

Knowledge and Attitude of Nursing School Students Regarding Telenursing in Sharkia Governorate

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Abstract

Background: Telenursing is a cost-effective and time-saving innovative technology that plays a vital role in client care by enabling access to nursing services at home. **Aim of the study:** Assess the knowledge and attitude of nursing school students regarding telenursing. **Subjects and Methods; Research design:** A descriptive, cross-sectional research design was utilized. **Setting:** The study was conducted at Sherief Omar, Fakous, Abu Kaber, Al-Husseiniyah, and Kafer Saker School. **Subjects:** A cluster sample of 400 students from these settings was used. **Tools of data collection:** Two tools were used in this study to collect the data. Tool I: A self-administered questionnaire which consisted of two parts to assess nursing students' socio-demographic characteristics and their knowledge about telenursing. Tool II: Questionnaire to measure attitude of nursing students regarding telenursing. **Results:** 41.75% of them had information about telenursing from social media, 52.25% had an average level of total knowledge, and 22.5% showed a good level of total knowledge. Furthermore, 44.25% had a positive attitude regarding telenursing. **Conclusion:** More than half of the nursing students demonstrated an average level of knowledge, while more than one-fifth exhibited good knowledge. Over two-fifths displayed a positive attitude toward telenursing. There was a highly significant positive statistical correlation between the total knowledge of nursing students regarding telenursing and their overall attitude. **Recommendations:** Educational programs should be developed and implemented to enhance nursing school students' knowledge and attitudes regarding telenursing, as well as establishing protocols for the integration of telenursing into nursing curricula and clinical practice.

Key words: Attitude, Knowledge, Nursing Students, Telenursing

Introduction:

The global expansion of information and communication technology (ICT) is pivotal in achieving several Sustainable Development Goals (SDGs) for 2030. ICT advancements are revolutionizing fields like nursing, enhancing healthcare services' quality through remote client connectivity, health assessment, education delivery, and support provision. This transformation, facilitated by ICT, underscores SDG 3 (Good Health and Well-being) by improving healthcare access and quality, SDG 4 (Quality Education) by enabling continuous learning and training for healthcare professionals, and SDG 9

(Innovation and Infrastructure) by fostering technological innovation in healthcare delivery, including telenursing practices⁽¹⁾.

Telenursing utilizes telecommunications technology such as mobile devices, computers, mobile applications, and video technologies to deliver nursing services, client education, and support remotely. With the increasing prevalence and accessibility of mobile devices, telenursing is becoming an attractive alternative in healthcare delivery. It allows clients to access healthcare services beyond traditional clinical settings, enabling nurses to communicate with clients easily and

monitor clients who are geographically distant from healthcare facilities ⁽²⁾. However, the effective implementation of telenursing in healthcare organizations is influenced by various factors. Addressing these factors requires appropriate strategies, particularly focusing on human-related factors such as users' knowledge and attitudes toward technology, which play a crucial role in its successful deployment ⁽³⁾.

Nursing school students, integral to the healthcare system, are increasingly recognized as avid users of technology. Given their pivotal role, it is essential to prepare nursing students for future healthcare roles by equipping them with skills in information and communication technology (ICT) ⁽⁴⁾. Creatively preparing students for this evolving field involves understanding their perspectives on telenursing in the hyper-connected world. Exploring how undergraduate nursing students perceive and embrace telenursing is crucial as healthcare transitions towards a telehealth-driven era ⁽⁵⁾.

Nursing students demonstrate a positive outlook on telenursing despite their limited awareness and understanding of its nuances. This gap in knowledge may be attributed to the absence of formal education on telenursing within nursing curricula. Research underscores the potential benefits of integrating telenursing into nursing education programs, emphasizing its role in enhancing the quality and safety of healthcare delivery ⁽⁶⁾.

As nursing students acquire experience and knowledge in telenursing, they are prepared for diverse roles such as telehealth nurses, remote client monitoring specialists, tele triage nurses, or telehealth educators ⁽⁷⁾.

In telenursing, community health nurses (CHN) deliver nursing care over the phone, and consultation through call center of the helpline.

Basic nursing activities such as assessment of needs and situation of the caller, teaching, providing support and reassurance, as well as making referrals or collaboration in problem-solving should be performed during encounters. CHN should ideally tailor interactions to fit the individual needs of each caller ⁽⁸⁾.

Significance of the study:

The rapid development of information and communication technology has altered the nursing care paradigm and made telenursing a reality ⁽⁹⁾. More than 50% of health care services will be consumed virtually by 2030. In Egypt, telenursing sector is poised for significant growth, driven by technological advancements ⁽¹⁰⁾. Furthermore, the Egyptian government's Vision 2030 includes digital transformation as a key pillar, with healthcare identified as a priority sector which aligns with global trends towards digital health solutions and presents numerous opportunities for innovation and investment in telenursing ⁽¹¹⁾.

