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Physicians' and Nurses' Attitudes, Awareness, Knowledge, and Skill in Telemedicine

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ABSTRACT

Aims This systematic review aims to examine physicians' and nurses' attitudes, knowledge, awareness, and skill in telemedicine technology.

Information & Methods Studies were extracted from the PubMed, Embase, Scopus, and Web of Sciences databases in March 2023, following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Cross-sectional studies examining physicians' and nurses' attitudes, awareness, knowledge, and skill in telemedicine were considered as the inclusion criteria. A similar checklist was used for data extraction, and Joanna Briggs Institute's (JBI) critical appraisal checklist specific for cross-sectional studies was employed to assess the quality of the entered studies to this research.

Findings A total of 13 studies with the inclusion criteria were entered into the study. Seven studies (54%) examined health specialists' attitudes and revealed their proper and promising attitudes toward telemedicine. Among five studies probing their participants' awareness of telemedicine, three reported high awareness, while two had documented moderate levels of awareness. On the other hand, among ten studies investigating telemedicine knowledge, seven had reported high, one moderate, and two low telemedicine knowledge. Three studies evaluated telemedicine skillfulness and reported moderate (two studies) and low (one study) skill levels of their participants.

Conclusion Health specialists hold positive and promising attitudes toward telemedicine. Telemedicine awareness, knowledge, and skill among health professionals are above-moderate and desirable.

Keywords Telemedicine; Attitudes; Knowledge; Nurse; Physician

CITATION LINKS

[1] Telemedicine awareness, knowledge ... [2] Knowledge, attitudes, and ... [3] What drives attitude towards ... [4] User acceptance level of ... [5] Video consultation during ... [6] Rapid implementation of telemedicine ... [7] Telemedicine technologies for ... [8] Patient satisfaction with neurosurgery ... [9] Acceptance, use, and barriers ... [10] Defrag and reboot? Consolidating ... [11] The effect of tele-rehabilitation on improving ... [12] Investigating the effect of virtual reality ... [13] Evaluating the cost effectiveness of ... [14] The paradox of project success ... [15] Non-use of telemedicine ... [16] Challenges and opportunities of ... [17] The individual and contextual ... [18] referred reporting items for systematic ... [19] The PRISMA statement for reporting ... [20] Checklist for analytical cross sectional ... [21] Remote working: Survey of attitudes to ... [22] Awareness and attitudes to telemedicine ... [23] Evaluation of knowledge and perception ... [24] Clinicians' knowledge ... [25] Knowledge and attitudes of doctors towards ... [26] Awareness, knowledge, attitude and ... [27] Knowledge and attitude regarding telemedicine ... [28] Assessment of physician's knowledge, ... [29] Attitudes, barriers, and concerns ... [30] Knowledge and awareness ... [31] Assessment of knowledge and ... [32] Awareness and skills of modern telemedicine ... [33] Awareness, knowledge, attitude ... [34] Attitude, awareness, and knowledge ... [35] Health care professionals' ... [36] Patient and provider perceptions ... [37] Acceptance of health information ... [38] Telemedicine in surgical care ... [39] Awareness and readiness to use ... [40] Nurses' perceived knowledge ... [41] Clinical dashboard in ... [42] Awareness, attitude and ... [43] E-health literacy and health ... [44] Knowledge and awareness of teledentistry ... [45] Challenges of telemedicine ... [46] Healthy ageing through ... [47] Healthcare workers' knowledge ... [48] Knowledge and attitude ... [49] Attitudes, knowledge ... [50] Effect of mobile health ... [51] The effect of nutrition ... [52] Teleophthalmology ... [53] Telerehabilitation in response ... [54] Evaluating the impact ... [55] Expert consensus ... [56] Rehabilitation registration systems ... [57] A comparative study ... [58] Application of artificial intelligence ...

Introduction

Telemedicine is defined as using web-based sources and electronic information together with advanced digital network technology to promote remote professional health services, publish medical safety reports, present health-related training to people, and monitor public health [1]. Indeed, telemedicine is a branch of medicine that uses electronic media to build relationships among healthcare employees, including physicians, nurses, healthcare providers, and patients. As a vital factor for health specialists, telemedicine facilitates the exchange of information for the diagnosis, treatment, and prevention of diseases and traumas, as well as assessment, research, and healthcare providers' training, improving individual and social health [2]. Today, telemedicine, employed by numerous medical specialists, such as cardiologists, neurologists, surgeons, optometrists, radiologists, and pediatricians is recognized as an approach to improving care access, quality, and efficiency [3]. In addition, telemedicine shortens patients' hospitalization time, reduces the number of visits and care-associated costs, improves healthcare access, decreases care traveling time and cost, and enhances patient satisfaction [4, 5]. Many care professionals prefer to work in metropolises, and this issue results in the shortage of healthcare services in rural and underprivileged regions. In the meantime, telemedicine can be a promising solution for many of these drawbacks by eliminating the barriers of physical distance [6]. On the other hand, the World Health Organization (WHO) recommends introducing telemedicine in locales with high patient demands [7]. Despite numerous likely barriers, such as the inability to examine physically, and limited access to sensitive communities with low literacy, like villagers, ethnic minorities, elderly patients, and poor socioeconomic communities, telemedicine is counted as a helpful tool for physicians and patient care [6]. Telemedicine is historically used to provide healthcare to rural populations to manage chronic diseases, psychological and medical conditions, and real-time visits in acute care settings and facilitates video counseling and the use of mobile apps to provide medical consultation, diagnosis, and treatment and reduce the risk of infection. On the whole, many physicians believe that telemedicine is extensively promising for the management of patient care [8, 9].

Although the present advantages of telemedicine have been proved, the health domain has been slow to adopt Information and Communication Technology (ICT) compared to other sectors [10]. There are many reasons why the implementation of e-health systems is still challenging despite the existing studies on its clinical benefits, efficient cost, and high healthcare accessibility at macro levels [11-13]. Regardless of the merits and potential technical superiority of telemedicine, its acceptance is often considered a failed project [14], and user non-acceptance is one of the pivotal causes of failure in this respect [15]. In other words, to ensure telemedicine acceptance and use, it is necessary to possess gross resource capital and human forces and attempt to recognize its utility [4]. On the other hand, since the success of every novel technology depends on many factors, such as the respective professionals' knowledge and perceptions of the concept, acquired skills, and working environments [16], health specialists' attitudes, awareness, knowledge, and skill in telemedicine are among the imperatives of the successful implementation of telemedicine [17].

