

Understanding the Reach of Telemedicine: Awareness, Usages, and Social Business Opportunities for Sustainable Healthcare in Rural and Urban Bangladesh

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Abstract

This study investigates awareness, use, perceptions, and future intentions regarding telemedicine among rural and urban populations in Bangladesh. It further explores how these findings can inform sustainable social business strategies to expand access to telemedicine. A survey of 76 individuals from Dhaka (Urban) and Gopalganj (Rural) was conducted to assess key behaviors and attitudes. The results show that urban respondents are more familiar with telemedicine, whereas rural participants perceive it as more effective and are more likely to use it in the future. A notable gap exists between awareness and actual usage across age groups, with only weak correlations observed between perceived quality, awareness, and future intention. This suggests that people's interest in telemedicine is driven more by their healthcare needs than by familiarity with the technology. A social business model that focuses on keeping costs low, engaging the community, and reinvesting profits could help overcome barriers such as low awareness, lack of trust, and limited access. The study concludes that telemedicine, when supported by sustainable social business practices, has the potential to improve healthcare access in underserved areas of Bangladesh and other developing countries.

Keywords: social business, telemedicine, Bangladesh, digital health

Abstrak

Kajian ini menyelidik kesedaran, penggunaan, persepsi, dan hasrat masa hadapan mengenai teleperubatan dalam kalangan penduduk luar bandar dan bandar di Bangladesh. Ia seterusnya meneroka bagaimana dapatan ini boleh memandu strategi perniagaan sosial yang mampan bagi memperluas akses kepada teleperubatan. Satu tinjauan terhadap 76 individu dari Dhaka

(Bandar) dan Gopalganj (Luar Bandar) telah dijalankan untuk menilai tingkah laku dan sikap utama. Hasil kajian menunjukkan bahawa responden bandar lebih maklum mengenai teleperubatan, manakala peserta luar bandar menganggapnya lebih berkesan dan lebih cenderung untuk menggunakannya pada masa hadapan. Wujud jurang yang ketara antara kesedaran dan penggunaan sebenar merentas kumpulan umur, dengan hanya korelasi lemah diperhatikan antara persepsi kualiti, kesedaran, dan hasrat masa hadapan. Ini menunjukkan bahawa minat masyarakat terhadap teleperubatan lebih didorong oleh keperluan penjagaan kesihatan berbanding kebiasaan dengan teknologi tersebut. Model perniagaan sosial yang memberi tumpuan kepada pengekal kos yang rendah, penglibatan komuniti, dan pelaburan semula keuntungan berupaya membantu mengatasi halangan seperti tahap kesedaran yang rendah, kurangnya kepercayaan, dan akses yang terhad. Kajian ini menyimpulkan bahawa teleperubatan, apabila disokong oleh amalan perniagaan sosial yang mampan, berpotensi meningkatkan akses penjagaan kesihatan di kawasan yang kurang mendapat perkhidmatan di Bangladesh serta negara-negara membangun yang lain.

Introduction

Bangladesh is a densely populated developing country that continues to struggle to provide equitable access to quality healthcare. The national doctor-patient ratio is well below the World Health Organization (WHO) recommendations, with only seven doctors per 10,000 population (World Bank, 2021; Kumar & Pal, 2018). The gap is even wider between cities and rural areas. Rural regions have just 1.1 doctors per 10,000 population, while major cities have 18.2 per 10,000 (Ahmed et al., 2011). Because of this shortage, many rural residents turn to informal and untrained “village doctors, who are often the first people they consult for health issues (Mahmood et al., 2010).

This situation raises concerns about improper treatment, misuse of medication, and long-term health risks.

In recent years, digital health tools, particularly telemedicine, have emerged as promising solutions to overcome barriers to healthcare resulting from distance and limited resources. Telemedicine has been around for decades, but its widespread use was limited due to challenges related to access to technology, cost, and infrastructure (Bergmo, 2015; Nessa et al., 2008). The COVID-19 pandemic quickly changed this, making telemedicine a crucial means of providing care remotely and maintaining services during lockdowns and travel restrictions (Chowdhury et al., 2021). Increasingly, studies from both

international and local contexts demonstrate that telemedicine can enhance access, reduce costs, and facilitate the delivery of timely healthcare, particularly in underserved communities (Ahmed et al., 2023; Bali, 2019).

