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Assessing knowledge, attitude, and readiness to use e-health among doctors in a tertiary health care unit in Bhubaneswar city, Odisha - A cross-sectional survey

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Abstract:

BACKGROUND: The term “e-health” refers to all technological applications in the delivery of a more affordable, high-speed, and widely accessible mode of health care. It is a definite solution to managing the public’s health and well-being during the coronavirus disease (COVID-19) pandemic, and doctors from all fields of expertise are required to be at par with it in terms of knowledge, attitude, and readiness to use it to their advantage under the current circumstances.

MATERIALS AND METHOD: A cross-sectional survey was conducted among the faculty, postgraduates, and interns of the medical and dental schools of a university, which used an expert-validated self-administered questionnaire assessing knowledge, attitude, and readiness to use e-health.

RESULTS: Among the 400 participants, it was observed that the categories of age ($P < 0.0001$), gender ($P = 0.018$), designation ($P = 0.031$), and years of service ($P < 0.0001$) have significant differences across the groups. It was seen that the mean e-health knowledge (3.55 ± 0.52) and mean attitude (2.42 ± 0.59) to use e-health were more in dentists while participants from the medical field showed higher mean readiness (1.97 ± 0.58) to use e-health in daily practice. It was observed that male professionals had more mean knowledge (3.54 ± 0.60) than female professionals (3.43 ± 0.52) while female participants had more mean e-health readiness (1.96 ± 0.57).

CONCLUSION: In a broad sense, the majority of participants responded positively to using e-health in their everyday practice. While medical doctors have a stronger outlook and preparedness, dentists showed more literacy and a supportive attitude to adopting e-health and telemedicine. Thus, it is necessary to step up comprehensive e-health workshops and training sessions for health care experts.

Keywords:

Doctors, e-health, e-health knowledge, information and technology, questionnaire survey

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Introduction

Information and communication technologies underpin almost every single activity undertaken in the modern world and affect everyone on the planet. Since the 1990s, when the internet started to be widely known, a slew of new e-terms emerged and took over the world. With the launch

of e-health, the promise of information and communication technologies to improve health and the health care system was realized.

At first look, the “e” in e-health may appear to simply stand for “electronic.” Although “electronic” is one facet, the whole definition includes several other “E’s” that represent

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the true meaning of this idea. Gunther Offenbach, in 2001, speculated the “10 E’s to be efficiency, enhancing quality, evidence-based, empowerment, encouragement, education enabling, extension, ethics, and equity.”^[1]

In the Indian scenario, the Ministry of Health and Family Welfare has created e-health portals under the National Health Portal of India for various health care sectors in India. This e-Gov initiative defines e-health as “the use of Information and Communication Technology (ICT) in health.”^[2]

It mentioned scopes of e-health inclusive of web services, mobile services, SMS, and call center facilities to make all health care facilities available at all times from anywhere in the world.

The objective of e-health is to cover online medical consultations, online medical records, online pharmaceutical supply management, and pan-India patient information exchange in a common network system.^[3]

The capacious usability of e-health would not only aid in improving health as well as oral health equity but also cut health care service costs, bridging the sustainable gap between health care providers and consumers at all levels of society.

It can provide access to information databases, knowledge resources, and decision-support tools to guide service delivery.^[4]

E-health technologies are designed to assist with health surveillance, health-system administration, health education, and clinical decision-making, as well as behavioral changes connected to public health concerns.^[5]

Managing the good health and well-being of the public at the times of the coronavirus disease (COVID-19) pandemic has become more of a concern when movement has become restricted. Thus, this obligates the concerned doctors to become more e-health oriented in adjunct to traditional care.^[6] The depth of knowledge among practitioners could be considered incomplete.^[7]

Health professionals are unaware of the benefits of e-health and show skepticism or negative perception in accepting it into daily practice. Readiness of e-health refers to the psychological, skill-wise, and financial preparedness of health care service providers to directly support prevention, patient diagnosis, patient management, and care through means of e-health.

Organizational as well as individual readiness to use e-health are lacking in all sectors of the country.

