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Understanding digital health needs: a qualitative study to explore urban and peri-urban user experiences and challenges in strengthening digital health services in Bangladesh

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Abstract

Background Bangladesh is moving toward digitizing its healthcare system through internet-based services, telemedicine, and mobile health platforms. Despite various digital health initiatives and supportive policies, uptake remains limited. This study applies the digital inclusion framework to examine how access, skills, content, inclusive design, and enabling environments influence the use of digital health platforms, particularly for sensitive services such as sexual and reproductive health and rights (SRHR).

Methodology This qualitative study followed a participatory action research (PAR) approach. Data were collected through 26 in-depth interviews and 18 focus group discussions with young adults (18–35 years), including persons with disabilities and gender-diverse individuals. Thematic analysis was guided by the digital inclusion framework, structuring inquiry around access to technology, digital skills, content relevance, inclusive system design, and supportive policy environments. Ethical approval was obtained from the BRAC James P Grant School of Public Health (IRB-19 March '23 – 009).

Results Fewer than half of participants (44%) reported positive experiences with digital health platforms, while most lacked awareness or the skills to use them effectively. Key barriers included limited access to private devices, low digital literacy, insufficiently tailored content for marginalized groups, cost (29%), and privacy concerns (64.5%). Knowledge of digital health laws and user rights was limited. These findings reveal persistent gaps across all five dimensions of digital inclusion.

Conclusions Adopting a digital inclusion lens is essential to build a sustainable and equitable digital health system in Bangladesh. This includes improving digital literacy, promoting inclusive and culturally sensitive content, and strengthening policy enforcement to ensure trust- and rights-based access, particularly for marginalized communities. The findings provide practical guidance for policymakers and developers to design accessible, inclusive digital

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SRHR services and demonstrate how applying a digital inclusion perspective can systematically identify barriers and facilitators to digital health engagement.

Keywords Digital health technology, Qualitative research, Semi-structured interviews, Health system challenge, Digital health, Young adults, Health apps, Bangladesh

Introduction

Digital health is playing an increasingly important role in healthcare delivery, with the World Health Organization (WHO) highlighting its potential to expand access, improve quality, and enhance efficiency as part of the Global Strategy on Digital Health 2020–2025. Digital health, defined by WHO as 'the development and use of digital technologies to improve health' [1], includes tools such as artificial intelligence (AI), the Internet of Things (IoT), and mobile applications that support remote care and data-driven decision-making [2]. The COVID-19 pandemic accelerated the global adoption of these technologies, offering solutions for continued service delivery during lockdowns [3–5] while simultaneously revealing persistent gaps in digital infrastructure, regulatory frameworks, equitable access, and users' ability to effectively engage with these services. While these trends highlight global progress, the realities in low- and middle-income countries reveal a more complex picture of adoption, access, and sustainability. The COVID-19 pandemic accelerated digital health adoption worldwide, but the resulting opportunities and challenges have been particularly pronounced in countries like Bangladesh.

In Bangladesh, this duality is particularly stark. Internet penetration has expanded rapidly, with 52.58 million users and a 31% penetration rate as of 2022 [6], and the number of digital health services such as telemedicine and mobile platforms has increased significantly during the pandemic [7]. However, the long-term effectiveness and adoption of digital health services remains a concern because of limited data protection frameworks [8–16, 17], declining public trust [18], and widespread digital literacy disparities, especially among rural, low-income, and marginalized populations [19].

These gaps are even more pronounced in sensitive health domains such as sexual and reproductive health and rights (SRHR), where issues of stigma, social taboos, and fears of confidentiality breaches discourage platform use, particularly among adolescents, women, gender diverse individuals, and persons with disabilities [20, 21–23]. Surveys indicate that as many as 90% of transgender people experience mental or sexual harassment when seeking medical services [24]. In South Asia, studies from India and Nepal have similarly reported that young people often hesitate to access digital SRHR services because of fear of judgment, lack of privacy, and social repercussions [25, 26].

While rapid digitization during the COVID-19 pandemic has illustrated what is possible, it has also emphasized that infrastructure alone is insufficient to ensure quality health education. Understanding users' lived experiences and the barriers they face is critical not only for identifying gaps in digital health access but also for informing the design and implementation of systems that are responsive to sociocultural realities and capable of promoting equitable use. This study responds to that need by examining the digital health experiences of adolescents and young adults (18–35 years) in urban and peri-urban Bangladesh, focusing on SRHR and the challenges marginalized groups face in accessing these services. Thus, this study investigates the ways in which adolescents, young adults, and marginalized groups in urban and peri-urban Bangladesh interact with digital SRHR services and the factors that enable or hinder their engagement.

Methodology

Aim and study design

This study aimed to:

1. Examine the experiences of young adults (aged 18–35 years) in using digital health services (especially related to SRHR) and identify the specific challenges they encounter.
2. Assess the transparency and accountability of existing digital health platforms and explore ways in which policies and regulations can be strengthened.
3. Investigate effective strategies for building a sustainable digital health ecosystem through collaborative efforts involving policymakers, healthcare professionals, technology developers, and community stakeholders.

An exploratory qualitative design was employed via a participatory action research (PAR) approach [27–29], involving representatives from study respondent clusters, including slum dwellers, garment workers, day laborers, housewives, students from public and private universities, persons with disabilities and gender diverse individuals. Participatory Action Research (PAR) was selected because it meaningfully involves participants in shaping the research process, strengthens the validity of qualitative inquiry, and helps ensure that marginalized groups' lived experiences directly inform analysis and action. PAR is well established as an approach that shares power

with communities, democratizes knowledge production, and produces contextually grounded findings—particularly valuable when working with populations facing structural inequities [30–32]. Two validation workshops were conducted. The first workshop, held before piloting the tools, involved sample cluster representatives and helped refine the interview and discussion guidelines. The second, a validation workshop consisted of two parts: the user end, which included representatives from the sample clusters, and the provider end, which brought together policymakers, digital health service providers, and representatives from organizations working with and advocating for persons with disabilities and gender diverse communities. Feedback from both workshops was actively incorporated into the final analysis, ensuring that the findings authentically reflected participants' lived experiences and the perspectives of key stakeholders.

To strengthen the conceptual and analytical structure, the digital inclusion framework (Fig. 1) was integrated into the study design. This framework comprises five key dimensions: (1) access to digital infrastructure and devices, (2) digital skills and literacy, (3) inclusive and safe design, (4) culturally and linguistically relevant content, and (5) enabling regulatory and policy environments [33]. This study is among the first to apply a structured digital inclusion framework to digital SRHR in Bangladesh, providing a comprehensive lens to examine how structural, social, and technological factors shape access, trust, and engagement. These dimensions informed the development of interview tools, and thematic coding categories, enabling a holistic understanding of both enabling and inhibiting factors in digital health service use, especially in the context of sexual and reproductive health and rights (SRHR). In this study, digital SRHR services refer to sexual and reproductive health information, counselling, and support accessed through digital channels, including teleconsultation platforms, mobile or web-based SRHR information portals, dedicated hotlines, SMS-based services, and social media–mediated sources of guidance.

Study sites and duration

This study was conducted in urban and peri-urban regions of the Dhaka division of Bangladesh. The urban area specifically focused on the metropolitan city of Dhaka, whereas the peri-urban areas included Tangail, Savar, and Narayanganj, each representing different aspects of the broader Dhaka region.

