



KNOWLEDGE AND ATTITUDE OF THE PHYSICIANS TOWARD TELEMEDICINE

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ABSTRACT

Information and communication technologies (ICTs) have great potential to address some of the challenges faced by both developed and developing countries in providing accessible, cost-effective, high-quality health care services. Telemedicine uses ICTs to deliver service and exchanging information related to health care issues across distance. This study explores the current knowledge and attitude of physicians toward telemedicine at a 'micro level'. A cross sectional survey was carried out among 200 physicians from Mohammadpur and Mohakhali area of Dhaka city by convenience sampling. A pretested semi-structured questionnaire was used to assess the knowledge and attitude of the respondents. It was revealed that majority (92%) of the respondents were aware of telemedicine. Out of 200 respondents, 48.5% had good knowledge of telemedicine. About 37% had average knowledge and 14.5% had poor knowledge of telemedicine. Among the respondents 48% had positive attitude, 32.5% had moderate and 19.5% had negative attitude toward telemedicine. Though it was found that their knowledge level is high but there was lacking of understanding telemedicine concept clearly. Majority (75.5%) of the respondents thought that telemedicine is used for treatment over telephone. Associations between the knowledge level and age, rank, specialities and service length of the respondents were found in the study. Statistically significant differences were found in attitude level and the respondents who are user of telemedicine and who are nonuser of telemedicine. Though majority (82.5%) of respondents said that they have never attended any formal training on telemedicine, 82% of the respondents had expressed interest to attend any conference or seminars related to telemedicine and 73.5% of them wanted to use telemedicine at their place of work. The results of this study are expected to help in future successful implementation of telemedicine systems in Bangladesh.

INTRODUCTION

Now a days, the use of information technology and software applications constitutes an integral component of the daily workload in business, banking, industry, education and health care settings. As a part of modern information and communication technology, computers and the internet have changed the way of how people communicate and exchange information to each other. The development of this technology and telecommunication services has had a significant impact on quality of health care especially for rural areas where access to quality health care has usually been an obstacle (Bashshur et al, 2002). Telemedicine is one of those technologies that have brought an opportunity for people who are living in rural areas to gain better accessibility and quality of healthcare services. Telemedicine is one of the growing area in which information and communication technology has a crucial role. This modern technology offers a new method of providing healthcare services across different geographical areas (Khammarnia, 2010). It is used for promoting and facilitating the accessibility of healthcare services to people when distance causes the receiver and the service provider to fall off (Atkinson et al, 2002). In short we can say that it is one of the ways of telecommunication to provide medical information and medical services. This service includes all the activities of the medical practice like diagnosis, treatment, prevention, education and research (Adewale, 2004). Over the past few years, user resistance and acceptance of technology has received more attention in healthcare research (Kim et al, 2010). Schopenhauer, a German philosopher in 1860, suggested that there are three stages for the revelation of each truth. "First, it is ridiculed; in the second, resisted; in the third, it is considered self-evident".

The same situation is applicable with regards to telemedicine technology. Telemedicine is one of the technologies that help to facilitate medical care at a distance and have been found useful to reach those patients living in rural and underserved areas (Alajlani, 2010). The goal of telemedicine is to bridge the gap between high demands and limited access to health care in rural and urban areas (Atkinson et al, 2002). However, it is still not self-evident because it is still not an integral part of classic healthcare practice (Weiss, 2008).

The successful adoption of telemedicine technology relies mainly on the recognizing of barriers to telemedicine. Physician's knowledge, attitude and acceptance are considered some of the main challenges for telemedicine. In order to overcome these issues and facilitate the adoption of innovative technologies, it is very important to understand the factors that affect the acceptance of telemedicine technologies by clinical staff in healthcare (Kim et al, 2010).

In fact, healthcare professionals' knowledge and attitude on telemedicine are important factors that can influence its future success. Research has shown that a lack of knowledge, skills, and training among users, along with factors such as a lack of technical expertise, initial costs, and reimbursement issues, is an important barrier to the use of telemedicine (Judi et al, 2009). On the other hand, proper understanding of telemedicine technology, especially by physicians, is an important requirement for successful implementation and deployment of the technology (Hu et al., 2002). The more knowledge of the benefits and capabilities of telemedicine the users have, the more positive their attitudes toward this technology are expected to be. As a result, their confidence in using this technology will increase. Consequently, if the use of a new technology is supported by the people working in the field, others will have more confidence in the use of the technology, and a higher degree of positive attitude will be realized (Levy et al, 2013). In a study by Cramp entitled "Principles of telemedicine: that an overview and introduction to the history of technology" was conducted, it was clear that future of telemedicine depends on its acceptance by professionals, and most importantly on our health care customers (Dargahi, 2005).

Telemedicine has a great benefit in our health service such as cost-effectiveness of health care, instant access to information, search online, relying less on health care institutions, shorter travel times and distances between patients and care providers. Another major benefit is the increased efficiency of all types of medical services. Although telemedicine has a number of benefits, some weaknesses of telemedicine include the initial cost of equipment and installation, no third party payment, medical malpractice issues etc. (Crump, 1995)

The industrial countries have had a significant amount of experience with the use of telemedicine during the last 50 years. In 1959, Nebraska Psychiatric Institute was one of

the first health organizations that implemented telemedicine in the United States (Jung et al., 2012). It utilized a television link to connect with Norfolk Hospital, which was 12 miles away. Such a link allowed physicians and patients on the other end (Ramos, 2010). In April of 1968, there were some other early implementations of telemedicine services in Massachusetts General Hospital where a microwave video was used to communicate with Boston Logan airport. With such a link, Massachusetts General Hospital was able to provide instant healthcare services to employees and passengers at the airport. The services provided at the Logan airport included cardiology, dermatology and radiology services (Adler, 2000). Since then, telemedicine has achieved significant progress in developed world. Currently, there is a wide range of services already implemented in the industrial countries ranging from basic forms to complicated virtual reality services. These services can be used everywhere mostly in areas whereas a shortage physicians and specialist of specific medical condition. Moreover, there are various successful implemented projects, and plenty of pilot projects under development that would change the way in which a healthcare is delivered (Bashshur, 2002).

The implementation of telemedicine might be more effective in developing countries like Bangladesh since those countries are being challenged with medical service problems, financial needs, lack of resources and lack of healthcare professionals (Khalifehsoltani & Gerami, 2010). Telemedicine is one of advanced technologies that attempt to solve the problem related to the provision of quality healthcare (Bashshur, 2002). The key objectives of telemedicine are to provide clinical decision support by sharing information among the healthcare providers, overcome geographical barriers by connecting consumers who are not in the same physical location and improve healthcare outcomes by enabling patients to manage their own healthcare (Horsch & Balbach, 1999).

Bangladesh has successfully applied IT to its information and management systems to ensure they are easily accessible for performance assessment of specific programme at least up to sub district level. Internet access has been established up to union-level facilities and the community clinics will soon be included in the HIS net for the generation of various databases aiding management decision-making. Under e-Health, all the UHCs and district hospitals have mobile phone-based services for providing

necessary medical advice free of charge. Telemedicine service is now available in eight hospitals through high-quality video-conferencing devices and this has expanded to several thousands of community clinics. This expands the opportunity for providing medical consultation to rural areas where there is no access to specialist doctors. The pilot project MOVE-IT has opened the prospect of building a unified electronic information system to register all vital statistics and improve coverage of priority maternal and child health services.

Launched in July 2011, telemedicine service is now available from nine hospitals (three UHCs, three district hospitals and three tertiary hospitals) and uses high-quality video conferencing devices. It has thus expanded the opportunity of medical consultation to rural areas often not served by specialist doctors. By 2013, telemedicine services will be expanded to several thousands of community clinics and to facilitate this, internet-ready mini-laptops are being distributed to the clinics. Currently, a pilot project named MOVE-IT is in place to build a unified electronic information system to register all pregnancies, births, deaths, cause of death, non-fatal health events and coverage of priority services for maternal and child health harnessing the power of mobile and IT. This is being implemented by the Government in partnership with an NGO and an IT company under funding from the WHO Health Metrics Network (Bangladesh Health System Review, 2015). With great advances of modern medical systems, and growing demand for qualified physicians and surgeons in Bangladesh, it becomes a necessity to find new and creative ways to help in achieving healthcare goals. The idea of adoption was introduced as a supportive tool that could promote quality healthcare services easily and conveniently (El-Mahalli, 2012).

MATERIALS AND METHODS

Study design

A cross-sectional study was undertaken to find out physician's knowledge and attitude toward telemedicine. This was a descriptive type of study.

Study duration

The study was carried out from July-September, 2016 through individual structured interviews.

Place of study

The study was carried out among the physicians from Government and Nongovernment Medical colleges, Hospitals, Private Chambers, Medical service related Organizations located in and around Mohammadpur and Mohakhali area of Dhaka city.

Study population

Different levels of physicians, meant all registered doctors and working with the participating study place in various capacities such as Lecturers, Medical Officers, Specialists, Consultants and General Practitioners. The selection criteria were-

Inclusion criteria

1. Physicians of different level at selected study place.
2. Physicians who were connected with telemedicine service.
3. Physicians who were willing to participate in this study.

Exclusion criteria

1. Physicians who were on internship.
2. Physicians who were not willing to take part in this study.
3. Physicians who were absent in the study place at the time of study.

Sample Size

To determine the Sample size the following formula was used

$$n = \frac{z^2 pq}{d^2}$$

Here,

n = desired sample size

z = standard normal deviate. (In 95% confidence interval usual value is 1.96)

p = Probability of the study population

p = 50% = (0.50), was used as no relevant estimate was found.

q = 1 - p = (1 - 0.5) = 0.5

d = Precision or allowable error, 5% = (0.05)

Therefore,

$$\begin{aligned} n &= \frac{z^2 pq}{d^2} \\ &= \{(1.96)^2 \times 0.5 \times (1-0.5)\} / (0.05)^2 \\ &= 0.96 / 0.0025 \\ &= 384 \end{aligned}$$

But considering the resource constraints, 200 participants were included in this study.

Sampling technique

Respondents included in this study were selected by convenience sampling.

Data collection tools

A semi structured questionnaire designed for the study was pretested on a group of medical doctors before it was distributed to research participants. The questionnaire elicited information about background of doctors and assessed self-reported level of Knowledge and Attitude of doctors towards telemedicine attributes. The questionnaire

was constructed after a review of the literature pertaining to telemedicine (Meher et al., 2009; Ibrahim et al., 2010; Meher et al, 2014). The self-administered questionnaire was used for the survey which consists of 5 sections: 1) Demographic details of the respondent; 2) Awareness and Information about telemedicine by respondents; 3) Knowledge level with respect to telemedicine; 4) Attitude towards telemedicine; 5) Open ended question for respondents.