Various studies have shown that the experiences of health care workers or practitioners are rarely in compliance with providing health care services through e-health modalities.^[8-10] Though studies have been done assessing the knowledge and attitude to practicing dentistry among health care workers, there is a dearth of research in assessing literacy, user acceptance, and readiness to use e-health as a whole health care service medium among general health and oral health practitioners, particularly in the eastern region of India which depicts the novelty of the present research.

The present study attempts to measure the knowledge, attitude, and core as well as organization readiness to use e-health among the medical and dental doctors in a tertiary teaching hospital in Bhubaneswar, Odisha specifically considering the ongoing COVID-19 pandemic.

Materials and Methods

Study design and setting

A cross-sectional questionnaire study was conducted among the faculty, postgraduates, and interns of the medical and dental school of a University in Bhubaneswar city, Odisha, India.

The study was conducted from October 2021 to December 2021 in Bhubaneswar city. The sampling method has been demonstrated in Figure 1.

Sample size estimation

Sample size estimation was done by using G*Power software (version 3.1.9.4) (Universität Düsseldorf: Psychologie - HHU, Germany)

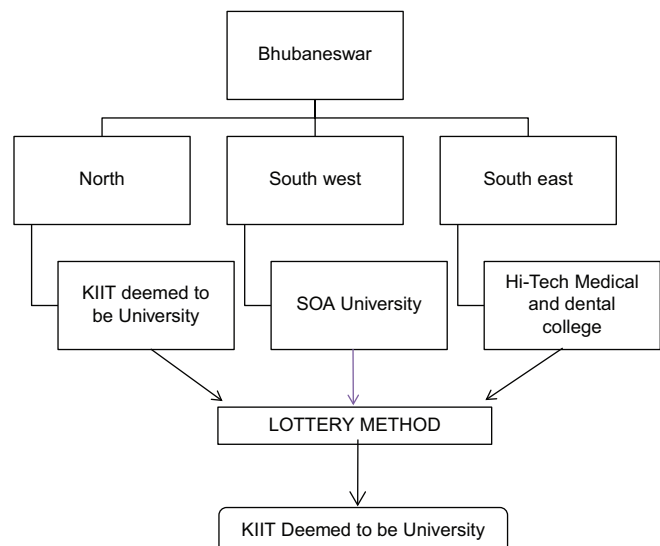


Figure 1: Flow chart showing sampling method used for the study

The minimum estimated sample size was obtained at 111.

t tests - Correlation: Point biserial model

Analysis: A priori: Compute required sample size

Input: Tail (s) = One

Effect size $|\rho| = 0.3$

α err prob = 0.05

Power (1- β err prob) = 0.95

Output: Non-centrality parameter $\delta = 3.3133098$

Critical t = 1.6589535

Df = 109

Total sample size = 111

Actual power = 0.9503016

A two-stage sampling procedure was followed to recruit participants. Firstly, the study setting was chosen through a stratified random sampling method; then, a universal sampling procedure was applied among the faculty, postgraduates of all the departments, and current interns of the two tertiary teaching hospitals.

Data collection tools

The study was a questionnaire based survey.

Questionnaire

Assessment of knowledge, perception, and e-health readiness was done through a self-administered close-ended validated questionnaire (Exurban VII) containing 34 statements divided into 4 sections:

Demographics: 1–5

Knowledge: 6–15

Attitude: 16–25

E-Health Readiness: 26–34

Two of the three, that is, “knowledge” and “attitude” domains were derived.^[11,12] The third domain was self-constructed using the Telehealth Readiness Assessment (TRA) Toolkit (Developed by Maryland Health Care Commission - RTI International, 2018).

Face validation and content validation of the questionnaire were done before starting the survey by at least five experts (Kappa value = 0.88). Suggestions were incorporated and corrections were made to improve the quality of the questionnaire keeping the study population in mind. The scoring of the questionnaire was based on a 5-point Likert scale.

For each of the questions in the knowledge section, it consists of the following options: Strongly Disagree, Disagree, Undecided, Agree, Strongly Agree (Scores from 1 to 5). E-HEALS total score would range from 8 to 40. To measure attitudes towards the use of e-health, responses were scored (“from strongly agree” =5 to “strongly disagree” =1). Study participants who had a total score of 35–50 were categorized as “favorable,” those who received a total score of 20–34 as moderately “favorable,” while those who received a total score of less than 20 as “unfavorable.”