Despite the increasing contribution of telemedicine to healthcare and studies on physicians' and nurses' attitudes toward telemedicine, a few systematic reviews have synthesized the best evidence and provided a general view in this domain, and neither has so far examined physicians' and nurses' attitudes, awareness, knowledge, and skill as health professionals. Hence, the present systematic review investigated physicians' and nurses' attitudes, knowledge, awareness, and skills in telemedicine.

Information and Methods

Design

This systematic review followed PRISMA guidelines to report evidence from included studies [18, 19]. In this respect, the researchers searched some keywords in titles, abstracts, and the PubMed, Embase, Scopus, and Web of Sciences databases on March, 2023, and employed the MeSH and Emtree keywords and terms in the three below categories to search the databases.

1. Physicians OR Physician OR Doctors OR Doctor OR Nurses OR Nurse OR "Personnel, nursing" OR "Nursing personnel" OR "Registered nurses" OR "Nurse, registered" OR "Nurses, registered" OR "Registered nurse".
2. Attitude OR Attitudes OR Knowledge OR Awareness OR Awarenesses OR Skill OR Skills.
3. "Telemedicine" OR "Telerehabilitation" OR "telehealth" OR "Mobile Health" OR "Health, Mobile" OR "Virtual Medicine" OR "Medicine, Virtual" OR "eHealth" OR "mHealth" (Table 1).

Eligibility criteria

Studies that possessed the following inclusion criteria were entered into the examination process:

1) Cross-sectional studies investigating physicians' and nurses' attitudes, awareness, knowledge, and skill in telemedicine;

2) Studies examining physician and nurse populations.

On the other hand, the exclusion criteria were:

1) Publication types other than papers of high-prestigious journals, such as books, review papers, and letters to editors-in-chief;

2) Not accessing the full text of the paper in English;

3) Irrelevance of the title, abstract, or full text to the purpose of the study.

Data extraction and synthesis

After the extraction of studies from the databases, repeated studies were removed. First, titles and abstracts were screened independently based on the eligibility criteria. Papers lacking the inclusion criteria were omitted from the investigation. Then, the full texts were retrieved and screened independently by two researchers based on the eligibility criteria. The inter-researcher conflicts were solved through discussions. A similar checklist was used for data extraction. The data items in this checklist included the reference, examined country, publishing year, applied instruments, study purposes, telemedicine attitudes, telemedicine knowledge, telemedicine awareness, telemedicine skills, and main findings.

Table 1. Search strategy for each database

Search strategy		Results
PubMed		
1	((((Physicians[MeSH Terms]) OR (Nurses[MeSH Terms])) AND (Attitude[MeSH Terms])) OR (awareness[MeSH Terms])) OR (Knowledge[MeSH Terms])) AND (Telemedicine[MeSH Terms])	N=535
2	(Physicians[Title/Abstract] OR Physician[Title/Abstract] OR Doctors[Title/Abstract] OR Doctor[Title/Abstract] OR Nurses[Title/Abstract] OR Nurse[Title/Abstract] OR "Personnel, nursing"[Title/Abstract] OR "Nursing personnel"[Title/Abstract] OR "Registered nurses"[Title/Abstract] OR "Nurse, registered"[Title/Abstract] OR "Nurses, registered"[Title/Abstract] OR "Registered nurse"[Title/Abstract])	N=827,867
3	(Attitude[Title/Abstract] OR Attitudes[Title/Abstract] OR Knowledge[Title/Abstract] OR Awareness[Title/Abstract] OR Awarenesses[Title/Abstract] OR Skill[Title/Abstract] OR Skills[Title/Abstract])	N=1,327,736
4	("Telemedicine"[Title/Abstract] OR "Telerehabilitation"[Title/Abstract] OR "telehealth"[Title/Abstract] OR "Mobile Health"[Title/Abstract] OR "Health, Mobile"[Title/Abstract] OR "Virtual Medicine"[Title/Abstract] OR "Medicine, Virtual"[Title/Abstract] OR "eHealth "[Title/Abstract] OR "mHealth"[Title/Abstract])	N=51,334
5	2 AND 3 AND 4	N=263
6	1 OR 5	N=784
Embase		
1	physicians:ti,ab,kw OR physician:ti,ab,kw OR doctors:ti,ab,kw OR doctor:ti,ab,kw OR nurses:ti,ab,kw OR nurse:ti,ab,kw OR 'personnel, nursing':ti,ab,kw OR 'nursing personnel':ti,ab,kw OR 'registered nurses':ti,ab,kw OR 'nurse, registered':ti,ab,kw OR 'nurses, registered':ti,ab,kw OR 'registered nurse':ti,ab,kw	N=1,132,427
2	attitude:ti,kw,ab OR attitudes:ab,kw,ti OR knowledge:ti,ab,kw OR awareness:ti,ab,kw OR awarenesses:ti,ab,kw OR skill:ti,kw,ab OR skills:ti,ab,kw	N=1,691,367
3	telemedicine:ti,ab,kw OR telerehabilitation:ti,ab,kw OR telehealth:ti,ab,kw OR 'mobile health':ti,ab,kw OR 'health, mobile':ti,ab,kw OR 'virtual medicine':ti,ab,kw OR 'medicine, virtual':ti,ab,kw OR ehealth:ti,ab,kw OR mhealth:ti,ab,kw	N=63,762
4	1 AND 2 AND 3	N=2,259
Scopus		
1	TITLE-ABS-KEY ((Physicians OR Physician OR Doctors OR Doctor OR Nurses OR Nurse OR "Personnel, nursing" OR "Nursing personnel" OR "Registered nurses" OR "Nurse, registered" OR "Nurses, registered" OR "Registered nurse"))	N=1,414,153
2	TITLE-ABS-KEY (Attitude OR Attitudes OR Knowledge OR Awareness OR Awarenesses OR Skill OR Skills)	N=4,242,34
3	TITLE-ABS-KEY ("Telemedicine" OR "Telerehabilitation" OR "telehealth" OR "Mobile Health" OR "Health, Mobile" OR "Virtual Medicine" OR "Medicine, Virtual" OR "eHealth " OR "mHealth")	N=105,781
4	1 AND 2 AND 3	N=4,501
Web of Science		
1	TS=((Physicians OR Physician OR Doctors OR Doctor OR Nurses OR Nurse OR "Personnel, nursing" OR "Nursing personnel" OR "Registered nurses" OR "Nurse, registered" OR "Nurses, registered" OR "Registered nurse"))	N=774,609
2	TS=(Attitude OR Attitudes OR Knowledge OR Awareness OR Awarenesses OR Skill OR Skills)	N=2,320,906
3	TS=("Telemedicine" OR "Telerehabilitation" OR "telehealth" OR "Mobile Health" OR "Health, Mobile" OR "Virtual Medicine" OR "Medicine, Virtual" OR "eHealth" OR "mHealth")	N=55,058
4	1 AND 2 AND 3	N=1,854

