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Original Article

Education Section

# Awareness, Knowledge, Attitude and Skills of Telemedicine among Health Professional Faculty Working in Teaching Hospitals

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## ABSTRACT

**Introduction:** Telemedicine is an emerging technology in health sector in India. The success of any new technology depends on many factors including the knowledge and understanding of the concept, skills acquired, attitude towards technology and working environment by the concerned professionals.

**Aim:** The main objective of this study was to assess the awareness, knowledge, attitude and skills of telemedicine among the health professionals working in the teaching hospitals of Puducherry Region of India.

**Materials and Methods:** A cross-sectional survey was carried out among various healthcare professionals using a proper sampling frame obtained from a list of teaching hospitals located in Puducherry Union Territory, India. A total of 120 teaching faculties and practitioners from the preclinical, para-clinical and clinical departments were taken up for the study. A pre-validated self-administered questionnaire was used for the survey to assess the awareness, knowledge, attitude and skills of telemedicine. The questionnaires were mailed to the respondents and the completed questionnaires were analysed as per the study objectives using descriptive statistics for the quantitative data and content analysis for the qualitative data.

**Results:** The knowledge level of the respondents was found to be good with 41% of the respondents, 35% possess fair knowledge and 24% don't have adequate knowledge of telemedicine. With regard to the attitude towards telemedicine 39% of the respondents possess high attitude, 31% possess moderate attitude and 30% possess low level of attitude. Investigations on the skills of the respondents on telemedicine showed that 19% respondents are highly skilled or experts, 25% are moderately skilled which includes learners or beginners, and 56% are unskilled in handling telemedicine and its related equipments.

**Conclusion:** The findings of the study suggest that although the respondents experience and knowledge are limited in telemedicine technology a fair number of them have positive attitude towards telemedicine. It is the need of the hour to educate and train the teaching faculty, practicing physicians, residents, medical students and other health professionals about telemedicine and issues related to its use.

**Keywords:** Training and Curriculum, Utilization, MCI Regulations, Internship

## INTRODUCTION

IT enabled medical services such as Telemedicine and e-health is fast developing from the recent past which supports long distance health care services. The term is often used as an umbrella term that includes tele-health, electronic medical records, e-health and other components of health information technology [1]. Telemedicine and e-health is the use of electronic information and advanced telecommunication technologies to support long distance clinical health care, patient's health records, patients and professional health related education, public health and health administration [1,2]. The World Health Organization (WHO) defines e-health as the cost effective use of ICT (Information and Communications Technologies) in the support of health and health related fields including healthcare services, health surveillance, education, knowledge and research [2]. E-health may be synchronous/real-time or non-synchronous/ "store and forward". It is seen as a means of overcoming the growing shortage of health practitioners in developing countries [2]. The health sector has been much less effective than many other sectors in reaping reward from the applications of ICT [3]. There are many possible reasons why implementation of e-health systems continues to be challenging despite the available literature. The success of any new technology depends on many factors including the knowledge and understanding of the concept, skills acquired attitude and working environment by the concerned professionals. This is applicable for any new medical technology like telemedicine where it is important to make professionals understand the new concept and assess how far they are professionally ready to accept and provide telemedicine services. Telemedicine is an emerging technology in health sector in India, so it requires study to be done to know the health professionals and patients' awareness and their attitude towards Telemedicine [4-7]. To facilitate the adoption of telemedicine in India requires information about the Awareness, Knowledge, Attitude and Skills (AKAS) of the user groups [8].

## AIM

In the present study an attempt has been made to assess the Awareness, Knowledge, Attitude and Skills (AKAS) of telemedicine of the various health professionals who form the user group along with patients.

## MATERIALS AND METHODS

### Study sample and design

The study was a cross-sectional survey that was carried out among various healthcare professionals using a sampling frame obtained from a list of teaching hospitals located in and around Puducherry Union Territory, from 2011-2013. A total of 120 volunteers from eight medical colleges took part in the study. Based on the available e-mail database of participants who attended the National Course on Educational Science for Teachers of Health Professionals conducted by the Department of Medical Education since 2007, a request to participate in the survey was sent to the 178 faculties, via e-mail, working in eight medical colleges in Puducherry region. A total of 136 faculties showed willingness to participate in the study. The questionnaire to assess the Awareness, Knowledge,

Attitude and Skills (AKAS) along with an informed consent form was then mailed to the respondents. Finally, 120 questionnaires were received that were complete in all the respects and were taken for analysis as per the study objectives.