Out of the five domains of the TRA toolkit, two sections, core readiness and patient readiness were referred to construct the questions for the e-health readiness assessment in the current study. The responses were “No,” scored as 0; “Unsure” scored as 1; “Somewhat” scored as 2; “Definitely” scored as 3; and “Not Applicable” scored as 9. When the score is less than or equal to 50%, readiness is interpreted as low; more than 50% but less than or equal to 75% as moderate; and more than 75% as high.

Data collection techniques

The target of the study, compilation and construction of the questionnaire, and acquiring necessary permission, and collection of employee and students list from the HR cells were done well in advance. The subjects who gave consent to the study, who completed the questionnaire provided to them, and who were present at the time of the study were only included in the survey, while those who had not consented to the study or who were provided with an incomplete questionnaire were excluded.

Two forms were attached with the main questionnaire; one was an information sheet and another was the subject consent form. Participation was anonymous and voluntary. The estimated time taken was 5–10 min to complete the survey.

Before the commencement of the main study, a pilot study was conducted on 50 participants to determine the feasibility of the study and to assess the questionnaire for its easy understanding and completion by the participants.

After the commencement of the study, the questionnaires were distributed to the participants and collected after the completion of each survey. Each preponderant was given a week’s time before the questionnaire was collected. Reminders were given to the participants at regular intervals. Department-wise distribution and collection of questionnaires were done to make the documentation and recording process simpler and quicker. A total of 397 doctors participated in the study.

Ethical approval

The study protocol was reviewed by the Institutional Ethics Review Board and ethical clearance was granted according to the Helsinki ethical guidelines (KIIT/KIMS/IEC/752/2021).

Statistical analysis

The data acquired was entered into Microsoft Excel (Windows, version 10) and analyzed using SPSS (Statistical Package for the Social Sciences) version 23, IBM, USA. Inferential statistics were performed using the Chi-square test, Mann–Whitney U test, and analysis of variance (ANOVA) test. Descriptive statistics were presented with mean \pm standard deviation for continuous variables depending on their distribution. The Chi-square test was used to measure the association between independent groups. Inter-group comparisons of various domains were done using the Mann–Whitney U test. Variations between the domains were analyzed using a two-way ANOVA test. The confidence interval was kept at 95% and the level of significance was set at 0.05.

Results

Socio-demographic variables

Out of the 397 responses that were collected, 3 participants were excluded due to the unavailability of consent or an incomplete questionnaire. A total of 394 responses were analyzed. The distribution of participants among socio-demographic variables is given in Table 1. It has been observed that the categories

of age, gender, designation, and years of service have significant differences across the groups of all the participants.

Profession

When compared between medical and dental branches, there was a statistically significant difference (P value 0.002) in knowledge about e-health between the two groups of professionals, whereas no such variation was observed for the attitude and readiness domains. It was seen that the mean e-health knowledge and mean attitude to using e-health were more in dental professionals as compared to medical professionals, while participants from the medical branch showed a slightly higher mean readiness to use e-health in daily practice than the participating dentists.

Fields of service

When the domain values were compared between the two professions, there was no significant difference found. It was observed that the mean knowledge was highest among the faculties while the interns had low mean readiness to use e-health despite having a high mean attitude among the three groups. The postgraduates had the least variation in having knowledge, attitude, and readiness to use e-health.

Age groups

Lower mean knowledge was observed in the older age group as compared to the youngest age group, while the mean attitude to using e-health was lowest in the age

Table 1: Distribution of the demographic variables of the study population

Variables	Sub-Categories	Frequency (n)	Percentage	Chi-square	P
Age	20–25	153	38.5	115.48	<0.0001*
	26–30	98	24.7		
	31–35	36	8.8		
	36–40	52	13.1		
	>40	55	13.9		
	Total	394	100.0		
Gender	Male	174	44.0	5.62	0.018*
	Female	220	56.0		
	Total	394	100.0		
Designation	Faculties	150	38.1	6.96	0.031*
	Postgraduates	108	27.4		
	Interns	136	34.5		
	Total	394	100.0		
Field of service	Medical	212	53.8	2.28	0.131
	Dental	182	46.2		
	Total	394	100.0		
Years of service	<5 years	261	66.4	364.91	<0.0001*
	6–10 years	63	15.8		
	11–15 years	40	10.2		
	>15 years	30	7.6		
	Total	394	100.0		

*Statistically significant

group of 26–30 years, while the highest mean readiness was observed among the age group of 31–35.

