Peoples' Perception towards Telemedicine: A Case Study on Rural Area of Bangladesh

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Abstract

Telemedicine is a two-way, real time interactive session between the patient and the physician or practitioner at the remote location for the purpose of providing consultation. Telemedicine has enormous prospect to reduce health care service gap between rural area and urban area of Bangladesh. The aim of this paper is to demonstrate the peoples' perception towards telemedicine and the factors influencing peoples' perception in telemedicine. The chi-square analysis and descriptive statistics have been used as statistical tools to test the hypotheses. A self-administered questionnaire has been developed and snowball sampling method is used to collect data from the study area. In addition to the traditional health care system, urban specialist doctors provide medical consultation in rural area by telemedicine. The findings of this study have revealed that age, gender, educational qualification, trust, privacy and confidentiality, awareness, service quality, existing equipment status, proper coordination, treatment cost and IT infrastructure have significant influence on the perception of telemedicine. The findings and recommendations may be taken by policymakers to make effective decisions regarding telemedicine services.

Keywords: Telemedicine, Urban area, Peoples' perception, Bangladesh.

1. Introduction

Telemedicine (also referred to as "telehealth" or "e-health") allows health care professionals to evaluate, diagnose and treat patients in remote locations using telecommunications technology (AMD Global Telemedicine, 2016). Moreover, Chowdhury et al. (2009) mentioned in their research work that telemedicine is the use of medical information exchanged from one site to another via electronic communications to improve patients' health status. They also mentioned that telemedicine can minimize the gap between medical professionals and patients along with playing a very important role in the diagnosis, management, and follow-up of patient across continents.

The concept of telemedicine is not new. It has been used since 1959, when a two way video conferencing link was established using microwaves between university of Nebraska medical school and state mental hospital (Bauer, 1999). Then, The National Aeronautics and Space Administration (NASA) also played significant role in the early development of telemedicine.

NASA's endeavor in telemedicine started in the early 1960s when man began to fly in space. In 1970s and 1980s, telemedicine experiments focused on the transmission of medical images using television. In 1990's, the rapid growth of computer and information technology gave a rebirth to telemedicine (Thiyagarajan., 2008).

Bangladesh is one of the most densely populated countries with frequent natural disasters and poor primary care facilities. About 80% of Bangladesh's population stays in rural areas where the unequal distribution of physicians and healthcare providers is a common picture. In addition, the number of formally qualified registered Health Care Providers is 7.7 per 10,000 populations. Under these circumstances telemedicine is the best way as it can provide better health care by using maximum utilization of limited resources. Telemedicine efforts in Bangladesh started in around 1999 and have been aimed at connecting various rural healthcare facilities with Dhaka based hospitals. A significant portion of these have been promoted by private organizations as pilot basis. Some of them have experienced tangible results at a small scale while most have faded away due to lack of financial viability and government support. (Ethnographic Medical Research Group, 2015)

In 2009, mobile phone health service was first introduced by ministry of health in 418 upazila health complexes and 64 district hospitals (total 482). Each of the hospitals has a mobile phone which an on-duty doctor carries and is accessible for incoming calls round-the clock. People living in the catchment areas call the doctor, if need arises, and the doctor answers to give appropriate medical advice. In the fiscal year,2009-2010, equipment for 8 telemedicine centers and one coordination center at MISDGHS were procured, resulting in setting up of telemedicine centers in 8 hospitals of Bangladesh. In 2012, ten more telemedicine centers in 10 different hospitals were opened. In 2013, another 10 new telemedicine centers were established in 10 different hospitals. In the fiscal year, 2013- 2014, additional 15 telemedicine centers were added. Therefore, current number of telemedicine centers is 43 (DGHS , 2014).

Real–time and store and forward are the main methods for conducting telemedicine. Real-time telemedicine allows participants to send and receive information almost instantly with negligible delay. This method is carried out by a discussion about a patient over the telephone and videoconferencing. In "store and forward" telemedicine method, information is encapsulated and then transmitted to the recipient for subsequent reply. This method is generally cheaper and more convenient (Anthony C Smith, Telemedicine and rural health

care applications, 2005).

Literature Review

Smith et al. (2005) conducted a study on telemedicine and rural health application. In their study, they found a common and expensive mistake for telemedicine service developer is to focus entirely on the technology. They also revealed that all sites involved need to be well resourced with the appropriate personnel, equipment, telecommunications, technical support and training in order to conduct telemedicine successfully.