On the other hand, the utilization of telenursing may be influenced by many factors including the nurses' knowledge and attitude regarding telenursing as well as their acceptance of new technologies. Nursing students will play crucial roles as essential practical personnel. Furthermore, understanding and utilizing the potential of telenursing can be significantly aided by the perspectives and knowledge of nursing students ⁽⁶⁾. Consequently, integrating telenursing education into nursing school curricula becomes essential to nurture the professional growth of nurses ⁽¹²⁾. Educating nursing students about telenursing is pivotal, influencing their knowledge, attitudes, and preparedness for future healthcare roles, with studies showed a 40% increase in readiness and positive attitude among trained students ⁽¹³⁾.

Aim of the study:

This study aim was to assess knowledge and attitude of nursing school students regarding telenursing.

This aim was fulfilled through the following objectives:

- Identify the nursing school students' knowledge regarding telenursing.
- Determine the nursing school students' attitudes regarding telenursing.

Research Questions:

- What is the nursing school students' knowledge regarding telenursing?
- What is the nursing school students' attitude regarding telenursing?

Subjects and Method:**Research design:**

A descriptive, cross-sectional design was used to conduct the present study.

Study setting:

The current study was conducted in five secondary nursing schools. These schools were Sherief Omar, Fakous, Abu Kaber, Al-Husseiniyah, and Kafer Saker, which randomly selected by drawing from a jar from 17 nursing schools in Sharkia Governorate.

Study subjects:

The study sample composed of 400 students distributed as follows: Sherief Omar (85), Fakous (54), Abu Kaber (82), Al-Husseiniyah (140), and Kafer Saker Nursing School (41).

Sample size calculation:

The sample size was estimated to determine the prevalence of good knowledge (35.0%) and attitude (50.0%) or more among students ⁽¹⁴⁾, with a 2% standard error and a 95% level of confidence. Utilizing the single proportion sample size for dichotomous variables (Open-Epi software package) and accounting for finite population, the estimated

sample size is 354 students. After adjusting for a non-response rate of approximately 10%, the sample size was increased to 400 students.

Sampling Technique:

A cluster random sampling technique was employed to recruit nursing school students for the study. The investigator randomly selected classes of nursing students by drawing from a jar. Once a class was selected, all students within that class were included in the study.

Tools for data collection:

Two tools were used in this study to collect the data:

Tool I: Self-administered Questionnaire: It was developed by researchers based on literature review and written in a simple clear Arabic language; it comprised of two parts to assess the following:

- **Part (1): Socio-demographic Characteristics of the Nursing School Students** which adapted from Gilany et al. ⁽¹⁵⁾ and included 16 questions concerning the following:
 - **Personal data:** Such as student's age, gender, residence, and educational level.
 - **Family data:** Such as parents' educational level, occupation, and family income.
 - **Socio-economic data:** Such as house type, family members, number of rooms in the house, home condition, family property, family healthcare places, and socio-economic level.

Scoring system for nursing students' socio-economic level:

The total score was 48. The social class was classified as follows: High ($\geq 70\%$, 33.6 - 48), Medium (40 - $< 70\%$, 19.2 - < 33.6), and Low ($< 40\%$, < 19.2). These classifications were based on statistical analysis ⁽¹⁵⁾.

➤ **Part (2): Self-administered Student Knowledge Questionnaire Regarding Telenursing:**

This section was developed by the researcher and guided by **Abd Ellatif et al.** ⁽¹³⁾ to identify the knowledge level of nursing school students regarding telenursing. It comprised 11 questions covering diverse topics such as the concept, aims, advantages, disadvantages, types, communication means, global adoption factors, nursing services and guidelines, barriers. Also, this part asked about sources of knowledge about telenursing.

Scoring system for nursing students' knowledge:

For the knowledge items, a correct and complete answer was scored 2, a correct but incomplete answer was scored 1, and no answer was scored 0. The total score for all items was 22. The scores for each area of knowledge were summed, and the total was divided by the number of items, giving a score for that section. These scores were then converted into percentages, with knowledge levels categorized as follows:

- **Good:** When the total score were $\geq 70\%$.
- **Average:** When the total score was 50% to less than 70%.
- **Poor:** When the total score was less than 50%.

Tool II: Self-administered Student Attitude Questionnaire Regarding Telenursing: It was concerned with scale to measure the attitude of nursing students about telenursing adopted from **Glinkowski et al.** ⁽¹⁶⁾ and modified by the researchers which included 12 items covering various aspects of telenursing.

Scoring system for nursing students' attitude:

A 3-point Likert scale was employed, with responses of "Agree", "Uncertain", and "Disagree" scored as 2, 1, and 0, respectively, for attitude scoring. The scoring was reversed for negative statements. The scores of the items were summed, and the total was divided by the number of items, yielding a score. These scores were then converted into a percentage score with attitudes classified as follows: Positive: $>70\%$, and Negative: $\leq 70\%$.

Content validity and reliability:

A panel of three experts assessed the validity: Professor of nursing staff from the Medical and Surgical department, a professor from the Administration Department, and a professor from the Faculty of Medicine specializing in Community Medicine. They evaluated the tools for face and content validity, focusing on clarity, relevance, comprehensiveness, and understandability. The tools were then modified according to their feedback and suggestions.