Years of service

A trend of more mean e-health knowledge was observed in the participants with more years of experience while the participants with 11–15 years were found to have more readiness to use e-health. The mean enabling attitude of the participants was similar to each other.

Gender

When compared between the male and female professionals, it was observed that male professionals had more mean knowledge (3.54 ± 0.60) than female professionals (3.43 ± 0.52) while female participants had more mean e-health readiness (1.96 ± 0.57).

No significant difference was observed between knowledge, attitude, and readiness.

Evaluation of the domain responses

It has been observed that the responses to all the questions of each of the three domains of knowledge, attitude, and readiness were statistically significant (P value < 0.0001).

In the present study, when we compared between medical and dental branches, there was a statistically significant difference (P value 0.002) in knowledge about e-health between the two groups of professionals whereas no such variation was observed for the attitude and readiness domains. Around 38.04 percent had good knowledge of e-health, 29.72 percent had average knowledge, and 32.24 percent had poor knowledge. Overall, doctors were considered to have unfavorable attitudes (53.40%; $n = 212$), and moderately favorable attitudes (42.32%; $n = 168$), with favorable attitudes, present among only 4.2 percent of doctors ($n = 17$). The level of readiness to use e-health was good (55.67%) among the participants while average readiness (20.40%) was observed among 81 participants and 95 participants had a low attitude (23.93%). Table 2 displays the total level of knowledge, attitude, and readiness about e-health among all the participants. Table 3 demonstrates the knowledge, attitude, and readiness among dental and medical professionals regarding e-health.

Discussion

“E-Health can be explained as health services offered or enhanced through the internet and related information and communication technologies.”^[1] Similarly, the emerging field of e-oral health uses dentistry and information and communication technologies for oral health care.^[2] E-health technology has the potential to help solve a variety of issues when incorporated with traditional health care modalities.^[3-5] It enhances

Table 2: Demonstration of knowledge, attitude, and readiness about e-health among all the participants

Levels	Range	Domain	Domain matrix
		Knowledge	Knowledge matrix
Poor	0%–50%	151	38.04%
Average	50%–75%	118	29.72%
Good	75%–100%	128	32.24%
		Attitude	Attitude Matrix
Favorable	35–50	17	4.28%
Moderately favorable	24–34	168	42.32%
Unfavorable	Below 24	212	53.40%
		Readiness	Readiness matrix
Poor	0%–50%	95	23.93%
Average	50%–75%	81	20.40%
Good	75%–100%	221	55.67%

patient access, efficiency, and standard of care and aids in expanding trade prospects in both developed and developing countries.^[6,7]

Demographic characteristics

Out of the 394 participants, it was observed that most (38.5%) of them belonged to the 20–25 year age group, and female participants were found to be more than males.^[10] This was in contrast to other studies where male professionals were seen participating more in numbers than their female counterparts.^[6,13-16] It was seen that age, gender, designation, and years of service have significant differences ($P = < 0.05$) across the groups of all the participants. This kind of detailed demographic analysis was found in a study done in Bangladesh.^[17]

Knowledge of e-health

It was observed that overall participants knew much about e-health. Many respondents (67%) agreed to know how to find health-related information on the internet while only 48% knew to differentiate between high-quality and low-quality health resources on the internet. This corroborates with findings found in one Nigerian research of health professionals’ knowledge and perceptions of e-health and medicine, which found that 52 percent of respondents had average knowledge of e-health, but that engaging with colleagues was their primary source of information (67%).^[16] In a Sri Lankan assessment of medical students’ knowledge and perceptions of e-health, 51% of respondents assessed their knowledge of e-health applications as minimal.^[9] In contrast, the majority of respondents in another Polish poll said they had strong expertise (82%).^[18] The present study observed that 39.01% of medical professionals have good knowledge, while only 26.89% of dental professionals had good knowledge.