The study was conducted over a one-year period, from January 2023 to December 2023. Data collection, particularly interviews, was conducted between June and September 2023.

Study population, sample size and sampling technique

The study included 124 participants, targeting young adults as defined by the Bangladesh Youth Policy 2017, which considers any citizen aged between 18 and 35 years as a youth. The study population was divided into nine clusters: slum dwellers ($n=14$), garment workers ($n=22$), day laborers/menial job holders ($n=5$), job holders ($n=3$), housewives ($n=13$), private university students ($n=13$), public university students ($n=16$), persons with disabilities (PWDs) ($n=12$), and gender-diverse community members ($n=13$).

Participants who met the following criteria were included in this study.

a) Age between 18 and 35 years
b) Capable of using mobile phones, whether button phones or smartphones, indicating digital literacy
c) Access to digital devices, either their own or through shared use

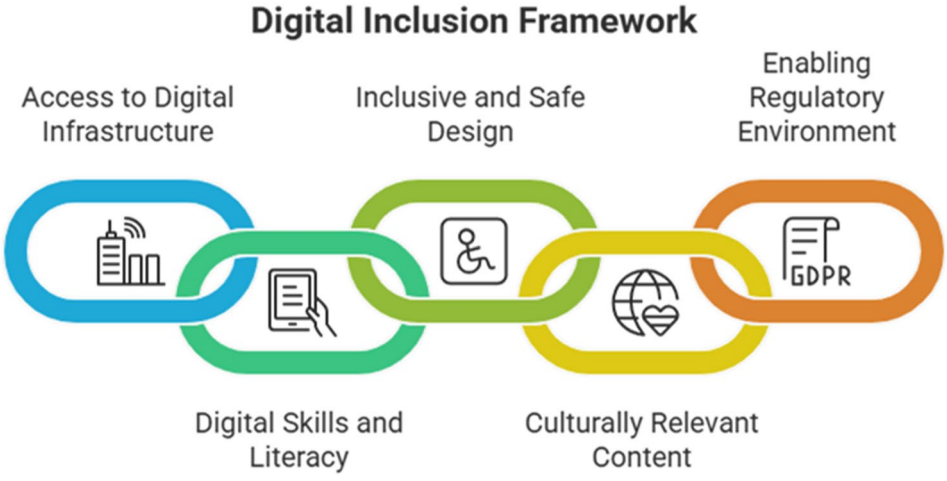


Fig. 1 Digital inclusion framework dimensions

Both male and female participants were selected through purposive sampling. They took part in in-depth interviews (IDIs) and focus group discussions (FGDs) as part of the qualitative study. Gender-diverse community members and persons with disabilities (PWDs) were approached and chosen via the snowball sampling technique. Gender diverse community members and persons with disabilities (PWDs) were approached and selected through snowball sampling because these groups are often hard to reach through conventional recruitment methods and may not be visible within formal community structures. Many individuals within these populations experience heightened concerns about privacy, stigma, and safety, which can limit their willingness to engage with unfamiliar researchers or public recruitment channels. Snowball sampling allowed the research team to build trust by relying on existing social networks and peer referrals, which is especially important when working with marginalized groups whose experiences with digital health services are shaped by exclusion, discrimination, and limited-service accessibility. This approach ensured that participants who are typically underrepresented were meaningfully included in the study and that their perspectives were captured in a respectful and ethical manner.

Key informant interviews (KIIs) were also conducted with stakeholders such as digital health service providers and leaders from organizations supporting persons with disabilities. Participants were selected based on their direct involvement in the design, delivery, or oversight of digital health services, as well as their experience working with populations who face barriers to digital inclusion. Digital health service providers in this study refers to institutions that deliver health information, counselling, or clinical services through mobile applications, telemedicine portals, and social media-based health channels. Eligible providers included licensed healthcare professionals offering remote consultations and digital content creators who disseminate health related information online. Leaders from disability focused organizations were included because of their expertise in accessibility, user needs, and service gaps affecting persons with disabilities. This selection ensured that the KIIs captured informed perspectives on both system level and user level challenges within the digital health ecosystem.

Data collection tools

The study followed a participatory action research (PAR) approach, and representatives from various sample clusters including slum dwellers, garment workers, day laborers, housewives, students from public and private universities, persons with disabilities, and gender diverse individuals were actively engaged in developing the qualitative interview guidelines. Their feedback focused on clarity, language, question sequence, and relevance during a guideline validation workshop and was thoughtfully integrated into the final version, ensuring that the guidelines were contextually relevant and aligned with the lived experiences of the study population. The development of the tools was also informed by the digital inclusion framework, ensuring that all five dimensions—access, skills, design, content, and an enabling environment—were adequately explored during the interviews.

The participants were asked to review the semi-structured interview guidelines, with a focus on several key aspects [34]:

a) Clarity of Content: Ensuring that the questions were straightforward and easy to understand, even for people with varying backgrounds or challenges.
b) Clarity of Wording: Confirming that the terminology and language were suitable for the target participants.
c) Grouping of Questions: Checking that the questions were grouped logically and that their order made sense.
d) Relevance of the Data Provided: Evaluating whether the questions were relevant and yielded the necessary data to meet the study objectives.
e) Number of Questions: Assessing whether the number of questions was appropriate, ensuring that the interview did not feel overly long or burdensome for participants.

Prior to the commencement of formal interviews, the guidelines were pretested to identify potential challenges and refine the interview process. During this phase, the interviewers systematically documented their field experiences, including observations made during interactions with respondents. These insights were subsequently discussed in a structured debriefing session to facilitate collective learning by the research team. This iterative approach enabled the evaluation and refinement of the interview methodologies, ensuring alignment with best practices and minimizing potential biases. The findings from the pretesting phase informed the necessary adjustments, optimizing the effectiveness and efficiency of the interview process.

Data collection process

A total of 26 IDIs, 3 KIIs, and 18 FGDs were conducted across urban and peri-urban areas. The distribution of participants across the study sites is presented in Table 1.

To ensure methodological rigor, separate open-ended interview guidelines were developed for each type of interview (IDI, KII, and FGD). Face–to-face interviews were scheduled at predetermined times based on the participants' availability, and the interviewers visited the

Table 1 Gender distribution of the interview participants across the study sites

Types of interviews	Gender	Urban	Peri-Urban			Total
		Dhaka	Narayanganj	Savar	Tangail	
IDI	Male	6	3	5	-	14
	Female	7	-	3	1	11
	Gender diverse	-	1	-	-	1
FGD	Male	17	-	15	-	32
	Female	20	6	18	6	50
	Gender diverse	5	7	-	-	12
KII	Male	1	1	-	-	2
	Female	2	-	-	-	2
Total		58	18	41	7	124

data collection sites. The establishment of rapport was prioritized, as the interviewers introduced themselves, expressed gratitude, explained the research objectives, and encouraged participants to ask questions or share their perspectives. All the interviews were conducted in Bangla, the native language of both the interviewers and the participants.

Written informed consent was obtained prior to participation. The consent document outlined the background and purposes of the study, potential risks and benefits, participant roles, the right to withdraw, confidentiality measures, and contact information for further queries. Participants who agreed to take part signed the form, and the interviews were audio-recorded with their permission to ensure accurate data capture.