Quality assessment

Joanna Briggs Institute's (JBI) critical appraisal checklist specific to cross-sectional studies was used for the quality assessment of the included studies [20]. In particular, with eight questions for assessing the quality of studies, this checklist involves the following issues: The inclusion criteria of samples, examined population, examined setting, and valid and reliable measurement instruments (mentioning the validity and reliability of the questionnaires). The included studies used standard measurement criteria, identified confounding factors, pursued strategies to cope with confounding factors, reported valid results, and followed appropriate statistical analyses. The responses to the questions included four yes, no, unclear, and not applicable categories. Positively and negatively answered questions received scores of 1 and 0, respectively, and the maximum quality score of every study was 8. If the quality score of a study was <5, it was omitted from the review.

Findings

Selection of studies: The search into scientific databases led to the retrieval of a total of 9398 studies initially. After the omission of repetitive cases (2873), 6525 studies remained for the title and abstract examination. 6494 studies not aligning with the purpose of the study were removed. Then, 31 remaining papers were examined with their full texts, and finally, 13 eligible papers were entered into the study (Table 2; Figure 1).

Table2. PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) checklist

Section/topic	#	Checklist item	Reported on page #
Title			
Title	1	Identify the report as a systematic review, meta-analysis, or both	1
Abstract			
Structured summary	2	Provide a structured summary including, as applicable: Background; Objectives; Data sources; Study eligibility criteria, participants, and interventions; Study appraisal and synthesis methods; Results; Limitations; Conclusions and implications of key findings; Systematic review registration number	2
Introduction			
Rationale	3	Describe the rationale for the review in the context of what is already known	3, 4
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS)	4
Methods			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number	N/A
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale	4, 5
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched	5
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated	5
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis)	5, 6
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators	6, 7
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made	4, 5
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis	4, 5
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means)	N/A
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis	N/A
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies)	N/A
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified	N/A
Results			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram	6
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations	6-17
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12)	6-17
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: a) simple summary data for each intervention group; b) effect estimates and confidence intervals, ideally with a forest plot	6-17
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency	N/A
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15)	N/A
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression (see Item 16))	N/A
Discussion			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; Consider their relevance to key groups (e.g., healthcare providers, users, and policy makers)	20, 21
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias)	20, 21
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research	21
Funding			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); Role of funders for the systematic review	1

Quality assessment: No considerable bias was observed in the studies, and all studies were entered into the systematic review (Table 3).

Characteristics of studies: Out of 13 studies, three (23%) were conducted in India [22, 26, 32], two (15%) in Pakistan [27, 31], and the rest in Scotland, Malesia, Iran, Uganda, Saudi Arabia, Sweden, Ethiopia, and Egypt [21, 23-25, 28-30, 33]. In addition, only one study [29] belonged to a developed country, and 12 were performed in developing nations [21-28, 30-33]. The data were collected by questionnaires in all studies; Two studies had posted their questionnaires [21, 26], three

had administered in-person questionnaires [28, 30, 31], one had used online questionnaires [29], and seven had provided no relevant details (Table 4 & 5) [22, 25, 27, 32, 33].

Physicians' and nurses' attitudes toward telemedicine

Seven of the studies included in this review evaluated health specialists' attitudes toward telemedicine, and all revealed the positive and promising attitudes of the examined physicians and health specialists toward telemedicine (Tables 2 & 3) [21, 22, 25, 26, 29, 31, 33]. Richards *et al.* [21] report that when their participants have been asked to explain their e-health programs, 112 respondents (54%) were familiar with the internet-based informing of laboratory results, 20% were acquainted with video conferences held for education or clinical purposes, and 27% were informed of other applied programs. 68% declare that they have good or excellent experiences and positively evaluate the experiences of easy equipment utilization (74%), equipment performance (75%), clinical utility (76%), technical support (44%), and education (39%). Also, Meher *et al.* [22] document that many physicians are aware of telemedicine technology, and a total of 86 physicians are using telemedicine. The majority of these 86 physicians express their willingness to cooperate with other centers. In Olok *et al.*'s [25] study, many healthcare specialists maintain positive attitudes toward e-health properties (Mean=3.5), and the average comparative advantage of ICT, adaptability, testability, and observability is 4.3, 3.8, 3.2, and 3.5, respectively. Zayapragassarazan & Kumar [26] report that many physicians hold high and positive attitudes toward telemedicine. 29% of the respondents possess high altitudes, 31% moderate attitudes, and 30% low attitudes. The maximum and minimum averages associated with attitudes toward telemedicine are obtained for 51-60-year-old (35.61±3.12) and paraclinical respondents (33.21±3.76).

Likewise, Glock *et al.* [29] report that first-care doctors express generally positive attitudes toward digitalization and are almost impatient for it. They assert that enormous sources should be accessed in healthcare and particularly perceived that, along with simplifying physicians' responsibilities, telemedicine enhances patient empowerment and improves medical care, though some physicians held skeptical attitudes. Furthermore, Kumar *et al.* [31] show their respondents have agreed that telemedicine can help enhance the interrelationships of healthcare providers (141 individuals), decrease the number of references to health centers (151 individuals), accelerate the accomplishment of tasks (118 individuals), improve clinical decisions (67 individuals), and present more inclusive health services. In addition, Fouad *et al.* [33] have found high attitudes of mental health providers toward telemedicine and a statistically significant relationship between attitudes toward telemedicine and every one of the following cases: Being heard of telemedicine, willingness to participate in every telemedicine educational program, time spent on individual or collective treatments with telemedicine, time spent on tele-assessment, advantages of telemedicine, reasons for using telemedicine, and telemedicine in specific psychotherapies.

