity. Awareness of complications was low, with 44.5% recognizing cardiovascular complications, 47.5% neurological complications, 45.3% HIV-related risks, and 49.3% pregnancy-related risks. Only 4.7% correctly identified that there was no vaccine for syphilis (Table S1). Detailed item-level responses for each domain are presented in the Supplementary Tables to provide additional context for the summarized findings.

3.3. Attitudes Toward Syphilis

Overall, participant attitudes were mostly neutral. The median attitude score was 34 (IQR, 32–38), with 74.2% falling into the neutral group and 25.6% demonstrating positive attitudes. Most participants agreed that syphilis was dangerous (67% “agree” or “strongly agree”) and that early testing was important (approximately 72%). Support for the incorporation of syphilis screening into national programs was notable. In fact, 60.8% agreed that premarital testing was necessary, and 48.9% supported testing during pregnancy. However, personal intention to undergo testing was low, with only 17% expressing willingness to test within the next six months, even if the service was free (Table S2).

3.4. Practices Related to Syphilis

The preventive practices were poor across the sample. The median practice score was 2 (IQR: 1–3), and 99% were classified as having poor practices. Only 7.7% had undergone premarital screening, and only 4% had ever been tested for syphilis which was likely performed for medical indications other than premarital screening. Only 34–36% reported adopting preventive behaviors such as reducing sexual risk or using protection with new partners. Engagement in health-seeking activities was also low, with only 16.6% having asked a healthcare provider about syphilis testing and just 25.2% having ever checked availability or cost. Among pregnant respondents, fewer than 3% reported being offered, completing, or receiving the results of a syphilis test during antenatal care (Table S3).

3.5. Bivariate Analysis

In bivariate analyses, males had lower knowledge and attitude scores than females (median knowledge: 11 vs. 12, $p = 0.001$; median attitude: 35 vs. 34, $p = 0.009$). Practice scores did not differ meaningfully, despite the statistical significance driven by distributional skew. Participants with educational attainment below a bachelor's degree showed much lower knowledge, attitude, and practice scores than those who had a bachelor's degree or higher (all $p < 0.047$).

Health sector workers consistently showed higher knowledge, attitude, and practice scores than non-health workers (all $p < 0.001$), with a markedly higher proportion achieving adequate knowledge. Adding syphilis testing to premarital screening was associated with higher knowledge, attitudes, and practice scores (all $p < 0.001$). Similarly, acceptance of antenatal syphilis screening was associated with higher knowledge, attitude, and practice scores, as well as more favorable attitude levels ($p \leq 0.038$) (Table 2).

Table 2. Bivariate associations between demographic characteristics and knowledge, attitudes, and practices related to syphilis.

		Sex		p-Value	U-Value
Variable	Level	Female (n = 520)	Male (n = 415)		
Knowledge score (median [IQR])		12.0 [8.0, 16.0]	11.0 [2.0, 15.0]	0.001 ^{*a}	94.4
Attitude score (median [IQR])		35.0 [33.0, 39.0]	34.0 [32.0, 37.0]	0.009 ^{*a}	98.9
Practice score (median [IQR])		2.0 [1.0, 3.0]	2.0 [0.0, 3.0]	0.009 ^{*a}	98.900
Knowledge level (%)	Adequate	107 (20.6)	72 (17.3)	0.015 ^{*b}	NA
	Moderate	214 (41.2)	145 (34.9)		
	Poor	199 (38.3)	198 (47.7)		
Attitude level (%)	Negative	0 (0.0)	2 (0.5)	0.003 ^{*b}	NA
	Neutral	367 (70.6)	327 (78.8)		
	Positive	153 (29.4)	86 (20.7)		
Practice level (%)	Good	5 (1.0)	4 (1.0)	1 ^b	NA
	Poor	515 (99.0)	411 (99.0)		
		Education		p-value	U-value
Variable		Bachelor's or higher (n = 779)	Below bachelor's (n = 156)		
Knowledge score (median [IQR])		12.0 [7.5, 16.0]	9.0 [0.0, 13.0]	<0.001 ^{*a}	45.6
Attitude score (median [IQR])		35.0 [33.0, 38.0]	33.0 [32.0, 37.2]	0.047 ^{*a}	55.5
Practice score (median [IQR])		2.0 [1.0, 3.0]	1.0 [0.0, 2.2]	<0.001 ^{*a}	46.0
Knowledge level (%)	Adequate	163 (20.9)	16 (10.3)	<0.001 ^{*b}	NA
	Moderate	313 (40.2)	46 (29.5)		
	Poor	303 (38.9)	94 (60.3)		

Table 2. Cont.

