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Original Research Article

Knowledge, attitude and perceived barriers to telemedicine among medical professionals: a cross sectional study

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ABSTRACT

Background: Telemedicine, an evolving technology in India's healthcare sector, offers promising avenues for improving healthcare accessibility and delivery. Its successful implementation relies on several factors, including the comprehension of its concepts, skill acquisition, attitude toward technology, and conducive work environments among healthcare professionals. Despite the pressing need for enhanced healthcare in developing countries like India, telemedicine remains more advanced in developed nations. The objective of this study was to evaluate the knowledge, attitude, and perceived barriers to telemedicine among medical professionals at government medical college Trivandrum and KIMS health Trivandrum.

Methods: A cross-sectional survey involving 150 medical professionals across various departments was conducted using a structured questionnaire via the Kobo toolbox, an online survey tool. The collected data were analyzed to assess the understanding of telemedicine, attitudes toward its adoption, and barriers encountered by respondents.

Results: The analysis revealed that while a commendable 35.3% of respondents exhibited a good understanding of telemedicine, the majority 64.7% lacked sufficient knowledge in this domain. However, there was a positive disposition towards telemedicine adoption, with 64.7% displaying strong positive attitudes, 24.7% expressing moderate attitudes, and 10.7% indicating lower inclinations. Notably, human resource availability emerged as the most prevalent barrier, while sustainable practices were cited least frequently.

Conclusions: While many medical professionals showed support for telemedicine, their knowledge was limited, and the study identified multiple barriers to its adoption. Urgent action is needed to narrow the disparity between telemedicine's potential and its actual use in India's healthcare system.

Keywords: Telemedicine, Healthcare professionals, Knowledge, Attitudes, Barriers

INTRODUCTION

Telemedicine, defined as the electronic exchange of medical information to enhance patient health, represents a novel healthcare approach integrating medical assistance with information and communication technology (ICT). This approach serves remote and underserved areas as well as traditional healthcare facilities.[1] E-health, as defined by the world health organization (WHO), emphasizes the cost-effective use of ICT to support various health-related domains, including healthcare services, education, and research. Despite its potential benefits, the health sector has encountered challenges in effectively harnessing ICT applications.[2] Successful adoption of new technologies like telemedicine relies on factors such as professionals' understanding, skills, attitudes, and working environments.[2] However, implementation hurdles persist,

as evidenced by issues highlighted by the Indian space research organisation (ISRO) regarding manpower availability and system administration continuity.[3]

Telemedicine benefits underserved regions, improving healthcare access and quality, particularly for chronic illnesses.[4] Advancements in technology make telemedicine viable in low-resource settings, with high-income countries leading in areas like teleradiology. However, outside wealthy nations, formalizing telemedicine services is limited, with store-and-forward methods prevalent due to their simplicity.[5] India's telemedicine adoption requires a thorough understanding of users' awareness, knowledge, attitudes, and skills (AKAS).[2]

Despite its potential, limited data exist on telemedicine understanding in India, showing the need for studies to identify barriers and drive future development. The primary aim of this research was to evaluate the level of understanding, perspectives, utilization, and obstacles encountered in the implementation of telemedicine among healthcare professionals at government medical college Trivandrum and KIMS health Trivandrum.

METHODS

The study employed a cross-sectional design to assess the knowledge, attitude, and application of telemedicine among medical professionals in Thiruvananthapuram, with a focus on both public and private sector hospitals, specifically government medical college Thiruvananthapuram and KIMS health Thiruvananthapuram. The study period spanned from February 2021 to March 2021.

The inclusion criteria encompassed medical professionals employed in selected private and public sector hospitals, while the exclusion criteria comprised medical professionals who declined participation in the study. A sample size of 150 participants, consisting of both genders, was determined based on a previous study indicating a 63% awareness rate of telemedicine among medical professionals in Puducherry, India.[2] Sample size was calculated using the following formula:[6]

Sample size,

$$n = Z^2 \frac{pq}{e^2}$$
$$= 1.96^2 \frac{0.63x0.37}{0.10^2}$$
$$= 90$$

Where,

n=minimum required sample size,
Z=1.96 at 95% confidence interval,
p=expected proportion in population based on previous study,
q=1-p
e=margin of error, 10%

The minimum required sample size was 90 medical professionals. Within the time frame, we were able to collect 150 participants who were willing to participate in the study. The sampling technique involved selecting one hospital each from the public and private sectors in Thiruvananthapuram, considering patient load, and conducting an online survey among medical practitioners and non-random sampling was done.