Data collection was conducted by two interviewers, one male and one female, with social science and medical backgrounds. Each interviewer was accompanied by a research assistant of the same gender, who documented detailed field notes. The interviewers were trained in qualitative research methods and had experience applying similar data collection tools and techniques. The researchers followed an open-ended and probing approach, allowing them to explore participants' lived experiences and elicit richer narratives. The average duration of each FGD was 45–60 min, whereas IDIs and KIIs lasted between 30 and 45 min.

Prior to data collection, a training session led by the core research team was conducted for field researchers. It included (1) an overview of qualitative research methods, (2) practical exercises on conducting interviews via open-ended guidelines, and (3) ethical procedures in human research. All the interviews were digitally recorded.

This structured approach ensured methodological consistency, ethical compliance, and high-quality data collection, enabling a comprehensive exploration of the research theme.

Data analysis

Rigorous thematic analysis was employed to analyze the qualitative data [35]. All the recorded interviews were transcribed and translated by trained transcribers to ensure participant anonymity. The transcripts were imported into Dedoose software (version 9.0) for systematic coding and analysis.

A stepwise approach was followed to perform the thematic analysis.

(a) An a priori coding framework was developed based on literature, the research team's prior experience, and engagement in the study context.
(b) Familiarization with textual data through iterative reading of transcripts,
(c) Adding emergent codes derived from the transcripts to the code list
(d) Reviewing and categorizing all coded data and constructing a thematic matrix,
(e) Synthesizing and reporting the findings under the themes.

Initially. a deductive coding approach was applied to identify predefined themes based on the interview guidelines. As the analysis progressed, additional themes emerged inductively from the participants' narratives during the interviews and FGDs. To ensure analytical rigor and consensus, the researchers engaged in iterative discussions, comparing coded data for similarities and divergences across participant groups. The transcripts were coded through multiple rounds of reading and rereading to ensure thematic robustness and analytical reliability. A list of shared codes for themes was finalized based on patterns and variations observed across the IDIs, KIIs, and FGDs. Thematic convergence was noted across the data sources, with merged themes capturing overlapping insights while preserving the contextual nuances. The findings are presented in depth, reflecting both the commonalities and variations in the participants' experiences. Figure 2 depicts the steps followed for data analysis.

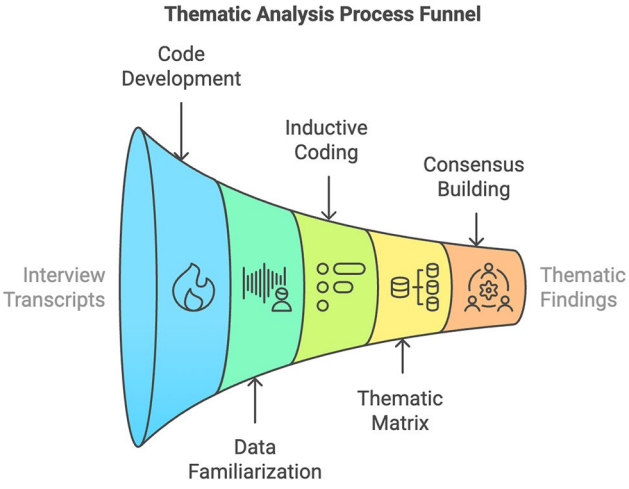


Fig. 2 The thematic data analysis funnel

Results

During the data analysis, the emerging themes and subthemes were organized into four overarching categories because they reflected the most dominant patterns in participants' narratives and aligned closely with the key dimensions of the Digital Inclusion Framework. (1) User experience impacts captured how interface design, accessibility, and digital skills shaped participants' interactions with digital health platforms, directly reflecting the framework's emphasis on access to digital infrastructure, digital literacy, and inclusive design. (2) Challenges and coping strategies emerged as a distinct category because participants consistently described barriers related to affordability, connectivity, safety, and navigation difficulties, which correspond to limitations in the enabling regulatory and policy environment outlined in the framework. (3) Preferences for in person services were maintained as a separate category, as these accounts highlighted unmet relational, emotional, and clinical needs that digital platforms could not adequately address, revealing gaps in culturally relevant and user centered service delivery. (4) Transparency and accountability formed the final category, capturing recurring concerns about data privacy, provider accountability, and trust, which are essential components of safe and equitable digital ecosystems within the framework. These four categories were therefore selected because they most effectively represented the central patterns in the data and provided a clear structure for understanding how digital inclusion factors shape engagement with digital health services in urban and peri urban Bangladesh.

The participants were actively encouraged to critically assess the interpretations, provide clarifications, and identify any gaps or overlooked nuances within the findings. This process was conducted through a two-part validation workshop, with one session focused on end users and the other involving stakeholders, including policymakers, digital healthcare professionals, technology developers, and community stakeholders, allowing perspectives from diverse actors to be incorporated. Their firsthand insights and contextual knowledge were pivotal in refining the thematic framework, ensuring that the results remained accurate and meaningful. By incorporating stakeholder feedback into the final analysis, the validation process strengthens the credibility and relevance of the study.

Demographics

A total of 124 participants took part in the qualitative component of the study, comprising 26 in-depth interviews (IDIs), 18 focus group discussions (FGDs), and 3 key informant interviews (KIIs). The participants were adolescents and young adults aged 18–50 years, with a mean age of 24.4 years. Three participants were gender-diverse individuals. Given the social taboo and discrimination faced by gender-diverse communities in Bangladesh, applying the inclusion criteria for the study required additional flexibility. Although all gender-diverse participants met these criteria, recruiting an adequate number who felt safe and willing to participate remained challenging due to stigma. Four participants were KII respondents, and therefore their ages were not restricted by the study's inclusion criteria. The sample included 53 males, 66 females, and 5 participants identified as gender diverse or transgender (See Table 2).

The participants were drawn from four key urban and peri-urban locations: Dhaka, Savar, Narayanganj, and Tangail. A wide range of occupations was represented in the sample, including students, garment workers, housewives, private and public sector employees, teachers, businesspeople, and members of gender-diverse and sex worker communities.

User experience impacts

Positive digital patient experience (PEx) Positive experiences were common; nearly half of the participants (55 of 124; 44%) reported positive experiences while using digital platforms for health services, particularly for issues they felt uncomfortable discussing in person. SRHR topics were the most common, and many young adults, particularly those in the late adolescents relied heavily on online sources to obtain health information due to social stigma, lack of privacy, and limited in-person support. The ability to access information anonymously gave them a sense of autonomy over their health needs, which they felt was lacking in traditional clinical encounters.

> *When I feel ill, I search on YouTube or Google to gather information about my symptoms. I also*

Table 2 Demographic characteristics of the population

Demographic	Category	Number of individuals
Self-reported gender	Female	66
	Male	53
	Transgender	3
	Trans woman	1
	Gender-diverse (GD)	1
Age range (years)	18–24	77
	25–30	27
	31–35	13
	36+	7
City	Dhaka	58
	Narayanganj	18
	Tangail	7
	Savar	41
Occupation	Student	55
	Housewife	19
	Garment/RMG worker	22
	Sex worker	6
	Teacher	2
	Private company job holder	2
	Businessman/small business/ menial job holder	7
	Slum dweller	5
	Other (photographer, office assistant, researcher)	6

searched online to know about medicines. (Male, 18–24 years, private university student)

During my adolescence, I did not feel comfortable talking and sharing about my physical changes with anyone. I relied entirely on the internet to obtain health information. (Male, 18–24 years, menial job holder)

Digital consultations also help many patients avoid long waiting times and cumbersome clinic visits. More than half of users (60 out of 120 participants) mentioned that online services allow users to choose providers, reschedule at their convenience, and, in some cases, even prepay for appointments all of which make the process smoother.

