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# Awareness and attitude toward telemedicine of students at university of paramedical sciences

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**A B S T R A C T**

Introduction: Telemedicine technology is no longer a futuristic concept and is increasingly integrated into health care. As the studies on attitudes toward telemedicine focus mainly on physicians and medical students, there is a need to evaluate the views of students in other fields of paramedical sciences. Thus, the present study aims to evaluate the awareness of and attitude towards telemedicine among the Paramedical Sciences students of Varastegan Institute for Medical Sciences in Mashhad.

Material and Methods: A cross-sectional study was conducted in May 2022. A standard questionnaire was used to evaluate the awareness of and attitude towards telemedicine. This questionnaire included 14 questions, including demographic information (5 questions), information related to exposure to telemedicine (5 questions), interest in telemedicine (2 questions), and plans for future use (2 questions). A proportional per-size sampling method was used for paramedical sciences students.

Results: A total of 81 participants responded to the research questionnaire. Most of the students (70.4%) stated that they had seldom been exposed to telemedicine technology. However, 50 students (62.6%) agreed and strongly agreed that exposure to telemedicine in the classroom is an important educational aspect. Also, 37 students (45.7%) strongly agreed that telemedicine needs face-to-face education. A significant difference was observed between the field of study and interest after experiencing telemedicine among the students ($p=0.04$). Also, there was a significant difference between the academic semester and the level of interest in telemedicine among the students ($p<0.001$).

Conclusion: The results of this survey show that the majority of paramedical sciences students still lack the experience of being exposed to it, despite the increasing development of telemedicine. Since the majority of them are interested in using telemedicine as an educational aspect, future studies are recommended to help the education and experience of exposure to telemedicine among paramedical science students.

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## INTRODUCTION

Based on the definition of the American Telemedicine Association, telemedicine is defined as the use of electronic communication to exchange medical information from one area to another with the aim of improving the health status of patients [1]. Thanks to the rapid development of telemedicine equipment

and information and communication technology, telemedicine has developed rapidly and is now widely used throughout the world as an innovative method of providing medical services [2-4]. At present, the application of telemedicine has expanded from providing health care services in hospitals, outpatient departments, and specialized offices to providing care in patients' homes [5-7].

Moreover, by overcoming geographical barriers, telemedicine is an innovative and promising approach for wide access to health care services in disadvantaged areas, villages, and other areas that face barriers in providing health care services around the world [8, 9]. Telemedicine has been implemented greatly, either successfully or unsuccessfully, around the world in the years 2017 to 2024 [10, 11]. Many factors are involved in the success of a new technology or system, including technical, managerial, and human factors [12–14]. However, these factors are not limited to management and technical barriers. Recent studies have revealed that the challenges of using and implementing telemedicine have shifted from technical issues to human and management challenges [12]. One of the most important human factors is user acceptance and the willingness or unwillingness of physicians and other health care providers to use telemedicine, which is known as a facilitator or inhibitor for the adoption of telemedicine [15–17].

Furthermore, previous studies have shown that the acceptance of telemedicine systems depends on the satisfaction of physicians and patients with telemedicine services [18, 19]. In other words, the success of any new technology depends on many factors, including the knowledge and understanding of the concept, acquired skills, attitude, and work environment of the relevant professionals [12]. The attitude and awareness of physicians and students of medical and paramedical sciences as key today and future agents of digital health are essential elements for its success and acceptance [20]. Since the studies on attitudes towards telemedicine mainly focus on physicians and medical students [20–24], there is a need to evaluate the views of students in other fields of paramedical sciences. Thus, the present study aims to evaluate the awareness of and attitude towards telemedicine among the students of paramedical sciences at Varastegan Institute for Medical Sciences in Mashhad.

## MATERIAL AND METHODS

### Study design

The present cross-sectional descriptive study was carried out in May 2022. We observed that, according to the Declaration of Helsinki. After explaining the study, the students entered the study with their informed consent. All people's information was used confidentially and without disclosing names.

### Sample size

The statistical population of the present study included all students of the Varastegan Institute for Medical Sciences, including four fields: health information technology, laboratory science, nutrition science, and food industry (n=625). A stratified sampling method proportional to sample size was used based on the Cochran formula with a confidence coefficient of 95% of the sample volume.