In a research study, Nessa et al. (2010) point out the cost of telemedicine equipment, user acceptance, privacy and confidentiality of patients' data and lack of structured rules and regulations for telemedicine as challenges for implementing telemedicine service in Bangladesh. They also revealed that the addition of telemedicine in existing health centers can make it easier and cheaper to provide health care to the people in remote areas along with generating new source of employment for them.

Ahmed et al. (2014) mentioned in their research work that it is yet not clear how eHealth and mHealth will be integrated into the existing health system given the dearth of reliable evidence. They also notified that involvement of the public sector will help in generating evidence on the most effective means of integrating eHealth and mHealth into health systems. Moreover, they revealed that there are extremely few individuals with eHealth training in Bangladesh and there is a strong demand for capacity building and experience sharing, especially for implementation and policy making

Khatun and Sima (2015) pointed out that positive change has occurred in providing ICT health services in Sadar Hospital. In addition to that, they mentioned in their study that e-health services are hampered in Sadar hospital and other hospitals due to the lack of skilled manpower, insufficient patients' knowledge regarding how to get this service and inadequate monitoring from the central government.

Yasir et al. (2015) conducted a study on the telemedicine system for financially unstable people of Bangladesh. In their research they found that the quality of Service (QoS) is very important in telemedicine system. They also revealed that providing service in timely manner is a must in remote areas where internet connectivity is a barrier to them. That is why, they focused on developing systems for low end devices as well low income people.

In essence, a few works have been done regarding telemedicine service in Bangladesh. Most of works are done to identify the status, applicability and prospect of telemedicine in Bangladesh but there is no research work available which shows the impact of patient, health staff and doctor's perception on telemedicine services in Bangladesh. This research work is targeted at abridging the gap by pointing out the perception of the people toward telemedicine service on rural area of Bangladesh.

Objectives of the Study

The study has general and some specific objectives. The general objective of the study is to understand the perception of people towards telemedicine on rural area of Bangladesh. The specific objectives of the study can be expressed in the following ways:

- To examine the perception of patient towards telemedicine
- To identify the perception of support staff towards telemedicine
- To find out the perception of doctor towards telemedicine
- To recommend some policy measures to design strategies for telemedicine service

Methodology of the Study

This paper is essentially conclusive research that has been conducted to test specific hypotheses and examine relationship about how independent variables (Age, education level, time saving, trust, privacy and confidentiality etc.) affect the dependent variable (Peoples' perception towards telemedicine) in some way while survey is a leading factor. This study is done through primary and secondary data through direct interview and relevant publications, journals, books, newspapers and different relevant websites. Chi-square test has been used to test the hypothesis. Percentage analysis has also been applied to appropriate cases. Structured questionnaire was used to collect data from both service providers (supply side) and the service recipients (demand side). The population of this study consists of telemedicine service providers and service recipients in rural area of Bangladesh. Respondents were selected from the area of Gopalganj Sadar Hospital telemedicine center, Upazila Health Complex telemedicine center (Amua, Jhalokati) and Sher-e-Bangla Medical College (Barisal) over different gender age group and occupation having telemedicine experience. This study was conducted over the period of February to March 2016 in that rural area of Bangladesh. The sample size of the field survey is 100 telemedicine service providers and service recipients. For the collection of data, snowball sampling has been used to generate reliable representative data. In snowball sampling an initial group of respondents is selected usually at random and after being interviewed, these respondents are asked to identify others who belong to the target population of interest. (Dash, 2010)