Attitude level (%)	Negative	2 (0.3)	0 (0.0)	0.803 ^b	NA
	Neutral	577 (74.1)	117 (75.0)		
	Positive	200 (25.7)	39 (25.0)		
Practice level (%)	Good	7 (0.9)	2 (1.3)	1 ^b	NA
	Poor	772 (99.1)	154 (98.7)		
Occupation					
Variable		Health sector (n = 364)	Non-health sector (n = 571)	p-value	U-value
Knowledge score (median [IQR])		16.0 [13.0, 18.2]	8.0 [0.0, 12.0]	<0.001 ^{*a}	70.0
Attitude score (median [IQR])		35.0 [33.0, 37.0]	33.0 [32.0, 39.0]	0.037 ^{*a}	93.5
Practice score (median [IQR])		3.0 [2.0, 3.0]	1.00 [0.0, 2.0]	<0.001 ^{*a}	68.5
Knowledge level (%)	Adequate	150 (41.2)	29 (5.1)	<0.001 ^{*b}	NA
	Moderate	189 (51.9)	170 (29.8)		
	Poor	25 (6.9)	372 (65.1)		
Attitude level (%)	Negative	0 (0.0)	2 (0.4)	0.048 ^{*b}	NA
	Neutral	285 (78.3)	409 (71.6)		
	Positive	79 (21.7)	160 (28.0)		
Practice level (%)	Good	5 (1.4)	4 (0.7)	0.494 ^b	NA
	Poor	359 (98.6)	567 (99.3)		
Acceptance of Adding Syphilis Testing to Premarital Screening					
Variable		No (n = 366)	Yes (n = 569)		U-value
Knowledge score (median [IQR])		9.0 [0.0, 14.0]	13.0 [9.0, 16.0]	<0.001 ^{*a}	76.0
Attitude score (median [IQR])		33.0 [32.0, 34.0]	36.0 [33.0, 42.0]	<0.001 ^{*a}	72.5
Practice score (median [IQR])		1.0 [0.0, 3.0]	2.0 [1.0, 3.0]	<0.001 ^{*a}	82.0
Knowledge level (%)	Adequate	39 (10.7)	140 (24.6)	<0.001 ^{*b}	NA
	Moderate	109 (29.8)	250 (43.9)		
	Poor	218 (59.6)	179 (31.5)		
Attitude level (%)	Negative	2 (0.5)	0 (0.0)	<0.001 ^{*b}	NA
	Neutral	339 (92.6)	355 (62.4)		
	Positive	25 (6.8)	214 (37.6)		
Practice level (%)	Good	2 (0.5)	7 (1.2)	0.483 ^b	NA
	Poor	364 (99.5)	562 (98.8)		

Table 2. Cont.

Acceptance of Antenatal Syphilis Screening				
Variable		No (n = 478)	Yes (n = 457)	U-value
Knowledge score (median [IQR])		11.0 [0.0, 15.0]	12.0 [8.0, 16.0]	<0.001 ^{*a}
Attitude score (median [IQR])		33.0 [32.0, 35.0]	37.0 [34.0, 45.0]	<0.001 ^{*a}
Practice score (median [IQR])		2.0 [0.0, 3.0]	2.0 [1.0, 3.0]	<0.001 ^{*a}
Knowledge level (%)	Adequate	79 (16.5)	100 (21.9)	<0.001 ^{*b}
	Moderate	162 (33.9)	197 (43.1)	
	Poor	237 (49.6)	160 (35.0)	
Attitude level (%)	Negative	2 (0.4)	0 (0.0)	<0.001 ^{*b}
	Neutral	436 (91.2)	258 (56.5)	
	Positive	40 (8.4)	199 (43.5)	
Practice level (%)	Good	1 (0.2)	8 (1.8)	0.038 ^{*b}
	Poor	477 (99.8)	449 (98.2)	

Table 2: Data are presented as median (IQR) or frequency (%). Comparisons of continuous variables were performed using the ^a Mann–Whitney U test, and results are reported as U statistics with corresponding *p*-values. Associations between categorical variables were assessed using ^b Fisher’s exact test results are reported as *p*-values. A *p*-value < 0.05 was considered statistically significant. * Statistically significant; NA; not available.