They will confirm 15 min before your scheduled time. You can prepay. If you have a problem, you can reschedule to your convenience. (gender diverse individual, 18–24 years)

For most of the marginalized users such as gender-diverse individuals (6 out of 10), the digital space offered emotional safety by removing the stress of face-to-face interactions, which were often described as judgmental or hostile.

I prefer the online source for SRH problems because if I go in person, I get harassed. I can't see the doctor's face online. Therefore, even if they judge me while providing treatment, I do not suffer from mental breakdowns. (gender diverse individual, 18–24 years)

Negative digital patient experience (PEx) Many users, about one-third of participants (35 out of 124) expressed concerns regarding the quality of digital consultations. Several participants reported that doctors often seemed rushed or distracted during online interactions, leaving patients to feel unheard and dissatisfied with the service. This was especially troubling for users who had sought help with sensitive issues and who expected personalized attention.

When we call a doctor online, they seem too busy and treat us in a rush. This in turn decreases the quality of service they provide. (Female, 18–24 years, private university student)

Members of the gender-diverse community felt that healthcare providers lacked both the clinical expertise and the cultural competence to address their needs. Even after paying high consultation fees, they were met with vague responses or were redirected elsewhere—an experience that reinforced their marginalization.

I talked online for a thousand taka per hour. The healthcare provider said, 'I'm extremely sorry. I can suggest to you someone else who is more expert than me.' They did not know what advice to provide me. (gender diverse individual, 25–30 years)

Mixed or double-edged experiences Around 40% of participants shared ambivalent experiences, appreciating the convenience and privacy of digital services while simultaneously questioning their adequacy and safety. They noted that while digital consultations provide more accessible and less stigmatizing alternatives to in-person care, they may not provide adequate support for diagnosing complex or serious health conditions. Participants frequently expressed concerns about being misunderstood, having physical symptoms overlooked, and potential breaches of privacy.

Online doctor visits are convenient, but discussing sexual health issues can be awkward on camera. Even so, it is less embarrassing than in-person visits. (Male, 25–30 years, private university student)

Financial concerns further complicated these experiences. While users acknowledged that digital health

could fill gaps in access, they often found it unaffordable, particularly those without a steady income, such as students or unemployed youth, with 36 out of 124; 29% of participants describing cost as a significant barrier.

> *Digital services are convenient for consultations but can be costly, posing a challenge for students. (Female, 25–30 years, private university student)*

Validation workshop participants highlighted that digital health services provide flexibility, convenience, and rapid access to care, especially during situations such as COVID-19 lockdowns. Participants described using telehealth platforms and mobile applications to consult doctors for physical issues like back pain or to seek psychological support remotely. One participant noted, *"During the corona lockdown, I contacted my doctor via WhatsApp because I couldn't travel to Dhaka, and it helped me manage my back problem without delay."*

Stakeholders confirmed that urban users generally had greater familiarity and comfort with these platforms, while rural populations relied heavily on informal networks or family connections to access care. Participants also noted challenges related to language and comprehension, particularly for SRHR information in English, limiting younger adolescents' ability to navigate digital health content effectively. As one stakeholder explained, *"Many users struggle with English terms in apps, so they either give up or use unreliable sources like Google or even Facebook to search for information."*

Challenges and coping strategies

Limited awareness of digital health services Nearly half of participants (55 of 124), especially those from low-income and low-literacy groups, were unaware of existing digital health platforms or how to access them. This digital exclusion was not due to a lack of interest but rather to a lack of exposure and digital literacy. Several participants stated that they would have considered using these services had they known about them. Participants' accounts indicated a clear gap in outreach and awareness-building within existing digital health initiatives.

> *If someone showed us where health services are available on the internet; we would not go to the doctor's chamber for treatment. (Female, 31–35 years, slum dweller)*

> *Not everyone knows about these apps. Only the educated people know about those, and people like us who never had proper education don't know about these. (Female, 31–35 years garment worker)*

This statement reflects the participant's perception that digital SRHR services are generally more familiar to individuals who have received formal education. In contrast, those with limited or no schooling may have less exposure to, or awareness of, these platforms. The participant suggests that a lack of formal education may contribute to difficulties in identifying, accessing, or navigating digital SRHR resources.

The digital health service providers acknowledged these limitations and noted the need for expanded outreach.

Cost barriers Financial constraints were a recurring theme, reported by almost half of students and menial job holders (36 of 124) particularly among young adults, who often lack income. While aware of the benefits of digital platforms, many reported avoiding them because the consultation fees were too high. These cost-related barriers limit access for a significant segment of the youth population, especially students and unemployed individuals.

> *I saw that these facilities are available online, but as a student with no income, I could not afford them. If I needed to use these services, I would have to ask my parents for money. (Female 18–24 years, private university student)*

Harassment and stigma avoidance Among gender-diverse individuals, harassment avoidance was a universal motivator (all 10 participants), with many preferring online consultations because they feared harassment or judgment in physical settings. The digital interface offered a layer of protection and anonymity that made it easier to discuss intimacy issues. However, this came at the cost of emotional connection and trust-building, some of which were found to be lacking in online care.

> *For intimate problems, I prefer online consultations. You do not see the doctor's face, so you avoid judgment and potential harassment. (gender diverse individual, 25–30 years)*

Data security concerns Data privacy has emerged as a significant barrier. More than two-thirds of the participants (80 out of 124; 64.5%) were particularly concerned about unauthorized access to their personal information and feared that sensitive health data might be misused, especially in local contexts where personal reputations could be easily harmed.

> *It is alarming to think these apps can access my phone and take my data. It's scarier because someone local could misuse my information. The plat-*

form needs to be more secure before I can trust it. (gender diverse individual, 25–30 years)

Misinformation and cross-verification Less than one-third of the participants (20 out of 124) reported difficulty navigating online health content. The abundance of conflicting information across platforms makes it difficult to distinguish credible advice from misinformation. In response, participants employed coping strategies such as comparing data across multiple sources to make more informed decisions.

Exactly not everything is right online. We obtain many types of information. We take the information that we find proper. (gender diverse individual, 18–24 years)

Exclusionary app design Some platforms require users to select either "male" or "female" during registration, effectively excluding nonbinary and gender-diverse individuals. Viewed through the lens of the digital inclusion framework, this rigid binary option reflects a gap in inclusive and safe design, creating structural barriers that limit equitable access and erode trust in digital SRHR systems. This exclusion is further compounded for gender diverse individuals, whose intersecting identities heighten their vulnerability to digital marginalization.