The study variables encompassed several aspects, including sociodemographic variables such as age, gender, and sector of work (public/private), as well as department/specialty of work. Additionally, the study examined knowledge and attitudes towards telemedicine, along with the extent of its application. Factors influencing attitudes were also explored. Furthermore, perceived barriers to telemedicine adoption were investigated, including the availability of human resources, e-readiness, infrastructure availability, the time required for technical manpower to adapt to new technology, physicians' interests and attitudes, financial resources, support availability for system maintenance, and sustainable practices.

After obtaining ethical clearance for the study from the human ethics committee, Thiruvananthapuram, a questionnaire was distributed through online platforms to the medical professionals in the respective hospitals. Prior to the questionnaire, the medical professionals were informed about the aim of the study, their role in the study, the confidentiality of information, their right to participate or withdraw, and how to contact the researcher. An informed consent was taken electronically before they participated in the study. A final date for receiving responses was communicated to the participants and all responses received by this date were analyzed.

The questionnaire utilized in this study was adapted from previous research conducted by Zayapragassarasan et al Puducherry.[2] Questions 1 and 3-10 required responses in either ‘yes’ or ‘no’ format. Each ‘yes’ response was assigned a score of 1, while each ‘no’ response was assigned a score of 0. Participants scoring <5 were categorized as having poor knowledge, while those scoring ≥5 were considered to have Good Knowledge. The questionnaire used to assess the study participants' attitudes toward telemedicine was developed based on a literature review, particularly a study conducted in North Western Ethiopia by Biruk et al.[4] Perceived attributes of telemedicine, including relative advantage, compatibility, and complexity, were evaluated using a 5-point Likert scale ranging from "1=strongly disagree" to "5=strongly agree". Scores for each attribute statement were averaged to generate mean scores between 1 and 5.[7]

The study utilized a structured questionnaire implemented through Kobo toolbox, an online survey tool, as its

primary data collection instrument.[8] Subsequently, data management and statistical analysis were conducted using appropriate software, with quantitative variables represented by mean and standard deviation and qualitative variables by proportions. Non-parametric tests were employed where necessary to ensure robust analysis.

Ethical considerations were carefully addressed throughout the study. Participants faced no medical risks and bore no additional costs for their involvement. Confidentiality was rigorously maintained, and the research team collected only necessary information for the study, free from conflicts of interest. Participants provided informed consent in English, and the study commenced only following clearance from the institutional ethics committee. Data analysis was performed using SPS software to tabulate frequencies and percentages. The study was reported in line with the STROBE reporting guidelines for cross-sectional studies.[9]

RESULTS

Out of the 150 individuals included in the study, all responses regarding age were valid. The age distribution ranged from a minimum of 24 to a maximum of 69 years. The mean age was 37.49 years±10.166. The median age was 35 years. Gender parity within the participant pool is evident, with female representation accounting for 50% (n=75) and male participants mirroring this proportion (n=75). In delineating participants' affiliations within the healthcare sector, discernible disparities emerge, with 28.7% (n=43) emanating from the private sector and a substantial 71.3% (n=107) affiliating with the public sector.

We categorized the collected data based on the department of work. The results showed a majority representation from the Departments of General Medicine, Obstetrics and Gynaecology, Ophthalmology, and Paediatrics. the results were in the following distribution frequencies and percentages: anaesthesia-4 (2.7%), community medicine-9 (6.0%), dermatology-9 (6.0%), ENT-15 (10.0%), general medicine-16 (10.7%), general surgery-9 (6.0%), medical super specialty-13 (8.7%), obstetrics and gynaecology-12 (8.0%), ophthalmology-16 (10.7%), orthopaedics-9 (6.0%), others-7 (4.7%), paraclinical departments combined-4 (2.7%), paediatrics-10 (6.7%), preclinical-3 (2.0%), psychiatry-5 (3.3%), radiology-7 (4.7%), and surgical super specialty-2 (1.3%).