3.6. Multivariable Regression

Overall, health sector employment emerged as the strongest predictor of adequate knowledge (OR 12.63, 95% CI 8.22–19.42), while older age and attitudes were key predictors of screening acceptance.

In univariate analyses, adequate knowledge was significantly associated with lower educational attainment and working in the health sector, with health sector employment showing the strongest association (OR 13.10, 95% CI 8.54–20.10). However, sex and age were not significantly associated with knowledge. In the multivariate model, only working in the healthcare sector remained an independent predictor of adequate knowledge (OR 12.63, 95% CI 8.22–19.42).

For attitudes, univariate analyses identified significant associations with male gender (OR 0.63, 95% CI 0.46–0.85), working in the health sector (OR 1.70, 95% CI 1.52–1.92), and older age (OR 1.10, 95% CI 1.08–1.12). In the multivariable model, male gender (OR 0.66, 95% CI 0.48–0.91) and older age (OR 1.10, 95% CI 1.08–1.12) remained independently associated with positive attitudes. No demographic variables were significantly associated with good practice in either the univariate or multivariate analyses.

Univariate analyses showed that the acceptance of adding syphilis testing to premarital screening was associated with male sex, higher education, health sector employment, and older age. In multivariable analysis, acceptance remained independently associated with male gender (OR 0.72, 95% CI 0.55–0.93), working in the health sector (OR 1.43, 95% CI 1.09–1.87), and older age (OR 1.05, 95% CI 1.03–1.06). Similarly, acceptance of antenatal syphilis screening was associated in univariate analyses with education level, occupation, and age, while multivariable analysis identified lower educational attainment (OR 0.69, 95% CI 0.48–0.99), working in the health sector (OR 1.41, 95% CI 1.08–1.85), and older age (OR 1.05, 95% CI 1.03–1.07) as independent predictors (Table 3).

Table 3. Multivariable regression analysis for variables predicting knowledge, attitude, and practice.

Variable	Unit	Odds Ratio	95% CI	p-Value
Knowledge				
Univariate				
Gender	Female		Reference	
	Male	0.81	(0.58, 1.13)	0.21
Education	Bachelor or higher		Reference	
	Below bachelor	0.43	(0.25, 0.75)	0.002 *
Occupation	Non-health sector		Reference	
	Health sector	13.1	(8.54, 20.10)	<0.0001 *
Age		1	(0.98, 1.02)	0.83
Multivariate				
Education	Bachelor or higher		Reference	
	Below bachelor	0.65	(0.36, 1.19)	0.16
Occupation	Non-health sector		Reference	
	Health sector	12.63	(8.22, 19.42)	<0.0001 *
Attitude				
Univariate				
Gender	Female		Reference	
	Male	0.63	(0.46, 0.85)	0.002 *
Education	Bachelor or higher		Reference	
	Below bachelor	0.96	(0.65, 1.43)	0.86
Occupation	Non-health sector		Reference	
	Health sector	1.7	(1.52, 1.92)	0.03 *
Age		1.1	(1.08, 1.12)	<0.0001 *
Multivariate				
Gender	Female		Reference	
	Male	0.66	(0.48, 0.91)	0.01 *
Occupation	Non-health sector		Reference	
	Health sector	1.3	(0.92, 1.80)	0.22
Age		1.1	(1.08, 1.12)	<0.0001 *
Practice				
Univariate				
Gender	Female		Reference	
	Male	1	(0.27, 3.76)	0.99
Education	Bachelor or higher		Reference	
	Below bachelor	1.43	(0.29, 6.96)	0.66
Occupation	Non-health sector		Reference	
	Health sector	1.97	(0.53, 7.40)	0.31
Age		1.05	(0.98, 1.11)	0.16

Table 3. Cont.