### Data collection

A standard questionnaire developed by Kong et al. was used to evaluate the people's awareness and attitude [20]. The face validity of the questionnaire was tested by members of the faculty, and its reliability was measured using the test-retest method (Cronbach's alpha: 78%). This questionnaire included 14 questions, including demographic information (5 questions), information related to exposure to telemedicine (5 questions), interest in telemedicine (2 questions), and plans for future use (2 questions).

### Statistical analysis

Frequency and percentage were used to analyze descriptive data, and mean and standard deviation were used to describe continuous variables. Chi-square and Pearson tests were used to analyze the relationship between classification variables. A P-value of 0.05 was used to determine the level of statistical significance. The analysis was done using SPSS Statistics v11 software.

## RESULTS

According to Table 1, a total of 81 participants responded to the research questionnaire (response rate: 100%). Their average age was 20.97±2.49 years. Sixty-five students (80.2%) were female. The frequency of students' fields of study was as follows: health information technology (n=40, 49.4%), laboratory science (n=20, 24.7%), nutrition science (n=20, 24.7%), and food industry (n=1, 1.2%). Most of the students were in the fourth academic semester (n=19, 23.5%).

According to Table 2, the majority of the students (n=57, 70.4%) stated that they had never been exposed to telemedicine technology. Furthermore, most of the students (n=41, 50.6%) stated that their telemedicine care experience did not affect their interest in telemedicine. However, students (n=40, 49.4%) stated that they were not sure if the school provided telemedicine education.

**Table 1: Demographic information**

| Variable | | N (%)/ Mean±SD |
|---|---|---|
| Age | | 20.97±2.49 |
| Sex | Male | 16 (19.8) |
| | Female | 65 (80.2) |
| Marital Status | Single | 74 (91.4) |
| | Married | 7 (8.6) |
| Field of Study | Health information technology | 40 (49.4) |
| | Laboratory sciences | 20 (24.7) |
| | Nutrition science | 20 (24.7) |
| | Food industry | 1 (1.2) |
| Degree | Associate Degree | 2 (2.5) |
| | BSc | 79 (97.5) |
| Educational Semester | 1st | 9 (11.1) |
| | 2nd | 18 (22.2) |
| | 3rd | 3 (3.7) |
| | 4th | 19 (23.5) |
| | 5th | 6 (7.4) |
| | 6th | 13 (16.0) |
| | 7th | 2 (2.5) |
| | 8th | 11(13.6) |

However, students (n=51, 63%) agreed and strongly agreed that exposure to telemedicine in the classroom is an important educational aspect. In addition, students (n=37, 45.7%) strongly agreed that telemedicine needs face-to-face education. Also, half of the students (51.9%) stated that they are not sure if they will use telemedicine in their profession in the future.

In response to the open question of the questionnaire regarding the opinions and views of telemedicine students, seven students presented their opinions, as presented in Table 3.

No notable difference was observed between gender and interest in telemedicine among the students (p=0.742). However, a significant difference was observed between the field of study and interest after experiencing telemedicine among the students (p=0.04). In this regard, students in the field of health information technology were most interested after experiencing telemedicine. Also, there was a significant difference between the academic semester and the level of interest in telemedicine among the students (p<0.001), so that the 4th semester students were most interested in telemedicine. Additionally, a significant difference was observed between the academic midterm and the fourth question of the questionnaire regarding whether your faculty provides telemedicine education (p=0.02). Students in the higher semesters (semester 6 and above) stated that the faculty does not provide telemedicine education.