Hypotheses of the Study:
Hypotheses for age and perception towards telemedicine:
Ho: There is significant relationship between age and perception towards telemedicine.
H1: There is no significant relationship between age and perception towards telemedicine.
Hypotheses for gender and perception towards telemedicine:
Ho: There is significant relationship between gender and perception towards telemedicine.
H1: There is no significant relationship between gender and perception towards telemedicine.
Hypotheses for educational level and perception towards telemedicine:
Ho: There is significant relationship between educational level and perception towards telemedicine.
H1: There is no significant relationship between educational level and perception towards telemedicine.
Hypotheses for occupation and perception towards telemedicine:
Ho: There is significant relationship between occupation and perception towards telemedicine.
H1: There is no significant relationship between occupation and perception towards telemedicine.
Hypotheses for time saving and perception towards telemedicine:
Ho: There is significant relationship between time saving and perception towards telemedicine.
H1: There is no significant relationship between time saving and perception towards telemedicine.
Hypotheses for trust and perception towards telemedicine:
Ho: There is significant relationship between trust and perception towards telemedicine.
H1: There is no significant relationship between trust and perception towards telemedicine.
Hypotheses for privacy along with confidentiality and perception towards telemedicine:
Ho: There is significant relationship between privacy along with confidentiality and perception towards telemedicine.
H1: There is no significant relationship between privacy along with confidentiality and perception towards telemedicine.
Hypotheses for staff behavior and perception towards telemedicine:
Ho: There is significant relationship between staff behavior and perception towards telemedicine.
H1: There is no significant relationship between staff behavior and perception towards telemedicine.
Hypotheses for awareness and perception towards telemedicine:
Ho: There is significant relationship between awareness and perception towards telemedicine.
H1: There is no significant relationship between awareness and perception towards telemedicine.
Hypotheses for service quality and perception towards telemedicine:
Ho: There is significant relationship between service quality and perception towards telemedicine.
H1: There is no significant relationship between service quality and perception towards telemedicine.
Hypotheses for status of equipment and perception:
Ho: There is significant relationship between status of equipment and perception.
H1: There is no significant relationship between status of equipment and perception.
Hypotheses for proper coordination and perception towards telemedicine:
Ho: There is significant relationship between proper coordination and perception towards telemedicine.
H1: There is no significant relationship between proper coordination and perception towards telemedicine.
Hypotheses for treatment cost and perception towards telemedicine:
Ho: There is significant relationship between treatment cost and perception towards telemedicine.
H1: There is no significant relationship between treatment cost and perception towards telemedicine.
Hypotheses for government financial support and perception towards telemedicine:
Ho: There is significant relationship between government financial support and perception towards telemedicine.
H1: There is no significant relationship between government financial support and perception towards telemedicine.
Hypotheses for IT infrastructure and perception towards telemedicine:
Ho: There is significant relationship between IT infrastructure and perception towards telemedicine.
H1: There is no significant relationship between IT infrastructure and perception towards telemedicine.

Analysis and Findings:
Age and perception of telemedicine about 61% (=28%+33%) of the respondents belong to the age group of 18-37 years category, 23% belong to the above 38-47 years category and 14% belong to above 47 years category. This has been illustrated along with hypothesis testing in table 1.

Table 1 Age and perception of telemedicine

Age Category	Yes	No	Indifferent	Percentage
18-27	28	0	0	28
28-37	33	0	0	33
38-47	23	0	0	23
Above 47	14	1	1	16
Total	98	1	1	100

Source: Primary Data (Survey Period: February-March, 2016).

Gender and Perception of Telemedicine: The respondents comprised of about 80% male and about 20% female. Gender and perception of telemedicine have been portrayed in table no. 2.

Table 2: Gender and perception of telemedicine

Gender	Yes	No	Indifferent	Percentage
Male	78	1	1	80
Female	20	0	0	20
Total	98	1	1	100

Source: Primary Data (Survey Period: February-March, 2016).

Educational Qualification and Perception of Telemedicine: The educational qualification reveals that 8% of the respondents are postgraduates, 10% are graduates, 36% are others, 28% are higher secondary and 18% are secondary education categories. Table 3 gives the details along with the testing of hypothesis.

Table 3: Educational qualification and perception of telemedicine

Education Level	Yes	No	Indifferent	Percentage
SSC	18	0	0	18
HSC	28	0	0	28
Graduate	10	0	0	10
Post Graduate	8	0	0	8
Others	34	1	1	36
Total	98	1	1	100

Source: Primary Data (Survey Period: February-March, 2016).

Occupation and Perception of Telemedicine: The occupation reveals that 35% of the respondents are service holder and businessman (22%), professional (8%) and others (35%). Table 4 exhibits this with the testing of hypothesis.

Table 4: Occupation and perception of telemedicine

Occupation	Yes	No	Indifferent	Percentage
Service Holder	34	0	1	35
Businessman	22	0	0	22
Professionals	7	1	0	8
Others	35	0	0	35
Total	98	1	1	100

Source: Primary Data (Survey Period: February-March, 2016).

Time Saving and Perception of Telemedicine: Out of 100 respondents 96% believe that telemedicine save time to get treatment, only 1% doesn't think so and 3% are indifferent regarding this issue and Table 5 exhibits the analysis.

Table 5: Time saving and perception of telemedicine

Perception		Yes	No	Indifferent	Percentage
Time Saving	Yes	96	0	0	96
	No	1	0	0	1
	Indifferent	1	1	1	3
	Total	98	1	1	100

Source: Primary Data (Survey Period: February-March, 2016).

Trust and Perception of Telemedicine: Incase of trust on telemedicine service, 97% respondents have trust

on telemedicine service, 1% does not have trust on telemedicine and 2% are indifferent Table 6 exhibits the analysis.