One of the primary objectives of the study was to assess the level of knowledge about telemedicine among medical professionals in Thiruvananthapuram. Out of the 150 subjects examined, a significant majority, 144 (96%), reported being aware of telemedicine, while only 6 (4%) admitted to never having heard of it (Table 1).

The minimum score of knowledge based on the questionnaire attained by a participant was 0, while the maximum score was 9. The mean score among participants was 6.3067, with a median of 6.5000 and a standard deviation of 2.23140. Among the participants, 97 (64.7%) individuals scored <5, indicating poor knowledge of telemedicine. Conversely, the remaining 53 participants (35.3%) scored ≥5, signifying good knowledge of telemedicine.

Regarding attitude in this study, mean scores below 2.5 were categorized as poor attitude, scores between 2.6 and 3.0 as moderate, and scores above 3.0 as good attitude. Among the 150 study participants, 16 (10.7%) exhibited a low level of attitude, 37 (24.7%) possessed a moderate level of attitude, and the majority, 97 (64.7%), demonstrated a good attitude toward telemedicine. The participants' attitudes toward telemedicine were then summarized in terms of frequencies and percentages in format of n (%) in Table 2.

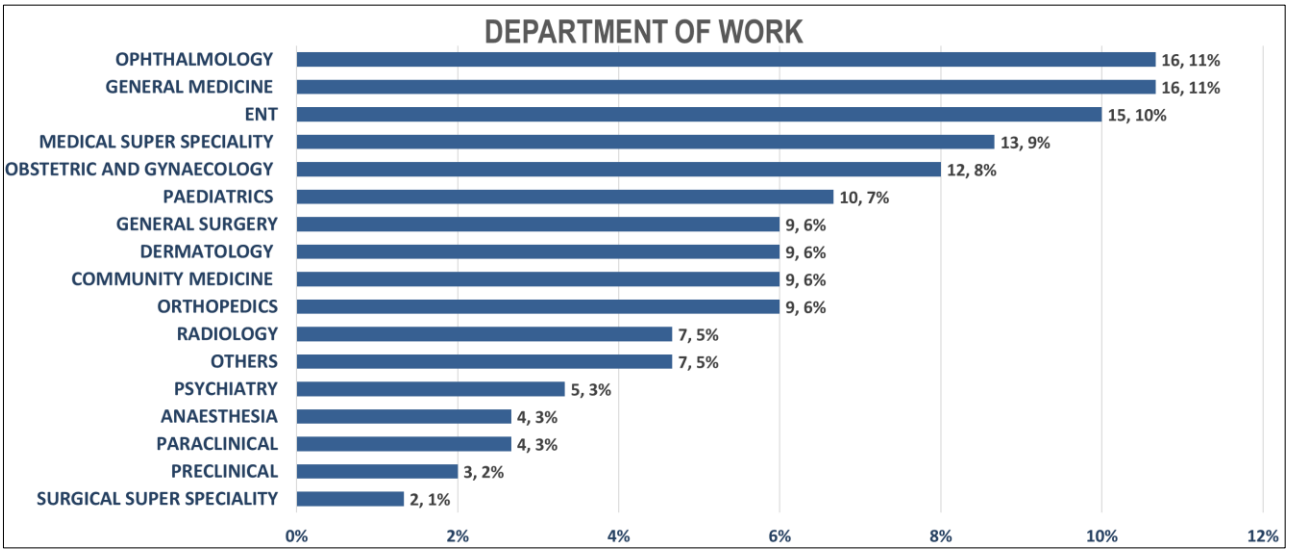

Figure 1: Distribution of the departments of work of the study population.

Table 1: Demographic distribution of the study.

Total participants	Age (in years)				Gender (%)		Hospital sector (%)	
	Range	Mean	Median	SD	Male	Female	Public	Private
150	24-69	37.49	35	10.166	75 (50)	75 (50)	107 (71.3)	43 (28.7)

Table 2: Questions assessing knowledge and their frequency distribution.