The reliability of the proposed tools was assessed using Cronbach's Alpha test, yielding a score of 0.833 for Tool I and 0.819 for Tool II.

Field work:

After securing all official permissions, data collection commenced in October 2023 and continued through March 2024. The investigator visited the study settings from 9:00 a.m. to 3:00 p.m., meeting with students individually to explain the study's aim and procedures and to invite them to participate. Students who gave their oral consent participated using the two data collection tools. Each student took between 35 and 40 minutes to complete the two forms, which covered socio-demographic characteristics, knowledge, and attitudes regarding telenursing. The investigator conducted fieldwork two

days per week, on Sundays and Wednesdays.

Pilot study:

The pilot study was conducted on 40 students, representing 10% of the study sample, to test the applicability of the constructed tools and the clarity of the questions related to students' knowledge and attitudes regarding telenursing. Based on the pilot results, necessary modifications were made, and the tools were finalized. The nursing school students who participated in the pilot study were excluded from the main study sample.

Administrative and Ethical considerations:

An official request to conduct the study was issued by the Faculty of Nursing, Zagazig University, to the directors of the selected nursing schools. The request explained the aim of the study to obtain their permission and cooperation.

The research was approved by the Ethics Committee at the Faculty of Nursing, Zagazig University (Reference Number **M.D ZU.NUR 182**). Students were informed that their participation was voluntary, with anonymity and confidentiality assured through data coding. They were also given the right to withdraw from the study at any time.

Statistical analysis:

Data collected from the study sample were revised, coded, and entered using a personal computer. Computerized data entry and statistical analysis were performed using the Statistical Package for Social Sciences (SPSS) version 22. Data were presented using descriptive statistics, including Mean \pm S.D for quantitative data while using frequencies and percentages for qualitative data. The correlation coefficient (Pearson correlation) was used to measure the statistical relationship between two variables (total knowledge and overall attitude regarding telenursing). The Chi-square (χ^2) test was employed to

determine the relationship between categorical variables (socio demographic data and knowledge regarding telenursing).

Statistical Significance of the results:

- Highly significant at p-value < 0.01.
- Statistically significant at p-value < 0.05.
- Non-significant at p-value \geq 0.05.

Results:

Table (1): Presents the personal characteristics of the nursing school students. The mean age of the students was 16.06 ± 1.25 years, and 46.5% of them aged 16 years to less than 17 years old. In terms of gender distribution, 65% were female. Furthermore, 54.25% of the students resided in rural areas, and 46.5% belonged to the second educational level of nursing school. The same table points to the nursing students' socio-economic level where 51.25% of the nursing students belonged to a low socio-economic class, while only 15.5% were in a high socio-economic class.

Figure (1): Displays the sources of information about telenursing among nursing school students. Social media emerges as a prominent source, capturing the interest of 41.75% of students, followed by the library, which accounts for 39.5%.

Table (2): Delineates the distribution of the nursing school students based on their knowledge of telenursing. Their understanding of telenursing revealed incomplete correct answers, with percentages as follows: Telenursing aim (51.5%), advantages of telenursing (55.5%), means of communication used in telenursing (56.75%), factors contributing to the global adoption of telenursing (54.25%), nursing services deliverable through telenursing (52.75%), types (48%), guidelines for nurses in telenursing

service provision (52%), scope of telenursing (51.25%), challenges and barriers in telenursing (56.75%), and disadvantages of telenursing (57%). Conversely, 48.75% of the students indicated a lack of knowledge about the concept of telenursing.

Figure (2): Portrays that 52.2% of nursing school students had an average level of total knowledge regarding telenursing, while 25.25% demonstrated a poor level of total knowledge, and 22.5% showed a good level of total knowledge.

Figure (3): Illustrates that 55.75% of nursing school students had a total negative attitude toward telenursing, while 44.25% demonstrated a total positive attitude.

Table (3): Indicates a highly statistically significant association between the total knowledge level regarding telenursing among nursing students and their age, educational level ($p=.002$) and social level ($p=.006$). Furthermore, a statistically significant association was found between the nursing students' total knowledge level regarding telenursing and their gender ($p < 0.05$).

Table (4): Explains the correlation between the studied variables. A highly significant positive statistical correlation is observed between the total knowledge of nursing students and their total attitude ($p = .001$; $r = 0.591$).

Discussion:

The current era of healthcare reform is driving a shift in the priorities for delivering high-quality healthcare. In order to effectively address client care demand and adapt to the continual advancements in information and communication technologies, there exists a timely opportunity for innovative care delivery through telenursing. Telenursing has experienced rapid expansion in recent years and is poised for further growth, representing a promising avenue for 21st-century nursing professionals⁽¹⁷⁾.

Moreover, harnessing the potential of telenursing can be greatly facilitated by incorporating the perspectives and insights of nursing students⁽¹⁾. Furthermore, the education of nursing students plays a pivotal role in shaping their knowledge, attitudes, and preparedness for future practice⁽¹³⁾. Thus, this study aims to assess knowledge and attitude of nursing school students regarding telenursing in Sharkia Governorate.