In section one, participants were asked to provide information about their personal and professional background. Section three consisted of 11 statements to assess the knowledge level of the respondents with respect to telemedicine. This section required a graded response to each statement on a two-point scale. Each statement was to be answered in either 'Yes' or 'No'. A score of '1' was given for 'Yes' and '0' for 'No'. One can score a minimum of 0 and a maximum of 11 in this section. Section four consisted of 9 statements constructed to assess the attitude of the respondents towards telemedicine. This section required a graded response to each statement on a five-point Likert scale ranging from 0-4 i.e. '0' for strongly disagree, '1' for disagree, '2' for undecided, '3' for agree and '4' strongly agree. One can score a minimum of '0' and a maximum of '36' in this section. Section five consisted of open-ended questions.

Scoring of the tool

The raw scores were calculated for all the statements of knowledge and attitude. The mean and standard deviation for the sub samples and the range for the overall samples were calculated. Further the raw scores were converted to percentage. The scores equal to and less than 49% were considered as poor/negative, the scores between 50% to 70% was considered as average/moderate with and the scores equal to and above 71% were considered as good/positive with respect to Knowledge and Attitude score.

Data collection procedure

After explaining the purpose of the study and taking permission data were collected through face to face interview using a Bengali semi-structured questionnaire.

Data management and analysis

After collection, the raw data were checked, cleaned, edited and analyzed by using software SPSS [version 19]. The means, modes, percentages and standard deviations were calculated to describe the profile of the respondents. Chi-square test was used as appropriate, to evaluate the statistical significance of the differences between the responses of the participants. A P-value < 0.05 was considered significant.

Result Presentation

Suitable tables and figures were prepared to explain the obtained information

RESULTS

Figure 1

Distribution of the respondents by Sex

[n=200]

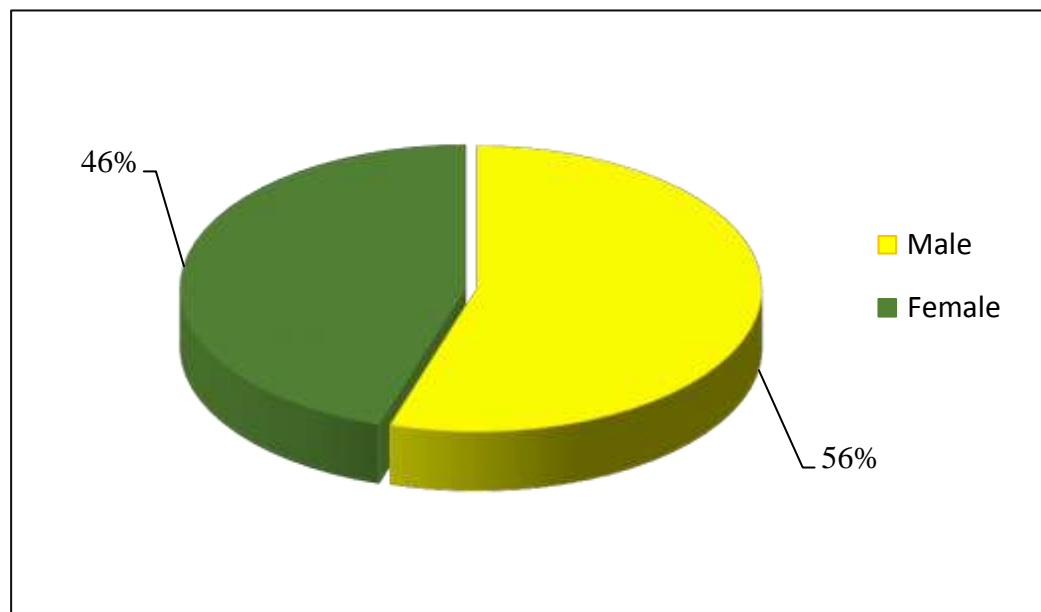


Fig-1 shows the distribution of the sex of the respondents, where out of 200 respondents 56% (112) of the respondents were male and 46% (88) were female.

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Table 1**Distribution of the respondents by Age group****[n=200]**

Age group (years)	Frequency (f)	Percent (%)	Mean = 37.08 Median = 32.00 Mode = 28 Std. Deviation = ± 11.241 Minimum = 25 Maximum = 68
25-34	111	55.5	
35-44	50	25.0	
45-54	16	8.0	
55-64	16	8.0	
≥ 65	7	3.5	
Total	200	100.0	

Table-1 shows that the majority of the respondents belonged to the age group of 25-34 years (55.5%) followed by 35-44 years of age group (25%). Respondents belonging to age group of 45-54 years and 55-64 years were same (8%). Only 3.5% respondents were above 65 years. Minimum and Maximum age of the respondents were 25 years and 68 years respectively.

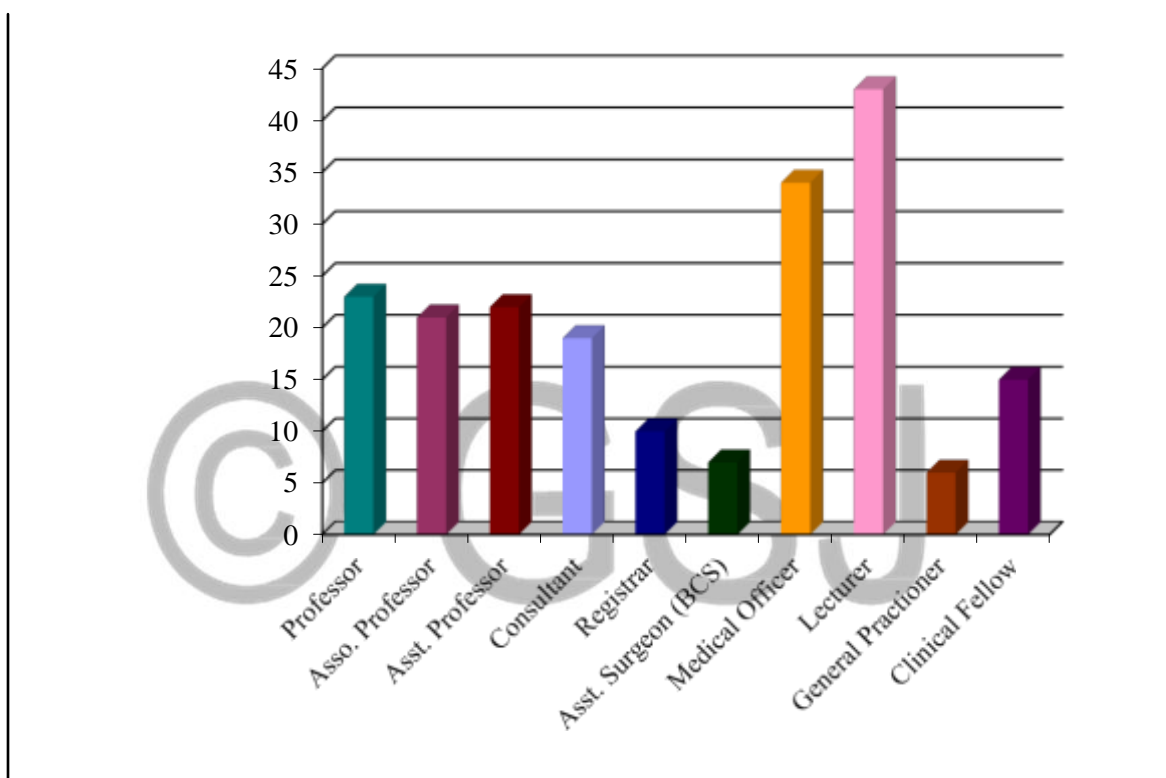
Figure 2**Distribution of the Respondents by Designation****[n=200]**

Fig-2 shows designation of the respondents where 21.5% of the respondents (43) were Lecturer involved in medical teaching in their respective specialities. 17% of the respondents (34) were Medical officer of different hospitals. Rest 11.5% were Professor (23), 10.5% were Associate Professor (21), 11% were Assistant Professor (22), 9.5% were Consultant (19), 5% were Registrar (10), 7.5% were Clinical Fellow (15), 3.5% were Assistant Surgeon of BCS health cadre (7) and 3% were General Practitioner (6).

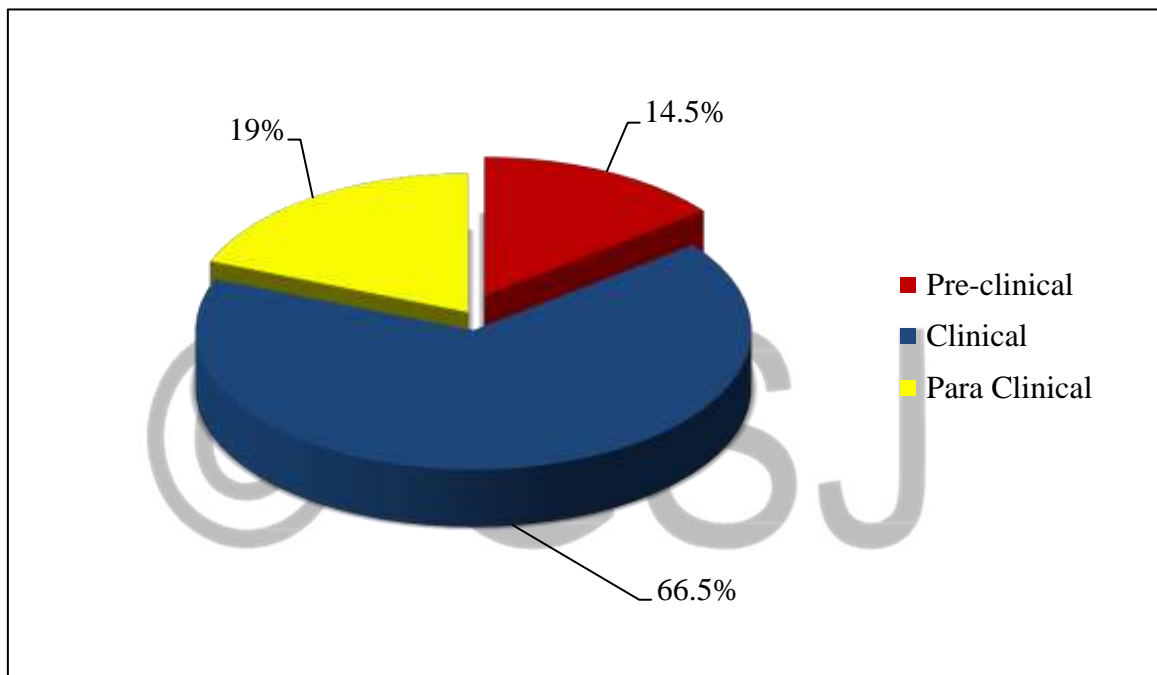
Figure 3**Distribution of the Respondents by Speciality****[n=200]**

Fig-3 shows that the clinical respondents formed the majority (66.5%) of the sample followed by Para-clinical respondents (19%) and Pre-clinical respondents (14.5%).