There are no other options. If I don't choose either male or female, they won't let me enter the app. (gender diverse individual, 18–24 years)

Validation workshop participants highlighted structural barriers such as high consultation costs, data charges, and limited access to devices, which constrained engagement with digital health platforms. They also described social and cultural challenges, including stigma surrounding SRHR, taboos around puberty, and gender norms influencing whether users felt comfortable seeking advice online. One participant explained, *"Even though we have the right to information, we don't know how to access it, so we end up not thinking about SRHR issues at all."*

Stakeholders confirmed that these barriers were particularly pronounced for marginalized groups, including gender diverse individuals and persons with disabilities. They suggested interventions such as multilingual terms and conditions, greater platform interoperability, leveraging community health workers to raise awareness, and designing services that account for sexual violence and gender diversity. As one stakeholder recommended, *"Apps should be inclusive and reach both rural and urban people, with content tailored to marginalized users and accessible in local languages."*

Preference for in-person services

Despite the increasing use of digital platforms, most participants (100 out of 124) expressed a strong preference for traditional, face-to-face healthcare. Familiarity with providers, trust in local clinics, and the ability to describe symptoms physically were cited as reasons. For many, especially those from low-income communities, interpersonal connections and established relationships with known providers mattered more than did technological convenience.

We do not use those services because, like I said earlier, we prefer visiting nearby doctors for treatment or checkups since we know them. (Female, 25–30 years, slum dweller)

Stakeholders from the validation workshop, confirmed that trust, cultural norms, and social acceptance shaped preference for in-person consultations. They noted that families in urban areas often insisted on clinic visits over online consultations, and marginalized populations continued to rely on face-to-face interactions for sensitive SRHR concerns. As one stakeholder explained, *"Even with digital services available, people from all backgrounds, poor or wealthy, prefer to visit doctors in person for important health issues."*

Transparency and accountability

The participants raised critical concerns about the integrity, governance, and legal framework underpinning digital health systems in Bangladesh. These concerns coalesced around five key issues: privacy, data protection, accountability, interoperability, and the lack of a responsive legal or regulatory infrastructure.

Privacy was a key theme across interviews, especially for those from gender-diverse and marginalized groups. Users felt anxious when asked to share sensitive personal and sexual health details without strong assurances that their identity would be protected.

They asked me a very intimate sexual question; I won't feel comfortable giving any information there. However, at the same time if I see they are taking information and they can maintain their anonymity, in that case, why not? (gender diverse individual, 25–30 years)

Relatedly, data protection was seen as inadequate, about 50% of participants expressing concern about the potential misuse of health and identity data. Several mentioned deliberately using spare SIM cards or generic contact information to register for apps to avoid being traced or judged by local actors.

When I'm taking a particular medical service, then I'm sharing that only with the doctor. The app can be registered with anything; you can register an app with a phone number. Nobody currently has only one SIM. Therefore, it will be seen that people would keep a SIM for anonymity only. (gender diverse individual, 25–30 years)

Concerns about accountability were pronounced, particularly concerning mental health services. About one-third of participants doubted whether online harassment or misconduct could be effectively investigated or resolved, citing gaps in cybercrime enforcement and limited police capacity to monitor or respond to digital violations.

Many of us know what type of harassment people are having while taking mental health services online. Nobody will try to search that much online. Police don't have that much time that they scroll through Facebook all day to determine who works in that group. (Male, 25–30 years, public university student)

The participants also reflected on the absence of interoperability—the ability of systems to share patient data across providers—in Bangladesh's digital health infrastructure. This was seen as a missed opportunity for improving diagnostic accuracy and continuity of care.

I've heard about interoperability from my relatives in the USA, where one doctor can send a patient's medical history to another; it is not available in Bangladesh. If it was available, it would help doctors diagnose patients better, and misdiagnosis would decrease. (Male, 25–30 years, private university student)

Furthermore, complaints against providers—especially private or commercial platforms—were often dismissed or mishandled. The participants felt that justice was unevenly applied depending on one's social status or influence.

If a random student complained at a police station, they might be ignored, while a prominent doctor would receive immediate attention. They are treated based on one's status. (Male, 25–30 years, private university student)

Finally, the legal frameworks governing digital health were described as outdated and ineffective. The existing penalties were too minor to act as deterrents, whereas newer regulations, such as those under the Digital Security Act, posed the opposite problem—excessively large penalties that discouraged users from reporting grievances.

Validation workshop participants highlighted that these concerns are shared widely among both users and stakeholders. They emphasized that issues of privacy, data security, and provider accountability are central to user trust and uptake. Gender diverse participants specifically expressed anxiety about disclosing identities online, reflecting ongoing gaps in safe and inclusive design. Stakeholders confirmed that platforms are taking steps to address these challenges through mechanisms like patient feedback systems, artificial intelligence assisted efficiency tools, and cloud-based medical records. They stressed the need for clear multilingual terms, strong authentication systems, and participatory design to improve accountability. One stakeholder noted, *"Platforms need well-defined safeguards and user input in their design to ensure people feel secure and confident in using digital health services."*

Discussion

We applied the digital inclusion framework to guide our understanding of how adolescents and marginalized groups in Bangladesh access and experience digital SRHR services. The different dimensions of the framework (access to digital infrastructure and devices, digital skills and literacy, inclusive and safe design, culturally and linguistically relevant content, and enabling regulatory and policy environments.) helped highlight how digital health service processes shape usability, trust, and engagement with these services. Figure 3 illustrates the five interrelated dimensions of the digital inclusion framework: availability, affordability, digital skills, relevance, and safety and provides a structured lens to understand how systemic and social factors shape access to digital health services. Availability refers to the presence and accessibility of digital infrastructure, including devices, internet connectivity, and reliable platforms, without which users cannot engage with digital health services. Affordability captures the financial barriers associated with accessing devices, data plans, or subscription-based services, which particularly limit low-income youth and students from fully utilizing digital platforms. Digital skills encompass users' ability to navigate, evaluate, and effectively use digital tools; gaps in these skills were highlighted in our study as a critical limitation affecting engagement and confidence in using digital SRHR services. Relevance reflects the degree to which digital platforms meet the specific needs of diverse user groups, including gender diverse individuals and persons with disabilities; participants noted that platforms lacking customization or inclusive design failed to address these needs. Safety involves concerns related to data privacy, confidentiality,

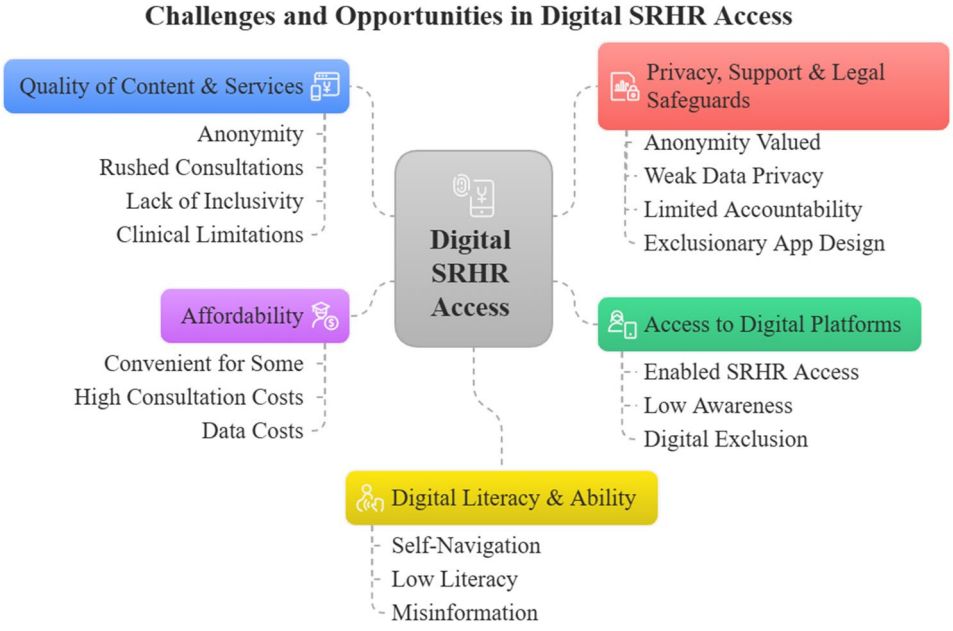


Fig. 3 Summary of study findings categorized using the digital inclusion framework

potential surveillance, and social stigma, which in some cases discouraged users from seeking sensitive SRHR information or services online.