Question	Yes (%)
Have you heard about telemedicine systems?	144 (96)
What was your source of information?	
Internet	85 (56.67)
Colleagues	71 (47.33)
Public media	68 (45.33)
Training	49 (32.67)
others	15 (10)
Have you ever seen the telemedicine system?	96 (64)
I know about telemedicine technology.	76 (50.67)
I know telemedicine tools like telesurgery, teleconferencing, teleconsultation and so on.	87 (58)
I know about the effect of telemedicine on health care quality.	120 (80)
I know the effect of telemedicine on reducing the number of health care staff needed.	123 (82)
Have you heard about telemedicine system?	144 (96)
What was your source of information?	
Internet	85 (56.67)
I know about telemedicine infrastructure	78 (52)
I know the benefits of telemedicine in reducing unnecessary transportation costs.	119 (79.33)
I know the benefits of telemedicine in saving clinician time.	109 (72.67)

Table 3: Attitude questions and their frequency distribution.

Attributes of telemedicine attitude	Strongly disagree (1) (%)	Disagree (2) (%)	Neutral (3) (%)	Agree (4) (%)	Strongly agree (5) (%)
Reduce medical error	6 (4)	36 (24)	38 (25.3)	46 (30.7)	24 (16)
Facilitate diagnosis and treatment	4 (2.7)	21 (14)	37 (24.7)	80 (53.3)	8 (5.3)
Increase communication among healthcare providers	3 (2)	19 (12.7)	44 (29.3)	64 (42.7)	20 (13.3)
Telemedicine can reduce hospital visits	3 (2)	10 (6.7)	28 (18.7)	80 (53.3)	29 (19.3)
Enables me to accomplish tasks quicker	1 (0.7)	38 (25.3)	35 (23.3)	49 (32.7)	27 (18)
Improve clinical decision	8 (5.3)	45 (30)	27 (18)	62 (41.3)	8 (5.3)
Provide more comprehensive health care services and compatibility	4 (2.7)	23 (15.3)	46 (30.7)	63 (42)	14 (9.3)
Telemedicine is compatible with all aspects of work	10 (6.7)	58 (38.7)	34 (22.7)	28 (18.7)	20 (13.3)
Telemedicine is completely compatible with my current situation	15 (10)	47 (31.3)	28 (18.7)	38 (25.3)	22 (14.7)
Telemedicine fits well with the way I like to work	13 (8.7)	33 (22)	36 (24)	52 (34.7)	16 (10.7)
Using telemedicine fits well into my work style complexity	8 (5.3)	46 (30.7)	35 (23.3)	41 (27.3)	20 (13.3)
I believe using telemedicine requires a lot of mental effort	1 (0.7)	16 (10.7)	46 (30.7)	59 (39.3)	28 (18.7)
Increase communication among healthcare providers	3 (2)	19 (12.7)	44 (29.3)	64 (42.7)	20 (13.3)
Telemedicine can reduce hospital visits	3 (2)	10 (6.7)	28 (18.7)	80 (53.3)	29 (19.3)
Enables me to accomplish tasks quicker	1 (0.7)	38 (25.3)	35 (23.3)	49 (32.7)	27 (18)
Improve clinical decision	8 (5.3)	45 (30)	27 (18)	62 (41.3)	8 (5.3)

Table 4: Barriers and their frequency distribution.

Barriers faced	N (%)
Human resource availability (lack of required professionals to help out with technology)	92 (61.3)
Time taken to adapt to new technology	82 (54.7)
Interests of fellow physicians and their attitude	69 (46)
Financial resource availability	69 (46)
E readiness and availability of infrastructure (hesitance to change and the lack of needed technology)	88 (58.7)
Availability of support to maintain system	78 (52)
Sustainable practices	43 (28.7)

Additionally, when participants were asked about their current use of telemedicine, 75 (50%) reported never using telemedicine technology, 38 (25.3%) indicated rare usage, 30 (20%) reported occasional usage, and 7 (4.7%) stated frequent usage. Regarding their willingness to opt for telemedicine if given the opportunity, 45 (30%) responded negatively, while the majority, 105 (70%), expressed a positive inclination toward its usage. All barriers were encountered by our sample population, with human resource availability being the most prevalent, cited by 92 (61.33%) participants. Table 3 displays the barriers and frequency distribution among the study participants.