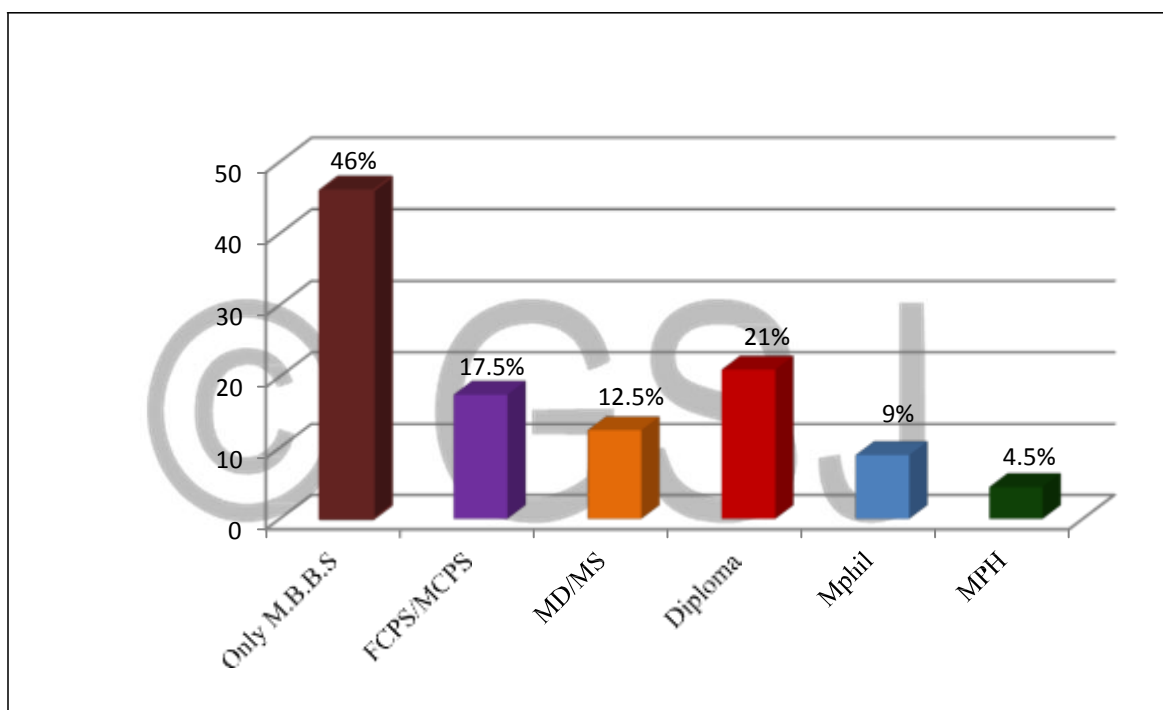
Figure 4**Distribution of the respondents by Educational qualification****[n=200]*****Multiple responses**

Fig-4 shows that Out of the 200 respondents, 92 (46 %) had only M.B.B.S degree. Rest of the 108 respondents had multiple degrees where 17.5% had FCPS/MCPS, 12.5% had MD/MS, 21% had Diploma, 9% had MPhil and 4.5% had MPH degree.

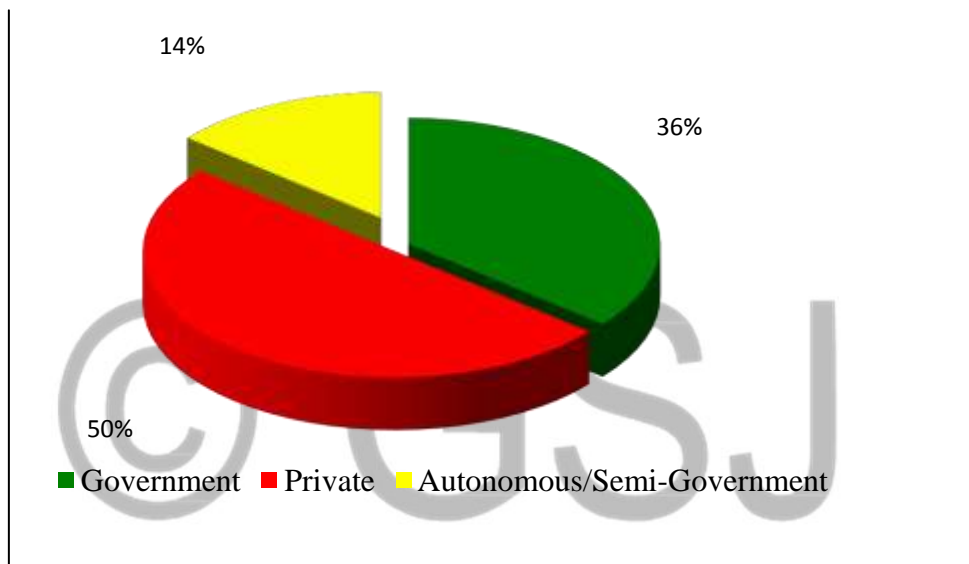
Figure 5**Distribution of the respondents by working sectors****[n=200]**

Fig-5 shows that the respondents from the private sector formed the half of the sample (50%) followed by respondents from government sector (36%) and respondents from Autonomous/Semi-Government sector (14%).

Table 2**Distribution of the respondents by job/working experience****[n=200]**

Experience in Years	Frequency (f)	Percent (%)	
1 <	21	10.5	Mean = 9.840
1-7	95	47.5	Median = 5.500
8-14	35	17.5	Mode = 2.00
15-21	23	11.5	Std. Deviation = ±10.031
22-28	6	3.0	Minimum = .25
29-35	15	7.5	Maximum = 38.00
≥ 36	5	2.5	
Total	200	100.0	

Table-2 shows that the majority of the respondents belonged to the experience group of 1-7 years (47.5%) followed by 8-14 years of experience group (17.5%). Respondents belonging to experience group of 15-21 years, 22-28 years and 29-35 years were 11.5%, 3% and 7.5% respectively. 10.5% respondents belonged to less than 1 year of experience and only 2.5% respondents belonged to more than 36 years of experience. Minimum experience was 4 months and the maximum was 38 years.

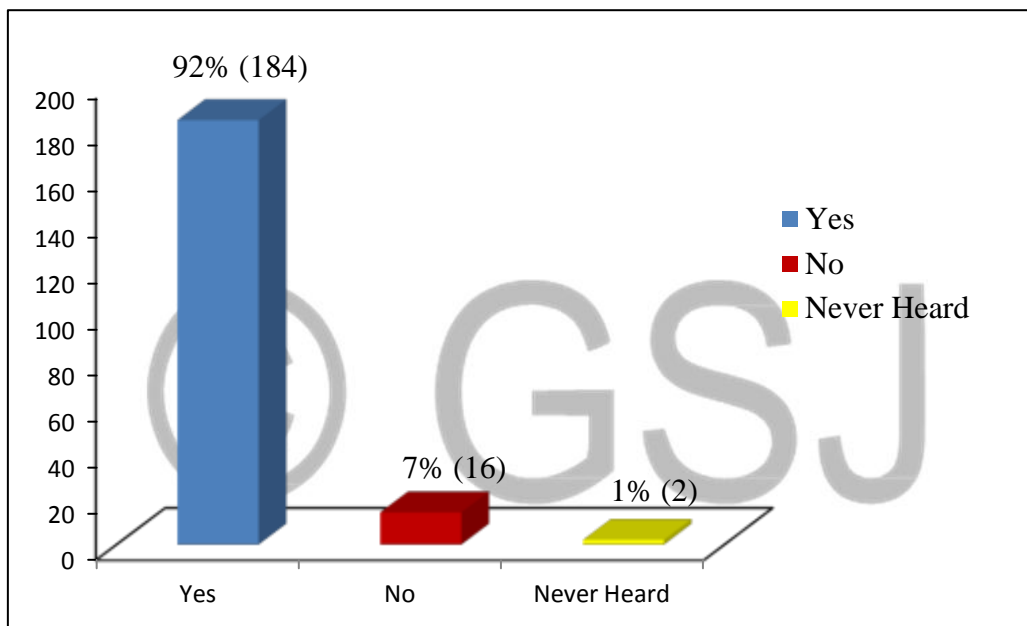
Figure 6**Distribution of the respondents regarding their awareness about telemedicine****[n=200]**

Fig-6 shows, in response of a question regarding whether they know about telemedicine or not, majority of respondents (92%) said that they are aware of telemedicine (184). Out of rest 16 respondents, 14 respondents said that they do not know about telemedicine (7%) and 2 respondents said that they never heard about telemedicine (1%).

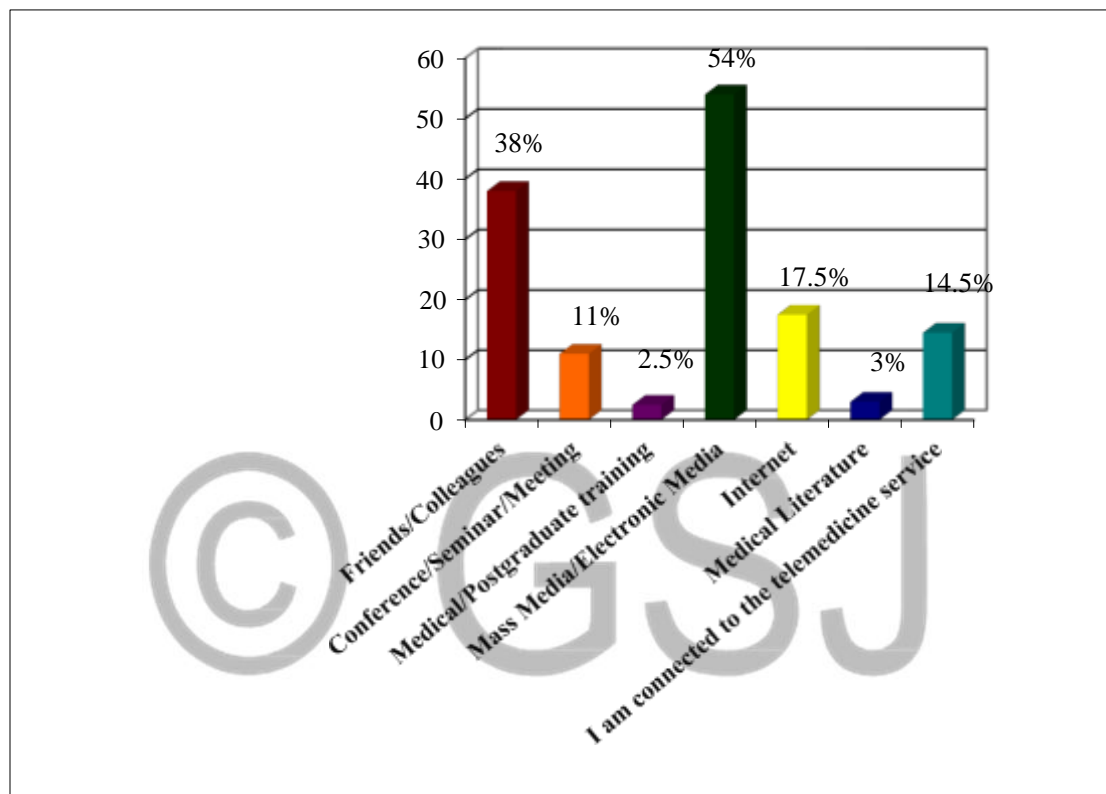
Figure 7**Distribution of respondent's sources of information about telemedicine****[n=200]*****Multiple responses**

Fig-7 shows, majority of the respondents (54%) reported that Mass media/Electronic media was the source of information about telemedicine for them, followed by 38% respondents from Friends/Colleagues. Other sources mentioned included Internet (17.5%), Conference/Seminar/Meeting (11%), Medical Literature (3%) and Medical/Postgraduate training (2.5%). Rest 14.5% respondents said that they are connected to the telemedicine service or having past experience on telemedicine service.