By mapping our findings onto this framework, we can interpret barriers not merely as individual limitations but as manifestations of broader structural digital exclusion. In our study, affordability and digital skills emerged as the most significant constraints, while relevance and safety were central to concerns among marginalized groups. This highlights that promoting digital SRHR services requires comprehensive interventions: expanding access, reducing costs, enhancing digital literacy, redesigning platforms for inclusivity, and strengthening protective regulations to ensure equitable digital participation.

This study provides nuanced insights into the experiences, challenges, and expectations of adolescents and young adults in Bangladesh in accessing digital platforms for sexual and reproductive health and rights (SRHR) services. Through a mixed-methods and participatory approach, we categorized users' experiences as positive, negative, or double-edged and identified a complex web of sociocultural, economic, and policy-related barriers that affect digital health uptake. These findings are particularly relevant in the context of Bangladesh's rapid digital transformation post-COVID-19 and offer transferable lessons for other low- and middle-income countries (LMICs). The study findings highlight how challenges such as digital literacy gaps, privacy concerns, and trust issues can shape user engagement, providing insights applicable to implementing digital health initiatives elsewhere.

The image presents a consolidated overview of the key drivers and barriers shaping the uptake of digital health services in this study. The drivers show how digital platforms create a supportive environment through enhanced privacy, anonymity, and emotional safety, which are particularly important for users seeking sensitive SRHR support, including gender diverse populations. Convenience, flexibility, and time efficiency further encourage engagement, while access to online health information, peer recommendations, and discreet modes of care strengthen users' confidence in digital health options. Additional facilitators include flexible communication channels, the natural integration of these services into everyday technology use, opportunities for self-management, and the availability of culturally and linguistically relevant content. These features allow users to navigate their health needs with greater autonomy and with fewer social and logistical barriers than in traditional health care settings.

In contrast, the barriers highlight persistent structural and experiential challenges that limit meaningful uptake. High costs limited digital literacy, and concerns about data privacy discourage many potential users, particularly students, low-income groups, and those who rely heavily on shared devices. Service-related issues such as poor consultation quality, exclusionary or binary app design, unstable connectivity, and limited personalization further reduce user satisfaction. The lack of provider competence in SRHR and gender affirming care also lowers trust, especially among marginalized groups who are more likely to experience dismissal or misinformation. Broader social norms and fears of family surveillance continue to shape online health seeking behavior, while

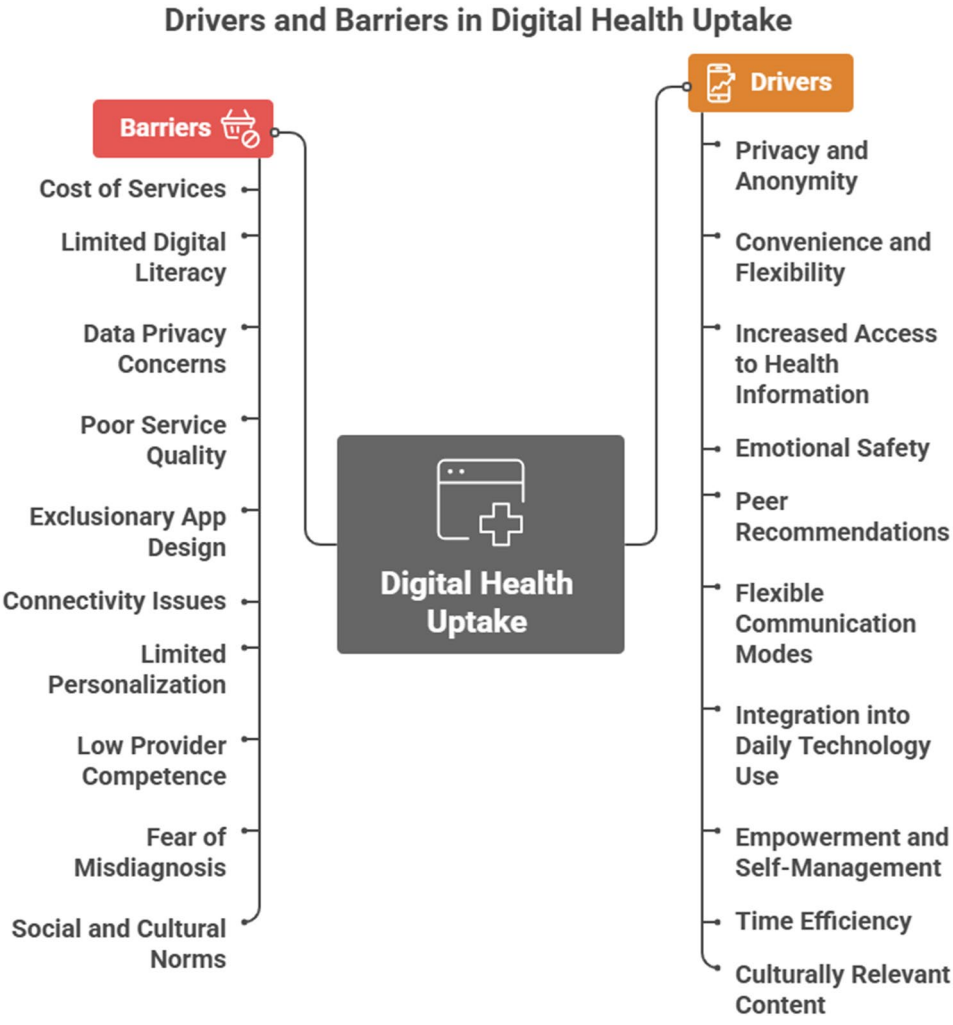


Fig. 4 Drivers and barriers in the uptake of digital health services

inadequate technical support, language constraints, low trust in unfamiliar platforms, and fragmentation across digital services create additional points of confusion and frustration. The Figure (Fig. 4) maps the key facilitators and barriers influencing digital health service use, showing how factors at individual, social and system levels jointly shape uptake and user experience. Taken together, the image illustrates how the interaction between individual, social, and system level factors influences the overall engagement with digital health services in the Bangladeshi context (Fig. 4).