Variable	Unit	Odds Ratio	95% CI	p-Value
Acceptance of adding syphilis testing to premarital screening				
Univariate				
Gender	Female		Reference	
	Male	0.68	(0.53, 0.89)	0.004 *
Education	Bachelor or higher		Reference	
	Below bachelor	0.71	(0.50, 1.00)	0.049 *
Occupation	Non-health sector		Reference	
	Health sector	1.39	(1.06, 1.80)	0.01 *
Age		1.05	(1.03, 1.06)	<0.0001 *
Multivariate				
Gender	Female		Reference	
	Male	0.72	(0.55, 0.93)	0.01 *
Education	Bachelor or higher		Reference	
	Below bachelor	0.72	(0.50, 1.04)	0.08
Occupation	Non-health sector		Reference	
	Health sector	1.43	(1.09, 1.87)	0.01 *
Age		1.05	(1.03, 1.07)	<0.0001 *
Acceptance of Antenatal Syphilis Screening				
Univariate				
Gender	Female		Reference	
	Male	0.8	(0.61, 1.04)	0.09
Education	Bachelor or higher		Reference	
	Below bachelor	0.66	(0.47, 0.94)	0.02 *
Occupation	Non-health sector		Reference	
	Health sector	1.91	(1.45, 2.53)	<0.0001 *
Age		1.04	(1.02, 1.06)	<0.0001 *
Multivariate				
Education	Bachelor or higher		Reference	
	Below bachelor	0.69	(0.48, 0.99)	0.04 *
Occupation	Non-health sector		Reference	
	Health sector	1.41	(1.08, 1.85)	0.01 *
Age		1.05	(1.03, 1.07)	<0.0001 *

Table 3: Results are presented as odds ratios (OR) with 95% confidence intervals (CI) from logistic regression analyses. Univariate and multivariate models were constructed to identify predictors of knowledge, attitudes, practices, and acceptance outcomes. A *p*-value < 0.05 was considered statistically significant. * Statistically significant.

Knowledge showed a moderately positive correlation with attitude ($r = 0.55$), whereas the correlations between knowledge and practice ($r = 0.14$) and attitude and practice ($r = 0.13$) were weak. Compared with poor knowledge, both moderate and adequate knowledge were associated with higher odds of a positive attitude (OR = 1.57 and 1.62, respectively), whereas only adequate knowledge was significantly associated with good practice (OR = 13.73), with no significant association observed for moderate knowledge (Table 4).

Table 4. Regression analysis of the relationships between knowledge, attitudes, and practices.

Variable	Odds Ratio	95% CI	p-Value
Predictors of positive attitude			
Poor knowledge	Reference		
Moderate knowledge	1.57	(1.12, 2.19)	0.008 *
Adequate knowledge	1.62	(1.08, 2.42)	0.019 *
Predictors of good practice			
Poor knowledge	Reference		
Moderate knowledge	2.22	(0.20, 24.56)	0.52
Adequate knowledge	13.73	(1.64, 114.91)	0.01 *

Table 4: Results are presented as odds ratios (OR) with 95% confidence intervals (CI) from logistic regression analyses assessing the relationships between knowledge, attitudes, and practices. A *p*-value < 0.05 was considered statistically significant. * Statistically significant.

4. Discussion

Syphilis is a preventable disease that is under-reported and still a major challenge to public health. Although screening can be successfully done with the help of diagnostic techniques and treatment, there is still a lack of awareness, access to care, and stigma, which can be used to mitigate morbidity. This study provides one of the first nationwide surveys in Saudi Arabia evaluating knowledge, attitudes, and practices related to syphilis, with broad geographic coverage across all regions, while also assessing public support for the incorporation of syphilis testing into premarital and antenatal screening programs.

4.1. Knowledge Gaps and Knowledge-Practice Disconnect

Although 81.4% of the respondents indicated that they were aware of syphilis, just 19.1% possessed the necessary levels of knowledge, and there was a significant level of misinformation about how the disease is transmitted, the existence of a vaccine, and immunity after infection. It is interesting to note that 4.7% identified that there is no vaccine, and about 27% falsely thought a previous infection to be immunizing. There was also inconsistency in knowledge about complications and clinical manifestations. These results are consistent with a recent Saudi-based study which found that 31.7% of women were unaware of the routes of STIs, 40.8% knew little about the main symptoms, and 35.2% lacked awareness on how to prevent the disease [16], which suggests that the same gaps in knowledge exist on the national level. Our results are also consistent with international evidence. Even among the medical students in Bangladesh, there was still the misconception even with the general awareness [7], which is still shallow in understanding, as seen in our people. More than 50% of university students in Oman did not know about syphilis [9], which agrees with the low 19.1% of sufficient knowledge in our survey, despite a relatively large percentage of overall awareness. Similar patterns have been observed in Nigeria [17], Brazil [8], and Australia [18], where the lack of knowledge on STIs transmission, especially via casual contact, is still prevalent, and directly reflects the misconceptions found in our cohort. Taken together, these findings suggest that general awareness alone does not translate into functional health literacy or effective preventive practices, highlighting a persistent knowledge–practice gap shaped by both behavioral and structural factors [14,15].