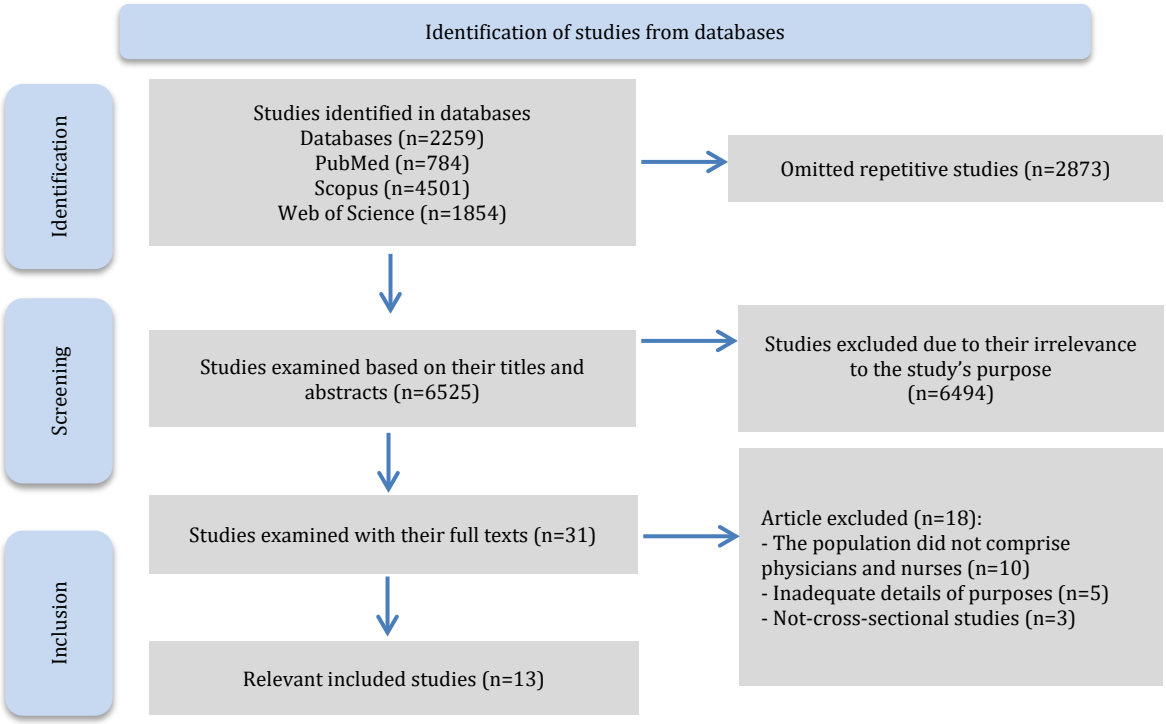

Figure 1. Study selection PRISMA

Table 3. Summary of the quality assessment of articles using the JBI critical appraisal checklist

Study location, year	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Score
Scotland, 2004 [21]	Y	Y	Y	Y	N	N	Y	Y	6
India, 2009 [22]	Y	Y	Y	Y	N	N	Y	Y	6
Malesia, 2010 [23]	Y	Y	Y	Y	N	N	Y	Y	6
Iran, 2015 [24]	Y	Y	Y	Y	N	N	Y	Y	6
Uganda, 2015 [25]	Y	Y	Y	Y	N	N	Y	Y	6
India, 2016 [26]	Y	Y	Y	Y	N	N	Y	Y	6
Pakistan, 2020 [27]	Y	Y	Y	Y	N	N	Y	Y	6
Saudi Arabia, 2021 [28]	Y	Y	Y	Y	N	N	Y	Y	6
Sweden, 2021 [29]	N	Y	Y	Y	N	N	Y	Y	5
Ethiopia, 2022 [30]	Y	Y	Y	Y	N	N	Y	Y	6
Pakistan, 2022 [31]	Y	Y	Y	Y	N	N	Y	Y	6
India, 2022 [32]	Y	Y	Y	Y	N	N	Y	Y	6
Egypt, 2023 [33]	Y	Y	Y	Y	N	N	Y	Y	6

* JBI: Joanna Briggs Institute; Q: Question; N: no; NA: Not/applicable; U: Unclear; Y: Yes; Score: The quality assessment score ranged from 0 to 8 based on each question of the JBI checklist

Physicians' and nurses' awareness of telemedicine

Among the included studies, all in developing countries, five have evaluated health specialists' awareness of telemedicine [26, 30, 31, 33]. Only one study addresses nurses and reports their moderate awareness [33]. Three studies document high telemedicine awareness of healthcare specialists [26, 30, 31], and two uncover healthcare specialists' moderate awareness of telemedicine [32, 33].

In their research, Zayapragassarazan & Kumar [26] show that telemedicine awareness is low for 12%, moderate for 25%, and high for 63% of the respondents. The maximum telemedicine awareness belongs to the 30-40-year age group. Moreover, Kumar *et al.* [31] Considering the perspectives of 183 participants, express that telemedicine can save time for healthcare specialists and physicians. In contrast, Sukumaran *et al.* [32] discover moderate telemedicine awareness among the majority of their participants (431 individuals), and 19 physicians maintain poor awareness. In the current COVID-19 scenario, many medical webinars and seminars are held remotely worldwide. A total of 249 participants believe in the training of specific software for telemedicine practices. Almost 262 individuals are concerned with the complaints about arising problems for patients during telemedicine operations. The researchers also have found a weak positive and significant correlation between awareness and skill scores (Pearson correlation=0.20; P<0.0001). Furthermore, Fouad *et al.* [33] report moderate telemedicine awareness of their participants and show telemedicine awareness maintained statistically significant relationships with being heard of the telemedicine terminology and the spent time. On the other hand, they have found out telemedicine awareness had statistically significant relationships with the benefits of providing mental health services remotely, reasons for using remote mental health services, reasons for not employing telemedicine, and using telemedicine for specific cases. Assaye *et al.* [30] have discovered that telemedicine awareness is strongly related to knowledge, such that healthcare professionals are aware of telemedicine services. In this respect, 77.1% of the participants are aware of the clinical telemedicine uses for radiology, and 51.6% are aware of the conventional uses of public health in the telemedicine domain. Teaching about telemedicine is strongly associated with awareness of telemedicine services in this study. Those receiving telemedicine training are likely 2.33 times more aware of telemedicine services than untrained ones. Another factor influencing telemedicine awareness was access to computers in hospitals where health specialists worked. Those accessing computers in their hospitals were apparently 1.42 times more aware of telemedicine than those not accessing this technology.

