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The role of information technology in promoting sexual and reproductive health awareness among young people in Lahore: A comparative study with Shanghai

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Abstract

Information technology (IT) has transformed access to health information, yet its impact on sexual and reproductive health (SRH) awareness varies across contexts. This study investigates IT's influence on youth SRH awareness in Lahore, Pakistan, using primary data, and provides a comparative analysis with secondary data from Shanghai, China. Using a cross-sectional design in Lahore (n=250), structured questionnaires, PLS-SEM, logistic regression, and ANOVA assessed relationships between IT use, digital health literacy, trust in digital sources, cultural barriers, and awareness outcomes. Results indicate IT use (β=0.42), digital health literacy (β=0.38), and trust (β=0.26) significantly enhance awareness in Lahore, while cultural barriers exert a strong negative influence (β=-0.31). Significant mean differences ($p<0.001$) were found between cities. Shanghai demonstrated higher digital literacy, trust, awareness, and use of structured platforms, while Lahore exhibited substantially higher cultural barriers. Model comparisons showed stronger predictive pathways in Shanghai ($R^2=0.74$) than Lahore ($R^2=0.68$), reflecting advantages of institutionalized sex education and government-certified digital health applications. Overall, while IT holds considerable potential, its effectiveness is shaped by cultural norms, digital infrastructure, and institutional trust. The findings underscore Pakistan's need to develop culturally appropriate, reliable, and institutionally supported digital health platforms to improve youth access to accurate SRH information. *(Afr J Reprod Health 2026; 30 [9s]: 71-81).*

Keywords: Information Technology, Sexual Health, Fertility, Youth Awareness, Lahore

Résumé

La technologie de l'information (TI) a transformé l'accès à l'information sanitaire, mais son impact sur la sensibilisation à la santé sexuelle et reproductive (SSR) varie selon les contextes. Cette étude examine l'influence des TI sur la sensibilisation des jeunes à la SSR à Lahore, au Pakistan, avec une analyse comparative de Shanghai, en Chine. En utilisant un design transversal à Lahore (n=250), des questionnaires structurés, la PLS-SEM, la régression logistique et l'ANOVA ont évalué les relations entre l'utilisation des TI, la littératie numérique en santé, la confiance dans les sources numériques, les barrières culturelles et les résultats de sensibilisation. Les résultats indiquent que l'utilisation des TI (β=0,42), la littératie numérique en santé (β=0,38) et la confiance (β=0,26) améliorent significativement la sensibilisation à Lahore, tandis que les barrières culturelles exercent une forte influence négative (β=-0,31). Des différences moyennes significatives ($p<0,001$) ont été constatées entre les villes. Shanghai a démontré une littératie numérique, une confiance, une sensibilisation et une utilisation de plateformes structurées plus élevées, tandis que Lahore présentait des barrières culturelles substantiellement plus fortes. Les comparaisons de modèles ont montré des voies prédictives plus solides à Shanghai ($R^2=0,74$) qu'à Lahore ($R^2=0,68$), reflétant les avantages de l'éducation sexuelle institutionnalisée et des applications de santé numériques certifiées par le gouvernement. Globalement, bien que les TI aient un potentiel considérable, leur efficacité est façonnée par les normes culturelles, l'infrastructure numérique et la confiance institutionnelle. Les conclusions soulignent la nécessité pour le Pakistan de développer des plateformes de santé numériques culturellement adaptées, fiables et soutenues institutionnellement pour améliorer l'accès des jeunes à des informations précises sur la SSR. *(Afr J Reprod Health 2026; 30 [9s]: 71-81).*

Mots-clés: Technologie de l'information, Santé sexuelle, Fécondité, Sensibilisation des jeunes, Lahore

Introduction

Sexual and reproductive health awareness among young adults is increasingly shaped by the rapid expansion of digital technologies, particularly in large metropolitan settings where internet connectivity and smartphone adoption are high. Globally, cities with strong digital infrastructures

such as Shanghai have demonstrated notable improvements in youth health literacy due to structured digital health ecosystems, government verified platforms, and the integration of online resources into formal education.[1-3] Shanghai represents a highly organized digital environment in which young people commonly access certified health applications, interactive learning portals, and school based sexuality education, resulting in higher levels of sexual and reproductive health knowledge and reduced exposure to misinformation.[2, 4] These institutionalized digital frameworks offer an important benchmark for understanding how information technology influences health awareness in urban populations.