4.2. Attitudes and Acceptance: Policy Support When Personally Hesitant

Attitudes toward syphilis and syphilis prevention were predominantly neutral to moderately positive. The majority of respondents recognized the severity of syphilis, as 60.8% believed it should be incorporated into premarital screening, and 48.9% believed it

must be included into antenatal screening programs. However, only 17% indicated that they would take the test in the next 6 months, even if the test was free of charge.

From a theoretical perspective, the observed acceptance of screening despite low individual engagement can be interpreted through established behavioral models. According to the Health Belief Model, acceptance of screening may be influenced by perceived severity and perceived benefits, even in the absence of strong perceived susceptibility or individual action. Similarly, the Theory of Planned Behavior suggests that social norms and external expectations—such as institutionalized screening programs—may play a significant role in shaping behavioral intentions. In this context, acceptance of syphilis screening may reflect alignment with system-level norms rather than individual readiness to engage in preventive behavior. Such an attitude–behavior discrepancy has been extensively reported in the literature on public health [19], and had often been attributed to social stigma, perceived personal risk, and the absence of provider-initiated testing. Despite these barriers, our results show that a substantial proportion of participants supported the inclusion of syphilis testing in premarital (60.9%) and antenatal (48.9%) screening programs. These findings suggest that institutionalizing such screening within existing national programs may enhance public acceptance.

The multivariate analysis demonstrated that attitudes were a stronger predictor of screening acceptance than knowledge. This reinforces the need to develop behavior change campaigns that incorporate knowledge delivery to influence belief systems, perceived benefits, and emotional drivers, an approach that has been successful in vaccination programs and other STI prevention initiatives.

4.3. Prevention Practices

Across all areas, preventive and health-seeking behaviors were very low. Only 4% of the respondents had ever been tested for syphilis, and 7.7% had done premarital screening. The extremely low uptake of antenatal screening observed in this study highlights a gap between international recommendations and current practice. This trend is due to weaknesses at the system level, rather than individual-level disengagement. Currently, Syphilis remains excluded from routine premarital and antenatal screening programs in Saudi Arabia, representing a key gap in early detection, while cultural sensitivities may limit provider–patient discussions around STI risk. The low correlations found between knowledge and practice ($r = 0.14$) and attitude and practice ($r = 0.13$) underline the fact that knowledge alone is not sufficient to influence behavior. Social and structural determinants, including stigma, reticence of providers to give information, and public access to preventive measures, should also be considered. Our study showed that the most frequently reported sources of information about syphilis were social media and the internet (46%), suggesting that access to information does not necessarily ensure access to reliable, evidence-based content. Therefore, digital platforms such as *Sehaty* provide an opportunity to enhance public education and support screening uptake. Our results support the integration of behavioral encouragement, including app-based prompts and/or electronic health record reminders, as an effective tool for increasing uptake of syphilis screening. Similar patterns have been reported in other studies, where gaps in preventive practices and health-seeking behaviors persist despite moderate or positive attitudes toward sexually transmitted infection (STI) prevention [7–9,17,18]. This disconnect between awareness, attitudes, and actual behavioral engagement has been consistently observed across different populations, reinforcing the need for system-level interventions to translate knowledge into practice.

4.4. Determinants of Screening Acceptance and Implications of Policy

Importantly, the observed discrepancy between low individual-level preventive behavior and relatively high acceptance of policy-driven screening reflects a context-specific dynamic shaped by the structure of the Saudi healthcare system. Although just 17% of respondents indicated their willingness to be tested and just 4 percent said they had already been tested, much greater percentages supported the addition of syphilis screening to premarital 60.8% and antenatal 48.9% programs. This trend indicates that people might be more open to interventions that are initiated by the system as opposed to self-managed health practices. In Saudi Arabia, the establishment of mandatory premarital testing on HIV and hepatitis has been practiced for a long time, and it is probable that institutionalized testing has become normalized and encouraged public confidence in the effectiveness of the healthcare policy whereby acceptance does not indicate individual willingness to pursue pre-preventive measures. This interpretation aligns with the Health Belief Model and the Theory of Planned Behavior, where low perceived susceptibility, stigma, and structural barriers can limit individual behavior, while system-level interventions help overcome these constraints.