Attitude to use e-health

All doctors had a favorable (78%) or moderately favorable (22%) view towards e-health. It was interesting

Table 3: Levels of knowledge, attitude, and readiness comparing among dental and medical fields

Range	Dental		Medical	
	Domain Knowledge	Domain Matrix Knowledge Matrix	Domain Knowledge	Domain Matrix Knowledge Matrix
Poor (0%–50%)	91	42.92%	57	31.32%
Average (50%–75%)	64	30.19%	54	29.67%
Good (75%–100%)	57	26.89%	71	39.01%
	Attitude	Attitude Matrix	Attitude	Attitude Matrix
Favorable (35–50)	8	3.77%	9	4.95%
Moderately favorable (24–34)	87	41.04%	81	44.51%
Unfavorable (Below 24)	117	55.19%	92	50.55%
	Readiness	Readiness Matrix	Readiness	Readiness Matrix
Poor (0%–50%)	52	24.53%	40	21.98%
Average (50%–75%)	40	18.87%	41	22.53%
Good (75%–100%)	120	56.60%	101	55.49%

to learn that there was no negative reaction, implying that doctors accept and welcome e-health and that future deployments will be successful.

Several studies have been undertaken to determine medical practitioners' and patients' attitudes about e-health. The findings of the investigations are almost identical to those of this study. According to research, the e-health system is well-accepted among medical professionals in India.^[10,19,20] The United Kingdom,^[21] Sweden,^[22] Bangladesh,^[12,17] the African countries,^[7,9,14,16] and the Middle East.^[8,15]

e-health Readiness

The questionnaire assesses the core readiness of the study participants to use e-health modalities in daily practice.^[23] In this assessment, the overall mean readiness score of those health professionals included in the survey was 4.27. The level of readiness to use e-health was good (55.67%) between the participants while average readiness was observed among 20.40% of participants and 23.93% of participants had low readiness.

The findings of this study revealed a significant correlation between the age of health care providers and their readiness for adopting an e-health system. The younger groups are likely to have more positive attitudes regarding the adoption of e-health than older age groups. This is in contrast to the findings of a study that found that older age groups have more positive attitudes regarding the use of technologies than younger age groups.^[8] Also, this study did not find a significant correlation between the gender of health care professionals and their readiness for adopting an e-health system. This is in line with the findings of a study that identified that the degree of perceived usefulness among participants differed depending on gender^[11] but no significant difference was observed between the occupation of the health professionals and their readiness for adopting the e-health system.

Strengths and limitations of the study

The study participants belonged to medical as well as dental professionals and various designations, which ensures a wide range of responses.

The preliminary literature search showed a dearth of targeted research in finding out the readiness of health care providers in all kinds of e-health services. A tertiary care hospital setup has a good potential to use e-health to its advantage. The present study can help policymakers and education planners to develop appropriate evidence-based strategies and curricula in medical and dental institutes for the successful implementation and use of e-health systems.

Limitations and recommendation

The limitation of the study was the restriction of wide coverage of data collection due to the recent ongoing pandemic. It also does not take into consideration cultural issues and barriers.

The survey has a questionnaire bias and the target of in-depth analysis of attitudes and barriers was limited due to a close-ended questionnaire-based study.

Future recommendations are for a series of detailed qualitative analyses of pan-nation health care service providers to gain distributive insight into the knowledge, attitude, and readiness to use e-health among the professionals.

Conclusion

E-health knowledge and applications could be a key to comprehensive therapeutic protocols advantageous to not only the practitioners but also to the patients. When compared to developed countries such as the United States and Canada, developing countries such as India have very limited resources, a lack of funds, a lack of public health infrastructure, and so on. In this situation,

e-health practices could be one of the most cost-effective ways to improve the health of Indians, particularly those who live in areas where health access is limited.

The results indicate that health professionals tend to have more motive, interest, and readiness to accept new technology developments and innovations to use e-health in their daily practice, but require more skills and knowledge to implement the use of the same. Government is upcoming on the inclusion of e-health sectors in traditional primary and advanced care, seen evident through e-health sections on government health websites. There is therefore the need to intensify training workshops for health professionals, which must include a practical component to provide health care providers with necessary hands-on skills.

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Conflicts of interest

There are no conflicts of interest.

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