DISCUSSION

The findings of our study revealed an equal representation of male and female participants, aligning with previous research indicating a male predominance among health professionals. For instance, a study conducted in Northwest Ethiopia similarly reported a higher percentage of male participants,[4] while another study in teaching hospitals of Puducherry showed a similar gender distribution.[2] In terms of departmental distribution, our study observed a majority from clinical sectors, with preclinical respondents forming only a small percentage, consistent with findings from Puducherry.[2] However, our study showed maximum responses from general medicine and ophthalmology, differing from a study in India where obstetrics and gynaecology had the highest responses.[3]

Regarding knowledge of telemedicine, our study indicated a lower level compared to previous research, with only 35.3% demonstrating good knowledge, contrasting with a higher percentage in the Puducherry study.[2] Although a high awareness rate (96%) was noted, understanding of telemedicine technology, infrastructure, and tools was notably low, suggesting a gap in knowledge among Thiruvananthapuram medical professionals. From these findings, it is apparent that the knowledge of telemedicine among health professionals is less than desirable and for telemedicine to be considered as a viable approach in the practice of medicine the professionals should be trained in and be made well aware of all dimensions and possibilities of telemedicine. When studying the global implementation rates, the African and Eastern Mediterranean regions generally had the lowest proportion of countries with established telemedicine services, and a higher proportion of countries offering informal telemedicine services than other regions.[5]

Assessing attitudes toward telemedicine, our study found that a majority (64.7%) displayed a positive attitude, consistent with similar studies, but higher than findings from Puducherry, indicating a favorable disposition among medical professionals in Thiruvananthapuram.[2,4] The findings of this study suggest that the medical professionals in Thiruvananthapuram generally have a positive attitude toward telemedicine. Research indicates that telehealth may match or surpass the clinical effectiveness of conventional care.[10] Nonetheless, embracing telemedicine poses challenges due to various health-policy implications and barriers.[11]

The study by Dr. Kannan Srinivasan on the "utilization of telehealth in India" highlighted barriers that were also evident within our sample population, albeit in varying proportions.[3] Human resource availability emerged as the most cited barrier, with 92 participants (61.33%) identifying it, despite the region's IT boom. Similarly, financial constraints and inadequate support systems, reminiscent of challenges faced, were reported as barriers by 46% and 52% of our participants, respectively which is also seen in published literature.[12] Additionally, concerns regarding e-readiness, encompassing equipment availability, cost of access, and regulatory frameworks, were echoed by 58.7% of respondents in our study. The interests of fellow physicians and the time required to adapt to new technologies were also significant concerns, with 82 and 69 responses, respectively, accounting for 54.67% and 46% of all responses. Furthermore, sustainable practices were identified as a barrier by 43 participants (28.67%). In a preliminary trial examining teleconsultation, 86.6% of participants favored WhatsApp.[13] This preference could be attributed to the user-friendly interface of the WhatsApp mobile application. Given the escalating demand for telemedicine amid the ongoing pandemic, understanding and addressing these barriers are imperative. Introducing appropriate measures and workshops can empower medical professionals to deliver essential healthcare services, even amidst crises such as pandemics or national lockdowns.[14-16]

The limitations of this study include the use of a cross-sectional design, which may not capture changes in knowledge, attitudes, and barriers to telemedicine over time. Additionally, the study focused solely on medical professionals in government medical college Trivandrum and KIMS health Trivandrum, which may limit the generalizability of the findings to other healthcare settings in India. The sample size was determined based on a previous study's awareness rate of telemedicine among medical professionals in Puducherry, which may not fully represent the population under study. Furthermore, the study relied on self-reported data, which may be subject to bias and may not accurately reflect participants' actual knowledge, attitudes, and practices regarding telemedicine. Finally, while the study identified various barriers to telemedicine adoption, it did not explore potential solutions or interventions to address these barriers comprehensively.

CONCLUSION

The study findings indicate that while the respondents exhibit limited knowledge of telemedicine, they generally possess a positive attitude toward its adoption. This shows the necessity of providing comprehensive training in telemedicine to bridge the knowledge gap. Despite high awareness of telemedicine, understanding of specific applications and tools remains lacking, possibly due to misconceptions about its efficacy and infrastructure requirements. Overcoming barriers such as infrastructure constraints and resistance to change among healthcare professionals is crucial, especially amid pandemics like COVID-19. Government support, increased awareness, and proper education can facilitate the transition to telemedicine, leveraging India's burgeoning IT sector and space technology advancements for sustainable implementation. Addressing manpower shortages and instituting specialized training programs are essential for ensuring the long-term viability of telemedicine in India.

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