Multivariate analysis revealed that age, sex and employment in the health sector were strongly related to the acceptance of syphilis screening. These results indicate that the acceptance is affected by the healthcare exposure and the perceived benefits of early detection because more people interested in healthcare systems or reproductive services might be better educated on the effects of the disease. This is consistent with evidence from established screening programs, where uptake is higher among individuals with greater healthcare contact and familiarity with preventive services [5,8]. HIV, hepatitis B and C represent a relevant comparison in Saudi Arabia, where mandatory premarital testing has made it the standard procedure and has provided uptake of testing on a large scale [10]. In general, these results suggest that both individual- and system-level factors contribute to screening acceptance and justify the inclusion of syphilis testing into the current premarital and antenatal programs.

Notably, individuals working in the health sector demonstrated significantly higher knowledge and engagement across KAP domains, highlighting their potential role as key facilitators in public health interventions. Healthcare workers can be early adopters of regular screening and can act as a reliable information source, community education, decreasing stigma, and improving implementation. Nonetheless, a lack of associations between demographic variables and good practices indicates that structural and cultural obstacles might dominate over individual knowledge to influence behavior. This supports the necessity of transforming screening from a personal initiative into a routinely conducted clinical practice. According to the recommendation of WHO and CDC, syphilis testing should be included in larger reproductive and maternal health initiatives to enhance uptake. Given the extremely low uptake of antenatal syphilis testing (<3%), these findings highlight a critical gap in maternal health services and support the need for strengthened national strategies aligned with global efforts to eliminate congenital syphilis. To close this gap, we suggest: (i) the incorporation of syphilis testing in national premarital and antenatal screening programs; (ii) the enhancement of provider involvement by training and task-shifting to support the provision of tests; and (iii) the use of digital health platforms and electronic medical record reminders to promote the screening uptake, enhance awareness, and improve test-taking follow-through.

4.5. Strengths and Limitations

This research contributes strong, nationally representative data in a relatively under-explored area of STI prevention in Saudi Arabia. Its strengths include a heterogeneous

sample, the use of KAP, and the novel assessment of screening acceptance as a separate outcome variable. Nevertheless, some limitations should be noted. The cross-sectional design precludes causal inference between KAP and screening acceptance. Although the study achieved broad geographic coverage across all regions of Saudi Arabia, the online sampling approach may introduce bias for more educated or urbanized respondents, and self-reported practices, particularly on sensitive topics, are susceptible to social desirability bias. Finally, clinically validated test histories could not be confirmed.

5. Conclusions

Knowledge and preventive measures of syphilis are still suboptimal among Saudi adults, though there is a high level of public support for the inclusion of screening in national premarital and antenatal programs. This disconnect between the acceptance of the policy and individual behavior highlights the significance of both targeted education and system-level integration. The incorporation of syphilis testing into routine reproductive health care and the utilization of existing national systems can enable Saudi Arabia to implement STI prevention strategies aligned with international best practices and achieve the elimination of avoidable consequences of syphilis transmission, including congenital syphilis. The directions of future work are to focus on longitudinal assessment, provider involvement, and digital solutions that can unite the popular support into a visible health outcome.

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/germs16020013/s1>, Supplementary S1A: Evaluation of Knowledge of Syphilis among the Saudi Arabian Population; Supplementary S1B: Assessment of Public Attitudes Toward Syphilis in Saudi Arabia; Supplementary S1C: Assessment of Public Practices Regarding Syphilis in Saudi Arabia; Table S1: Syphilis-related knowledge among study participants; Table S2: Syphilis-related attitude among study participants; Table S3: Syphilis-related practices among study participants.

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Abbreviations

The following abbreviations are used in this manuscript:

STIs	Sexually Transmitted Infections
WHO	World Health Organization
CDC	Centers for Disease Control and Prevention
KAP	Knowledge, Attitudes, and Practices
KAPs	Knowledge, Attitudes, and Practices
IQR	Interquartile Range
HIV	Human Immunodeficiency Virus

HBV	Hepatitis B Virus
HCV	Hepatitis C Virus
KSA	Kingdom of Saudi Arabia
IRB	Institutional Review Board
OR	Odds Ratio
CI	Confidence Interval
STD	Sexually Transmitted Disease

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