Physicians' and nurses' knowledge of telemedicine

Ten examined studies, all in developing countries, evaluated health specialists' knowledge of telemedicine [21-24, 26-28, 30, 32, 33]. Seven studies reported high and excellent telemedicine knowledge and its application [21-23, 26, 27, 30, 32]. Only one studies investigated nurses and reported their moderate knowledge and sufficient experience in employing telemedicine equipment [25]. Among these studies, one documented moderate knowledge [33], and two found poor telemedicine knowledge of healthcare specialists. In conclusion, they argued that constant education and meetings and conferences held on telemedicine were among the helpful approaches to knowledge enhancement [24, 28].

Richards *et al.* [21] have reported that many general practitioners consider the effect of counseling on patient privacy useful (44%), and only one-fourth claimed its detrimental impact (13%). 44% hve positively evaluated access to general practitioners, and just one-third hold positive attitudes toward the effect of counseling on patient privacy (16%). 32% consider it harmful, and 21% agree that e-health increases enjoyment. Meher *et al.* [22] report that the majority of their participants possess high knowledge, while a few lack any knowledge of telemedicine in large and remote hospitals. Ibrahim *et al.* [23] have found out that many of their respondents employ CD-ROMs (82%), emails (84%), and modems (76%), while more than three-fourths of

the respondents are inexperienced in using smart cards, Computer-Assisted Learning (CAL), tele-radiology, tele-surgery, telenursing, and tele-pharmacy. On the other hand, their general awareness of the components are 82% for CAL, 66% for telenursing, 57% for tele-surgery, 55% for tele-radiology, 55% for tele-pharmacy, and 46% for smart cards. Likewise, Zayapragassarazan & Kumar [26] have reported that 41% of the respondents lack proper knowledge, 35% are devoid of fair knowledge, and 24% maintain inadequate knowledge of telemedicine. Assaye *et al.* [30] discover that 57% of health specialists maintain high knowledge, and 56.4% hold moderate knowledge of telemedicine. Also, 36.7% (151 participants) of the respondents are informed of telephone communications, 28.47% (117 respondents) of online communications, and 15.33% (63) of live communications. Males maintain 1.73 times more knowledge of telemedicine services than females. Hence, health specialists in hospitals with IT support employees are 1.87 times more knowledgeable than their peers in hospitals lacking IT support staff. Another factor affecting health professionals' knowledge of telemedicine services is the culture of information sharing. Health professionals with an information sharing culture were three times more likely than those without an information sharing culture to have a good knowledge of telemedicine services. Information source was another factor associated with telemedicine knowledge. Health specialists using the internet as their source possessed 1.80 times more information than their peers. Besides, telemedicine awareness was strongly related to knowledge, i.e., those specialists who were aware of telemedicine services probably maintained 1.35 times extra knowledge than their unaware counterparts. Kumar *et al.* [31] assert that a total of 112 participants (52.8%) have worked with telemedicine equipment. The Internet (90, 42.4%) and public media (9, 55.25) were the main sources of telemedicine information. Concerning the tools of the telemedicine era, tele-counseling (120, 56.6%) and teleportation (1, 0.47%) were the most and least known tools. In addition, Ashfaq *et al.* [27] have found out that many physicians maintained high awareness (80.7) and moderate knowledge of telemedicine. For this reason, a large number (98.2%) have complained about the lack of conferences and meetings on telemedicine in their workplaces, leading to inadequate awareness of telemedicine guidelines. They believe that constant training is necessary for physicians, who should be equipped with the latest telemedicine advancements. On the other hand, physicians' perceptions of telemedicine support, development, and research are high. A considerable number of specialists had employed telemedicine for telephone counseling with physicians. Doctors found that telemedicine helped reduce transportation and hospitalization costs for patients who could be treated with a monitor while sitting in their homes. However, 42.9% of the physicians averagely believed that telemedicine distorted the doctor-patient relationship, violated patient privacy, or raised costs. In contrast, Ayatollahi *et al.* [24] reveal that many physicians' knowledge of telemedicine technology is considerably low (1.75±0.51). They believe that continuous training in telemedicine utilization would be the most efficient approach to raising their knowledge of telemedicine. Among physicians, pharmacists maintained higher knowledge of telemedicine applications than other doctors and dentists (1.14±0.37). Physicians' perceptions of the benefits of telemedicine were moderate. The maximum average belonged to the reduction in unnecessary transport costs, and the minimum average was associated with the general familiarity of physicians with telemedicine benefits. Concerning the reduction in unnecessary transport costs, nurses and pharmacists had the highest and lowest means, respectively. Likewise, Albarrak *et al.* [28] report that 46.1% of the participants hold low knowledge of telemedicine technology among various special relationships. Also, this study shows that 53.1% of the specialists are unfamiliar with telemedicine tools and their medical uses and technology. Interestingly, 69.5% reported that a few conferences, lectures, or meetings were held on telemedicine technology in their workplaces. On the whole, 77.4% of the specialists asserted that constant education was indispensable for telemedicine application (p=0.01).

Physicians' and nurses' skill in telemedicine

Among examined studies, three evaluated healthcare specialists' skills in telemedicine technology in developing countries [25, 26, 32]. Two of these studies reported moderate skills of specialists in telemedicine [25, 32], and one found that healthcare specialists were unskillful in applying telemedicine and its related equipment [26].

Olok *et al.*'s [25] study reveals that the ICT skill of the respondents is moderate (mean=3.66) and differs in all applied ICT programs and facilities in hospitals. It is also the most significant predictor of ICT application in healthcare. However, the results showed that the skill level for the real use of the ICT tool was slightly better than other cases. Just as this tool was highly used for accessing mobile phones, the mean score of the respondents was also high in using computers and their axillary equipment. Yet, whether these observed differences in the use and real utilization of ICT tools reflect the degree of access to this equipment in physicians' workplaces in northern Uganda or not is unclear. Sukumaran *et al.* [32] report that the telemedicine skill of specialists is moderate (68.22%), good (27.85%), and poor (3.92%), and females' moderate skillfulness (72.39%) is higher than males' (61.72%). Likewise, the telemedicine skills were significantly different among physicians with various years of experience (0.025), and a larger number of doctors with 5-10 years of experience

were poorly skilled compared to others. On the whole, 374 participants knew that the first consultation of patients with registered doctors was called the first counseling, and all knew that medical records should not be sent to the medical council every counseling session. Only 198 respondents knew that the first counseling session was considered for patients consulting with doctors earlier but over six months ago. Only 246 knew that patients had consulted with doctors earlier, but the first counseling was considered for their different health conditions. Generally, 401 participants knew that the next counseling might be in the case of a chronic disease or a treatment, such as re-prescribing or changing drugs when in-person counseling was unnecessary.