Telemedicine in Bangladesh is not just about making healthcare more convenient. It also offers an opportunity to integrate social business and other entrepreneurial innovation models, such as Micro Healthcare Entrepreneurship (MHE), which combines affordability, accessibility, community empowerment, and sustainable healthcare delivery (Hossain et al., 2024). These models can help bring telemedicine, how much they know about it, how often they use it, and how these factors differ between rural and urban areas.

While earlier studies have explored telemedicine in Bangladesh, there are still few detailed comparisons of awareness, usage, and attitudes between rural and urban populations. Even fewer studies connect these findings to social business opportunities that could help telemedicine grow and last. This study aims to fill that gap by analysing survey data from Gopalganj (a rural area) and Dhaka (an urban area) to understand better how far telemedicine has reached and what its potential is in Bangladesh.

Research Objectives

This study has three primary objectives:

1. To assess the level of awareness and usage of telemedicine services among rural and urban populations in Bangladesh.
2. To examine perceptions, perceived benefits, concerns, and perceived effectiveness of telemedicine across rural and urban contexts.
3. To explore how these empirical insights can inform sustainable social business opportunities for expanding telemedicine reach in Bangladesh.

This study aims to provide evidence to help policymakers and practitioners improve digital health strategies and create scalable, socially focused telemedicine models for Bangladesh. The next sections cover literature review, methodology, results and discussion, limitations, and conclusion.

Literature Review

Telemedicine has become a vital component of digital health systems worldwide, particularly in areas where healthcare access is limited by geography, income, or staff shortages. It refers to providing healthcare remotely via technologies such as audio, video, and

digital platforms (WHO, 2010). Early studies looked at whether telemedicine was practical and cost-effective. For instance, Bergmo (2015) described ways to measure economic results in eHealth, showing that telemedicine can lower costs for travel, waiting, and administration. Later research found that telehealth systems improved inpatient care, patient satisfaction, and access to specialists (Krzystanek *et al.*, 2018; Wootton, 2012).

Telemedicine in Developing Countries

In developing countries, the adoption of telemedicine is influenced by factors such as technology readiness, digital literacy, reliable infrastructure, and local cultural norms. Sood *et al.* (2007) reviewed telemedicine programs in low- and middle-income countries and found that, while these programs often lead to better health outcomes, they also face challenges such as limited internet access, low awareness, and uneven service quality. Bali (2019) also noted that many developing countries face challenges in expanding telemedicine due to weak policies, uneven workforce training, and low public awareness. These challenges underscore the need for solutions that cater to local contexts and address the disparities between urban and rural areas, particularly in Bangladesh.

Telemedicine in Bangladesh

Bangladesh's healthcare system has an uneven distribution of medical professionals, and rural areas often have too few qualified doctors (Ahmed *et al.*, 2011). Telemedicine is seen as a possible way to close this gap. Nessa *et al.* (2008) described the early history of telemedicine in Bangladesh and found that early adoption was low due to infrastructure constraints and low public trust. The COVID-19 pandemic, however, led to a significant increase in telemedicine use. Chowdhury *et al.* (2021) reported that teleconsultations rose rapidly when people could not move freely, indicating that many accepted telemedicine when regular healthcare was difficult to access. Despite recent progress, telemedicine in Bangladesh still faces challenges, including high costs, gaps in digital skills, and privacy concerns. Hoque & Sorwar (2017) found that while most people think telemedicine is helpful, in many rural areas, people often know little about it and rely heavily on informal healthcare providers, such as village doctors, which makes early adoption more difficult. Mahmood *et al.* (2010) noted that village doctors are often the first to treat rural patients, so they can either accelerate or slow the spread of telemedicine, depending on their involvement.

Social Business Model and Telemedicine Sustainability

Social business models are now seen as a way to provide healthcare that is both helpful to society and financially stable. Yunus (2010) introduced this idea, focusing on solving social problems through businesses that support themselves instead of relying on donations. In healthcare, social businesses have improved access by supporting local communities, offering low-cost services to underserved groups, and utilizing digital platforms to reduce costs (Battilana & Lee, 2014). Several studies show that social business can work well in digital health. Yi et al. (2024) found that community-based digital health businesses in Southeast Asia improved health outcomes and remained financially stable by employing mixed revenue models. In rural telemedicine, social business methods can help more people utilize these services by involving local community members, encouraging them to try the services, and sustaining the programs over time. In Bangladesh, social business solutions have been used across many areas, but they are not yet widely used in telemedicine (Ashraf et al., 2019). Because there are significant differences in telemedicine awareness between cities and rural areas, and rural residents are open to using telemedicine in the future, social

businesses could be a good way to expand these services sustainably.