Figure 8

Distribution of the respondents regarding whether they know what is telemedicine or not

[n=200]

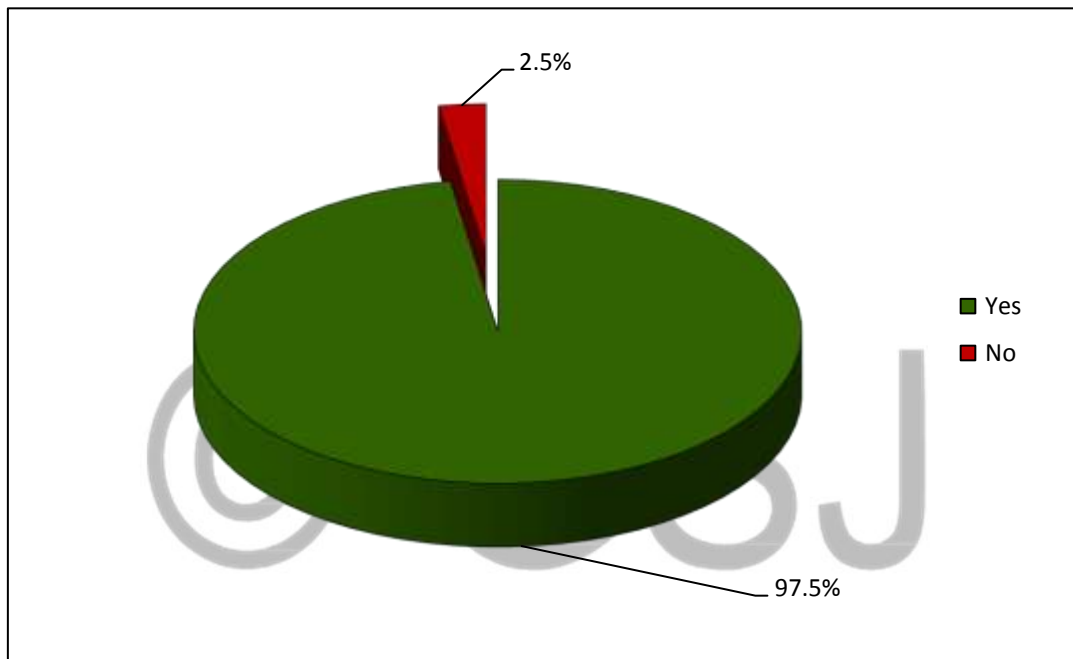


Fig-8 shows, in response of a question regarding whether they know what is telemedicine or not, majority (97.5%) of respondents said that they know what is telemedicine (195). Rest 2.5% respondents said that they do not know clearly what is telemedicine (5).

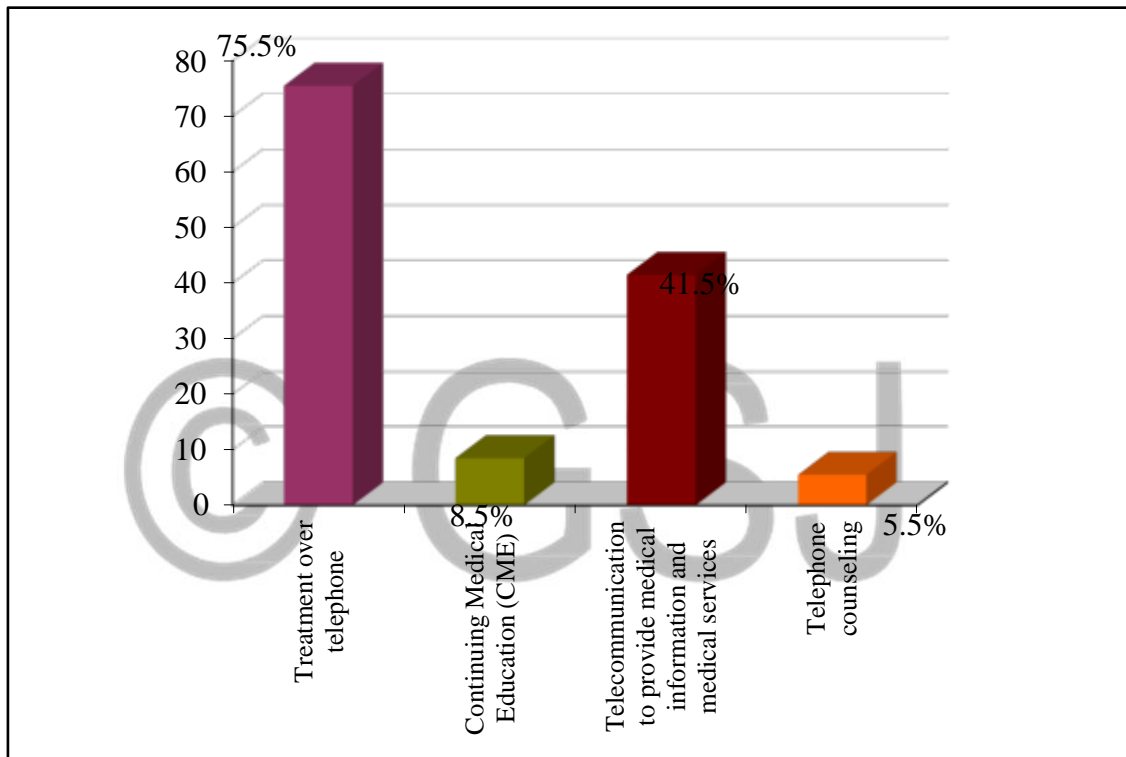
Figure 9**Distribution of response regarding for what purpose the telemedicine is used****[n=200]*****Multiple responses**

Fig-9 shows, majority (75.5%) of the respondents mentioned that telemedicine is used for treatment over telephone. Around 41.5% felt it is used for telecommunication to provide medical information and medical services. 8.5% said that it is a part of continuing medical education (CME) and rest of the 5.5% respondents included it on Telephone counseling.

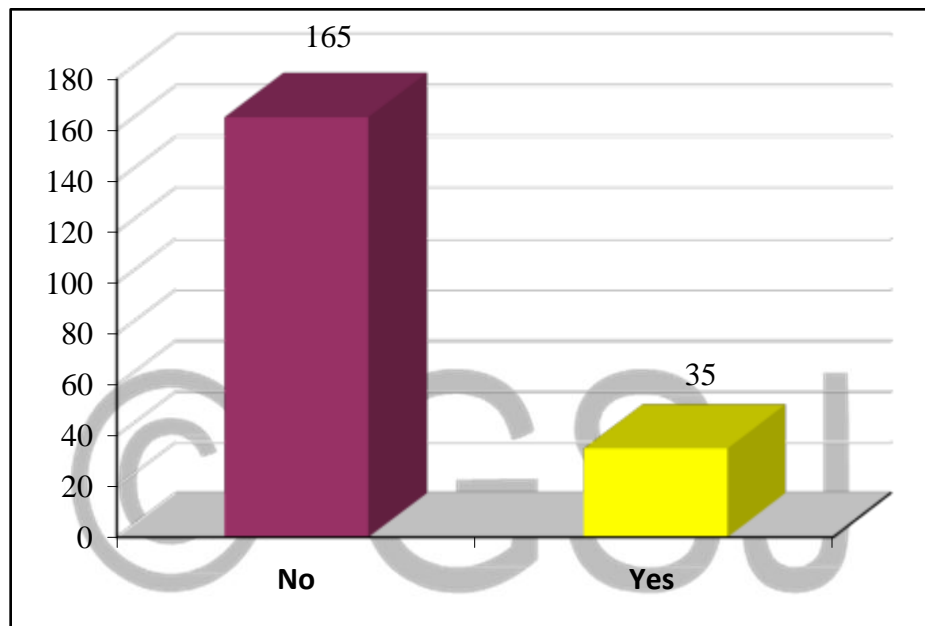
Figure 10**Distribution of the respondent's attendance to any formal training on telemedicine****[n=200]**

Fig-10 shows, in response of a question regarding attendance to any formal training on telemedicine, majority of respondents (165) said that they have never attended any formal training on telemedicine. Rest 35 respondents said that they had formal training on telemedicine.

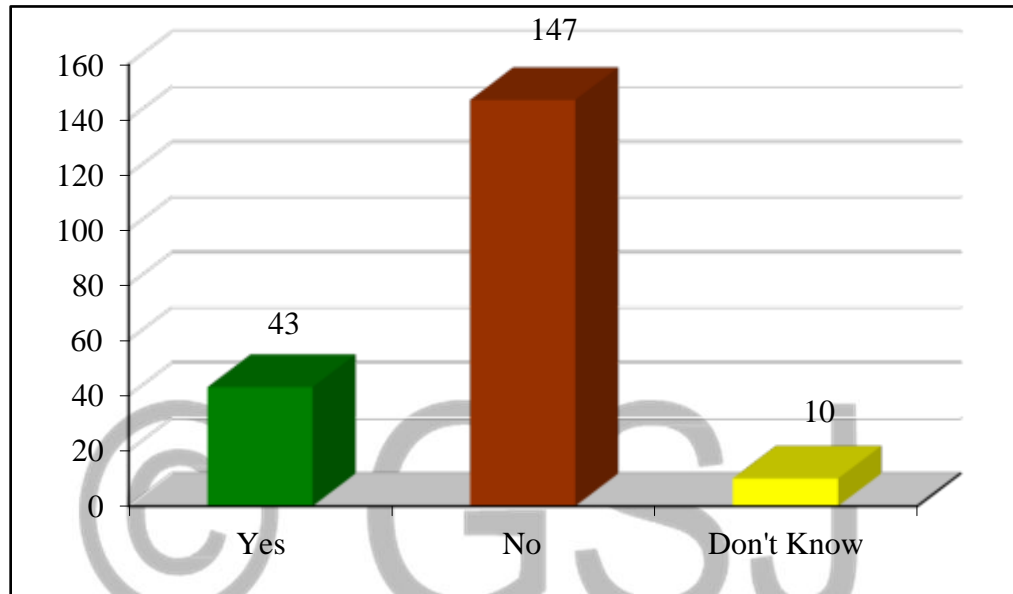
Figure 11**Distribution of response regarding presence of telemedicine unit at workplace****[n=200]**

Fig-10 shows, in response of a question regarding presence of telemedicine unit at their workplace, majority (147) of respondents said that there is no telemedicine unit at their workplace. 43 respondents said 'Yes' regarding presence of telemedicine unit at their workplace and 10 respondents said that they don't know about this.