Table 6: Trust and perception of telemedicine

Perception		Yes	No	Indifferent	Percentage
Trust	Yes	97	0	0	97
	No	0	0	1	1
	Indifferent	1	1	0	2
	Total	98	1	1	100

Source: Primary Data (Survey Period: February-March, 2016).

Privacy & Confidentiality and Perception of Telemedicine: Among 100 respondents, 71% think that telemedicine service providers maintain privacy and confidentiality of patients' record, 5% do not think so. Moreover, 24% of respondents don't have knowledge in this issue. Table 7 exhibits the analysis.

Table 7: Privacy & confidentiality and perception of telemedicine

Perception		Yes	No	Indifferent	Percentage
Privacy & confidentiality	Yes	69	1	1	71
	No	5	0	0	5
	Indifferent	24	0	0	24
	Total	98	1	1	100

Source: Primary Data (Survey Period: February-March, 2016)

Behavior and Perception of Telemedicine: Out of 100 respondents, 87% are satisfied with the behavior of telemedicine service provider, 4% are not satisfied and 9% are indifferent in this matter.

Table 8: Behavior and perception of telemedicine

Perception		Yes	No	Indifferent	Percentage
Behavior	Yes	86	1	0	87
	No	4	0	0	4
	Indifferent	8	0	1	9
	Total	98	1	1	100

Source: Primary Data (Survey Period: February-March, 2016)

Awareness and Perception of Telemedicine: Awareness about the operational procedure of telemedicine service reveals that 50% of the respondents are aware, 6% are not aware and 44% are indifferent.

Table 9: Awareness and perception of telemedicine

Perception		Yes	No	Indifferent	Percentage
Awareness	Yes	49	1	0	50
	No	6	0	0	6
	Indifferent	43	0	1	44
	Total	98	1	1	100

Source: Primary Data (Survey Period: February-March, 2016)

Service Quality and Perception of Telemedicine: Out of 100 respondents, 49% believe that the service quality is at satisfactory level, 24% are not satisfied and 27% are indifferent in this matter.

Table 10: Service quality and perception of telemedicine

Perception		Yes	No	Indifferent	Percentage
Service Quality	Yes	48	1	0	49
	No	24	0	0	24
	Indifferent	26	0	1	27
	Total	98	1	1	100

Source: Primary Data (Survey Period: February-March, 2016)

Existing Equipment and Perception of Telemedicine: Relating to the existing equipment details majority (70%) of the respondents believe existing equipments are not backdated and insufficient, 15% believe that existing equipments are backdated and insufficient and 15% are indifferent.

Table 11: Existing Equipment and perception of telemedicine

Perception		Yes	No	Indifferent	Percentage
Existing Equipment	Yes	15	0	0	15
	No	69	0	1	70
	Indifferent	14	1	0	15
	Total	98	1	1	100

Source: Primary Data (Survey Period: February-March, 2016)

Existing Equipment and Perception of Telemedicine: 59% believe that proper coordination is not absent in telemedicine service center, 16% believe that proper coordination is absent in telemedicine service center and 25% are indifferent.

Table 12: Coordination and perception of telemedicine

Perception		Yes	No	Indifferent	Percentage
Coordination	Yes	16	0	0	16
	No	58	1	0	59
	Indifferent	24	0	1	25
	Total	98	1	1	100

Source: Primary Data (Survey Period: February-March, 2016)

Treatment Cost and Perception of Telemedicine: 93% believe that treatment cost is affordable, 6% believe that treatment cost is not affordable and 1% is indifferent. The analysis is presented in Table 13 with the test of hypothesis.

Table 13: Treatment cost and perception of telemedicine

Perception		Yes	No	Indifferent	Percentage
Treatment Cost	Yes	92	0	1	93
	No	6	0	0	6
	Indifferent	0	1	0	1
	Total	98	1	1	100

Source: Primary Data (Survey Period: February-March, 2016)

Financial Support and Perception of Telemedicine: 62% believe that financial support from government is sufficient, 34% believe that treatment financial support is not sufficient and 4% are indifferent. The analysis is presented in Table 14 with the test of hypothesis.

Table 14: Financial Support and perception of telemedicine

Perception		Yes	No	Indifferent	Percentage
Financial Support	Yes	61	1	0	62
	No	34	0	0	34
	Indifferent	3	0	1	4
	Total	98	1	1	100

Source: Primary Data (Survey Period: February-March, 2016)

IT Infrastructure and Perception of Telemedicine: Out of 100 respondents, 44% believe that existing IT infrastructure is enough, 39% believe that existing IT infrastructure is not enough and 17% are indifferent. The analysis is presented in Table 15 with the test of hypothesis.

