



Knowledge comparison amongst telehealth service utilized and never-utilized adults in Bangladesh: a cross-sectional study

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Background: Telehealth service is an approach to health care delivery that uses various telecommunication technologies, where the knowledge of the patient plays an important role in its acceptance, preference, and utilization. This study compared telehealth service knowledge among adults who utilized and never-utilized telehealth services and explored factors associated with telehealth knowledge.

Methods: This comparative cross-sectional study recruited 1252 adults from Bangladesh. The outcome variable of the study was the knowledge of telehealth services. We used convenience sampling approaches to recruit participants. The online questionnaire was distributed via Google Forms through Facebook, Messenger, and WhatsApp. The independent variables of the study were sociodemographic factors and the perceived health status of the participants. The bivariate logistic regression model was used to investigate the association between study variables and the level of knowledge among those who utilized and never-utilized the telehealth service. The data analysis was done using STATA version 16.

Results: In the never-utilized group, 54.41% of participants were male, with an average age of 28.89 years. In the utilized group, 55.77% of the participants were male, with an average age of 30 years. Age, marital status, educational level, student status, and perceived health status were significantly associated with good telehealth knowledge among those who never-utilized the telehealth service. Among the utilized groups, we found that age, marital status, and perceived health status were significantly associated with good knowledge of telehealth services.

Conclusions: This study emphasizes the importance of addressing the associated factors to improve telehealth knowledge, considering existing variations among adults who utilized and who never-utilize telehealth services.

Keywords: Bangladesh, health care, knowledge, telehealth, utilization

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HIGHLIGHTS

- Individuals who were younger, unmarried, higher educated, and in poorer health had better telehealth knowledge.
- Those who utilized telehealth were generally more knowledgeable than those who never-utilized it.
- Individuals who never-utilized services but had good knowledge were more likely to be younger, married, highly educated, and students.
- Significant knowledge gaps were observed among different demographic groups.
- Tailored programs are required to increase telehealth knowledge, understanding, and utilization.

Background

Telehealth is the remote delivery of health care using various telecommunication methods, such as internet, telephones, cell-phones, and mobile wireless devices^[1]. The Health Resources and Services Administration acknowledged telehealth as the use of telecommunication technologies to offer quality treatment, information, and education to the patient^[2,3]. From the perspective of patients, the fundamental aim of telehealth is to have convenient access to care, and as such, it has historically increased

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access to health care for conditions and populations for which care was otherwise not available^[4]. Rural and remote patients were reported as the original target audience for the development of telehealth^[5]. It was reported that telehealth could potentially reduce health care costs by reducing the burden in health care delivery, such as prescription usage, needless hospital visits, and extended waiting period^[3]. Telehealth has emerged as an important medium or tool for addressing health care access disparities, particularly in resource-limited settings^[6,7]. However, there is limited understanding of how telehealth knowledge varies between telehealth service utilized and non-utilized groups, especially in low- and middle-income countries like Bangladesh. This study addresses this gap by comparing telehealth knowledge of telehealth services utilized and never-utilized groups in Bangladesh, providing key insights into the factors influencing telehealth knowledge and informing evidence-based strategies to enhance telehealth adoption and policy planning.

According to Rutledge *et al* (2017), telehealth minimizes patient transportation and longer waits, which helps improve the health care system's overall productivity without increasing overall health care costs^[3]. While Bangladesh has a large number of population living in rural settings, telehealth may have the potential to lessen the numerous difficulties the health care system encounters^[8]. However, acceptance of telehealth is always a concern which can be affected by how telehealth services are provided^[9]. Therefore, it is important to comprehend what goals are to achieve and, more significantly, to compare the knowledge of this service among the general population to ensure effective implementation and utilization^[10].