Summary Gaps

Research shows that telemedicine can help solve major problems in Bangladesh's healthcare system, especially in rural areas. However, there are still gaps in our understanding:

1. Differences in awareness and actual usage between rural and urban populations.
2. How perceived benefits, concerns, and service quality perceptions influence adoption.
3. The role of social business opportunities in extending telemedicine reach and ensuring long-term sustainability.

This study addresses these gaps by comparing awareness, usage, perceptions, and the perceived effectiveness of telemedicine between rural and urban groups in Bangladesh. It also examines the results from the perspectives of social business and sustainable healthcare.

Methods

The study employed a cross-sectional survey design to assess awareness, usage behaviour, perceptions, and perceived effectiveness of telemedicine services among rural and urban populations in

Bangladesh. The study also aimed to identify gaps between awareness and usage, demographic differences in telemedicine attitudes, and potential implications for sustainable social business strategies. The survey was conducted using structured questionnaires, both online and in person.

Two locations were selected to represent distinct population settings in Bangladesh. Dhaka is an urban metropolitan area with widespread access to healthcare facilities, diverse socio-economic groups, and relatively advanced digital infrastructure. Gopalganj is a rural district characterized by limited access to certified healthcare providers and greater reliance on informal healthcare providers. These locations were intentionally chosen to enable direct comparison between rural and urban populations regarding telemedicine awareness and adoption.

Individuals aged 18 years or older residing in Dhaka and Gopalganj were included in the study. The sample consisted of 76 participants, comprising 41 from Dhaka and 35 from Gopalganj. Convenience sampling was employed due to challenges in accessing certain rural areas and achieving a balanced sample. Participants from Dhaka were recruited online, whereas local field workers in

Gopalganj invited individuals in public places to share their feedback.

Data collection was conducted in May 2024. Two modes were utilized: an online survey for Dhaka residents, distributed via Google Forms through social networks and email, and face-to-face interviews for Gopalganj residents using printed questionnaires to address lower digital literacy. Informed consent was obtained from all participants. The survey comprised close-ended questions on demographic characteristics, awareness and usage of telemedicine, perceived benefits and concerns, perceived effectiveness, and likelihood of future use, measured on a 5-point Likert scale. The primary variables included awareness (yes or no), telemedicine usage (yes or no, with frequency), perceived quality compared to in-person care (much better, better, about the same, or worse), perceived effectiveness for rural and urban healthcare needs (1-5 scales), and future likelihood of use (1-5 scale). Demographic data, including age, gender, occupation, and location, were also collected.

Data were analyzed using Python (Pandas, SciPy, StatsModels) to perform both descriptive and inferential statistical analyses. Descriptive statistics included frequencies, percentages, means, and standard deviations. Cross-tabulations were

used to explore patterns across demographic groups, and chi-square tests examined associations among categorical variables, including location and awareness, location and usage, awareness and usage, and gender and awareness or usage. Independent-sample t-tests and Mann-Whitney U tests compared rural and urban respondents on future likelihood of telemedicine use, perceived effectiveness, and perceived quality. Effect size calculations, such as the r-statistics, quantified the magnitude of observed differences. Logistic regression was attempted to predict telemedicine usage; however, quasi-separation occurred because none of the “not aware” respondents reported use, rendering awareness a perfect predictor of use. Consequently, the regression coefficient could not be reliably estimated. All analyses were conducted at a significance threshold of $p < .05$.

Participation was voluntary, and respondents were informed of the study objectives, confidentiality procedures, and their right to withdraw at any time. No personally identifiable information was collected. Online responses were stored securely, and physical questionnaires were managed exclusively by trained field assistants.

Results

This section presents findings on telemedicine awareness, usage patterns, perceptions and future intentions among rural and urban respondents in Bangladesh. These results incorporate deeper analytical insights, including age-based awareness-usage disparities and correlations among key behavioral variables.