### Tool

The questionnaire was constructed by the authors after a review of the literature pertaining to telemedicine and ICT skills [9-11] and consultation with professionals with expertise in the field of telemedicine. The face validity and content validity of the tool was evaluated by an expert panel during and after development to ensure that the respondents had a complete comprehension of the tool used in the study. After establishing the conceptual framework, six purposely chosen experts including a statistician, an educationist, two medical consultants, a communication engineer and two faculty in-charge of telemedicine unit who can contribute to questionnaire design, telemedicine and e-health were asked to review the draft items of questionnaire to ensure it was consistent with the conceptual framework. Each reviewer independently rated the relevance of each item in the questionnaire to the conceptual framework using a 4-point Likert scale (1=not relevant, 2=somewhat relevant, 3=relevant, 4=very relevant). The Content Validity Index (CVI) was used to estimate the validity of the items [12].

According to the CVI index, a rating of three or four indicates the content is valid and consistent with the conceptual framework [12]. To determine the face validity of the questionnaire, an evaluation form was developed to help respondents assess each question in terms of the clarity of the wording; likelihood that the target audience would be able to answer the questions and the layout and style. Twenty faculty members from seven medical colleges were randomly selected and completed the face validity form on a Likert scale of 1 to 4 (strongly disagree= 1, disagree= 2, agree= 3, and strongly agree= 4). All respondents rated each parameter at three or four on a Likert scale of 1 to 4. Ninety five percent indicated they understood the questions and found them easy to answer, and 90% indicated the appearance and layout would be acceptable to the intended target audience. This validated self-administered AKAS questionnaire was used for the survey which consists of 6 sections: 1) Demographic details of the respondent; 2) Awareness level about telemedicine; 3) Knowledge level with respect to telemedicine; 4) Attitude towards telemedicine; 5) Skills in telemedicine; and 6; other comments by respondents.

In section one, participants were asked to provide information about their personal and professional background. The information included their name, age, sex, designation, computer knowledge, subject (pre-clinical, para-clinical and clinical). Section two consisted of 12 statements to express their awareness about telemedicine. This section required a graded response to each statement on a three point scale ranging from 0-2 i.e. '0' for 'don't know', '1' for 'heard of it' and '2' for 'know about it'. One can score a minimum of '0' and a maximum of '24' in this section. Section three consisted of 11 statements to assess the knowledge level of the respondents with respect to telemedicine. 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 11 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' disagree. One can score a minimum of '0' and a maximum of '44' in this section. Section five consisted of 12 statements to evaluate the respondents level of skills with respect to ICT. This section required a graded response to each statement on a four point scale ranging from 0-3 i.e. '0' for 'unskilled, '1' for 'learner', '2' for 'mediocre' and '3' for 'expert'. One can score a minimum of '0' and a maximum of '36' in this section. Section six was an open ended section which allowed the respondents to express their opinions and other comments related to the area of research.

### Ethical Approval

This study is part of the departmental project titled, "Attitude of Health Profession Teachers and Students towards e-learning" approved by Institute Ethics Committee (Human Studies) with approval number EC/2010/1/12 dated 14.8.2010.

### Scoring of the tool

The raw scores were calculated for all the sections of AKAS. The mean and standard deviation for the sub samples and the range for the overall sample for AKAS were calculated. Further the raw scores for the AKAS were converted to percentage. At the discretion of the investigators the scores equal to and less than 49% were considered as low with respect to AKAS, the scores between 50% to 70% were considered as average with respect to AKAS and the scores equal to and above 71% were considered as high with respect to AKAS. The quantitative data obtained from the respondents was entered to Microsoft Office Excel 2007 and the descriptive statistics related to demographic characteristics and for AKAS was calculated for the overall sample and the sub samples. Answers to open-ended questions were analysed using content analysis in order to categorize them into three themes: observations by the authors, problems faced by the users as stated by the respondents and suggestions from the respondents.

## RESULTS

[Table/Fig-1] shows the distribution of the sub samples taken for the study. A 61% of the sample is male and 39% were female. The preclinical respondents formed the majority of the sample (40%) followed by paraclinical respondents (33%) and clinical respondents (27%). A 78% of the respondents were faculty members teaching undergraduate medical students and the rest 22% of the respondents were teachers involved in postgraduate teaching in their respective specialities. Majority of the respondents belonged to the age group of 30-40 years followed by 41-50 years of age group (36%). Respondents belonging to age group of 51-60 years and above 60 years were 9% and 7% respectively.