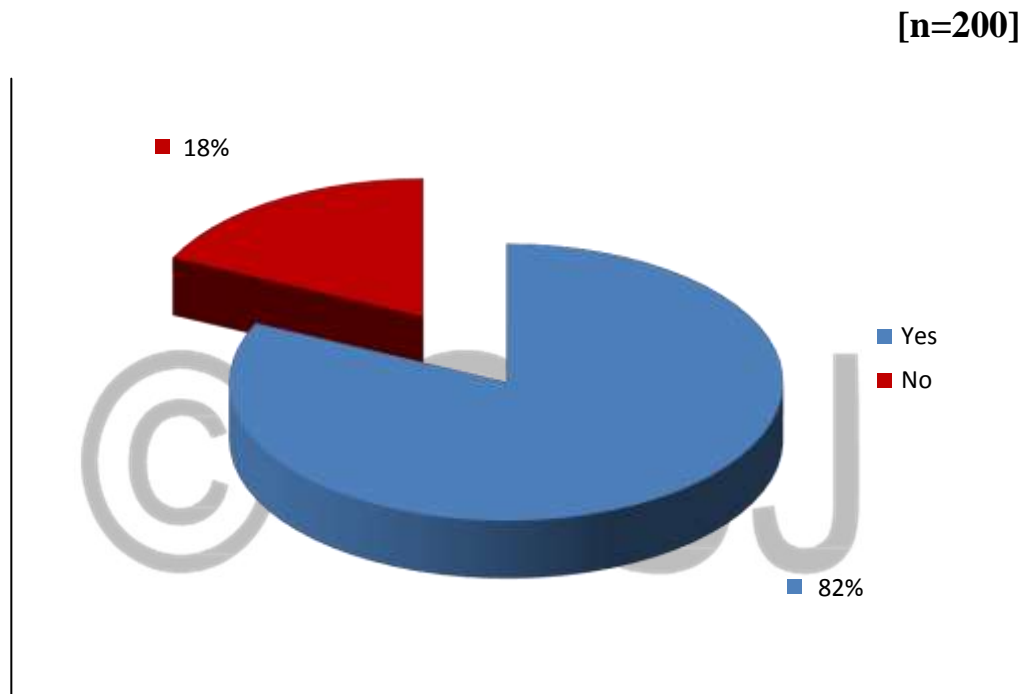
Figure 12**Distribution of respondents by willingness to attend any seminar on telemedicine**

Fig-11 shows, when asked about their willingness to attend seminar, approximately 82% said 'yes'. Rest of the 18% were not willing to attend any seminar regarding telemedicine.

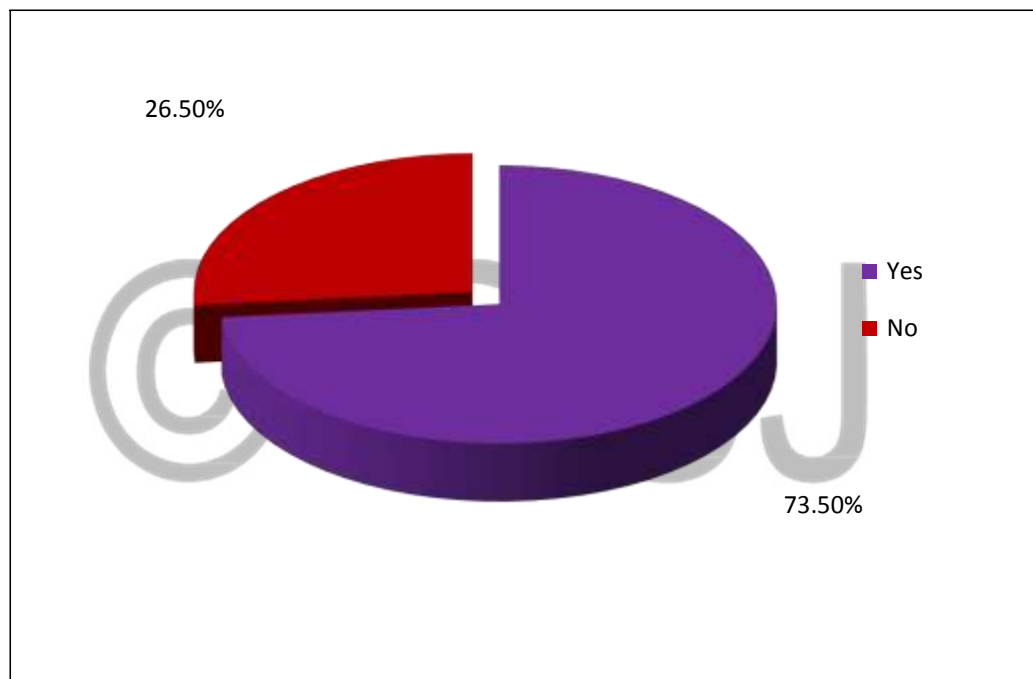
Figure 13**Distribution of respondents by willingness to use telemedicine at their workplace/private chamber****[n=200]**

Fig-12 shows, when asked about their willingness to use telemedicine in their place of work/private chamber, 73.50% said 'yes'. Rest of the 26.50% respondents were not willing to use telemedicine in their place of work/private chamber.

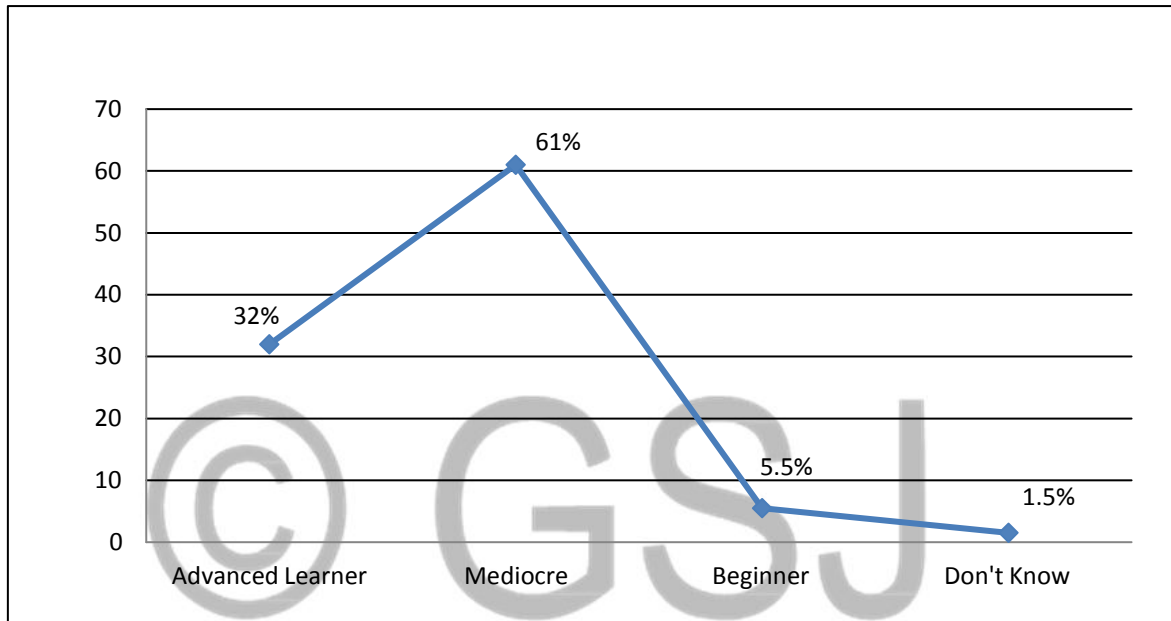
Figure 14**Distribution of the respondent's skill of computer & internet****[n=200]**

Fig-13 shows the skill of computer and internet of the respondents where 32% respondents were Advanced learner, 61% were Mediocre, 5.5% were Beginner and 1.5% had no skill on computer and internet.

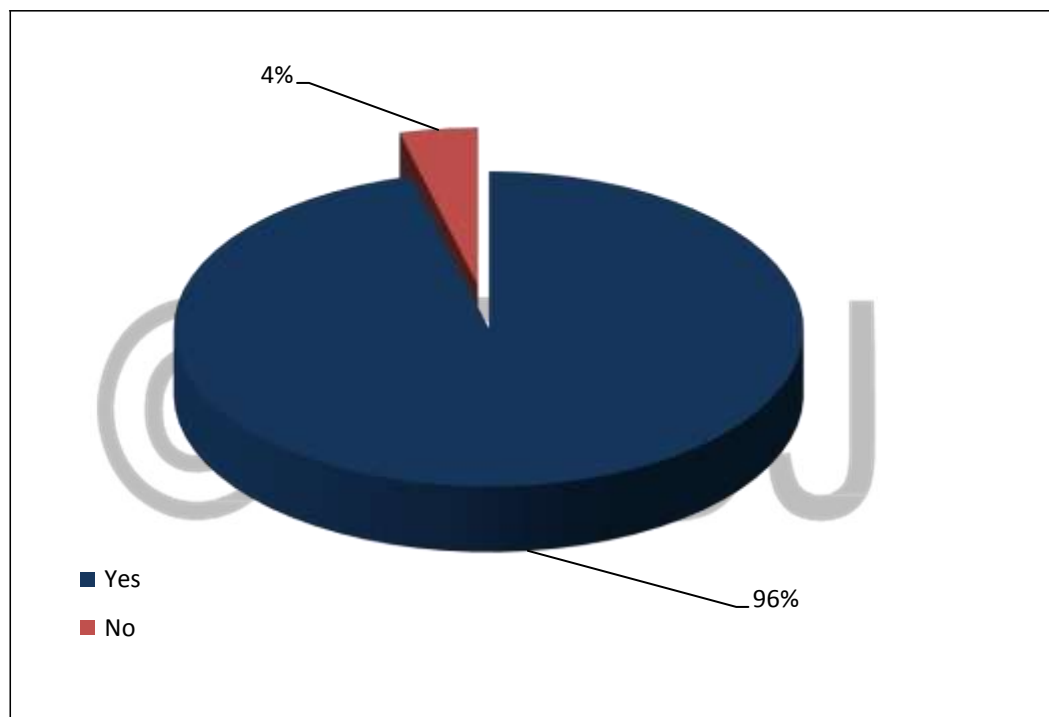
Figure 15**Distribution of the respondents by their use of Email****[n=200]**

Fig-14 shows, out of 200 respondents, 96% reported their access to Email and rest of 4% said they do not know how to use Email.