**Table 2: Awareness and attitude of students towards telemedicine**

| Questions | Result | n | % | p-value |
|---|---|---|---|---|
| Q1. I have had clinical (direct patient care) exposure to telemedicine. | Yes | 24 | 29.6 | <0.001 |
| | No | 57 | 70.4 | |
| Q2. How much time was spent in direct patient care via a telemedicine one-time encounter? | Multiple encounters, 5 hours or less total of patient contact | 63 | 77.8 | <0.001 |
| | Multiple encounters, 6-20 hours total of patient contact | 15 | 18.5 | |
| | Multiple encounters, 21-40 hours total of patient contact | 2 | 2.5 | |
| | Multiple encounters; greater than 40 hours total of patient contact | 1 | 1.2 | |
| Q3. My telemedicine patient care experience: | I increased my interest in telemedicine. | 32 | 39.5 | <0.001 |
| | I decreased my interest in telemedicine | 8 | 9.9 | |
| | It did not affect my interest in telemedicine. | 41 | 50.6 | |
| Q4. Does your medical school offer didactic exposure to telemedicine, such as lectures or conferences? | Yes | 18 | 22.2 | 0.005 |
| | No | 23 | 28.4 | |
| | Not Sure | 40 | 49.4 | |
| Q5. Does your medical school offer clinical (direct patient care) experience in telemedicine. | Yes | 11 | 13.6 | <0.001 |
| | No | 22 | 27.2 | |
| | Not Sure | 48 | 59.2 | |
| Q6. I think that clinical (direct patient core) exposure to telemedicine is an important aspect of medical school training. | Strongly Agree | 22 | 27.2 | <0.001 |
| | Agree | 29 | 35.8 | |
| | Undecided | 26 | 32.1 | |
| | Disagree | 3 | 3.7 | |
| | Strongly Disagree | 1 | 1.2 | |
| Q7. I think that clinical (direct patient care) experience in telemedicine should be a required part of medical school training. | Strongly Agree | 37 | 45.7 | <0.001 |
| | Agree | 26 | 32.0 | |
| | Undecided | 14 | 17.3 | |
| | Disagree | 2 | 2.5 | |
| | Strongly Disagree | 2 | 2.5 | |
| Q8. Choose the option that best characterizes your interest level in telemedicine. | Very Interested | 8 | 9.9 | <0.001 |
| | Interested | 18 | 22.2 | |
| | Undecided | 51 | 63.0 | |
| | Uninterested | 3 | 3.7 | |
| | Very Uninterested | 1 | 1.2 | |
| Q9. I plan to utilize telemedicine in my practice upon completion of medical school. | Yes | 33 | 40.7 | <0.001 |
| | No | 6 | 7.4 | |
| | Not Sure | 42 | 51.9 | |

**Table 3: Students' descriptions of telemedicine**

| Views | Students' opinions |
|---|---|
| Positive views | - Telemedicine can be very efficient in the age of communication.<br>- Telemedicine should be properly and fully taught to enhance people's knowledge<br>- Telemedicine is practical and effective<br>- Many challenges in the field of medicine can be overcome with the correct application of telemedicine<br>- Telemedicine can be very effective |
| Other views | - I did not understand what telemedicine meant.<br>- Using telemedicine requires internet access with high bandwidth and advanced equipment " |

## DISCUSSION

Telemedicine technology is no longer a futuristic concept and is increasingly integrated into health care. With expanding telemedicine in health care, it is revealed that the attitude and awareness of physicians and students of medical and paramedical sciences as key today and future agents of digital health are important for its success and acceptance. Since the studies on attitudes toward telemedicine focus mainly on physicians and medical students, there is a need to evaluate the views of students in other fields of paramedical sciences.

Thus, the present study aims to evaluate the awareness and attitude towards telemedicine among the paramedical sciences students of the Varastegan Institute for Medical Sciences in Mashhad. The results of the present survey indicate a gap between the willingness to acquire digital health literacy among medical students and the lack of education in this area. Also, despite the increasing development of telemedicine, the majority of paramedical science students do not have the experience of being exposed to it.

The results of the present study showed that the majority of students (70.4%) stated that they had never used or been exposed to telemedicine technology. In this regard, a study conducted in 39 European countries reported that almost two-thirds (n=274; 60.8%) of the medical students stated that they never use e-Health technologies [25]. Similarly, the studies conducted in Saudi Arabia, Sri Lanka, Nepal, and Iran reported that medical students have a very low level of awareness of the use and application of telemedicine [21, 23, 25-27].