[Table/Fig-2] shows the mimumum score and maximum score (range) of AKAS. The range was found to be 13-24 for 'Awareness'

| Sample | No | % |
|---|---|---|
| Overall | 120 | 100 |
| Male | 73 | 61 |
| Female | 47 | 39 |
| Preclinical | 48 | 40 |
| Paraclinical | 39 | 33 |
| Clinical | 33 | 27 |
| Teaching Undergraduates | 94 | 78 |
| Teaching Postgraduates | 26 | 22 |
| Age 30-40 Y | 57 | 48 |
| Age 41-50 Y | 43 | 36 |
| Age 51-60 Y | 11 | 9 |
| Age above 60 Y | 9 | 7 |

**[Table/Fig-1]:** Distribution of samples showing gender, discipline, teaching level and age group of respondents.

| Parameters | Awareness (Maximum possible score = 24) | Knowledge (Maximum possible score = 11) | Attitude (Maximum possible score = 44) | Skills (Maximum possible score = 36) |
|---|---|---|---|---|
| Range | 13-24 | 5-11 | 22-40 | 15-32 |

**[Table/Fig-2]:** Calculated range for AKAS.

(maximum=24), 5-11 for 'Knowledge' (maximum=11), 22-40 for 'Attitude' (maximum=44) and 15-32 for 'Skills' (maximum=36).

[Table/Fig-3] shows the frequency distribution with percentage of the overall sample and sub-samples and mean and SD for AKAS of the overall sample and sub-samples. The highest and lowest mean value for awareness about telemedicine was recorded among the faculty members teaching postgraduate courses (Mean 20.35 and SD 3.76) and among faculty members teaching undergraduate courses (Mean 16.84 and SD 4.29) respectively. The highest and lowest mean value for knowledge of telemedicine was recorded among the male respondents (Mean 10.43 and SD 2.78) and among the respondents whose age group was between 51-60 years (Mean 8.2 and SD 3.11) respectively. The highest and lowest mean value for attitude towards telemedicine was recorded among the respondents whose age group is between 51-60 years (Mean 35.61 and SD 3.12) and among the para-clinical respondents (Mean 33.21 and SD 3.76) respectively. The highest and lowest mean value for skills of telemedicine was recorded among the para-clinical respondents (Mean 25.14 and SD 3.58) and among the respondents whose age group is between 41-50 years (Mean 22.1 and SD 4.56) respectively.

| Category | Total | % | Awareness | | Knowledge | | Attitude | | Skills | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| Overall | 120 | 100 | 18.58 | 3.27 | 9.34 | 4.26 | 34.59 | 4.38 | 23.76 | 5.23 |
| Pre-clinical | 48 | 40 | 19.21 | 2.18 | 8.38 | 3.45 | 35.3 | 3.33 | 22.23 | 3.24 |
| Paraclinical | 39 | 33 | 18.1 | 3.23 | 10.16 | 3.27 | 33.21 | 3.76 | 25.14 | 3.58 |
| Clinical | 33 | 27 | 18.45 | 1.28 | 9.61 | 2.58 | 35.41 | 4.2 | 24.24 | 3.43 |
| Male | 73 | 61 | 18.96 | 3.67 | 10.43 | 2.78 | 35.1 | 2.98 | 23.47 | 4.12 |
| Female | 47 | 39 | 18.21 | 5.32 | 8.34 | 3.89 | 34.26 | 3.36 | 24.1 | 3.71 |
| UG | 94 | 78 | 16.84 | 4.29 | 8.48 | 3.21 | 35.61 | 4.23 | 22.94 | 3.69 |
| PG | 26 | 22 | 20.35 | 3.76 | 10.3 | 3.47 | 33.24 | 3.45 | 24.56 | 3.76 |
| Age 30-40 Y | 57 | 48 | 19.62 | 4.1 | 9.68 | 3.5 | 34.3 | 3.2 | 24,87 | 4.77 |
| Age 41-50 Y | 43 | 36 | 19.16 | 2.65 | 10.2 | 2.43 | 35.21 | 3.74 | 22.1 | 4.56 |
| Age 51-60 Y | 11 | 9 | 17.32 | 2.45 | 8.2 | 3.11 | 35.61 | 3.12 | 24.8 | 3.2 |
| Age above 60 Y | 9 | 7 | 18.26 | 4.79 | 9.26 | 2.89 | 33.24 | 2.48 | 24.24 | 3.83 |

**[Table/Fig-3]:** Mean and SD for AKAS of the overall sample and sub-samples.

[Table/Fig-4] shows the level of awareness, knowledge, attitude and skills among the sample taken for the study. The awareness level shows that 12% of the respondents have low level of awareness, 25% have average level of awareness and 63% have high level of awareness. The knowledge level shows that 24% of the respondents have low level or below average level of knowledge of telemedicine, 35% have average or moderate level of knowledge and 41% have high or above average level of knowledge of telemedicine. With respect to the attitude level 30% of the respondents have low or below moderate level of attitude towards telemedicine, 31% possess moderate level of attitude and 39% possess high attitude level towards telemedicine. With respect to the skill of telemedicine 56% don't have adequate skills of telemedicine, 25% possess moderate skills of telemedicine and only 19% have adequate skills of telemedicine.