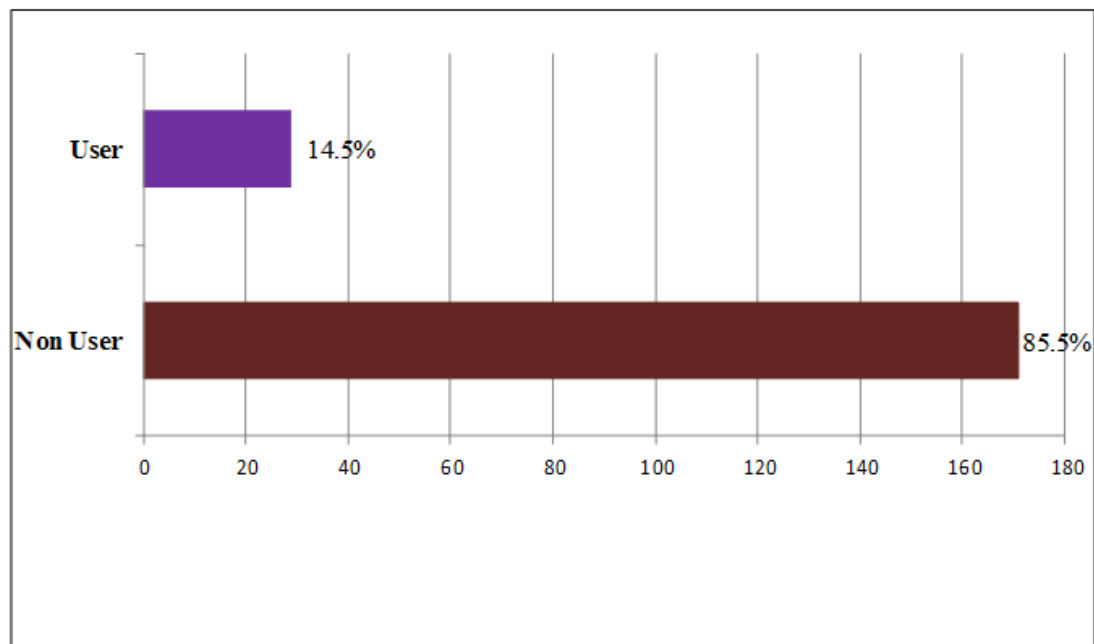
Figure 16**Distribution of the respondents by user and nonuser group of telemedicine****[n=200]**

Fig-15 shows, 29 respondents were connected to the telemedicine service. So, Among the 200 respondents 14.5% respondents were telemedicine user. Rest 85.5% (171) had never experienced the use of telemedicine.

Table 3**Distribution of respondent's level of Knowledge according to Likert scale****[n=200]**

Degree	Knowledge			Mean= 7.87 Median= 8 Mode= 9 Std. Deviation= ±2.26 Minimum= 0 Maximum= 11
	Poor ≤49%	Average 50%-70%	Good ≥71%	
Number	29	74	97	
%	14.5	37	48.5	

Table-3 shows the level of knowledge among the respondents according to Likert scale where 14.5% had poor level or below average level of knowledge of telemedicine, 37% had average or moderate level of knowledge and 48.5% had high or good level of knowledge of telemedicine. The minimum score for 'knowledge' was 0 and maximum score was 11. The Mean score was found 7.87 out of maximum possible score 11.

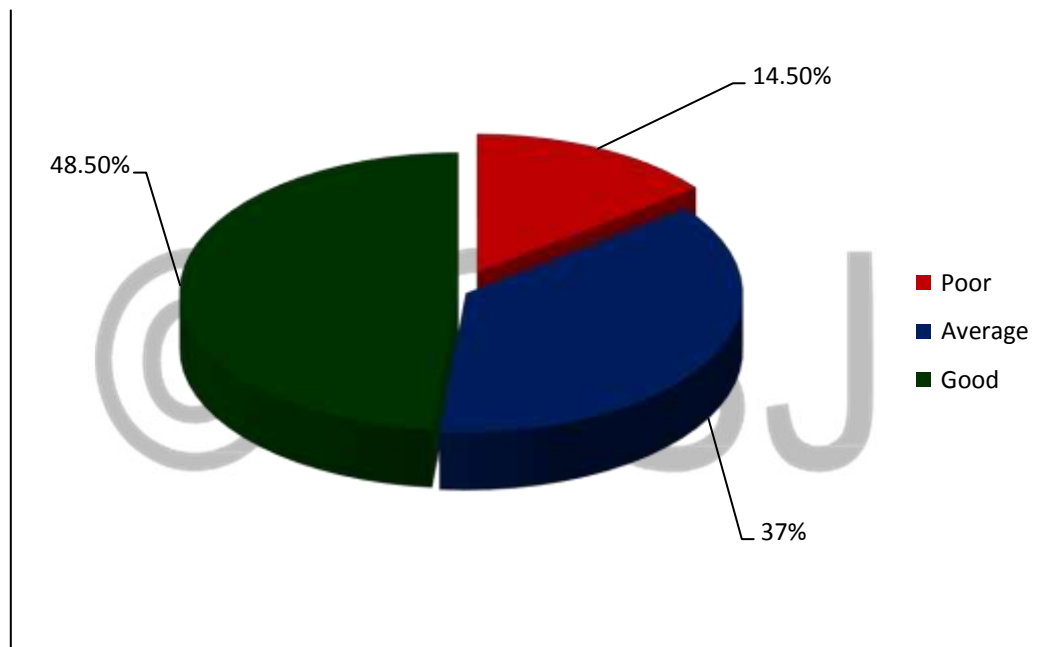
Figure 17**Distribution of the respondents by their level of Knowledge toward telemedicine****[n=200]**

Fig-16 shows the level of knowledge among the respondents where 14.5% had poor level or below average level of knowledge of telemedicine, 37% had average or moderate level of knowledge and 48.5% had high or good level of knowledge of telemedicine.

Table 4**Distribution of respondent's level of Attitude according to Likert scale****[n=200]**

Degree	Attitude			Mean= 23.89 Median= 25 Mode= 27 Std. Deviation= ±5.87 Minimum= 0 Maximum= 33
	Negative ≤49%	Moderate 50%-70%	Positive ≥71%	
Number	39	65	96	
%	19.5	32.5	48	

Table-4 shows the level of attitude among the respondents according to Likert scale where 19.5% had negative attitude toward telemedicine, 32.5% had average or moderate level of attitude and 48% had positive attitude toward telemedicine. The minimum score for 'Attitude' was 0 and maximum score was 33. The Mean score was found 23.89 out of maximum possible score 36.

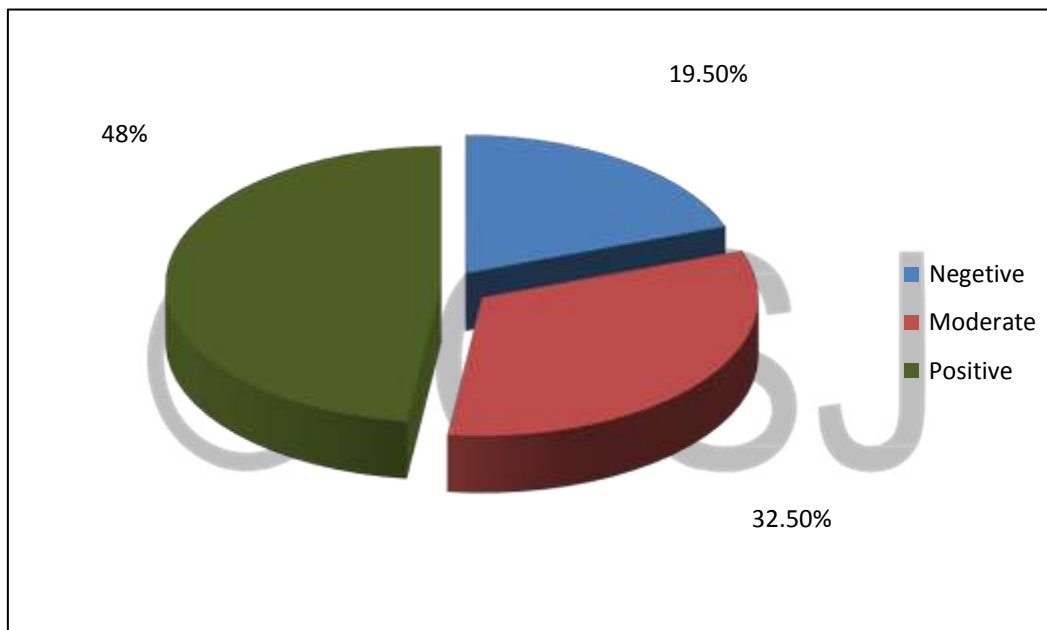
Figure 18**Distribution of the respondents by their level of Attitude toward telemedicine****[n=200]**

Fig-17 shows attitude level among the respondents where 19.5% of the respondents had negative level of attitude towards telemedicine, 32.5% had moderate level of attitude and 48% had positive attitude level towards telemedicine.

Table 5**Mean and SD for Knowledge and attitude of the overall sample and sub-samples****[n=200]**

Category	Total	%	Knowledge		Attitude	
			Mean	SD	Mean	SD
Overall	200	100	7.87	±2.26	23.89	±5.87
Pre-clinical	29	14.5	8.55	±1.53	25.00	±4.91
Clinical	133	66.5	7.97	±2.29	24.47	±4.81
Para-clinical	38	19	6.97	±2.40	21.00	±8.60
Male	112	56	7.91	±2.36	24.22	±5.25
Female	88	44	7.81	±2.13	23.47	±6.59
Government	72	36	7.86	±1.92	24.58	±4.65
Non-Government	128	64	7.87	±2.43	23.50	±6.44
Age 25-34 Y	111	55.5	7.59	±2.34	24.04	±6.49
Age 35-44 Y	50	25	8.02	±2.01	23.60	±4.51
Age 45-54 Y	16	8	8.38	±1.70	22.19	±7.45
Age 55-64 Y	16	8	9.13	±2.53	25.00	±4.15
Age 65 Y & above	7	3.5	7.14	±2.27	25.00	±3.10
Telemedicine User	29	14.5	7.62	±2.07	28.00	±4.15
Telemedicine Nonuser	171	85.5	7.91	±2.27	23.35	±5.96

Table-5 shows the frequency distribution with percentage of the overall sample and sub-samples and mean and SD for Knowledge and Attitude of the overall sample and sub-samples. The highest and lowest mean value for knowledge of telemedicine was recorded among the respondents whose age group was between 55-64 years (Mean 9.13 and SD ±2.53) and among the respondents whose age group was between 65 years and above (Mean 7.14 and SD ±2.27) respectively. The mean value for knowledge among the male (7.91) respondents were slightly higher than female (7.81). The highest and lowest mean value for attitude towards telemedicine was recorded among the respondents who were the telemedicine user (Mean 28.00 and SD ±4.15) and among the para-clinical respondents (Mean 21.00 and SD ±8.60) respectively.