Over the past few decades, Bangladesh has made significant improvements in public health, meeting the MDG-4 objective of reducing under-five child death by two-thirds from 1990 to 2015 and raising other important metrics^[11]. There have been increases in the availability of birthing services, children's vaccination coverage, diarrhea epidemics, and tuberculosis treatment success rates^[11]. Nevertheless, there are still challenges, such as the fact that Bangladesh is still far from providing universal health care for those in disadvantaged categories, such as those living in remote or rural areas^[12]. The challenges include inequitable access to health services between urban and rural areas, incoordination between elementary health care services in rural and urban areas, a severe shortage of educated health professionals with the right skills in public organizations, and a substantial increase in uncontrolled unofficial suppliers in the private sector, a persistently low annual contribution to health in the national budget, and transportation issues are obstacles to the realization of universal health coverage^[13]. Telehealth, therefore, utilizes modern technology that has the potential to limit the challenges, and patients can get care beyond the limitations of the health care system to many extent.

However, the comparison of knowledge of those who utilized and never-utilized the service has not been well reported in the literature. Cook *et al* (2016) conducted a qualitative study in the United Kingdom to understand the factors influencing decisions to start engaging with an integrated telehealth service who utilized and did not utilize telehealth, although the study did not compare the knowledge of those who have utilized and those who never-utilized the services. Saprikis *et al* (2022) analyze the factors that affect the adaptation of telehealth and identify their differences and similarities. In addition, Hofstede *et al* (2014) and Lee & Rho (2013) investigated perceptions of contributing

factors to the adoption of mobile health monitoring/telehealth services across both groups (utilized and never-utilized) in the Netherlands and South Korea, respectively. A significant limitation of these studies is the lack of comparative investigation into the level of knowledge between those who utilize and those who do not utilize telehealth services.

We found two trends in telehealth studies that have been observed in Bangladesh. One group examined the significance of using this service^[14,15] or assessed how people's perceptions of telehealth use differ from one another^[16,17]. The effectiveness of telehealth services in improving knowledge and behaviors in particular illnesses/specific conditions, such as maternal and newborn health care^[18], hypertension^[19], diarrhea^[20], and diabetes^[21] was discussed by the second group of researchers. However, to our knowledge, no previous study has investigated the comparison of knowledge between those who utilized and those who never-utilized the telehealth service among adults in Bangladesh. As a result, this study investigated the comparison of telehealth knowledge among adults who utilized and never-utilized telehealth services, as well as explored the association between study variables and telehealth knowledge. We believe that the findings of this study will provide policymakers with valuable insights into the implications of telehealth policies in Bangladesh.

Methods

Study design, settings, and participants

A comparative cross-sectional study was conducted between 22 May 2021, and 15 June 2021, among 1252 adults in Bangladesh. The inclusion criteria include the participants who should be at least 18 years old, Bangladeshi nationals, have access to online questionnaire, and agree with the informed consent to participate in the study. The participants provided incomplete responses were excluded from the studies.

Study variables

The outcome variable of this study was the level of knowledge regarding telehealth services. A set of five-item questionnaires was employed to measure knowledge, encompassing general knowledge as well as specific aspects of telehealth, such as diagnosis, intervention, appropriateness of interventions, and monitoring. This measurement tool was adapted from a previously conducted study in Quebec, Canada^[22]. Participants were required to respond on a three-point scale, with possible scores ranging from 5 to 15. The scores were subsequently categorized as either "good" or "poor." A "good" knowledge score was defined as a score of 15 or more. The questionnaire was translated into Bengali language using a standard forward and backward translation process to ensure accuracy and cultural relevance. This process involved bilingual experts who are proficient in both English and Bengali. To enhance validity, we conducted a pilot test with a small sample of participants from the target population to assess the clarity, relevance, and cultural appropriateness of the items. Based on the feedback received, we made necessary modifications to better align the questionnaire with the Bangladeshi socio-cultural context. In addition to knowledge, the study also incorporated various study variables, such as sociodemographic information (including age, sex, marital status, education,

profession, residence, and division) and health-related information, such as the perceived health status of participants. The assessment of perceived health status was done by using a single-item measure recommended by the World Health Organization: “In general, how would you rate your current health status?”^[23] The response scale included five options: “very good,” “good,” “fair,” “bad,” and “very bad.” For statistical analysis, responses of “very good” and “good” were categorized as “good,” while “fair” was classified as “as usual.” Similarly, “bad” and “very bad” were grouped as “poor.” A comparable scale was utilized to evaluate the perceived health status of Bangladeshi health care workers^[24].