## OBSERVATIONS

Four out of eight Medical Colleges that took part in the study were using Telemedicine. In the majority of the medical college hospitals Telemedicine is mostly used for Continuing Medical Education programmes only. Tele-consultation is practiced only in two medical colleges. 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.

### Problems faced by telemedicine users

Content analysis of responses to open-ended questions and direct observations made by the researchers revealed lack of organizing skills, technical skills including computing and management skills in organizing telemedicine sessions, management of telemedicine unit and handling telemedicine equipments was the common problems faced by the telemedicine users. Further it was also noted that there is no adequate financial and infrastructural support from the administration for using telemedicine. One of the remarkable comments among the telemedicine users is their concerns about ethical issues with respect to handling of patients, patient data and privacy.

## DISCUSSION

The present study reveals that the awareness, knowledge, attitude and skills with regard to telemedicine among the health professionals is not adequate which corroborates with the previous studies on doctors' knowledge, attitudes and practice regarding telemedicine and e-health in India [7] and studies on the knowledge, experience and attitudes of doctors to telemedicine in the Grampian region [13]. Monrad in his studies conducted in 2000 on telemedicine user characteristics and attitudes presented similar findings as interpreted in this study [14]. The findings of the present study agrees 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 specialist physicians who are users of telemedicine and specialist physicians who are nonusers of telemedicine [15].

A study conducted among 2987 Italian physicians by Gaggioli et al., on the current awareness about telemedicine technology reported a response rate of 12% (n-361). Among them 83% of them had heard about telemedicine and some considered telemedicine to be of limited interest [16]. These are in line with the findings of the present study.

The present findings also agrees with the conclusion of the studies done on the role of teledentistry in dental education and stressed the importance of development of knowledge, attitude and skills of teledentisry among the dental practioners [17,18]. The willingness to use telemedicine may also be influenced by attitude to telemedicine itself, attitude to the patient-physician relationship and by the level of technology anxiety [4,7].

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

| Degree | Awareness | | | Knowledge | | | Attitude | | | Skills | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Low ≤49% | Average 50%-70% | High 71%≤ | Low ≤49% | Average 50%-70% | High 71%≤ | Low ≤49% | Average 50%-70% | High 71%≤ | Low ≤49% | Average 50%-70% | High 71%≤ |
| Number | 14 | 30 | 76 | 29 | 42 | 49 | 36 | 37 | 47 | 67 | 30 | 23 |
| % | 12 | 25 | 63 | 24 | 35 | 41 | 30 | 31 | 39 | 56 | 25 | 19 |

**[Table/Fig-4]:** Different levels of AKAS of the sample.

on the awareness and attitudes to telemedicine among doctors and patients [4] and on the training needs of telemedicine staff [19]. Ketikidis et al., 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 [20].

Telemedicine by its nature may be associated with a lot ethical issues. Issues of major concern are related to security and confidentiality of patient data [21-23] and so appropriate knowledge and training in telemedicine ethics and medico-legal issues in telemedicine would solve this issue [19]. This corroborates with the expressions made by the respondents of this study.

## LIMITATIONS

This study was administered among the faculty members working in selected medical and para medical colleges in the Puducherry region and the results cannot be attributed to the whole health professional population. The study does not take into consideration the cultural issues towards telemedicine for discussing the results. The study was administered to the faculty whose contact details are available in the researchers department and hence the results cannot be attributed to the whole faculty community of the concerned colleges.

## CONCLUSION

Although the awareness, knowledge, attitude and skill of telemedicine among the health professionals on telemedicine-health and telemedicine was poor, majority of them were in favour of the services. Therefore, it is the need of the hour for better dissemination of information about the state of the art of research and development in telemedicine and to intensify training workshops for health professionals and improve telemedicine facilities to reach the unreached.

## RECOMMENDATIONS

The suggestions and recommendation obtained as part of the questionnaire from the respondents suggests that telemedicine should be first implemented compulsorily in all State capitals and district capitals as a prelude to popularize this technology all over the nation. Telemedicine may be good enough to be used for general follow ups but its application in the diagnosis and treatment of diseases like cancer, heart diseases and other super specialty areas is not clear. Professional credits, financial incentives could be extended for practicing telemedicine which will encourage the practioners to adopt telemedicine in their career. Telemedicine could be made mandatory during internship and must be included in the UG and PG curriculum to develop proper attitude and skills at grassroot level. Training programmes are the need of the hour to popularize telemedicine. Proper infrastructure should be made mandatory as part of Medical Council of India Regulations.

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