Regarding the socio-demographic characteristics of the nursing school students, the current study revealed that the majority of the students were aged between 16 and 17 years as more than two-fifths of the studied sample belonged to the second nursing school educational level. In contrast, **Megahed**⁽¹⁸⁾ reported that at the Faculty of Nursing, Port Said University, Egypt, 73.3% of the nursing students were aged between 20 and 22 years, with a mean age of 21.53 ± 1.4 years. This difference might be due to variations in the study samples.

The present study results illustrated that more than three-fifths of the nursing students were female, likely due to nursing being traditionally seen as a feminine occupation. This finding aligns with **Abd Ellatif et al.**⁽¹³⁾ at Benha University in Egypt, who found that 69.2% of the nursing students were female. Also, **Elewa and El Guindy**⁽¹⁹⁾, who reported that more than half of the nursing students in their study, were female. In contrast, **Bdair**⁽²⁰⁾ found that 54.6% of nursing students in Saudi Arabia were male, a discrepancy that might be explained by cultural differences.

Considering nursing school students' socio-economic level, the current study revealed that more than half of the students belonged to a low socio-economic class, reflecting the generally low socio-economic situation in the country. This finding contradicts with **Ali**⁽²¹⁾, who studied the awareness and attitudes of

pediatric nursing students, nurses, and adolescents regarding advanced devices and virtual nursing in Benha City, Egypt, and clarified that 44% of the studied sample had a good economic status. This difference may be ascribable to discrepancies in study design and sample size.

Concerning the sources of information about telenursing, the findings of the present study demonstrated that social media emerged as a prominent source, capturing the interest of more than two-fifths of the nursing school students. This result might be attributed to the current generation's familiarity with social media platforms. In this respect, **Eshita** ⁽³⁾ conducted a study titled "Knowledge and Attitude of Physicians toward Telemedicine in Dhaka City, Bangladesh," and found that social media emerged as a major source of information about telemedicine, capturing the interest of more than half of the participants. However, this finding contrasts with a study by **Butta et al.** ⁽²²⁾ in Ethiopia, which denoted that friends were the most prevalent sources of information about telenursing, capturing the interest of more than one-third of the participants. Additionally, a study conducted by **Mun et al.** ⁽⁶⁾ in Korea indicated that the internet was the most used source of information about telenursing among undergraduate nursing students. The discrepancy between results may be attributed to differences in ethnicities, cultures, beliefs, or traditions within these multicultural societies.

In addressing the first research question and objective, which aimed to identify the level of knowledge among nursing school students regarding telenursing, the present findings revealed a significant gap in knowledge. Half of the nursing students lacked knowledge of the concept of telenursing. This gap may be attributed to the insufficient integration of telenursing into the curriculum. Additionally, nursing

students may have limited exposure to telenursing practices during their clinical placements or educational experiences. This finding aligns with the recommendations of **Poreddi et al.** ⁽¹²⁾, in India who advocated for the integration of telenursing concepts into nursing curricula. Supporting this, **Dangyang** ⁽²⁴⁾ conducted a study in Plateau State, Nigeria, revealing that over half of the participants had not been exposed to telenursing. Similarly, **Megahed** ⁽¹⁸⁾ conducted research at Port Said University, Egypt, finding that roughly half of nursing students were unable to accurately define telenursing. Additionally, **Mun et al.** ⁽⁶⁾ investigated perceptions and attitudes toward telenursing among undergraduate nursing students in Korea, uncovering that approximately two-thirds of the students lacked knowledge about telenursing.

Contrarily, **Ranjbar et al.** ⁽²⁵⁾ conducted a study titled "Iranian Clinical Nurses' and Midwives' Attitudes and Awareness towards Telenursing and Telehealth," which revealed that two-thirds of nursing students recognized the definition of telenursing. Similarly, **Khraisat et al.** ⁽¹⁾, in their study titled "Telenursing Implications for Future Education and Practice: Nursing Students' Perspectives and Knowledge from a Course on Child Health, Jordan," found that the majority of nursing students correctly defined telenursing. The differences in results could be attributed to cultural differences between Egypt and other Asian countries, as well as variations in nursing curricula and training courses.

The current study highlighted that more than two-fifths of nursing students had incomplete correct answers regarding the types of telenursing. This gap may stem from a lack of access to appropriate technology and the absence of formal education on telenursing. To address this, nursing students should be required to complete at least one

academic unit of Information and Communication Technology (ICT) within their educational programs to enhance their telenursing awareness. **Rutledge et al.** ⁽²⁶⁾ support this, advocating that nursing schools should lead in healthcare by introducing telehealth education programs and providing hands-on telehealth and telenursing experiences. This finding in agreement with **Elsayed and Ebrahim** ⁽²⁷⁾, who found that 40% of participants had incomplete knowledge about telenursing types in their study at Benha University Hospital, Egypt.