Awareness and Usage of Telemedicine

Among the 76 respondents, 44.7% reported being aware of telemedicine services, but only 21.1% had ever used them. Awareness differed significantly by location: 68% of urban respondents were aware compared to 17% of rural respondents ($\chi^2(1) = 17.97, p < .001$). However, usage remained uniformly low in both groups (urban: 26.8%; rural: 14.3%), with no significant difference ($p = 0.292$). Importantly, none of the respondents who were unaware of telemedicine had ever used it, indicating that awareness is an essential prerequisite for adoption ($\chi^2(1) = 22.28, p < .001$). Age-based differences in the awareness-usage gap are visualized in Figure 1. Younger age groups (particularly 18-24 and 25-34) exhibit higher awareness, but their usage levels remain comparatively low, creating a substantial gap. Older age groups show lower awareness and nearly negligible usage. This pattern highlights significant latent potential in younger

populations, those who know about telemedicine but have not yet translated awareness into use. Such insights are useful for designing targeted awareness or activation strategies.

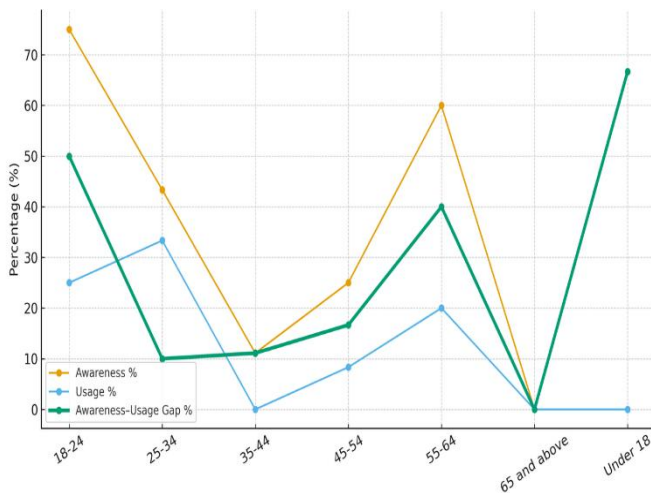


Figure 1: Awareness-Usage Gap by Age Group

Perceptions of Telemedicine: Quality, Benefits, Concerns, and Effectiveness

Respondents reported moderately positive views of telemedicine quality, with an overall mean of 2.56 on a 4-point scale, and no significant difference was found between rural and urban respondents ($p = 0.787$). Commonly reported benefits included convenience, reduced travel costs, and improved access to specialists.

Concerns, on the other hand, centred on privacy, connectivity issues, and a preference for face-to-face interactions. Perceived effectiveness varied by context. Rural respondents rated telemedicine as highly effective for improving rural healthcare access ($M = 4.06$), reflecting a strong recognition of unmet needs in their communities. Urban respondents rated effectiveness more moderately ($M = 3.10$), consistent with their greater access to in-person services. To better understand how perceptions relate to actual behavior, Figure 2 presents a correlation heatmap of four core variables: awareness, usage, perceived quality, and future intention. Awareness and usage are strongly correlated, confirming the dependency observed in descriptive results. However, perceived quality shows a weak association with both awareness and usage, suggesting that quality perceptions do not meaningfully drive adoption at this stage. Future intention also correlates only weakly with other variables, suggesting that motivational factors may be more influenced by contextual needs than by past experience or quality judgments.