Table 15: IT infrastructure and perception of telemedicine

Perception		Yes	No	Indifferent	Percentage
IT Infrastructure	Yes	42	1	1	44
	No	39	0	0	39
	Indifferent	17	0	0	17
	Total	98	1	1	100

Source: Primary Data (Survey Period: February-March, 2016)

Chi-Square Analysis

The λ^2 analyses have been used to test whether the different factors influence perception of telemedicine or not.

Table 16 shows the λ^2 analyses.

Table 16: Chi-Square Test Analyses

Factors	Calculated Value	Table Value	S/NS*	Decision
Age	10.714	12.592	NS	Accepted
Gender	.510	5.991	NS	Accepted
Educational Qualification	3.628	15.507	NS	Accepted
Occupation	13.473	12.592	S	Rejected
Time Saving	65.986	9.488	S	Rejected
Trust	1.495	9.488	NS	Accepted
Privacy and Confidentiality	0.834	9.488	NS	Accepted
Behavior of Service Provider	10.345	9.488	S	Rejected
Awareness	2.276	9.488	NS	Accepted
Service Quality	3.762	9.488	NS	Accepted
Equipment	6.137	9.488	NS	Accepted
Coordination	3.712	9.488	NS	Accepted
Treatment Cost	1.001	9.488	NS	Accepted
Government Support	24.844	9.488	S	Rejected
IT Infrastructure	2.597	9.488	NS	Accepted

* 0.05 level of significance, S = Significant, NS = Not Significant

The λ^2 analyses shows that occupation, time saving, behavior of telemedicine service provider and financial support from government have not significant influence over the perception of telemedicine as the null hypotheses of these factors are rejected (calculated X-2 value > table value). And age, gender, educational qualification, trust, privacy and confidentiality, awareness, service quality, existing equipment status, proper coordination, treatment cost and IT infrastructure have significant influence with the perception of telemedicine as the null hypotheses of the factor are accepted (calculated X2 value < table value).

Recommendations

The following recommendations can be considered for improving the standard of telemedicine services and to make it more available to the rural people of Bangladesh.

- Although all telemedicine centers are under the coverage of private and public telecommunication operators, the internet bandwidth provided by those operators in the rural telemedicine center is not at optimum level. So, internet bandwidth might be at optimal level in this center to run their operations smoothly.
- Significant portion of doctors, nurses and support staffs are not familiar with benefits and operational procedures of telemedicine service. So, different types of seminar, workshop, symposium, training, showing short films and campaign should be arranged to increase the awareness regarding this service.
- Skilled manpower (doctors and support staffs) might be employed in the telemedicine center to smoothly provide this service to the rural area of Bangladesh.
- Moreover, government may use electronic and print media to raise the awareness regarding the cost and benefits of telemedicine service among the people in rural area of Bangladesh.
- Another important issue is security and privacy on patients' records. All telemedicine centers might ensure security and maintain privacy on patients' personal information in order to ensure trust in this electronic service. Because patients may face embracing situation if anyone opens their privacy. In this situation, there may be specific privacy regulations on the practice of telemedicine service. So that patients can feel secure in the discloser of their personal information.
- The behavior of staffs, nurses and doctors should be friendly in order to motivate rural people to receive this service. In addition, the accountability and transparency of each employee in the telemedicine center should be monitored by concern authority.
- Legal and financial support may be enhanced to establish national standard for telemedicine service in rural area of Bangladesh. In addition, trust in telemedicine service is needed to flourish this sector.

Conclusion

Telemedicine is still at the beginning stage of development and information technology has not reached in expected position to improve its quality of service. Government and other private organizations have taken many initiatives to improve this status. Besides this, there are different issues such as people's trust, behavior of telemedicine service provider, awareness regarding this service, confidentiality and privacy of patients' records, infrastructure etc should be considered to generate positive perception regarding telemedicine service. Furthermore, telemedicine

service providers (government and nongovernment institutions) have to provide a quality health service with a view to flourish this health care service sector. In addition, telemedicine services are required to be accessible and affordable throughout the country. Findings of this study will provide some predictions regarding the factors affecting the peoples' perception toward telemedicine service. The outcome of this study might be used as the basis for the continuous development of the telemedicine service in Bangladesh.

Limitations and future research

Some limitations of the present study should be mentioned. First, the respondents were not willing to provide actual data. Secondly, the sample size in this study is relatively small and has employed simple statistical analysis. Future research should investigate further development of telemedicine service in rural area of Bangladesh. Researcher may also consider a large sample size and different statistical tools.

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