Regarding knowledge about the means of communication used in telenursing, the present study found that about three-fifths of the nursing students provided incomplete answers. This may be due to the rural residence of more than half of the sample, which limits access to technological resources and affects their knowledge. Conversely, **Megahed** ⁽¹⁸⁾ conducted a study at Port Said University, Egypt, and observed that the majority of participants were aware of the means of communication used in telenursing. This discrepancy may be attributed to differences in study settings and the age groups of the samples, which influence their experience with information and communication technology.

Regarding knowledge about the factors contributing to the global adoption of telenursing, the results of the current study showed that more than half of the nursing school students provided incomplete answers. This might be due to their lack of knowledge and interest in telenursing. This finding aligns with a study by **Elsayed and Ebrahim** ⁽²⁷⁾ at Benha University Hospital, Egypt, which found that more than one-third of the participants had incomplete answers about the reasons for using telenursing.

Concerning knowledge about the advantages of telenursing, the results of the current study illustrated that more than half of the nursing school students provided incomplete answers. This may be attributed to their insufficient knowledge of telenursing due to limited exposure to its application and the fact that telenursing is still in its nascent stage in the country. This finding corresponds with a study by **Ayatollahi et al.** ⁽²⁸⁾ titled "Clinicians' Knowledge and Perception of Telemedicine Technology, Iran," which concluded that participants had a moderate understanding of telemedicine's advantages. Similarly, **Elsayed and Ebrahim** ⁽²⁷⁾ at Benha University Hospital, Egypt, found that more than one-third of participants in the preprogram phase provided incomplete answers about the advantages of telenursing.

In contrast to the previous findings, **Alqurashi et al.** ⁽²⁹⁾, in their study titled "The Perception of Health Care Practitioners Regarding Telemedicine during COVID-19 in Saudi Arabia: Mixed Methods Study," indicated that three-quarters of the studied sample were familiar with the benefits of telemedicine technologies. This discrepancy may be due to the widespread adoption and necessity of telemedicine during the COVID-19 pandemic, which heightened awareness and familiarity among healthcare practitioners. In the same context, **Poreddi et al.** ⁽¹²⁾ in their study "Nursing Interns' Perceptions of Telenursing: Implications for Nursing Education, India," reported that the majority of participants acknowledged telenursing's usefulness in nursing practice, possibly due to targeted educational interventions and the integration of telenursing concepts in their curriculum.

The present study clarified that more than half of the nursing school students provided incomplete answers about the nursing services deliverable through telenursing and its

scope. This might be attributed to the scarcity of telenursing services and applications available in the students' regions, which affected their knowledge. This finding was consistent with **Elsayed and Ebrahim** ⁽²⁷⁾, who conducted a study at Benha University Hospital, Egypt, and reported that about half of the participants had incomplete answers about the uses, nursing services, and applications of telenursing.

With regards to knowledge about the disadvantages of telenursing, the concurrent study demonstrated that about three-fifths of the nursing school students provided incomplete answers. This might be attributed to their insufficient knowledge, limited practical experience, or uncertainty regarding sources of information about telenursing, including its advantages and disadvantages, as well as a lack of training courses about telenursing. This finding was in accordance with **Elsayed and Ebrahim** ⁽²⁷⁾, at Benha University Hospital, Egypt who highlighted that three-fifths of the studied sample had incomplete answers about the disadvantages of telenursing. Conversely, **Megahed** ⁽¹⁸⁾ implemented a study at Port Said University and observed that about half of the participants had high correct responses toward the disadvantages of telenursing. This difference may be attributed to the possibility that the faculty at Port Said University discussed telenursing with the nursing students, providing them with more information on the topic.

In light of the current study, more than half of the nursing school students provided incomplete answers regarding guidelines for nurses in telenursing service provision. Such results might be credited to the fact that this field is still under development, and there is insufficient information about telenursing. This finding is in agreement with **Malhotra et al.** ⁽³⁰⁾ in India, who noticed that about two-

thirds of the participants had low responses toward telenursing guidelines. However, this finding contradicted with **Alqurashi et al.** ⁽²⁹⁾, who implemented a study in Saudi Arabia and concluded that about two-thirds of the participants had high responses toward telenursing guidelines.

Based on the current study results, about half of the nursing school students provided incomplete answers regarding the challenges facing telenursing. This might be due to a lack of telenursing training courses and uncertainty about sources of information regarding telenursing. This finding was supported by **Dangyang** ⁽²⁴⁾ in Nigeria, who revealed that the majority of participants had inadequate knowledge about the challenges facing telenursing.

Regarding the overall knowledge levels of nursing school students about telenursing, the current study confirmed that more than half of the students had average total knowledge levels regarding telenursing. This may be attributed to social desirability bias, as nursing students may have answered some questions correctly, which may or may not truly reflect their knowledge. Additionally, nursing students may have a positive background understanding and outlook regarding telenursing. This finding is consistent with **Abd Ellatif et al.** ⁽¹³⁾, who conducted a study titled "Knowledge and Attitude of Faculty of Nursing Students regarding Telenursing in Benha University, Egypt," and emphasized that about half of the participants had average total knowledge levels regarding telenursing. Similarly, **Kunjumon et al.** ⁽²³⁾ studied "knowledge regarding telenursing among nursing students, India," and revealed that about three-quarters of the studied sample had average total telenursing knowledge.