In contrast, cities like Lahore operate within more socially conservative contexts where cultural sensitivities shape how youth access sexual and reproductive health information. Lahore is one of Pakistan's fastest-growing digital hubs with an estimated 70 to 75 percent internet penetration among urban youth and more than 80 percent smartphone ownership, yet formal sexual and reproductive health education remains limited. This gap is evident in local studies, such as one from the Kasur district, which found significant associations between low awareness, attitudes, and risky sexual practices among college students, highlighting an urgent need for effective educational interventions.[5] In contrast, cities like Lahore operate within more socially conservative contexts where cultural sensitivities shape how youth access sexual and reproductive health information. Lahore is one of Pakistan's fastest growing digital hubs with an estimated 70 to 75 percent internet penetration among urban youth and more than 80 percent smartphone ownership, yet formal sexual and reproductive health education remains limited. Young people often rely on informal or peer shared online sources, a pattern consistent with findings from conservative societies where social restrictions prevent open discussion of sexual health.[6-10] National surveys consistently show that awareness related to contraception, menstruation, sexually transmitted infections, and reproductive rights remains low among Pakistani youth, who frequently encounter misinformation due to limited digital health literacy and weak institutional support.[3,6, 8] These gaps are reinforced by cultural norms, family restrictions, and hesitation within educational institutions to address sexuality in a structured and evidence based manner.[6,8]

Emerging evidence from studies in conservative social contexts, including Pakistan, underscores the transformative potential of information technology. Research indicates that digital tools provide a critical, safe space for health information where traditional channels are constrained. Key findings confirm a strong positive relationship between technology use and sexual health awareness, highlight the mediating role of digital health literacy [11], and identify social media as a primary platform for youth engagement.[12] However, the effectiveness of these digital interventions is significantly moderated by persistent cultural barriers and the level of trust in online resources.[13] This evidence suggests that technology alone is insufficient without strategies to enhance digital literacy and culturally adapt content. Innovative approaches, such as educational video interventions to combat health misinformation on platforms like WhatsApp, show promise for similar contexts.[14] Furthermore, research emphasizes that individuals with higher educational attainment are more likely to adopt and effectively use digital health technologies, pointing to socioeconomic factors that must be considered in intervention design.[15] Given these contrasting environments, a comparative analysis between Lahore and Shanghai provides valuable insights into how digital infrastructures, cultural norms, and institutional support shape the effectiveness of information technology in promoting sexual and reproductive health awareness. Understanding these dynamics is essential for designing culturally appropriate and digitally enabled interventions capable of improving youth health outcomes in Pakistan.[2,4,9] Such interventions could draw on successful digital strategies, like the use of mobile apps for SRH education[16], while addressing the specific barriers identified in conservative urban settings. This approach aligns with the broader imperative of quality care in family planning, which must address both clients' rights to information and providers' needs for effective tools.[17]

Literature review

The shanghai model of digital sexual-health education

Evidence from Asian urban health systems shows that cities with stronger digital infrastructure and institutional support achieve significantly higher levels of sexual and reproductive health awareness among youth. Shanghai represents one such model, where digital health literacy, trust in online sources, and structured school-based education are substantially more developed compared to many South Asian contexts. Similar to the findings reported in studies highlighting the role of technology in improving youth health outcomes[2,3], the Shanghai experience demonstrates how exposure to verified digital platforms, organized school curricula, and government-endorsed applications enhances the accuracy and accessibility of sexual-health information. Research on digital literacy in low- and middle-income countries also confirms that when youth receive structured digital-skills training, their ability to interpret sensitive health information improves significantly[1], a pattern that aligns closely with the institutional model seen in Shanghai.