Questionnaire development

A semi-structured questionnaire was developed and reviewed by experts in the field, and we incorporated necessary modifications based on their feedback. The questionnaire was divided into separate sections to address specific aspects of the study. The initial section involved obtaining online consent from the participants. The subsequent section included items related to their knowledge score assessment, and then comprehensive sociodemographic information was collected. The last section involved collecting data on perceived health status.

Data collection

We employed convenient sampling techniques to recruit participants in this study. The questionnaire, which had been developed, was converted into an online version utilizing “Google Forms.” Our research assistants disseminated the questionnaire through various online platforms, including Facebook, Messenger, and WhatsApp. Due to the nature of the data collection method, the responses were automatically recorded in an online Excel spreadsheet. Subsequently, we downloaded the spreadsheet and imported it into the analysis software. This approach allowed us to collect 1252 completed responses for data analysis.

Data analysis

The data analysis was done using STATA version 16. Descriptive statistics such as frequency distribution and percentage were calculated for categorical variables. Mean and standard deviation were calculated for the continuous variables. The two-by-two table represents the distribution of the study variables. Pearson chi-squared test was used to test the relationship between the study variables and level of knowledge. Fisher’s exact test was performed instead of the chi-squared test on any cell with a value of less than 5. Bivariable logistic regression models were built to investigate the association between the study variable and the level of knowledge. All tests were two-sided, with a *P* value of 0.05 considered statistically significant.

Ethical issue

The first page of the questionnaire outlined the aims and objectives of the study. The authors preserved the data privacy and allowed participants to withdraw from the study at any time. All participants were Bangladeshi, and none were less than 18 years of age. The respondents were requested to provide written signatures; afterward, they were asked to respond and submit their responses. The Ethical Review Committee of Tejgaon College,

Dhaka-1215, Bangladesh, critically reviewed and approved the study (reference number 2021/OR-TGC/0202).

Results

Distributions of the study variables among those who never-utilized telehealth service

The distributions of the study variables among participants who never-utilized (unutilized) telehealth services are presented in Table 1. In the never-utilized group, 54.41% of participants were male, with an average age of 28.89 years. Unmarried individuals made up 61.59% of this group, and 50.19% were students. Nearly three-quarters (73.66%) of participants reported a poor perceived health status.

Distributions of the study variables among participants who utilized telehealth service

The distributions of the study variables among utilized participants of telehealth service are presented in Table 1. In the utilized group, the majority of participants (55.77%) were male, with an average age of 30 years. Among them, 57.69%

Table 1

Distributions of the study variables by telehealth service utilization (n = 1252)

Variables	Never utilized group	Utilized group
	n (%)	n (%)
Demographic information		
Sex		
Male	568 (54.41)	116 (55.77)
Female	476 (45.59)	92 (44.23)
Mean age (SD) in years	28.89 (11.18)	30 (11.28)
Age		
<20 years	82 (7.85)	13 (6.25)
20–29 years	656 (62.84)	121 (58.17)
30–39 years	120 (11.49)	32 (15.38)
≥40 years	186 (17.82)	42 (20.19)
Marital status		
Married	401 (38.41)	88 (42.31)
Unmarried	643 (61.59)	120 (57.69)
Educational status		
Graduate	407 (38.98)	106 (50.96)
HSC	455 (43.58)	78 (37.50)
Up to SSC	182 (17.43)	24 (11.54)
Profession		
Student	524 (50.19)	98 (47.12)
Employed	520 (49.81)	110 (52.88)
Residence		
Rural	147 (14.08)	17 (8.17)
Urban	897 (85.92)	191 (91.83)
Division		
Dhaka	839 (80.36)	168 (80.77)
Others	205 (19.64)	40 (19.23)
Health related information		
Perceived health status		
Poor	769 (73.66)	148 (71.15)
As usual	192 (18.39)	40 (19.23)
Good	83 (7.95)	20 (9.62)

were unmarried, and 52.88% were employed. 71.15% of participants in this group reported having poor health status.