According to the results of our study, 41 of the students (50.6%) stated that their telemedicine care experience did not affect their interest in telemedicine. On the other hand, half of the students (51.9%) stated that they are not sure if they will use telemedicine in their profession in the future. Inconsistent with the results of our study, in most of the previous studies, students had a positive attitude towards telemedicine [21, 23, 25, 28, 29]. The difference in the results might be due to the participants' exposure to, and low awareness of telemedicine technology. In addition, 40 students (49.4%) stated that they are not sure if the faculty provides telemedicine education. But, a significant difference was observed between the academic semester of the students and their awareness of telemedicine education courses at the university (p=0.02), so that students in higher semesters (6 and above) stated that the faculty does not provide telemedicine education. Thus, the results suggest that Iran's faculties of medical sciences are currently not obliged to include telemedicine education in the determined curriculum. However, 51 students (63.0%) agreed and strongly agreed that exposure to telemedicine in the classroom is an important educational aspect. Moreover, 37 students (45.7%) strongly agreed that telemedicine needs face-to-face education. In this regard, Edirippulige et al. reported that 88% of students reported that they had no e-health education [23]. Also, Yaghobian et al. reported that 97.9% of students stated that they did not receive enough telemedicine education [27]. However, the majority of the students in previous studies hoped for telemedicine as a platform for e-learning [28, 30], and they demanded that telemedicine education be held in their faculties [21–23, 25–28, 31, 32]. These findings are confirmed by a recent systematic review by Ghaddaripouri et al. They found that medical students have positive and hopeful attitudes toward telemedicine technology for education, treatment, and care. However, their knowledge level was very inadequate, and many of them had not completed any educational courses in this field [33].

No significant difference was observed between gender and interest in telemedicine among the students (p=0.742). However, a significant difference was observed between the field of study and interest after experiencing telemedicine among the students (p=0.04), so that the students in the field of health information technology were most interested after experiencing telemedicine. These results may be justified by the fact that health information technology students are more familiar with the applications and benefits of telemedicine than other paramedical sciences. Thus, the attitude toward and interest in using it among students might change after holding telemedicine education courses.

Students' descriptions of telemedicine in this study were mostly positive, so they were very hopeful

about the applications and use of telemedicine. However, in one case, one of the students stated that he did not understand what telemedicine meant. Among all the students (n=81), only seven (8.6%) presented their descriptions, so this result may be generalizable among a large number of students in a wider area. Also, the majority of the students stated that they are not sure that education related to telemedicine will be held in their faculty. These results suggest the educational weakness of the faculties in relation to telemedicine.

In summary, students had a moderate attitude towards telemedicine and its use in their future professions. However, their level of awareness and exposure to telemedicine has been very limited, and they have demanded more education in this area. On the other hand, considering that recent studies involve the use of telemedicine in many medical and health care settings [34–41], it is clear that students and future health care professionals must be equipped with adequate skills and knowledge in the use and operation of telemedicine technologies. Hence, such results can emphasize the necessity of planning, training, and empowering more digital health literacy and telemedicine among paramedical science students as the main users of this technology.

One strong point of this study was evaluating the attitudes and awareness of paramedical science students about telemedicine using a valid questionnaire.

However, this study had potential limitations. First, this study was a single-center study, which limits the generalizability of the study results. Second, since the students entered the study based on their own willingness, there was a bias in the selection of the samples. Third, most of the participants in this study were young students. Hence, it is not clear how adequate this type of investigation can be for an older population, such as senior professionals. Despite these limitations, the results of the present study provide valuable insights into the views and experiences of paramedical science students regarding telemedicine. Therefore, the perception of other students at other private and public universities requires further investigation and comparison with these results.

## CONCLUSION

As the medical industry continues to use technology to provide care for patients, universities and educational centers should also provide the necessary conditions and infrastructure for exposure to new care methods that will be used by health care professionals in the future. The results of this survey show that the majority of paramedical sciences students still do not have the experience of being exposed to it, despite the increasing development of telemedicine. Since the majority of them are interested in using telemedicine as an educational aspect, future studies are recommended to facilitate the education and experience of exposure to telemedicine among paramedical science students.

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## AUTHOR'S CONTRIBUTION

KGH conceptualization, project administration, supervision, writing, review & editing. SFMB formal analysis, methodology, writing, original draft, writing, review & editing. SAH data curation, Investigation. SSD data curation, Investigation. FDK data curation, Investigation. MRMH conceptualization, funding acquisition, project administration, supervision, writing, review & editing. All authors have read and approved the final version of the manuscript.

## CONFLICTS OF INTEREST

The authors declare no conflicts of interest regarding the publication of this study.

## FINANCIAL DISCLOSURE

No financial interests related to the material of this manuscript have been declared.

## ETHICS APPROVAL

This study was approved by the ethical committee of Mashhad University of Medical Sciences (approval number IR.MUMS.REC.1401.289).

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