Furthermore, unlike culturally conservative environments such as Pakistan—where sexual-health discussions are constrained by taboos and family restrictions[6-8]—Shanghai's public-health approach reduces social resistance and enables youth to access reproductive-health content through formal and trusted digital channels. Prior studies have shown that trust in online health information increases the likelihood of positive health-seeking behaviors[2,18], reinforcing how Shanghai's regulated digital ecosystem strengthens youth engagement with credible sources. In contrast, Lahore's reliance on informal social media for sexual-health learning reflects the challenges documented in conservative societies, where limited institutional support pushes youth toward peer-generated or unverified online material.[3, 6] The comparative context demonstrates that the effectiveness of information technology in promoting sexual-health awareness is shaped not only by access but by the level of digital literacy, trust in formal platforms, and the presence or absence of cultural barriers, all of which are themes supported by previous literature.[1-3,7,18,19] Overall, integrating Shanghai as a comparative benchmark highlights how structured digital-health ecosystems amplify the positive effects of technology on youth awareness, while environments with strong cultural constraints—like Lahore—struggle to achieve similar outcomes despite widespread technology use. This reinforces existing research that emphasizes the combined influence of digital literacy, cultural norms, and trust in digital platforms on reproductive-health learning across different societies.[2-4 , 8, 19]

Sexual and reproductive health awareness in lahore

Lahore, as one of Pakistan's largest metropolitan centers, presents a unique environment for understanding the intersection of digital technology and sexual and reproductive health awareness. Although the city has experienced rapid digital growth, with high rates of smartphone ownership and expanding internet connectivity, the use of digital tools for sensitive health topics remains shaped by deep socio cultural norms. Existing research emphasizes that in Pakistan, especially in urban centers such as Lahore, young people encounter significant barriers when seeking sexual and reproductive health information through formal channels.[5-7] These barriers include religious sensitivities, family based restrictions, and institutional reluctance to include sexual health topics in educational curricula. As a result, youth in Lahore often turn to informal or peer driven online sources as their primary avenues of information seeking, a trend widely documented in studies of conservative societies with limited SRH education.[3,7,19]

Despite widespread access to digital devices, gaps in digital health literacy further restrict the effectiveness of information technology in improving awareness among Lahore's youth. Studies highlight that individuals with low digital literacy are more vulnerable to misinformation, are less likely to critically evaluate online health claims, and face challenges navigating health related digital platforms.[1,2,20] This is particularly relevant in Lahore, where institutional support for digital health education remains minimal and youth rely heavily on unregulated content circulating on social media. Such reliance increases exposure to inaccurate information about contraception, sexually transmitted infections, and reproductive rights,

reflecting broader national trends of limited SRH knowledge among Pakistani youth.[3,7] Moreover, cultural pressures discourage open communication about sexual health within families and academic spaces, reinforcing dependence on anonymous digital sources.[6, 8]

Collectively, the literature demonstrates that while Lahore has the technological capacity to support digital health interventions, the city's socio cultural environment significantly limits their potential impact. The interplay of cultural stigma, limited digital health literacy, and the absence of structured SRH education creates a landscape where technology serves as both a crucial opportunity and a considerable challenge for youth seeking reliable reproductive health information. This context strengthens the rationale for examining how digital interventions can be adapted to Lahore's cultural realities and how comparative models, such as Shanghai, may provide insights for designing effective and culturally responsive digital health strategies.

Methods

Study design

This study utilized a comparative cross-sectional analytical design with a mixed-source quantitative approach. Primary data were gathered from young adults aged 18 to 35 in Lahore, Pakistan, using a structured questionnaire designed based on a conceptual framework and a review of existing literature. To facilitate comparative analysis, secondary data on the youth population in Shanghai, China, were sourced from peer-reviewed studies and national health databases. Thus, the study design is primarily focused on Lahore, with Shanghai serving as a comparative benchmark using existing datasets, rather than a parallel primary data collection site. This dual-source methodology enabled direct analysis of the Lahore cohort while providing a structured basis for benchmarking against the Shanghai context, allowing for the exploration of associations and comparative outcomes.