Distributions of study variables by telehealth knowledge level among participants who never utilized telehealth service

The distributions of study variables by telehealth knowledge level among participants who never-utilized telehealth service participants are presented in Table 2. Among the youngest age (<20 years), having good knowledge was significantly the highest (59.76%, $P < 0.001$). Among unmarried respondents, having good knowledge was significantly higher (54.59 vs. 39.65%, $P < 0.001$) compared to the married respondents. Educational status was significantly associated with the knowledge level of telehealth services ($P < 0.001$). Students had significantly higher levels of

good knowledge (57.82% vs. 39.81%, $P < 0.001$) than those who were employed. The level of good knowledge of the never-utilized service group was significantly highest (52.28%) among those who reported poor perceived health status ($P < 0.001$).

Distributions of study variables by telehealth knowledge level among participants who utilized telehealth service

The distributions of study variables by telehealth knowledge level among utilized telehealth service participants are presented in Table 2. Age was significantly associated with the knowledge level of telehealth service utilization ($P = 0.041$). The level of good knowledge was significantly higher (65.83% vs. 48.86%, $P = 0.014$) among the unmarried participants. The perceived health status was significantly associated with telehealth knowledge level ($P = 0.034$).

Table 2

Distributions of study variables by knowledge levels among those who never utilized and utilized telehealth service

Variables	Never utilized group		Utilized group	
	Poor knowledge, n (%)	Good knowledge, n (%)	Poor knowledge, n (%)	Good knowledge, n (%)
Sociodemographic information				
Sex				
Male	306 (53.87)	262 (46.13)	52 (44.83)	64 (55.17)
Female	228 (47.90)	248 (52.10)	34 (36.96)	58 (63.04)
P value	0.054		0.252	
Age				
<20 years	33 (40.24)	49 (59.76)	2 (15.38)	11 (84.62)
20–29 years	313 (47.71)	343 (52.29)	47 (38.84)	74 (61.16)
30–39 years	66 (55.00)	54 (45.00)	13 (40.63)	19 (59.38)
≥40 years	122 (65.59)	64 (34.41)	24 (57.14)	18 (42.86)
P value	<0.001		0.041	
Marital status				
Married	242 (60.35)	159 (39.65)	45 (51.14)	43 (48.86)
Unmarried	292 (45.41)	351 (54.59)	41 (34.17)	79 (65.83)
P value	<0.001		0.014	
Educational status				
Graduate	190 (46.68)	217 (53.32)	38 (35.85)	68 (64.15)
HSC	212 (46.59)	243 (53.41)	34 (43.59)	44 (56.41)
Up to SSC	132 (72.53)	50 (27.47)	14 (58.33)	10 (41.67)
P value	<0.001		0.114	
Profession				
Student	221 (42.18)	303 (57.82)	34 (34.69)	64 (65.31)
Employed	313 (60.19)	207 (39.81)	52 (47.27)	58 (52.73)
P value	<0.001		0.066	
Residence				
Rural	82 (55.78)	65 (44.22)	4 (23.53)	13 (76.47)
Urban	452 (50.39)	445 (49.61)	82 (42.93)	109 (57.07)
P value	0.225		0.120	
Division				
Dhaka	428 (51.01)	411 (48.99)	70 (41.67)	98 (58.33)
Others	106 (51.71)	99 (48.29)	16 (40.00)	24 (60.00)
P value	0.859		0.847	
Health related information				
Perceived health status				
Poor	367 (47.72)	402 (52.28)	53 (35.81)	95 (64.19)
As usual	114 (59.38)	78 (40.63)	21 (52.50)	19 (47.50)
Good	53 (63.86)	30 (36.14)	12 (60.00)	8 (40.00)
P value	<0.001		0.034	

* $P < 0.05$, ** $P < 0.01$, and *** $P < 0.001$

Factors associated with the good knowledge of telehealth among participants who never-utilized the service

Factors associated with the good knowledge of telehealth among participants who never-utilized the service are presented in Table 3. Compared to the younger age group (<20 years), the older age groups, such as 30–39 years and ≥40 years, were significantly 45% (OR: 0.55, 95% CI: 0.31–0.97) and 65% (OR: 0.35, 95% CI: 0.21–0.60) less likely to have good knowledge, respectively. The unmarried respondents were 83% (OR: 1.83, 95% CI: 1.42–2.36) more likely to have good knowledge of telehealth services than married respondents. The graduate and HSC (Higher Secondary Certificate) degree holders were significantly 3.02 (OR: 3.02, 95% CI: 2.06–4.41) and 3.01 (OR: 3.01, 95% CI: 2.08–4.40) times, respectively, more likely to have good knowledge on telehealth service compared to who was up to SSC (Secondary School Certificate) degree holders. The students were 2.07 (OR: 2.07, 95% CI: 1.62–2.65) times more likely to have good knowledge compared to the employees. The respondents who reported perceived poor health were 96% (OR: 1.94, 95% CI: 1.21–3.10) more likely to have good knowledge.