Table 6: Knowledge of the respondents towards telemedicine attribute [n=200]

Statement	Yes (%)	No (%)
Telemedicine is the use of telecommunication to provide medical information and services	199 (99.5)	1 (0.5)
Telemedicine is part of medical education technology	175 (87.5)	25 (12.5)
Telemedicine provides health care services where distance is a problem	197 (98.5)	3 (1.5)
Face to face interaction of patient and doctors is possible through telemedicine	131 (65.5)	69 (34.5)
Patients management with drugs can be done through telemedicine	175 (87.5)	25 (12.5)
Patients' examination can be communicated through telemedicine	25 (12.5)	175 (87.5)
Patients' investigations can be communicated through the telemedicine	102 (51.0)	98 (49.0)
Follow-up of patients can be done through telemedicine	139 (69.5)	61 (30.5)
Electronic medical record of patients' registration can be maintained through telemedicine	175 (87.5)	25 (12.5)
Telemedicine can be used in battlefield casualties, prisons, for disabled patients and during natural and man-made calamities distance	158 (79)	42 (21.0)
Health care through the internet is a recognized service	147 (73.5)	53 (26.5)

Table 7: Attitudes of the respondents towards telemedicine [n=200]

Statement	SD	D	UD	A	SA
	%	%	%	%	%
Knowing more about computers and applications of ICT in medical field is a must for health professionals	3.5	3.5	9.5	52.5	31
Telemedicine encourages team working among health professionals which leads to quality health care	3.5	7.5	25.5	53.5	10
Application of ICT in health care services reduces the financial burden to government	3.5	7.0	43.5	39.0	7.0
Health for all can be easily achieved through ICT enabled health services	4.5	3.0	31.5	56.0	5.0
Use of Telemedicine could make the distribution of healthcare more even with more emphasis on prevention	2.0	4.0	15.5	66.5	12.0
I would attend training courses in Telemedicine if they were offered at my hospital	3.5	6.5	1.5	82.0	6.5
Patients should be encouraged to have access to medical information through e-mails and websites so that they become better informed of their medical condition	5.0	15.5	14.5	51.0	14.0
Telemedicine combined with easy public access to health information and advice will make for a healthier population in the future	0.5	5.0	31.0	54.5	9.0
Use of Telemedicine will blur the distinction between primary and secondary healthcare by improving the links between patients, nurses, GPs and consultants	3.5	6.5	37.5	42.5	10.0

Table 8**Association between working sector and knowledge level of the respondents****[n=200]**

Working Sector	Knowledge Level			Total N (%)	Statistics
	Poor	Moderate	Good		
	N (%)	N (%)	N (%)		$\chi^2= 0.521$
Government	10 (13.9)	29 (40.3)	33 (45.8)	72 (100)	df= 2
Non-government	19 (14.8)	45 (35.2)	64 (50.0)	128 (100)	P= 0.771
Total	29 (14.5)	74 (37.0)	97 (48.5)	200 (100)	

Table-8 shows that out of 200 respondents, 72 (36%) respondents were from government sector and 128 (64%) respondents from non-government sector. Among the respondents from government sector 33 (45.8%) had good knowledge, 29 (40.3%) had moderate knowledge, 10 (13.9%) had poor knowledge on telemedicine. The Association between working sector and Knowledge level was not statistically significant ($\chi^2= 0.521$, df= 2, p=0.771)

Table 9
Association between working sector and attitude level of the respondents

[n=200]

Working Sector	Attitude Level			Total N (%)	Statistics
	Poor	Moderate	Good		
	N (%)	N (%)	N (%)		$\chi^2= 3.786$
Government	9 (12.5)	27 (37.5)	36 (50.0)	72 (100)	df= 2
Non-government	30 (23.4)	38 (29.7)	60 (46.9)	128 (100)	P= 0.151
Total	39 (19.5)	65 (32.5)	96 (48.0)	200 (100)	

Table-9 shows that out of 200 respondents, 72 (36%) respondents were from government sector and 128 (64%) respondents from non-government sector. Among the respondents from government sector 36 (50.0%) had positive attitude, 27 (37.5%) had moderate attitude, 9 (12.5%) had negative attitude towards telemedicine. The Association between working sector and attitude level was not statistically significant ($\chi^2= 3.786$, df= 2, p=0.151)

Table 10**Association between Speciality of the respondents and Knowledge level****[n=200]**

Specialty of the respondents	Knowledge Level			Total N (%)	Statistics
	Poor N (%)	Moderate N (%)	Good N (%)		
Pre-clinical	1 (3.4)	10 (34.5)	18 (62.1)	29 (100)	
Clinical	20 (15.0)	45 (33.8)	68 (51.1)	133 (100)	$\chi^2= 10.026$ df= 4 P= .040
Para clinical	8 (21.1)	19 (50.0)	11 (28.9)	38 (100)	
Total	29 (14.5)	74 (37.0)	97 (48.5)	200 (100)	

Table-10 shows that out of 200 respondents, Pre-clinical were 29 (14.5%), Clinical 133 (66.5%) and Para clinical 38 (19.0%). Among Pre-clinical respondents 1 (3.4%) had poor knowledge, 10 (34.5%) had moderate, 18 (62.1%) had good knowledge on telemedicine. The Association between Speciality of the respondents and Knowledge level was statistically significant ($\chi^2= 10.026$, df= 4, p=0.040)

Table 11**Association between Specialty of the respondents and Attitude level****[n=200]**

Specialty of the respondents	Attitude Level			Total N (%)	Statistics
	Negative N (%)	Moderate N (%)	Positive N (%)		
Pre-clinical	5 (17.2)	6 (20.7)	18 (62.1)	29 (100)	$\chi^2= 19.440$ df= 4 P= .001
Clinical	19 (14.3)	54 (40.6)	60 (45.1)	133 (100)	
Para clinical	15 (39.5)	5 (13.2)	18 (47.4)	38 (100)	
Total	39 (19.5)	65 (32.5)	96 (48.0)	200 (100)	

Table-11 shows that out of 200 respondents, Pre-clinical were 29 (14.5%), Clinical 133 (66.5%) and Para clinical 38 (19.0%). Among Pre-clinical respondents 5 (17.2%) had negative attitude, 6 (20.7%) had moderate, 18 (62.1%) had positive attitude on telemedicine. The Association between Specialty of the respondents and Attitude level was statistically significant ($\chi^2= 10.026$, df= 4, p=0.001)

Table 12**Association between knowledge level and different rank of the respondents****[n=200]**

Designation of the Respondents	Knowledge Level			Total	Statistics
	Poor	Moderate	Good		
	N (%)	N (%)	N (%)		
Professor	3 (13.0%)	9 (39.1%)	11 (47.8%)	23 (100.0%)	$\chi^2 = 34.65$ df= 18 P= 0.01
Associate Professor	1 (4.8%)	2 (9.5%)	18 (85.7%)	21 (100.0%)	
Asst. Professor	4 (18.2%)	5 (22.7%)	13 (59.1%)	22 (100.0%)	
Consultant	1 (5.3%)	10 (52.6%)	8 (42.1%)	19 (100.0%)	
Register	1 (10.0%)	4 (40.0%)	5 (50.0%)	10 (100.0%)	
Asst. Surgeon	1 (14.3%)	4 (57.1%)	2 (28.6%)	7 (100.0%)	
Medical Officer	5 (14.7%)	13 (38.2%)	16 (47.1%)	34 (100.0%)	
Lecturer	6 (14.0%)	20 (46.5%)	17 (39.5%)	43 (100.0%)	
General Practitioner	0 (0%)	4 (66.7%)	2 (33.3%)	6 (100.0%)	
Clinical Fellow	7 (46.7%)	3 (20.0%)	5 (33.3%)	15 (100.0%)	
Total	29 (14.5%)	74 (37.0%)	97 (48.5%)	200 (100.0%)	

Table-12 shows that out of 200 respondents, the majority of the respondents who had good knowledge of telemedicine were Associate Professor 85.7% compared to 28.6% of Asst. Surgeon (BCS). Among the respondents who had poor knowledge of telemedicine were Clinical Fellow (46.7%). The Association between Rank of the respondents and Knowledge level was statistically highly significant ($\chi^2= 34.65$, $df= 18$, $p=0.01$).

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Table 13
Association between Attitude level and different rank of the respondents

[n=200]

Designation of the Respondents	Attitude Level			Total	Statistics
	Negative	Moderate	Positive		
	N (%)	N (%)	N (%)		
Professor	3 (13.0%)	7 (30.4%)	13 (56.5%)	23 (100.0%)	$\chi^2= 46.372$ df= 18 P= 0.001
Associate Professor	1 (4.8%)	9 (42.9%)	11 (52.4%)	21 (100.0%)	
Asst. Professor	2 (9.1%)	12 (54.5%)	8 (36.4%)	22 (100.0%)	
Consultant	4 (21.1%)	9 (47.4%)	6 (31.6%)	19 (100.0%)	
Register	1 (10.0%)	2 (20.0%)	7 (70.0%)	10 (100.0%)	
Asst. Surgeon	1 (14.3%)	1 (14.3%)	5 (71.4%)	7 (100.0%)	
Medical Officer	5 (14.7%)	10 (29.4%)	19 (55.9%)	34 (100.0%)	
Lecturer	16 (37.2%)	5 (11.6%)	22 (51.2%)	43 (100.0%)	
General Practitioner	1 (16.7%)	0 (0.0%)	5 (83.3%)	6 (100.0%)	
Clinical Fellow	5 (33.3%)	10 (66.7%)	0 (0.0%)	15 (100.0%)	
Total	39 (19.5%)	65 (32.5%)	96 (48.0%)	200 (100.0%)	

Table-13 shows that out of 200 respondents, the majority of the respondents who had positive attitude toward telemedicine were General Practitioner 83.3% compared to 0.0% of Clinical Fellow. Among the respondents who had negative attitude toward telemedicine were Lecturer (37.2%). The Association between Rank of the respondents and Attitude level was statistically highly significant ($\chi^2= 46.372$, $df= 18$, $p=0.001$).