On the contrary, Zayapragassarazan & Kumar's [26] study on the telemedicine skills of respondents shows that 19% have been highly skilled or expert, 25% maintained moderate skills, e.g., learners or beginners, and 56% are unskilled in using telemedicine and its associated equipment. The maximum and minimum mean scores for telemedicine skills belonged to paraclinical (25.14±3.58) respondents and the 41-50-years aged group (22.10±4.56), respectively.

Table 4. Summary of characteristics of studies

Source (country year)	Study purpose	Type of research instrument	Results
Scotland, 2004 [21]	Understanding current uses and attitudes toward e-health in remote regions of Scotland	Postal questionnaire	Although first healthcare specialists detect the advantages of e-health, they hold poor perceptions. Considering the geographical barriers to the e-health perception in remote locales, broader policies should be informed about its implementation for initial care
India, 2009 [22]	Examining awareness and attitudes toward telemedicine among physicians and patients	Observation and questionnaire	Indeed, hospital educational programs that help the future use of telemedicine should be organized for physicians
Malesia, 2010 [23]	Assessing the preparedness of the country's healthcare professionals for accepting and providing telemedicine services, accessing perceptions and attitudes toward telemedicine, and acquiring telemedicine knowledge factors	Questionnaire	Many respondents mentioned that they had sound computers, and their access to internet and software packages was important to them. Nearly half of the respondents felt that computers were pivotal for their profession. Many used CD-ROMs and emails. Generally, they were less inclined to work in rural regions for a telemedicine project
Iran, 2015 [24]	Comparing telemedicine knowledge and perceptions among different physician groups	Questionnaire	It seems that physicians' limited knowledge of telemedicine impacts their conceptions of technology. Thus, providing further information to healthcare professionals about their perceptions of new healthcare technologies, such as telemedicine, can help attain a more real conception
Uganda, 2015 [25]	Determining the relationships among healthcare specialists' attitudes toward e-health, ICT skills, and use of e-health in providing care in state and private hospitals of Uganda	Questionnaire	The results show hospital management's need for reinforcing e-health service delivery in northern Uganda
India, 2016 [26]	Assessing telemedicine awareness, knowledge, attitudes, and skills among health professionals working in the educational hospitals of the Puducherry region of India	Postal questionnaire	The results show that although the respondents' telemedicine experience and knowledge are limited, many hold positive attitudes toward telemedicine. Thus, teaching faculties, employed physicians, assistants, medical students, and other health specialists about telemedicine and its application problems is now imperative
Pakistan, 2020 [27]	Assessing telemedicine knowledge and perceptions among healthcare professionals	Questionnaire	Telemedicine knowledge was moderate among physicians in Karachi. However, perceptions and attitudes toward introducing and implementing this new technology welcomed by many participants are necessary, with an emphasis on raising the awareness of educational conferences and workshops for enhancing knowledge in this respect
Saudi Arabia, 2021 [28]	Assessing telemedicine knowledge and perceptions and its applications among physicians and evaluating their willingness to adopt clinical telemedicine measures	In-person questionnaire	Although many specialists possessed two or more smart devices or communicated with patients through emails or social media, their knowledge of telemedicine was low. In addition, many participants manifested positive perceptions of telemedicine and tended to accept it in clinical operations. The main reported barriers to telemedicine acceptance were privacy-associated issues, lack of education, and ICT problems
Sweden, 2021 [29]	Investigating physicians' telemedicine experience by focusing on probable explanations for the intention-use gap through the analysis of open-question surveys	In-person questionnaire	All medical tools should be assessed in terms of their clinical utility for patients, and their safety and impacts on the work volume of employees and final users should be incorporated into this process. When digital caregiver-patient solutions are introduced, how the benefits of in-person contacts are preserved should be attended to maximally

Continue of Table 4 from the last page.

Ethiopia, 2022 [30]	Determining health specialists' knowledge and awareness of telemedicine in the northwest of Ethiopia	In-person questionnaire	More than half of the participants were well aware and familiar with telemedicine programs. Possessing information sources, ICT support employees, and information-sharing culture, gender, and awareness were significant for telemedicine services. Telemedicine knowledge and training and access to computers were chief factors in specialists' awareness of telemedicine. Hence, health professionals should receive proper and continuous informative education in telemedicine systems
Pakistan, 2022 [31]	Measuring healthcare specialists' awareness and attitudes toward using telemedicine in rural areas of Sindh, Pakistan	In-person questionnaire	Telemedicine has technologically revolutionized medicine. Healthcare specialists' telemedicine awareness and utilization were appropriate in Sindh. Telemedicine should provide high-quality health services in underprivileged regions and is applied through infrastructural investment and education
India, 2022 [32]	Assessing the awareness and skill of physicians who applied modern medicine during the Covid-19 epidemic	Questionnaire	Although the skills and awareness of physicians following modern medicine were desirable, their knowledge promotion necessitated holding more webinars and workshops. Telemedicine is an emerging technology in the health sector of India. Hence, gaining knowledge of the telemedicine awareness and skills of health professionals calls for further investigation
Egypt, 2023 [33]	Measuring telemedicine awareness, knowledge, attitudes, and skill among mental health providers	Questionnaire	These researchers concluded that the examined mental health providers had high attitudes, while other considered variables (awareness, knowledge, and skill) were moderate. Psychiatrists held high levels of the examined variables (awareness, attitudes, knowledge, and skills), while psychologists and nurses enjoyed the lowest levels of these variables