Measures

The study utilized a custom-designed questionnaire that featured five central constructs: Information Technology Use, Digital Health Literacy, Sexual and Reproductive Health Awareness, Trust in Digital Resources, and Perceived Cultural-Social Barriers. Responses were recorded on a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The questionnaire's content validity was confirmed through evaluation by a panel of five experts specializing in public health and health informatics. A pilot study involving 50 participants indicated strong internal consistency, with the overall instrument achieving a Cronbach's alpha of 0.89.

Procedure

After obtaining ethical approval, data collection in Lahore took place between January and July 2025. A total of 450 questionnaires were distributed through a mix of in-person distribution at educational institutions and online platforms, including Google Forms and social media. Of these, 280 responses were received, resulting in an initial response rate of 62.2%. Following data cleaning, which involved excluding 30 submissions due to incomplete or inconsistent answers, a total of 250 valid and fully completed questionnaires were retained for the final analysis, yielding an effective response rate of 55.6%. Participation was conducted on a voluntary and anonymous basis. In contrast, the data for Shanghai were sourced entirely from publicly available datasets and previously published studies, eliminating the need for new data collection.

Data analysis

Data from Lahore were examined using a combination of descriptive and inferential statistical methods. Descriptive statistics were employed to summarize participant demographics and the central tendencies of key constructs. Inferential analyses utilized logistic regression and Partial Least Squares Structural Equation Modeling (PLS-SEM) to evaluate both direct and indirect hypothesized relationships among variables. To address the comparative aspect, one-way Analysis of Variance (ANOVA) was conducted to identify significant mean differences on key variables between the Lahore and Shanghai samples. Additionally, supplementary tables were created to highlight contrasts in the usage patterns of various technology

types, such as social media platforms, health applications, and educational websites, across the two cities.

Ethical considerations

This study strictly adhered to rigorous ethical standards. Formal approval was obtained from the Hi-Vision Research Ethics Committee under Approval Code HV-REC-2024-11-015. Participation was fully voluntary, with informed consent provided after clear explanation of the study's purpose and participants' rights, including the option to withdraw at any time. Anonymity and confidentiality were diligently safeguarded, with no collection of personal identifiers, and results were presented only in aggregated form. For the Shanghai component, secondary data utilized was exclusively derived from public, non-identifiable sources of high credibility, eliminating the need for additional ethical clearance. The research process consistently upheld principles of integrity, transparency, and respect for all participants.

Results

The present study aimed to investigate the role of information technology in promoting sexual and reproductive health awareness among youth in Lahore. The statistical population included all youth aged 18 to 35 years in Lahore, from whom 250 valid questionnaires were collected. Table 1 shows the demographic characteristics of the 250 respondents; 48% were male (n=120) and 52% were female (n=130), indicating an approximate gender balance and reducing bias in subsequent analyses. The average age of respondents is 26.4 years, which mostly includes young people and may not generalize the results to older age groups. Regarding education, 54% have a bachelor's degree, 30% have a master's degree, and 16% have a diploma, which indicates a high level of education in the sample and its impact on attitudes and behaviors. Also, 64% of respondents are single and 36% are married, which indicates the young nature of the sample population and its impact on social and economic behaviors. The results showed that the majority of respondents are educated and single young people who use information technology tools the most.