Digital health services offer convenience and expand access, but uptake remains disproportionately low

The participants in our study frequently acknowledged the convenience, time savings, and reduced physical barriers associated with digital consultations. For individuals living in urban slums or those with mobility constraints, digital health platforms were often the only viable option for accessing healthcare during pandemic-related lockdowns.

This finding aligns with Ahmed et al. (2020), who asserted that access to digital health is not merely about device ownership or internet connectivity. Instead, it is shaped by a confluence of factors such as digital literacy, health literacy, awareness, affordability, and sociocultural norms [36]. In other words, access is both a technical and a social construct, and its distribution remains highly uneven. This discrepancy helps explain why the availability of digital SRHR platforms has not translated into higher uptake among the country's youth.

Impersonal and rushed care is a barrier—especially for sensitive SRHR concerns

The participants frequently cited negative experiences such as feeling rushed during consultations, not being listened to adequately, or encountering robotic, impersonal service. These perceptions were particularly pronounced when seeking advice on SRHR issues—topics

already stigmatized in many parts of Bangladeshi society. The respondents described digital consultations as lacking empathy, rapport, and follow-up, making it difficult to trust the advice given or feel comfortable disclosing sensitive information. This indicates that interpersonal elements of care which are often taken for granted in face-to-face consultations remain as critical determinants of whether users perceive digital health as credible and safe or not.

Fiske et al. (2020) identified a similar pattern in other contexts, where users reported that the liberatory potential of digital health—particularly for stigmatized conditions—was often undermined by low-quality interaction, fragmented service, and discomfort in remote clinical encounters [30]. In our study, this was exacerbated for gender diverse individuals and persons with disabilities, for whom cultural and institutional mistrust is already high. These findings suggest that the interpersonal dimensions of care remain critically important, even when they are delivered through digital means.

"Double-edged" patient experiences reflect both the value and limitations of digital health

A significant proportion of users described digital health as a "double-edged sword"—offering convenience and anonymity while also falling short in reliability, depth, and trust. The participants appreciated the opportunity to seek advice without judgment or travel, but they simultaneously feared misdiagnosis, miscommunication, and data misuse. For example, some users reported receiving generic or unclear guidance and expressed concern about whether their medical information was adequately protected. In our study, this dynamic was evident in users' SRHR-related experiences, where increased access coexisted with uncertainty, mistrust, and unmet informational needs reinforcing that availability alone cannot guarantee equitable or empowering digital health use.

This echoes Fiske et al.'s (2020) concept of "uneven emancipation," where digital platforms expand access in principle but may not deliver equitable or empowering experiences in practice [30]. Users' ambivalence reflects both the potential and the precariousness of digital health, particularly when it is poorly regulated, inadequately resourced, or not adapted to users' specific SRHR needs.

Digital health literacy are major bottlenecks to equitable access

Another critical finding was the lack of awareness of available digital health services. Many participants especially those from low-income or marginalized communities reported that they did not know that such platforms existed or were unsure how to navigate them. Digital literacy challenges compound these barriers, leading some to rely on informal or unverified sources of health information, such as social media or peer advice.

These challenges resonate beyond the Bangladeshi context, indicating that digital literacy barriers are a common obstacle globally. Kaihlanen et al. (2022) reported similar results in Finland, noting that even in technologically advanced contexts, barriers such as unfamiliarity with platforms, lack of e-identification, and communication apprehensions can reduce engagement [31]. The fact that such barriers exist in both high-income and low-income settings suggests that bridging the digital divide requires more than technical infrastructure—it demands community-level education, trust-building, and an interface design that is inclusive and intuitive.

Users clearly distinguished between digital care as complementary not a replacement for in-person services

A strong theme throughout the study was that participants viewed digital health as a helpful adjunct, but not a substitute, for in-person care. Digital consultations were considered suitable for minor ailments or general advice but were deemed inadequate for emergencies, reproductive health complications, or issues requiring physical examination. This layered perception of care reflects both pragmatism and caution, especially in a context where the quality of digital healthcare remains uneven.

Whitten et al. (2021) similarly stressed the importance of integrating digital health into existing systems rather than positioning it as an alternative. They argued that a hybrid model—combining the scalability of digital tools with the depth of clinical engagement in face-to-face care—offers the most sustainable path forward [32]. Our findings reinforce this perspective, highlighting that digital health should enhance, rather than replace, primary care systems.

Sociocultural stigma, gender norms, and economic inequality compound digital exclusion

Barriers to digital SRHR services extend beyond technology, reflecting deep-rooted social and cultural constraints. Participants highlighted how stigma particularly affecting unmarried women, LGBTQ individuals, and people with disabilities undermined their willingness to seek help, while financial barriers such as consultation fees and data costs further limited access. These findings suggest that addressing digital SRHR inequities requires interventions that go beyond platform design to tackle social norms, inclusivity, and affordability.

National-level policies in Bangladesh acknowledge many of these structural challenges, though gaps remain in implementation. The National Strategy for Adolescent Health (2017–2030) explicitly commits to improving adolescents' access to comprehensive information and services, including through telemedicine and portable

health records [37]. However, our findings show that stigma and fear of judgment still restrict young people's engagement with SRHR platforms, indicating that policy ambitions have yet to translate into user-level trust and comfort. Similarly, the Bangladesh Population Policy (2012) encourages the use of modern digital information technologies to improve access to information [38], yet participants' experiences reflect persistent inequities in digital literacy, device access, and social acceptability.

This indicates that effective digital health strategies must integrate social and structural considerations, such as creating safe, nonjudgmental spaces for sensitive discussions and implementing pricing or subsidy mechanisms to ensure equitable access. By addressing these intersecting barriers, digital SRHR services can move from merely available to genuinely accessible and empowering for diverse user groups.

Ahmed et al. (2020) noted that health service usage is shaped by an interlocking web of literacy, mobility, affordability, and social acceptance [36]. Salim et al. (2021) similarly reported that in Pakistan, high costs reduce the feasibility of telemedicine for large swaths of the population [39]. Our findings reaffirm these conclusions and indicate that structural inequalities such as gendered barriers, disability-related constraints, and sexuality-based stigma, including fear of social judgment and concerns about being monitored when seeking SRHR information continue to shape who can meaningfully access digital health. Without confronting these inequities and the social taboos that reinforce them, the promise of digital health will remain unfulfilled.

These social barriers also sit alongside national digital transformation agendas. The SMART Bangladesh ICT Master Plan 2024 outlines a long-term vision for inclusive, AI-enabled digital healthcare by 2041, emphasizing universal access to health information, telemedicine, and digital records [40]. While this framework prioritizes innovation and equitable access, our study highlights that users require more than technological availability alone—they need assurance of privacy, social acceptability, and support to navigate systems safely. The 2018 National ICT Policy similarly prioritizes equity and data protection, reinforcing the need for national e-Health policies that safeguard SRHR information and promote inclusive access for marginalized groups [41]. Aligning digital SRHR services with these commitments could help reduce disparities, but meaningful progress depends on addressing the social norms and affordability barriers identified by participants.

Building trust requires policy safeguards, transparency, and participatory platform design

A key concern across user groups was the lack of data security and accountability. These concerns directly intersect with the Digital Inclusion Framework, particularly its emphasis on inclusive and safe design as well as enabling regulatory and policy environments, underscoring the need for stronger safeguards to build user trust and ensure equitable digital health engagement. Many participants expressed hesitation in using SRHR platforms due to fear of data breaches or unwanted disclosure. Trust in digital services was closely linked to the perceived transparency, regulatory oversight, and responsiveness of the service provider.