* ICT: Information and Communications Technology

Table 5. Summary of included studies

Source (country year)	Attitudes of telemedicine	Awareness of telemedicine	Knowledge of telemedicine	Skill of telemedicine
Scotland, 2004 [21]	69% of the participants properly evaluated obtaining results from the Internet. 64% considered improvement in patient care as the paramount factor in e-health implementation. General practitioners were using e-health more than nurses	-	Many general practitioners evaluated that the quality of video counseling was useful (46%). One-fourth of physicians considered its detrimental impact on patient privacy (13%). One-third of the nurses evaluated that the quality of video counseling was useful (16%), and 32% believed in its detrimental impact on patient privacy	-
India, 2009 [22]	Many of the physicians were aware of telemedicine, and a total of 86 physicians used telemedicine. Many declared their willingness to cooperate with other centers	-	A few physicians revealed their lack of telemedicine knowledge in large and remote hospitals	-
Malesia, 2010 [23]	-	-	More than three-fourths of the respondents were inexperienced in using smart cards, Computer-Assisted Learning (CAL), teleradiology, telenursing, and telepharmacy	-
Iran, 2015 [24]	Dentists' knowledge of this technology is lower than other groups. Thus, they were less positive about the advantages of telemedicine compared to nurses and general practitioners	-	-	-
Uganda, 2015 [25]	Many healthcare specialists held positive attitudes toward e-health (mean=3.5)	-	-	The participants' skill level was moderate (mean=3.66) and was the most significant predictor of ICT utilization in healthcare
India, 2016 [26]	39% of the respondents had high attitudes toward telemedicine	63% held high awareness of telemedicine	41% of the respondents possessed proper knowledge of telemedicine	56% were unskilled in using telemedicine and its related equipment

Continue of Table 5 from the last page.

Pakistan, 2020 [27]	The participants' carried moderate perceptions. 80.7% of the physicians were aware of the telemedicine definition, and 28.1% believed that telemedicine was effective in fast service provision	-	-	-
Saudi Arabia, 2021 [28]	-	-	46.1% of the participants held low knowledge of telemedicine technology among various relationships specific	-
Sweden, 2021 [29]	The participants expressed generally positive attitudes toward the surge of digitalization	-	-	-
Ethiopia, 2022 [30]	-	77.1% of the participants were aware of the clinical uses of telemedicine for radiology, and 51.6% were aware of the conventional application of public health in the telemedicine domain	With a response rate of 411 (97.2%), about 56.4% and 57.4% of the participants held moderate and high knowledge of telemedicine, respectively	-
Pakistan, 2022 [31]	The respondents agreed that telemedicine could expand (141, 66.5%), and the interrelationships of healthcare providers could decrease the number of references to health centers (151, 71.2%)	187 participants (88.2%) were aware of the effect of telemedicine on healthcare provision	The highest and lowest knowledge of tele-counseling were 56.6% (120) and 0.47% (1)	-
India, 2022 [32]	-	The majority of the participants (431, 80.56%) maintained moderate awareness, and 19 physicians (3.55%) were poorly aware of this technology	-	365 participants (68.22%) were moderately skilled, and only 21 individuals (3.92%) were unskillful. The rest (149, 27.8%) held moderate skills
Egypt, 2023 [33]	Knowledge and attitudes increased among ≤30-year-old individuals, and those aged ≤30 and >50 manifested no significant differences	The average relationship between telemedicine awareness and the following factors (being heard of telemedicine and the spent time) was statistically significant	Moderate	Moderate

* CAL: Computer-Assisted Learning

Discussion

The present systematic review aimed to synthesize the best research evidence on the telemedicine attitudes, awareness, knowledge, and skills of physicians. In this respect, it identified 13 studies meeting the inclusion criteria. All these studies were cross-sectional and evaluated health specialists' attitudes, knowledge, awareness, and skills in telemedicine. The results of this investigation revealed that health specialists held positive and promising attitudes toward telemedicine for education, treatment, and care. Furthermore, many studies reported above-moderate and desirable telemedicine awareness, knowledge, and skill among specialists. In this regard, a systematic review of the telemedicine attitudes, awareness, and knowledge of medical students showed that the subjects maintained positive and promising attitudes toward telemedicine technology for education, treatment, and care. However, their knowledge level was low, and many had passed no educational courses. Such results can pave the way for the commitments of policymakers in the health, education, digital health empowerment, and telemedicine literacy domains to medical students as the main players of social health [34].

According to our outcomes, seven cases of the examined studies evaluated specialists' attitudes toward telemedicine and reported their participants' positive and promising attitudes [21, 22, 25, 26, 29, 31, 33].

In their recent study in Saudi Arabia, Bashir *et al.* [35] report the positive attitudes of the participants toward telemedicine and have found out that education and nationality minimally contribute to health specialists' attitudes toward this technology. They also assert that the proper attitudes of medical specialists toward this technology shape a compulsion enabling telemedicine implementation broadly. In America, Barton *et al.* [36] argue that urban regions use telehealth more than rural areas ($p<0.001$), and rural/border patients considerably maintaine lower attitudes than urban patients. Extra

video calls by urban providers and telephone calls by rural/border providers highlight the difference between urban and rural areas in telemedicine access and attitudes. Thus, several factors, such as the perceived application facility, perceived utility, and facilitative conditions can enhance the acceptance of the mobile health system. Therefore, it is recommended that these factors be considered in planning to implement these systems [37]. Willingness to apply telemedicine may also be influenced by attitudes toward this technology, attitudes toward the doctor-patient relationship, and the anxiety level of the technology [26].

Hence, it seems that regional differences and the passing of time with diverse problems and limitations did not drastically influence specialists' attitudes. On the other hand, according to the findings of the present review, there were no observable differences in the results of studies on attitudes in developed and developing countries since both revealed high and positive attitudes. However, since only one examined study was carried out in a developed country, this claim needs further investigation to be proven. Yet, the outnumbering of studies in developing countries (16 cases), compared to developed nations, indicates further attention to telemedicine technology in developing and low-income countries. In this regard, Owolabi *et al.* [38] examine telemedicine applications and expansion for surgery in low- and moderate-income countries and discover that telemedicine is expanding in less-developed and low-income countries and platforms, such as WhatsApp, WeChat, phone calls, and bilateral messages were used for post-surgery follow-up and education.

On the other hand, according to the physicians employed in high-care hospitals and clinics in Karachi, the current problem in first-world countries in telemedicine operation is physician accreditation, which may cause resistance to telesurgery, while many doctors agreed that the problems in third-world countries were related to the lack of adequate profit, internet connections, and education [27].