Table 14

Association between User Nonuser group and Knowledge level of the respondents

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[n=200]

User and Nonuser group	Knowledge Level			Total N (%)	Statistics
	Poor	Moderate	Good		
	N (%)	N (%)	N (%)		$\chi^2= 6.822$
Telemedicine User	3 (10.3)	17 (58.6)	9 (31.0)	29 (100)	df= 2
Telemedicine Non-user	26 (15.2)	57 (33.3)	88 (51.5)	171 (100)	P= 0.033
Total	29 (14.5)	74 (37.0)	97 (48.5)	200 (100)	

Table-14 shows that out of 200 respondents, 29 (14.5%) respondents were telemedicine user and 171 (85.5%) respondents were nonuser. Among the respondents from telemedicine user group 9 (31.0%) had good knowledge, 17 (58.6%) had moderate knowledge, 3 (10.3%) had poor knowledge on telemedicine. The Association between User Nonuser group and Knowledge level was statistically significant ($\chi^2= 6.822$, $df= 2$, $p=0.033$)

Table 15

Association between telemedicine User Nonuser group and Attitude level of the respondents [n=200]

User and Nonuser Group	Attitude Level			Total N (%)	Statistics
	Negative	Moderate	Positive		
	N (%)	N (%)	N (%)		$\chi^2= 7.840$
Telemedicine User	1 (3.4)	8 (27.6)	20 (69.0)	29 (100)	$df= 2$
Telemedicine Nonuser	38 (22.2)	57 (33.3)	76 (44.4)	171 (100)	$P= 0.02$
Total	39 (19.5)	65 (32.5)	96 (48.0)	200 (100)	

Table-15 shows that out of 200 respondents, 29 (14.5%) respondents were telemedicine user and 171 (85.5%) respondents were nonuser. Among the respondents from telemedicine user group 20 (69.0%) had positive attitude, 8 (27.6%) had moderate attitude, 1 (3.4%) had negative attitude toward telemedicine. The Association between User Nonuser group and Attitude level was statistically significant ($\chi^2= 7.840$, $df= 2$, $p=0.02$).

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DISCUSSION

This exploratory study conducted has shown us with a general idea about the readiness of healthcare professionals in participating in telemedicine services in Bangladesh. Telemedicine can be a useful method in expanding healthcare in rural areas which have limited healthcare facilities. It is predicted that Telemedicine may in fact have a more profound impact on developing countries than on developed ones (Edworthy, 2001). The use of information technology in healthcare organizations is affected by many factors. To deal with these factors, appropriate strategies need to be taken into account to facilitate the deployment of technology. Among these factors, human-related factors such as users' knowledge and attitude toward technology are of high importance. In fact, to make it more useful, smooth and efficient physicians should have good knowledge and positive attitude toward this new technology and should be willing to be technology friendly. Our study found that majority of the physicians have good knowledge and positive opinion toward telemedicine concept.

This cross-sectional study was conducted at randomly selected areas in Dhaka city. The respondents were Physicians between the age of 25 and 68 years with a mean of 37 years. Most of the respondents were from non-government sector (64%) and Clinical Speciality (66.5%) involved in different medical college hospitals, with 1-14 years of professional practice. The findings are similar to two other studies; the study of Lautech Teaching Hospital, Nigeria (Abodunrin & Akande, 2009) and the study of knowledge and attitude of faculty members of Zahedan university of medical sciences, Iran (Salahaddin & Alipour, 2012).

The results of this study show that, demographic characteristics such as age and gender, of the respondents were significantly related with their knowledge level. It has been observed that, the level of knowledge of the respondent increases with age. In this study respondents over 40 years were significantly more knowledgeable than the younger age group of 25-34 years, and males were more knowledgeable than females. Rank and length of Working experience of the respondents was also related with the knowledge level. The majority (59.5%) of the respondents who had good knowledge of telemedicine were Registrar to Professor rank who tended to be older with longer work experience.

These findings are similar to a study on knowledge, attitude, and practice of e-health among doctors working at selected private hospitals in Dhaka (Parvin & Shahjahan, 2016). Lack in the scope of gaining knowledge, training programs or proper guidance on telemedicine in the early stage of service might be a cause for this.

The reported findings of the current study revealed that the majority of our surveyed physicians (92%) were aware of telemedicine regardless of their personal characteristics, and almost 85% had never experienced the use of telemedicine. A study conducted among 2987 Italian physicians on the awareness about telemedicine technology reported 83% of them had heard about telemedicine and some considered telemedicine to be of limited interest (Gaggioli et al, 2005). A study among the health professionals working in the teaching hospitals of Puducherry Region of India found 88% awareness level on telemedicine service (Zayapragassarazan & Kumar, 2016). These are in line with the findings of the present study. Majority of the respondents (54%) reported that Mass media/Electronic media was the source of information about telemedicine for them, followed by 38% respondents from Friends/Colleagues, 17.5% from Internet. A study on Preference and Awareness of Telemedicine in Primary Care Patients in Korea by also showed that the Information of telemedicine was obtained via television (44.4%), hospital (19.7%), and the internet (16.2%) (Jung S-G et al, 2012).

In response of a question regarding attendance to any formal training of telemedicine, majority of respondents (82.5%) said that they have never attended any formal training on telemedicine. When asked about their willingness to use telemedicine in their place of work/private chamber, 73.5% said 'yes' and 82% of the respondents had expressed interest to attend any conference or seminars related to telemedicine. Majority of respondents (73.5%) also said that there is no telemedicine unit at their workplace. Where a study in India found that none of the respondents had undergone any formal training for Telemedicine. Similarly, none of the respondents had attended any conference or seminars related to telemedicine. Only 60% had expressed interest in adopting this new technology for their future career. Respondents who were less than 45 years of age had shown more interest and 91% of the respondents had expressed interest in undergoing training programmes and acquire hands-on experience on telemedicine (Zayapragassarazan & Kumar, 2016).

According to the results of this study, majority (83.5%) of them thought that knowing more about computers and applications of ICT in medical field is a must for them. The results are in line with the findings of other studies, in which physicians have reported the necessity of using telemedicine. For example, the study by Bagayoko et al. showed that telemedicine technology provides new opportunities for continuous education among healthcare professionals in rural and remote areas (Bagayoko et al, 2013). In another study, it was found that teleconsultation is a powerful tool for diagnosis and triage, and can help to provide timely care to patients (Blozik et al, 2012). George et al. indicated that the use of telemedicine can help to consult specialists at the right time to provide high-quality patient care. Therefore, the current findings are in line with the results of similar studies that have emphasized the positive aspects of the technology.

In the current study, the knowledge level of the respondents was found to be good with 48.5% of the respondents, 37% possess average knowledge and 14.5% don't have adequate knowledge of telemedicine. This result is similar to the findings noted by El Gatit et al. (2008) which showed that 12.2 percent of physicians had limited knowledge about telemedicine, 39 percent had a high level of knowledge and 48.8 percent had a good knowledge of telemedicine. An Indian study also found similar types of results in 2016 (Zayapragassarazan & Kumar, 2016). On the other hand, the findings are contradicted by a Irani study which found that most of the clinicians (96.1%) had little knowledge about telemedicine. (Haleh et al, 2013). Similarly, in the studies conducted Shahpori et al. (2011) the results showed that physicians had little knowledge about telemedicine.

Though it was found that their knowledge level is good according to survey scale but there was lacking of understanding telemedicine concept clearly. The result of the study shows, majority of the respondents thought that telemedicine is used for treatment over telephone (75.5%). Around 41.5% felt it is used for telecommunication to provide medical information and medical services. 8.5% said that it is a part of continuing medical education (CME) and rest of the 5.5% respondents included it on Telephone counseling. But telemedicine service is not just treatment over telephone or internet. Telemedicine technology is equipped with latest telemedicine devices such as digital

camera, digital electronic stethoscope, digital BP monitor, speedometer, ultrasound, tele-ECG, document camera, glucometer etc. And also need PC and standalone video-conferencing tools. In regards to transmission spectrum, you need to have good quality (ISDN and LAN) while maintaining secure lines (Ramesh, 2015).

With regard to the attitude towards telemedicine 41% of the respondents possess positive attitude, 39.5% possess moderate attitude and 19.5% possess negative attitude toward telemedicine. Physicians in this study appeared to think that Health for all can be easily achieved through ICT enabled health services and use of telemedicine could make the distribution of healthcare more even with more emphasis on prevention. A number of studies have assessed that healthcare professionals had positive attitudes toward ICT (Woodward et al, 2014; Sukums et al, 2014; Bagayoko et al, 2014; Loh et al, 2009). Our study found generally positive attitudes towards ICT which is similar to that of Loh et al. (2009), Woodward et al. (2014), Kipturgo et al. (2014), Gagnon et al. (2012) and Zailani et al. (2014). The positive attitudes toward telemedicine attributes appear to suggest that ICT could offer benefits in the delivery of health services in Bangladesh.

The findings of the present study agreed with the survey conducted by Barton et al., where statistically significant differences were found in attitude towards telemedicine, self-assessed knowledge and beliefs about telemedicine between the physicians who are users of telemedicine and who are nonusers of telemedicine (Barton et al, 2007). While knowledge and attitude tended to differ between users and non-users of telemedicine services, beliefs about the value of telemedicine among users and non-users tended to overlap. In general, both users and non-users believe that telemedicine has the potential to improve access to care, improve continuity, and decrease travel time for patients. The majority of respondents agree that patients prefer to see their physicians face-to-face, but recognize that telemedicine may represent an alternative to not seeing a physician at all.

The suggestions obtained from the participants of the present study stresses the need for awareness programmes and the need for training of health professionals and organization of hospital training programmes for all doctors, which will assist in future utilization of telemedicine. These suggestions are in agreement with the suggestions proposed in the studies conducted in India on the awareness and attitudes to telemedicine among doctors and patients (Sushil et al, 2009) and on the training needs of telemedicine staff

(Zayapragassarazan & Kumar, 2013). Ketikidis et al. (2012), in their studies on acceptance of health information technology among health professionals concluded that proper technology application model will help health professionals acquire expected knowledge and skills of health information technology as suggested by the respondents in this study.

CONCLUSION

Telemedicine technology could have bright and promising future when it gets more attention and consideration from decision makers. In the current study, it has been found that the knowledge of the physicians on telemedicine was at good level and majority of them support the introduction of telemedicine at their place of work. It was interesting to find out that a good proportion of the respondents were aware of the concept of telemedicine but not many were clear about what it entailed as majority of the respondents thought that telemedicine is a way of health service which is done by giving treatment over telephone or by internet. So, we can say there is an urgent need to eliminate knowledge deficits in order to develop telemedicine services. It has been also found that physicians' acceptance, preferences and willingness to use telemedicine technology are influenced by their characteristics such as age, experience and technology affinity. The current study reported a variation of physicians' preferences. There was a statistically significant relationship between the age, rank and service length of the doctors and level of knowledge among the doctors observed in this study, with knowledge level increasing with age and experience. Though it has been found that most of the physicians had positive attitude toward telemedicine, many of them feel that the clinical examination of the patients is necessary prior to performing any procedure on the patients. Moreover, there are also a lot of ethical and legal issues related with applications of telemedicine in resource limited settings. Bangladesh's health policy has no specific rules and regulations for applying ICT efficiently and effectively. A more systematic use of ICT in the health sector could be ensured through a better planning, monitoring, and

implementation of the government's health policies. We strongly feel that the Government should actively patronize private organization for investing in telemedicine sector. Government should take positive steps to remove the obstacles and to increase the benefits of general patients in telemedicine health services all over the country, which would help not only generating new source of employment but also the development prospects of Bangladesh.

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