In addressing the research objective of determining the attitudes of nursing school

students towards telenursing, the concurrent study results concluded that more than half of the studied nursing students had negative total attitude scores regarding telenursing. This may be due to the incomplete understanding of the benefits, components, and importance of telenursing applications in the healthcare system, as well as inadequate information about technology-based infrastructure and fear of nursing job losses within healthcare organizations. This underscores the need for adequate training and education for nursing students to fully comprehend telenursing and improve their attitudes towards it.

In the same context, **Elsayed and Ebrahim** ⁽²⁷⁾ at Benha University Hospital in Egypt found that 58.2% of the nursing intern had negative total attitude levels regarding telenursing. Similarly, **Hussain et al.** ⁽³¹⁾ carried out a study titled "Impact of an Educational Brochure on Nurses' Knowledge, Perception, and Attitude Towards Telenursing in Hospitals, Saudi Arabia" and concluded that 72.4% of the studied nursing students at the preprogram phase had negative total attitude levels regarding telenursing.

In contrast, **Mun et al.** ⁽⁶⁾ studied perceptions and attitude toward telenursing among undergraduate nursing students in Korea and demonstrated that the participants displayed positive outlook and attitude toward telenursing. This might be related to many factors as exposure to telenursing education or the participants' experiences in telenursing.

Regarding the relation between socio-demographic characteristics of the nursing school students and their total knowledge level regarding telenursing, the current study indicated that there was highly statistically significant relation between the studied nursing students' total knowledge levels and their age

where older nursing students had higher knowledge levels. Possibility may be due to the fact that older nursing students are usually exposed to greater experience and knowledge. This result was consistent with **Kunjumon et al.** ⁽²³⁾ who studied "Knowledge regarding telehealth among paramedical students, India" and concluded that there were statistically significant relation between total knowledge levels and age of the studied students.

On the other hand, this finding contrasted with a study done by **Abd Ellatif et al.** ⁽¹³⁾ at Faculty of Nursing Benha University and emphasized that there was no statistically significant relation between the studied nursing students' total knowledge levels and their age. This suggests that nursing students' knowledge toward telenursing is not invariably dependent on their age, as other factors such as academic educational programs and training courses can help to have better telenursing irrespective of the students' age.

In the light of the current study, there was statistically significant relation between total knowledge levels and gender, with females demonstrating higher knowledge levels than males. This finding may be attributed to societal norms where nursing is predominantly viewed as a female profession, potentially providing more exposure and interest among female students. In contrast, **Rettinger et al.** ⁽³²⁾ conducted a study titled "Telehealth Education in Allied Health Care and Nursing: Web-Based Cross-Sectional Survey of Students' Perceived Knowledge, Skills, Attitudes, and Experience" in Austria, where they reported no significant differences in telehealth knowledge between genders. This discrepancy could be influenced by variations in cultural norms and societal perceptions of gender roles between Egypt and other countries.

According to the findings of the present study, there was a highly statistically significant relationship between nursing students' total knowledge levels of telenursing and their educational level, indicating that higher education levels correlated with greater telenursing knowledge. This relationship can be explained by the fact that higher education provides nursing students with more opportunities to enhance their knowledge and awareness. It underscores the importance of integrating telenursing into nursing educational programs. This finding is supported by **Malhotra et al.** ⁽³⁰⁾ in Iran, who noted that there was little significant difference in telenursing knowledge among students undergoing medical education compared to non-medical students.

Concerning the relation between nursing students' total knowledge level regarding telenursing and their overall attitude, the present study demonstrated a highly statistically significant positive correlation between nursing students' total knowledge levels and their total attitude toward telenursing. This correlation suggests that as nursing students acquire more knowledge and information about telenursing, their attitudes toward it becomes more positive. Understanding information and communication technologies likely enhances their perception of the potential benefits of successful telenursing implementation.

These findings are consistent with **Abd Ellatif et al.** ⁽¹³⁾ at Benha University, who also found a strong positive correlation between overall knowledge scores and total attitude scores among nursing students. Additionally, **Mun et al.** ⁽⁶⁾ in Korea reported a statistically significant correlation between nursing students' total knowledge levels and their total attitude levels toward telenursing. Similarly, **Mohamed et al.** ⁽³³⁾ at

isolation hospitals in Mansoura and Kafr El-Sheikh, Egypt, observed a positive significant correlation between nurses' total knowledge and their attitude toward telenursing.

Conclusion:

Based on the findings of the current study and the answers to the research questions, it can be concluded that more than half of the nursing students demonstrated an average level of total knowledge regarding telenursing, while more than one-fifth exhibited good total knowledge. Moreover, over two-fifths of nursing students displayed a positive attitude toward telenursing. Furthermore, there were statistically significant associations between the total knowledge level regarding telenursing among nursing students and their age, gender and educational level. Additionally, a highly significant positive statistical correlation was observed between the total knowledge of nursing students and their overall attitude.