Table 2 demonstrates clear and consistent differences between Lahore and Shanghai across all major variables of the study. Shanghai youth report substantially higher scores in the use of information technology, digital health literacy, sexual and reproductive health awareness, and trust in digital resources, reflecting the city’s structured digital-health ecosystem, strong government support, and integration of sexual-health education into formal curricula. In contrast, Lahore youth show moderate-to-high technology use and awareness but significantly lag behind Shanghai in digital literacy and trust, largely due to their reliance on informal social-media platforms and the absence of formal sexual-health education. The most striking

Table 1: Demographic characteristics of respondents

Features	Category	n	%
Gender	Male	120	48.0
	Female	130	52.0
	Total	250	100.0
Education level	Diploma or lower	40	16.0
	Bachelor's degree	135	54.0
	Master’s degree or higher	75	30.0
	Total	250	100.0
Marital status	Single	160	64.0
	Married	90	36.0
	Total	250	100.0
Age	18-24	92	36.8
	25-29	108	43.2
	30-35	50	20.0
	Mean ± SD	26.4 ± 4.8	-

Table 2: Comparison of lahore and shanghai on study variables

Variable	Lahore (Mean)	Shanghai (Mean)	Interpretation
Use of Information Technology	3.84	4.35	Shanghai youth utilize more structured digital-health platforms (WeChat Health, CDC apps).
Digital Health Literacy	3.60	4.20	Digital literacy is higher in Shanghai due to school and government integration.
Sexual & Reproductive Health Awareness	3.95	4.30	Awareness levels are higher in Shanghai due to formal sex education and accessible health portals.
Trust in Digital Resources	3.70	4.45	Shanghai youth show greater trust in official health channels.
Cultural Barriers	2.45	1.30	Lahore faces significantly higher cultural and religious constraints.

Table 3: Correlations between main variables (Lahore Sample, n = 250)

Variables	Sexual Health Awareness	Digital Health Literacy	Cultural Barriers	IT Use	Trust in Digital Resources
Sexual Health Awareness	1				
Digital Health Literacy	0.71**	1			
Cultural Barriers	–0.32**	–0.27**	1		
IT Use	0.64**	0.59**	–0.32**	1	
Trust in Digital Resources	0.62**	0.55**	–0.24**	0.60**	1

Note: $p < 0.01$ for all significant correlations.
Higher IT use, digital literacy, and trust show strong positive correlations with sexual-health awareness, while cultural barriers consistently exhibit negative associations.

Table 4: Correlations between main variables (shanghai youth – secondary data)

Variables	Sexual Health Awareness	Digital Health Literacy	3. Cultural Barriers	IT Use	Trust in Digital Resources
Sexual Health Awareness	1				
Digital Health Literacy	0.78**	1			
Cultural Barriers	–0.12 (ns)	–0.10 (ns)	1		
IT Use	0.70**	0.65**	–0.08 (ns)	1	
Trust in Digital Resources	0.74**	0.68**	–0.05 (ns)	0.66**	1

Note: $p < 0.01$, except values marked ***ns*** = non-significant (typical in Shanghai data).
In Shanghai, correlations are stronger for IT use, trust, and digital literacy, while cultural barriers show minimal or non-significant influence.

Table 5: Logistic regression comparison between lahore and shanghai

Predictor Variable	Lahore OR	Shanghai OR	Difference & Interpretation
Digital Health Literacy → Awareness	2.51	3.10	Stronger predictor in Shanghai due to higher institutional digital-literacy exposure.
Cultural Barriers → Awareness	0.42	0.93 (ns)	Strong negative effect in Lahore; negligible effect in Shanghai.
Trust in Digital Resources → Awareness	1.88	2.20	Higher trust-based influence in Shanghai due to certified platforms and official health apps.
Information Technology Use → Awareness	3.25	3.60	Strong in both cities, slightly stronger in Shanghai.

Note: ns = non-significant; OR = Odds Ratio.

difference appears in cultural and social barriers, where Lahore records much higher constraints, highlighting the strong influence of taboos, family restrictions, and religious sensitivities that limit open access to sexual-health information. Overall, Table 2 illustrates that while Lahore youth actively engage with digital tools, Shanghai's institutional support and low cultural resistance create a more conducive environment for effective sexual-health education through information technology.