Factors associated with the good knowledge of telehealth among participants who utilized the service

Factors associated with the good knowledge of telehealth among participants who utilized the service are presented in Table 3.

Table 3
Factors associated with the good knowledge among those who never utilized and utilized telehealth service

Variables	Never utilized group OR (95% CI)	Utilized group OR (95% CI)
Sociodemographic information		
Sex		
Male	Reference	Reference
Female	1.27 (0.99–1.62)	1.39 (0.79–2.43)
Age		
<20 years	Reference	Reference
20–29 years	0.74 (0.46–1.18)	0.29 (0.06–1.35)
30–39 years	0.55 ^a (0.31–0.97)	0.27 (0.05–1.40)
≥40 years	0.35 ^c (0.21–0.60)	0.14 ^a (0.03–0.69)
Marital status		
Married	Reference	Reference
Unmarried	1.83 ^c (1.42–2.36)	2.02 ^a (1.15–3.54)
Educational status		
Graduate	3.02 ^c (2.06–4.41)	2.51 ^a (1.02–6.18)
HSC	3.01 ^c (2.08–4.40)	1.81 (0.72–4.58)
Up to SSC	Reference	Reference
Profession		
Student	2.07 ^c (1.62–2.65)	1.69 (0.96–2.95)
Employed	Reference	Reference
Residence		
Rural	0.81 (0.57–1.14)	2.45 (0.77–7.77)
Urban	Reference	Reference
Dhaka	1.03 (0.76–1.40)	0.93 (0.46–1.89)
Others	Reference	Reference
Perceived health status		
Poor	1.94 ^a (1.21–3.10)	1.36 (0.46–4.03)
As usual	1.21 (0.71–2.06)	2.69 ^a (1.03–6.99)
Good	Reference	Reference

^a $P < 0.05$

^b $P < 0.01$

^c $P < 0.001$

The older participants (≥40 years) were less likely to have good knowledge (OR: 0.14, 95% CI: 0.03–0.69). Unmarried participants were 2.02 (OR: 2.02, 95% CI: 1.15–3.54) times more likely to have good knowledge compared to the married participants. The graduate participants were 2.51 (OR: 2.51, 95% CI: 1.02–6.18) times more likely to have good knowledge compared to the participants' education up to SSC. The participants who reported perceived poor health status were more likely to have good knowledge (OR: 2.69, 95% CI: 1.03–6.99).

Discussion

Even though numerous studies conducted throughout the globe highlighted the value of telehealth applications and people's perceptions of and intentions to utilize this service^[16], few of these studies examined the knowledge gaps between telehealth, utilized and never-utilized. Evaluating the variability between the groups can be crucial in comprehending the long-term applications of telehealth services. Therefore, the main goal of our study was to compare various factors associated with the knowledge levels of individuals who utilized and never-utilized telehealth services. We found age, marital status, educational level, being students, and perceived health status were significantly associated with good knowledge of telehealth among the participants who never-utilized the telehealth service. Among the utilized group, we found that age, marital status, and perceived health status were significantly associated with good knowledge. The findings of this study advocate the need for strategies to address gaps in the telehealth knowledge spectrum across groups in Bangladesh.

Among participants who never-utilized telehealth services, younger individuals were more likely to demonstrate good knowledge. Notably, participants under 20 years old reported the highest proportion of good knowledge in the group that never-utilized telehealth services. Regression analysis indicated that participants aged 30–39 years and ≥40 years were 45% and 65% less likely to have good knowledge compared to those under 20 years. These results are consistent with previous research suggesting that younger individuals are generally more familiar with telehealth knowledge, possibly due to their greater exposure to technology and digital platforms. For instance, Lupton *et al* (2020) found that younger populations globally have higher engagement with digital health platforms, which aligns with the findings of this study^[25]. Alongside, Tsai *et al* (2019) found that younger individuals are more likely to adopt and understand telehealth^[26].