Recommendations:

Based on the study's findings, the following recommendations are advocated:

1. Develop and implement educational programs aimed to enhancing the knowledge and attitude of nursing students regarding telenursing.
2. Conduct further research to explore factors influencing the implementation and effectiveness of telenursing.
3. Establish protocols and guidelines for the integration of telenursing into nursing curricula and clinical practice.
4. Mandatory regular training courses for all nursing students regarding telenursing as a part of obtaining the academic certificate.

Table (1): Distribution of the nursing school students according to their personal characteristics (n=400)

Personal Characteristics	N	%
Age		
15- < 16 Y	94	23.5
16- < 17 Y	186	46.5
17+	120	30.0
Mean±S.D	16.06±1.25	
Gender		
Male	140	35.0
Female	260	65.0
Residence		
Urban	183	45.75
Rural	217	54.25
Educational Level in the Nursing School		
First Level	94	23.5
Second Level	186	46.5
Third Level	120	30.0
Social Class		
Low	205	51.25
Medium	133	33.25
High	62	15.50

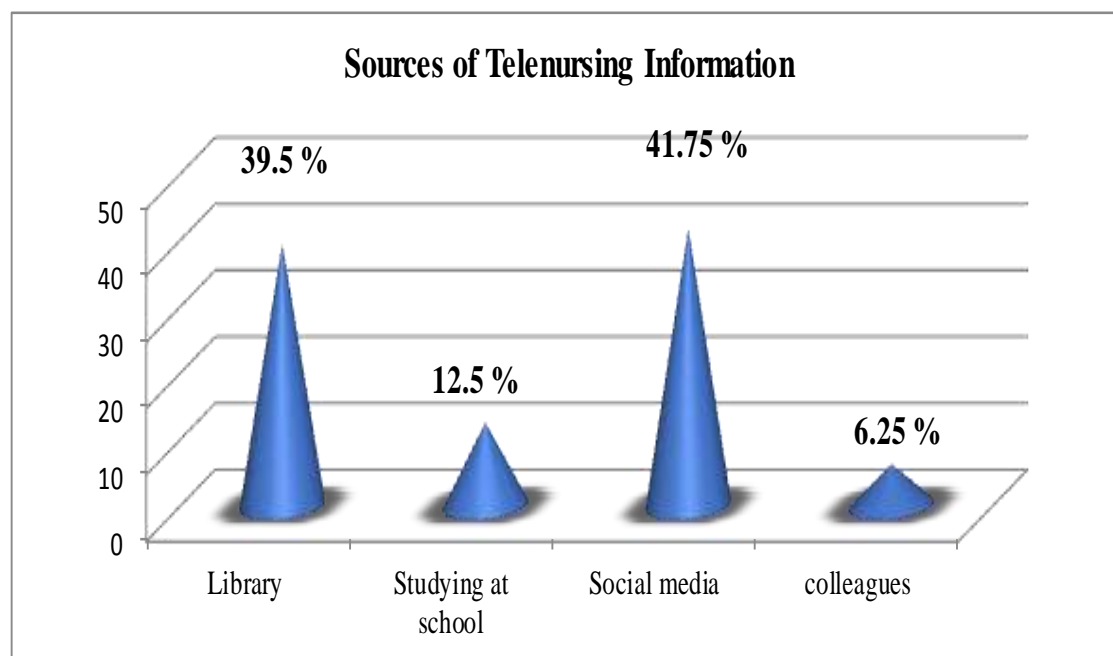
**Figure (1): Sources of Information about Telenursing among Nursing School Students (n=400)**

Table (2): Distribution of nursing school students based on their knowledge of telenursing (n=400)

Telenursing Knowledge Domains	Complete Correct		Incomplete Correct		Don't Know	
	No	%	No	%	No	%
Concept of telenursing	95	23.75	146	36.5	159	48.75
Aim of telenursing	91	22.75	206	51.5	103	25.75
Advantages of telenursing	56	14.0	222	55.5	122	30.5
Means of communication used in telenursing	78	19.5	227	56.75	95	23.75
Factors contributing to the global adoption of telenursing	90	22.5	217	54.25	93	23.25
Nursing services deliverable through telenursing	88	22.0	211	52.75	101	25.25
Types of telenursing	124	31.0	192	48.0	84	21.0
Guidelines for nurses in telenursing service provision	102	25.5	208	52.0	90	22.5
Scope of telenursing	120	30.0	205	51.25	75	18.75
Challenges and barriers in telenursing	90	22.5	227	56.75	83	20.75
Disadvantages of telenursing	75	18.75	228	57.0	97	24.25