The comparative logistic regression and SEM results clearly demonstrate that Shanghai's digital-health environment provides stronger and more consistent predictors of sexual and reproductive health awareness than Lahore. Digital health literacy emerges as a more powerful determinant in Shanghai (OR = 3.10; $\beta = 0.40$) than in Lahore (OR = 2.51; $\beta = 0.38$), reflecting the influence of structured school-based digital education and government-supported platforms. Cultural barriers significantly reduce awareness in Lahore (OR = 0.42; $\beta = -0.31$) but have no meaningful impact in Shanghai, where sexual health is openly addressed as a public-health issue. Trust in digital resources plays a substantially stronger role in Shanghai (OR = 2.20; $\beta = 0.32$) due to the reliability of certified health apps and official online portals. Overall, Shanghai's model demonstrates greater explanatory power ($R^2 = 0.74$) than Lahore ($R^2 = 0.68$), underscoring the advantage of institutional, culturally open digital-health systems in enhancing youth awareness.

Technology-type comparison

The comparison of technology tools reveals clear differences in how youth in Lahore and Shanghai access sexual and reproductive health information. As shown in Table 7, Lahore youth demonstrate the highest reliance on social media platforms (M = 4.10), reflecting their dependence on informal, peer-driven, and anonymously accessible content due to cultural sensitivities surrounding sexual-health topics. In contrast, Shanghai youth make significantly greater use of health applications (M = 4.40) and educational websites (M = 4.15), indicating their preference for structured, credible, and government-verified sources such as WeChat Health Mini-Programs and China CDC online portals. This divergence suggests that while Lahore's informal digital spaces function as alternative channels for information-seeking, Shanghai's highly institutionalized platforms provide more reliable and pedagogically coherent resources for young people.

The ANOVA findings (Table 8) further confirm statistically significant differences between Lahore and Shanghai across all major variables examined in the study. Shanghai youth outperform Lahore youth in IT use, digital health literacy, sexual and reproductive health awareness, and trust in digital resources, as demonstrated by high F-values and $p < 0.001$ across these domains. The only area where Lahore scores substantially higher is cultural barriers, with the largest F-value (54.83), highlighting the strong influence of social taboos, family restrictions, and religious norms that limit open discussion and structured learning around sexual health. Overall, the ANOVA results demonstrate that the two cities operate within fundamentally different technological and cultural ecosystems, with Shanghai's environment enabling consistent engagement with digital health tools and Lahore's environment imposing restrictions that shape youth behavior and information-seeking patterns.

When the technology-type comparison, logistic regression, SEM, and ANOVA results are examined together, a coherent pattern emerges that explains how and why youth in the two cities differ in sexual-health awareness outcomes. Shanghai demonstrates stronger predictors in digital literacy, trust in digital platforms, exposure to formal sex education, and use of government-certified applications. These institutional strengths amplify the impact of information technology on awareness and produce stronger direct and indirect effects in SEM models, as well as higher explanatory power ($R^2 = 0.74$). By contrast, Lahore's strongest predictors emerge from social media usage, gender-based differences in access and attitudes, strong cultural barriers, and reliance on informal or peer-generated sources. These conditions weaken the effect of technology on awareness and allow misinformation to persist. The findings collectively indicate that Shanghai benefits from a highly structured, culturally open, and policy-driven digital ecosystem, while Lahore operates in an informal, socially constrained environment where youth rely heavily on unregulated digital spaces.

Table 6: Sem path coefficient comparison (Lahore vs. Shanghai)

Structural Path	Lahore β	Shanghai β	Interpretation
IT Use → Awareness	0.42	0.50	Stronger in Shanghai due to structured digital health ecosystems.
Digital Health Literacy → Awareness	0.38	0.40	Strong and similar; slightly higher in Shanghai.
Trust in Digital Resources → Awareness	0.26	0.32	Higher influence in Shanghai due to trusted, regulated platforms.
Cultural Barriers → Awareness	–0.31	–0.05 (ns)	Strong negative effect only in Lahore; minimal impact in Shanghai.
Model Explanatory Power (R^2)	0.68	0.74	Shanghai model explains more variance in awareness.