Nwosu et al. (2022) and Reynolds et al. (2020) emphasized that digital health expansion must be accompanied by strong governance mechanisms that protect user rights, enforce ethical standards, and ensure affordability [42, 43]. In Bangladesh, this includes developing robust policies on data privacy, app certification, and grievances. The participants believed that digital health services have the potential to simplify healthcare access, particularly when platforms are designed to address the specific needs of people with disabilities and gender-diverse individuals. Such inclusive adaptations can enhance uptake by enabling marginalized groups to meaningfully access, navigate, and benefit from digital health services despite social, cultural, and structural barriers. Furthermore, actively involving users from these communities in the design and evaluation of digital platforms can improve the relevance of services and promote their sustained adoption.

Several national policies outline the foundations for such governance. The Digital Security Act (2020) establishes penalties for misuse of digital data and attempts to address online harassment, an issue that participants frequently worry about when engaging with SRHR content [44]. Although the Act aims to strengthen digital safety, users' perceptions indicate a need for clearer, health-specific data protection mechanisms, particularly for sensitive SRHR information. The National Health Policy (2011), aligned with earlier ICT policy frameworks, prioritizes integrating ICT in health service delivery and expanding e-governance and telemedicine [45]. Despite this, participants' concerns about surveillance, unauthorized data sharing, and lack of accountability suggest a substantial gap between policy mandates and user experience. Strengthening implementation, transparency, and user rights protections is essential for building confidence in digital SRHR platforms.

Conclusions

This study reveals a generally positive attitude toward digital health technologies among adolescents and young adults in Bangladesh. The participants believed that digital tools have the potential to simplify healthcare access by enabling remote consultations, reducing travel and waiting times, and providing confidential spaces to

discuss sensitive issues. These benefits are particularly valuable when platforms are designed to be inclusive, accessible, and tailored to the needs of persons with disabilities and gender diverse individuals. Such inclusive adaptations are essential to enhance uptake and ensure that marginalized groups can meaningfully access, navigate, and benefit from digital health services, overcoming social, cultural, and structural barriers. These adaptations are further supported by national policies, including the SMART Bangladesh ICT Master Plan and the National Strategy for Adolescent Health, which emphasize inclusive, technology-driven health access for all.

The qualitative findings provide insight into the range of end-user perspectives, highlighting the value of understanding users' lived experiences with digital health technologies. Using participatory action research (PAR) in this study ensured that participants from marginalized communities actively shaped the research process, enhancing the relevance and authenticity of findings. These insights are critical for developing digital health platforms that are not only functional but also responsive to the diverse cultural, social, and ethical contexts of sexual and reproductive health and rights (SRHR) services. Emphasizing SRHR ensures that digital interventions address sensitive health needs while navigating stigma and social taboos.

Consistent with the principles of the digital inclusion framework, our findings emphasize that equitable digital health adoption depends on multiple interconnected dimensions—access, literacy, affordability, usability, and empowerment. Addressing these dimensions requires proactive efforts to increase awareness among potential users about available digital health services and clear guidance on how to access them. Through social media, television, and other mass media channels, outreach can effectively disseminate this information to diverse populations.

Furthermore, the study highlights the critical need for a robust feedback mechanism that enables users to share their experiences and recommend improvements. Involving users in the development process through community outreach initiatives or participatory design workshops is crucial for digital health developers and policymakers to gain a deep understanding of user needs and concerns. This understanding allows health and ethical considerations, such as privacy, autonomy, and stigma, to be meaningfully incorporated into digital health platforms.

Finally, establishing comprehensive accountability and governance frameworks is paramount to protect users' data security and rights. This should include enacting robust data protection legislation that defines clear responsibilities for data handling and storage, implementing standardized certification processes for digital health applications to ensure reliability and quality, and creating transparent grievance and redress mechanisms that allow users to report privacy breaches, misdiagnoses, or other service concerns. Regular audits, monitoring, and enforcement mechanisms should be established to ensure compliance with these standards. Ensuring privacy and transparency will build trust among users, encouraging more widespread and sustained use of digital health services. Linking these governance measures to existing national frameworks, such as the Digital Security Act 2020, strengthens user confidence and aligns digital health practice with policy mandates. These findings contribute to the literature by demonstrating how user-centered and inclusive digital health approaches can address structural barriers, supporting prior evidence that digital health interventions are most effective when they consider accessibility, literacy, and socio-cultural context.

Limitations

This study included participants from diverse backgrounds, including program planners, healthcare managers, health providers, representatives from marginalized communities (persons with disabilities and gender-diverse individuals), and community members, which allowed for a variety of perspectives and enhanced data triangulation. However, the study has some limitations. The purposive sampling approach introduces a potential sampling bias, as it may not fully represent all user groups or regions. Additionally, the study was limited to specific urban and peri-urban areas, which may affect the generalizability of the findings to other contexts such as rural areas. Despite these limitations, the diverse participant perspectives provided sufficient depth to understand the key factors influencing patients' preference for in-person care over digital health services. Further research across broader geographic, socioeconomic, and digital literacy contexts will be important for identifying barriers, improving engagement, and refining digital health solutions in Bangladesh.

Abbreviations

GD	Gender diverse
PAR	Participatory action research
PEx	Patient experience
PWDs	Persons with disabilities
SRHR	Sexual and reproductive health and rights

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s44247-026-00243-2.

Supplementary Material 1

Supplementary Material 2

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Author contributions

The FAM conceptualized and designed the study, supervised the overall process, contributed to data interpretation, and reviewed the final manuscript. SMK managed the data collection, conducted the interviews, led the data analysis and coding, and contributed significantly to the drafting of the manuscript. MTA conducted the interviews and contributed to the data analysis and coding. MMM focused on the literature review and supported data interpretation. MHS provided critical feedback on the study design and played a key role in the literature review. All the authors reviewed and approved the final manuscript for publication.

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Data availability

The data supporting the findings of this study are not openly available owing to sensitivity concerns but can be obtained from the corresponding author upon reasonable request. The data are stored in a controlled-access repository at the BRAC James P Grant School of Public Health, BRAC University. In addition, the interview and focus group discussion guides are provided as supplementary materials to ensure transparency and replicability.

Declarations

Ethics approval and consent to participate

The Institutional Review Board (IRB) at the BRAC James P Grant School of Public Health (JPGSPH), BRAC University, reviewed and approved the study (IRB-19 March '23 – 009). All procedures adhered to institutional ethical guidelines and the principles of the Declaration of Helsinki [46]. Written informed consent was obtained from all participants before data collection. The consent document described the study purpose, procedures, potential risks and benefits, participant roles, confidentiality measures, the voluntary nature of participation, and the right to withdraw at any time. Participants who agreed to take part read and signed the consent form, and interviews were audio recorded with their permission to ensure accurate data capture. All data were anonymized prior to analysis.

Consent for publication

In this study, consent for publication was obtained via our institutional consent form, which complies with all relevant ethical guidelines.The form was signed by all participants, providing written informed consent for the publication of their anonymized personal data in this manuscript.

Competing interests

The authors declare no competing interests.

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