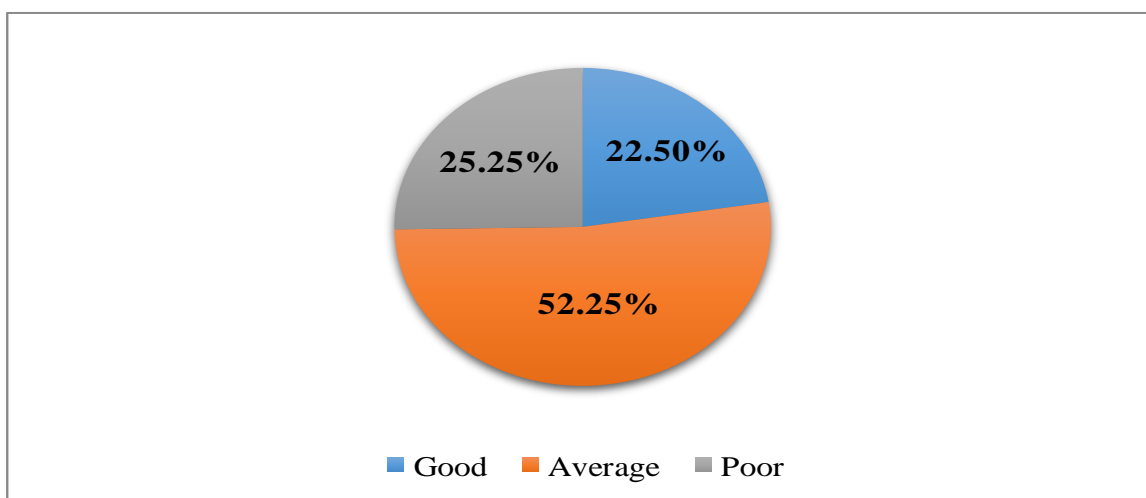


Figure 2: Percentage Distribution of the nursing school students according to their total knowledge levels regarding telenursing (n=400)

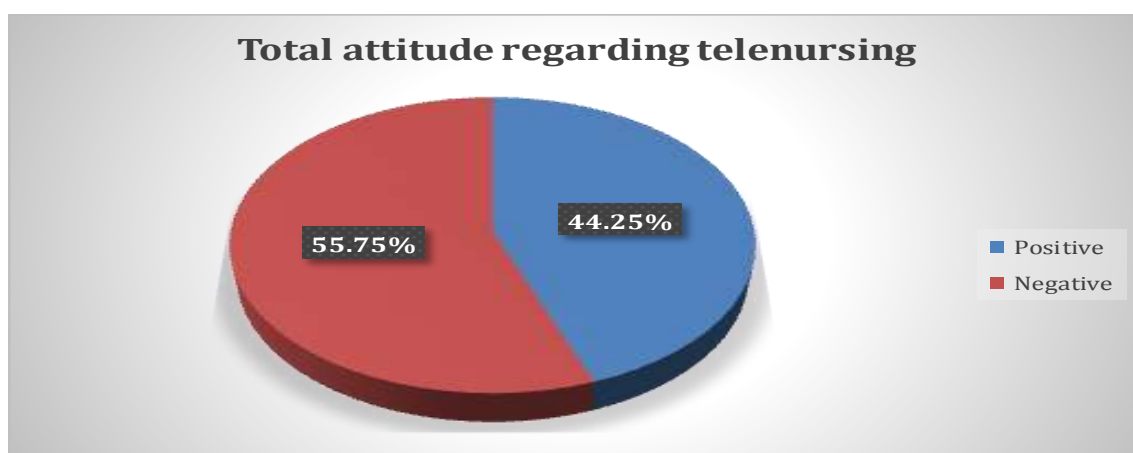


Figure 3: Percentage Distribution of Nursing School Students Based on Their Total Attitudes Regarding Telenursing (n=400)

Table (3): Relationship between Nursing School Students' Socio-demographic Characteristics and Their Total Knowledge Levels Regarding Telenursing (n=400)

Socio-demographic Characteristics	Total knowledge						X ²	P-Value
	Good N=90		Average N=209		Poor N=101			
	N	%	N	%	N	%		
Age								
15- < 16 Y	2	2.2	11	5.3	81	80.2	8.334	.002**
16- < 17 Y	4	4.4	169	80.9	13	12.9		
17+	84	93.4	29	13.8	7	6.9		
Gender							4.152	.021*
Male	15	16.7	49	23.4	76	75.2		
Female	75	83.3	160	76.6	25	24.8		
Residence							1.567	.067
Urban	39	43.3	100	47.8	44	43.6		
Rural	51	56.7	109	52.2	57	56.4		
Educational level							8.334	.002**
First Level	2	2.2	11	5.3	81	80.2		
Second Level	4	4.4	169	80.9	13	12.9		
Third Level	84	93.4	29	13.8	7	6.9		
Social level							6.001	.006**
Low	9	10	115	55	81	80.2		
Moderate	31	34.4	82	39.2	20	19.8		
High	50	55.6	12	5.8	0	0		

Table 4: Correlation between the studied nursing school students' total knowledge levels and their total attitude toward telenursing (n=400)

Item	Total Attitude
Total Knowledge Level	R 0.591
	p .001**

(**) Statistically significant at $p < 0.01$. R Pearson correlation

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