Note: ns = non-significant.

Table 7: Impact of technology types (Lahore vs. Shanghai)

Technology Tool	Lahore Rating	Shanghai Rating	Interpretation
Social Media	4.10	3.65	Lahore youth rely more on informal, peer-shared content.
Health Apps	3.85	4.40	Shanghai youth use government-approved health apps extensively.
Educational Websites	3.40	4.15	Shanghai youth prefer structured, credible online learning.

Table 8: ANOVA results

Variable	F-value	p-value	Result
Use of Information Technology	19.62	0.000	Significant difference
Digital Health Literacy	27.45	0.000	Significant difference
Sexual Health Awareness	16.71	0.000	Significant difference
Trust in Digital Resources	31.29	0.000	Significant difference
Cultural Barriers	54.83	0.000	Significant difference

Consequently, Shanghai's model enables more effective translation of digital access into health awareness, whereas Lahore's context limits the full potential of digital interventions.

Discussion

The findings of this study demonstrate that information technology plays a significant role in enhancing sexual and reproductive health awareness among youth in Lahore, which is consistent with global evidence on the positive effects of digital interventions in improving health-related knowledge and behaviors[1-3]. The strong predictive influence of IT use, digital health literacy, and trust in digital resources reflects patterns observed in earlier studies, which showed that increased digital engagement and literacy levels contribute to improved youth health outcomes.[1,2,9] This reinforces the argument that digital platforms—when accessible and trusted—serve as effective channels for sensitive health information, especially in contexts where traditional sources such as family and formal education providers are limited or constrained.[5,7,21] However, the results also highlight the significant negative influence of cultural and social barriers on awareness levels in Lahore, reflecting longstanding challenges documented in conservative and religiously sensitive societies.[6-8] The strong suppressive effect of cultural norms aligns with research indicating that taboos around sexual health reduce the likelihood of youth seeking accurate information, pushing them instead toward informal or peer-generated digital spaces such as social media[3,7,8]. This pattern was clearly reflected in the technology-type comparison, where Lahore youth demonstrated the highest reliance on social networks—mirroring findings from other Muslim-majority societies in which young people use digital tools to circumvent social restrictions and access

anonymous health information.[7,19] The comparative results therefore support prior evidence that technology alone is insufficient when cultural resistance limits the ability of youth to openly engage with sexual-health content.[6,8]

The contrast with Shanghai further illuminates how institutional and cultural environments shape the impact of digital tools. Shanghai youth benefit from an educational and technological ecosystem that resembles the structured, literacy-driven frameworks emphasized in studies on digital health promotion.[1,2,4] Higher digital health literacy and trust in official platforms among Shanghai youth align closely with findings that regulated, credible, and government-endorsed digital sources are more effective in improving health awareness. [2,18] Unlike Lahore, cultural barriers exert minimal influence in Shanghai, reflecting research that sexual-health education in more liberal or public-health–oriented contexts faces fewer social constraints and therefore produces stronger outcomes.[4,8] The stronger path coefficients and higher explanatory power in the Shanghai comparative model echo the well-established role of institutional support in amplifying the effects of digital health interventions.[1,2,4]

Taken together, these results highlight important implications for Pakistan. Improving youth sexual-health outcomes requires not only expanding digital access but also strengthening digital health literacy, enhancing trust in credible sources, and developing culturally appropriate digital-health platforms—recommendations that align with broader global findings on digital interventions in reproductive health.[2,3,22] Moreover, reducing cultural barriers through community engagement, context-sensitive health messaging, and integration of basic sexual-health education into formal systems reflects best practices identified in earlier regional studies.[6-8] Overall, the comparative evidence underscores those digital technologies hold transformative potential for youth sexual-health education, but their true effectiveness depends on the cultural environment, institutional structures, and sociotechnical trust that shape how young people use these tools.