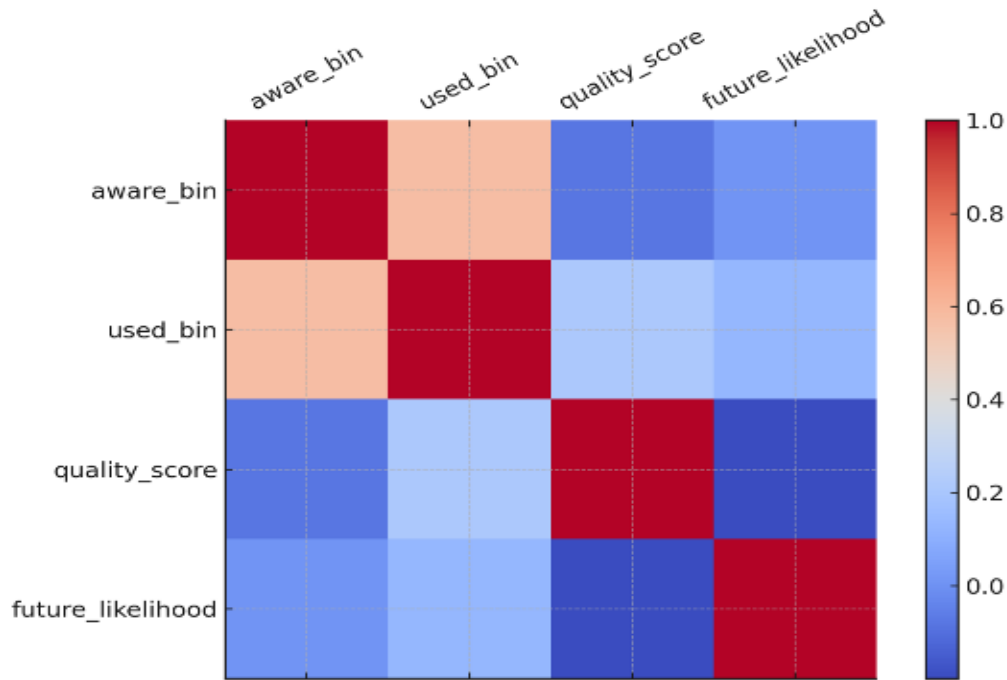


Figure 2: Correlation Heatmap of Key Telemedicine Variables

Future Intentions to Use Telemedicine

The overall mean score for future likelihood of using telemedicine was 3.34, indicating generally positive attitudes toward potential adoption. Rural respondents expressed significantly stronger intention to use telemedicine ($M=3.77$) than urban respondents ($M=2.98$), as confirmed by both parametric ($t(67.6) = -2.57, p = .012$) and non-parametric tests ($U=474.5, p=0.009$). This medium effect size ($r \approx 0.30$) indicates that, despite low awareness, rural communities exhibit higher motivation and perceive greater effectiveness, positioning them as a promising target group for future telemedicine expansion. Interestingly,

neither awareness nor prior usage significantly influenced future intention ($p > 0.30$), consistent with the weak correlations shown in Figure 2. This suggests that interest in telemedicine is not currently driven by familiarity or experience but by underlying unmet healthcare needs, especially in rural populations.

Taken together, the results show that while telemedicine awareness is concentrated in urban areas, rural respondents express stronger perceived effectiveness and higher future use intentions. The awareness-usage gap and weak behavioural correlations across variables suggest that telemedicine

adoption in Bangladesh is still in its early stages of development. These insights highlight clear opportunities for targeted awareness initiatives and socially oriented business models that prioritize rural healthcare access and community-level engagement.

Discussion

This study aimed to investigate how people in rural and urban Bangladesh perceive, utilize, and feel about telemedicine, as well as their future plans for its use. We also examined how these findings could inform sustainable social strategies. The results indicate that telemedicine is still relatively new in Bangladesh, characterized by low awareness, limited adoption, and a notable disparity between rural and urban areas. Still, people's views on its effectiveness and their intentions to use it suggest there are good opportunities for targeted, sustainable solutions.

Awareness-Usage Gaps in the Context of Existing Literature

The gap between awareness of telemedicine and its actual use in this study is similar to what has been observed in other low- and middle-income countries (LMICs). Research from South Asia shows that merely being aware of digital health tools does not guarantee their use (Rahman

et al., 2021; Hoque & Sorwar, 2017). Even though younger people are more comfortable with technology, they often lack clear ways to turn awareness into action, a phenomenon also observed in India and Nepal (Chandwani & Dwivedi, 2015). Our data, by age group, reveal the same trend: young adults are aware of telemedicine, but few actually utilize it. The significant difference in awareness between urban (68%) and rural (17%) areas is consistent with findings in Kenya, Ghana, and the Philippines, where city residents tend to benefit more from telehealth (Dodoo et al., 2021; Fabian et al., 2024). Rural areas often lack the digital infrastructure, support, or exposure needed to adopt telemedicine (Hengst et al., 2023). These results demonstrate that awareness is a crucial factor in adopting telemedicine, aligning with Technology Acceptance Models (TAM), which suggest that individuals must be aware of a technology before they intend to use it (Davis, 1989; Venkatesh et al., 2003).

Perceived Effectiveness and the Role of Contextual Healthcare Needs

Even though rural participants had less awareness and digital skills, they perceived telemedicine as being significantly more effective for healthcare. Similar results have been found in rural Indonesia and Ethiopia, where people view telemedicine

as a viable option when healthcare is difficult to access (Alfian et al., 2025; Chereka et al., 2024). This suggests that people's need for healthcare, rather than their familiarity with telemedicine, is the primary reason they accept it. The correlation heatmap shows that perceived quality, usage, and future intention are only weakly linked. Other studies have found that in places where digital health is new, people prioritize ease, convenience, and affordability over quality (Eslami Jahromi & Ayatollahi, 2023; Zahid et al., 2023). Our results are similar: people, especially those in rural areas where in-person care is difficult to access or expensive, are willing to use telemedicine, even if they do not think it is of high quality.