Among participants who utilized telehealth services, 65.83% of unmarried individuals demonstrated good knowledge, compared to 54.59% in the group that never-utilized the service. We found that unmarried participants were 83% and 2 times more likely to have good knowledge in the telehealth-utilized and never-utilized groups, respectively. Similarly, Rosenthal *et al* (2024) found that unmarried individuals often engage more actively with telehealth services^[27]. Furthermore, Jennett *et al* (2003) in a systematic review, discussed that marital responsibilities may impact the ability to engage with telehealth platforms^[28]. While the married participants are lagging behind, community-based telehealth programs or workshops could help address their unique challenges.

We found education status was a significant determinant of telehealth knowledge in both groups. Among those who utilized, 64.15% of graduates reported good knowledge, while 53.32%

of graduates demonstrated good knowledge in the never-utilized groups – graduates were more than three times and two times more likely to report strong telehealth knowledge in the never-utilized and utilized groups, respectively. These findings showed the important role of education in telehealth-related literacy and engagement. Lupton *et al* (2020) also reported that educational attainment significantly improves an individual's ability to navigate digital health platforms^[25]. To bridge the knowledge gap, educational initiatives targeting less-educated populations could include simplified telehealth resources.

Among participants who never-utilized telehealth services, 52.28% of those with poor perceived health reported good knowledge, compared to 36.14% of those with good health. Similarly, 64.19% of participants with poor health demonstrated good knowledge in the group that utilized telehealth services, while only 40% of those with good health did. Regression analysis showed that participants with poor perceived health were nearly twice as likely to report good knowledge in the never-utilized group. Like this, Allison *et al* (2022) discussed in their systematic review that patients with poor health status were more likely to demonstrate strong telehealth knowledge, supporting the findings of this study^[29]. Li *et al* (2024) found that countries with low-resource settings have similarly noted that individuals with chronic health conditions are often early adopters of telehealth^[30].

Limitations

The study employed a cross-sectional design; therefore, the observed associations cannot be interpreted as causal association. We used convenience sampling techniques, which may introduce several limitations, including potential selection bias and reduced generalizability. The reliance on self-reported data and the adaptation of a measurement tool from a Canadian context may lead to recall and applicability biases. We recommend that future studies address these limitations while investigating the dynamics of telehealth knowledge and utilization.

Conclusions

Telehealth has the potential to significantly broaden health care access and foster patient–health care workers relationships, particularly in remote and underserved regions. This study found that demographic variables such as age, education, marital status, and perceived health conditions significantly influence telehealth knowledge among both telehealth-utilized and never-utilized groups in Bangladesh. The findings of the study emphasized the importance of associated factors in influencing telehealth literacy and utilization patterns. Therefore, policymakers and health care practitioners should prioritize addressing disparities in telehealth knowledge by developing targeted educational programs specific to the needs of underserved populations. We suggest initiatives such as community-based telehealth workshops and investments in digital literacy could help bridge the gaps in knowledge and adoption. Moreover, we also suggest integrating telehealth concept into broader public health policies can enhance health care equity and efficiency in Bangladesh.

Ethical approval

The respondents of the study provided written signatures to willingly participate in this study. The Ethical Review Committee of

Tejgaon College, Dhaka-1215, Bangladesh, reviewed and approved the study (reference number 2021/OR-TGC/0202).

Consent

None.

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Author's contribution

H.K. and M.K.H. conceived and designed the study; M.A., S.A., M.I.A., N.A., S.A., A.K., S.M., and H.K. collected the data and wrote the manuscript; M.A., S.A., H.K., and M.K.H. investigated the study; H.K. analyzed, visualized, and validated the data; H. K. and M.K.H. critically reviewed the manuscript. All authors reviewed and approved the final version of the manuscript.

Conflicts of interest disclosure

None.

Research registration unique identifying number (UIN)

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Data availability statement

The data set used in this study will be available as per request (mailing to the corresponding author).

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