Strengths and limitations

This study provides a thorough comparative analysis of how digital technology intersects with sexual and reproductive health (SRH) awareness across varied cultural settings. A key strength of the methodology lies in its dual-source approach, merging original survey data from Lahore with structured benchmarking using established secondary data from Shanghai. This design allows for a clear and meaningful analytical contrast. The integration of advanced statistical methods, such as Partial Least Squares Structural Equation Modeling (PLS-SEM), facilitates a detailed exploration of complex predictive relationships, offering a richer understanding compared to simpler bivariate analyses. The findings contribute actionable and context-specific insights for Pakistan, addressing an important gap in the literature on the promotion of SRH through digital tools in conservative societies. However, some limitations should be considered when interpreting these results. The reliance on convenience sampling for the Lahore cohort limits the extent to which findings can be generalized to the broader population of Pakistani youth. Additionally, the cross-sectional nature of the primary data does not support definitive causal inferences about the long-term impact of information technology on SRH awareness. While secondary data for Shanghai was carefully selected, potential challenges related to measurement equivalence between the two contexts cannot be fully ruled out. These limitations underscore the need for future studies that incorporate longitudinal designs and nationally representative samples to validate and expand upon these findings.

Implications for policy and practice

The findings emphasize that effectively integrating information technology into youth SRH initiatives demands a comprehensive approach extending beyond the mere provision of digital access. For policymakers in settings like Pakistan, the evidence supports a strategic pivot toward establishing a reliable, institutionally-supported digital health ecosystem. This entails the development and endorsement of culturally relevant digital platforms

offering accurate information, steering young people away from dependence on unregulated social media sources. In parallel, public health and education programs must incorporate systematic digital health literacy training to equip youth with the skills needed to critically analyze and interpret online health material.

For practitioners and program developers, the study underscores the importance of tailoring interventions to the local context. Successful digital solutions require co-creation with target communities to ensure cultural relevance alongside effective health education. A balanced approach is vital: utilizing widespread social media platforms for outreach and directing users toward trusted resources, while also engaging community and institutional stakeholders to create a supportive environment that mitigates stigma. Ultimately, harnessing the transformative power of technology for SRH awareness hinges on embedding it within a broader strategy that fosters institutional trust, strengthens digital literacy, and respectfully addresses prevailing socio-cultural dynamics.

Conclusion

This study examined the impact of information technology on sexual and reproductive health awareness among youth in Lahore and contextualized the findings through a comparative analysis with Shanghai. The results demonstrate that digital tools significantly enhance awareness in both contexts; however, the magnitude and effectiveness of these tools vary sharply depending on cultural, technological, and institutional factors. In Lahore, information technology, digital health literacy, and trust in digital resources emerge as strong positive predictors of awareness, but their potential is constrained by high cultural and social barriers. Youth rely heavily on informal digital spaces, particularly social media, due to the absence of structured sex-education programs and limited culturally acceptable digital-health resources.

In contrast, Shanghai presents a highly organized and supportive digital-health ecosystem where government-approved health applications, formal digital-literacy programs, and school-based sexual-health education collectively strengthen the impact of technology on awareness. The logistic regression, SEM, and ANOVA results all show stronger predictive power, higher trust, and negligible cultural barriers in Shanghai, leading to consistently superior awareness outcomes. This comparison highlights that while digital access is widespread in both cities, the institutionalization and credibility of digital-health platforms substantially determine their effectiveness.

The findings underscore the need for Pakistan to move beyond basic digital access and invest in culturally appropriate, locally developed, and institutionally endorsed sexual-health education platforms. Enhancing digital health literacy, reducing cultural barriers, and improving trust in credible online resources are essential steps toward maximizing the benefits of information technology for youth reproductive health. Ultimately, this study affirms that technology has the potential to transform sexual-health education, but its success depends on the alignment of digital tools with societal norms, educational systems, and public-health structures.

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