Implications for Social Business Opportunities

Bringing together our findings and social business ideas points to several practical steps. The social business model, as described by Yunus (2010) as mission-driven companies that use profits to benefit society, is a good fit for growing

telemedicine in Bangladesh. The intense interest in rural areas suggests that these types of businesses could help address gaps in healthcare access. Previous studies on health-focused social businesses in Bangladesh, such as BRAC Health and Grameen Health, demonstrate that community-based services can foster trust and encourage people to utilize them, even in low-resource areas (Chowdhury et al., 2021; Jahan & Khondaker, 2023). Our results suggest that similar approaches could be effective for telemedicine, such as community kiosks, small telehealth centers, and hybrid digital and offline services. Table 1 illustrates how social business can help address the identified challenges. For instance, very low awareness in rural areas aligns with research indicating that community health workers are an effective way to promote digital health (Hosseini et al., 2024). Additionally, the strong interest in telemedicine in rural areas aligns with business models that prioritize low cost and subscription access, which have proven effective in Kenya and Rwanda (Wilson et al., 2023).

Table 1: Social Business Opportunities for Addressing Key Challenges in Telemedicine Awareness and Use

Social Business Features	Survey Insights	Key Challenges	Social Business Opportunities
Mission-driven focus	Rural respondents see telemedicine as highly effective.	Unmet rural healthcare needs.	Deploy low-cost rural telemedicine hubs prioritizing essential care.
Financial sustainability	High rural intention to use.	Limited ability to pay.	Affordable subscriptions or micro-payment models.
Affordable pricing	Low overall usage (21%).	Cost concerns and risk aversion.	Free first consultation; cross-subsidized pricing.
Community involvement	Very low rural awareness (17%).	Low digital literacy and trust.	Use community health workers or local entrepreneurs for awareness and service delivery.
Transparency and trust	Weak link between quality perception and usage.	Low trust in remote care.	Verified doctors, clear fees, guaranteed follow-up.
User empowerment	Awareness-usage gap (younger groups)	Awareness is not converting into action.	Simple interfaces, onboarding support, and incentives for first-time users.
Reinvestment for social impact	Rural areas identify strong benefits.	Scaling requires infrastructure.	Reinvest profits to expand kiosks, devices, and outreach.

A social business model can play a vital role by designing services that align with local needs, leveraging community networks, and operating sustainably with nominal profit while reinvesting profits to

support scale-up. Unlike charity-based rural health initiatives or costly private medical services, a social business-driven approach can deliver healthcare that is more accessible, affordable, and sustainable.

Such a model has the potential to bridge existing gaps in awareness, access, and infrastructure, ultimately leading to equitable adoption of telemedicine across the country.

Conclusion

This study investigated the awareness, utilization, perceptions, and future intentions regarding telemedicine among residents of rural and urban areas in Bangladesh. It further examined how these findings could inform social business strategies to enhance healthcare access. The results indicate that awareness of telemedicine is significantly higher in urban areas. However, rural participants perceived telemedicine as more effective and expressed greater willingness to use it in the future. These findings highlight a substantial unmet demand for telemedicine in rural communities and suggest that, with appropriate service models, telemedicine could serve as a practical and affordable healthcare solution. Adding social business to make service more affordable, involving the local community, and reinvesting profits can make telemedicine more sustainable and inclusive.

This study has several limitations. The sample size, limited to two districts, may restrict the generalizability of the findings. Self-reported data may introduce errors or bias. Additionally, the cross-sectional

design does not allow for causal conclusions. Future research should utilize larger, more diverse samples and consider longitudinal or experimental designs to gain a deeper understanding of the factors influencing telemedicine use.

Despite these limitations, the findings offer practical value. Policymakers, telemedicine providers, and social entrepreneurs can use this information to develop awareness campaigns, localized service models, and affordable packages tailored to community needs. Future research should explore strategies to bridge the gap between telemedicine awareness and usage, and assess how digital literacy programs and community health workers can support sustained engagement.

In summary, telemedicine has the potential to significantly improve healthcare access in Bangladesh and other developing countries, particularly in underserved rural areas. Combined social business strategies can contribute to a more equitable, sustainable, and scalable health system.

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