Five examined studies evaluated health specialists' awareness of telemedicine. Three of these studies reported high telemedicine awareness among respondents [26, 30, 31]. A study in Ethiopia documents that specialists' awareness is significantly associated with computer-related training, technical skills, experiences in supporting patients with ICT tools, and work experiences ($p<0.05$) [39]. In contrast, two studies reported moderate awareness of telemedicine among their participants. Telemedicine unawareness is one of the causes of physicians' unwillingness to provide telemedicine services [32, 33]. In their recent research, Purba *et al.* [40] report moderate telemedicine awareness of nurses in Indonesia (76%). Moderate awareness, self-confidence, and perceived attitudes indicate the need for improving educational programs through training and work experiences. Likewise, telemedicine raises nurses' knowledge and trust in developing positive attitudes toward the telemedicine concept. An Iranian study reports low awareness of care providers, especially among ICU nurses. The participants cast doubts about the positive or negative impacts of telemedicine but agree on its negative effect on the privacy of patients and caregivers [41].

In another Iranian study, Sheikhtaheri *et al.* [42] examine clinical employees' readiness, awareness, and attitudes toward telemedicine and show that awareness is higher in nurses and doctors than in other examined groups. Also, another study reports that health specialists' awareness of telemedicine is strongly associated with their knowledge, and the use of the internet as an information source increases knowledge 1.8 times more than other sources [30]. The results of this study were in line with the findings of a quest in Bangladesh, where many students used the Internet for health decisions [43].

Ten examined studies evaluated health specialists' knowledge of telemedicine. Seven of these inquiries reported that healthcare professionals held appropriate and high knowledge of telemedicine applications [21-23, 26, 30, 32], two studies documented moderate knowledge of its participants [27, 33], and one study reported low knowledge [24]. Therefore, the most significant organizational barrier to attracting e-health is the lack of proper perceptions among specialists and, in particular, nurses [21]. This issue can be solved by implementing Continuing Dental Education (CDE) and informing programs that help at different levels [44].

Three examined studies assessed health specialists' skills in telemedicine and mostly reported moderate telemedicine skills, perhaps due to the participants' low self-confidence and perceptions. They also revealed that physicians with varying working experiences were significantly different in their telemedicine skills (0.025) [25, 32]. Another study in Lebanon reports that respondents with professional computer skills considerably maintain high awareness ($p<0.001$). Thus, it is imperative to train and support healthcare employees and initiate programs that provide sufficient and supportive health services to patients in developing countries [1]. Only one study found that the participants' unskillfulness in applying telemedicine and its related equipment and emphasized the necessity for informing programs, specialist training, and the organization of educational hospital programs facilitating telemedicine use in the future for all physicians [26]. Therefore, the lack of ICT knowledge, unreliable ICT equipment, high ICT cost, the low skill of potential users, limited access to ICT, and unwillingness to employ e-health in healthcare services were reported as the challenges of ICT

utilization [25]. Thus, constant informing programs may be significant in improving applied telemedicine programs in healthcare [23].

In addition, many of the included studies suggested holding educational workshops and webinars on telemedicine and informing about its associated equipment and infrastructures to enhance health specialists' awareness, knowledge, and skills [21, 22, 25, 27, 28, 30-32]. In this regard, Mousavi Baigi *et al.* [16] and Ftouni *et al.* [45] examine the challenges of telemedicine during the Covid-19 epidemic and find out that education is one of the challenges of telemedicine application. Therefore, the correct utilization of telemedicine highlights the provision of training to health providers and patients [46].

Conforming to our results, Naqvi *et al.* [47] have investigated care providers' knowledge and attitudes toward telemedicine during the Covid-19 epidemic through global surveys from WHO-listed countries and have reported that the respondents possessed positive attitudes toward telemedicine. 80% thought that telemedicine reduced the work volume of employees, and 40.5% believed that telemedicine threatened information confidentiality and patient privacy. Hence, they concluded that an optimistic scope existed for introducing remote working systems worldwide after providing suitable healthcare training [47]. Likewise, Emami Zeydi *et al.* [48] systematically have reviewed nurses' awareness and attitudes toward telemedicine and report the positive attitudes of nurses, 56% of whom are desirably aware of this technology. Also, nurses' awareness and attitudes were significantly and directly associated. Hence, they concluded that one of the paramount components of telemedicine in nurse education was to raise their awareness.

Also, Mousavi Baigi *et al.* recently have conducted a systematic review with the aim of investigating the attitude, knowledge, and skills of health students in the field of artificial intelligence. The results of their study show that healthcare students have a positive and promising attitude toward artificial intelligence in medicine. However, most students have little knowledge of and limited skills in working with artificial intelligence [49]. Recently, many studies have been conducted in order to investigate the impact of telemedicine, telerehabilitation, and various methods of providing health and medical services based on technology, which proves their effectiveness, safety, and efficiency [50-53]. However, the lack of knowledge and skills of specialists and nurses as the main users of these services hinders significant progress in the health of society in the first place, and from a broader perspective, it hinders progress in the economies of countries. Spending the right amount on health services, especially telemedicine services, which empower patients to self-manage and prevent various diseases, prevents additional expenses later. Therefore, investing in the knowledge, awareness, and skills of students and healthcare professionals can be a powerful approach for further development [34, 49, 54-58].

In sum, the findings of this study indicated that health specialists maintained positive and promising attitudes and above-moderate awareness, knowledge, and skills, while many of the included studies asked for passing related courses on telemedicine. Thus, we suggest providing educational fundamentals, workshops, and classes about telemedicine, informing through media campaigns, and encouraging the treatment cadre to raise awareness.

Strengths and limitations

Among the limitations of this study, we can refer to the studies published in languages other than English and thus ignored in this review. Also, the differences in the specialty of the participants, the publication year of the studies, and the examined context, culture, and gender, as well as the degree of access to IT specialists in various places, may lead to bias in the results. Furthermore, the included studies employed various questionnaires with different items. Thus, one study might have questioned primary telemedicine knowledge and skills, e.g., working with emails and WhatsApp, and another interrogated the knowledge and skill in working with intricate telemedicine tools, such as artificial intelligence, working with robot surgeons, etc., and reported low knowledge of the participants. Thus, future studies are suggested to examine and assess an international survey with a standard and identical questionnaire to confirm the evidence of this systematic review. However, this research was the first systematic review evaluating the telemedicine attitudes, awareness, knowledge, and skills of health specialists that were the key players in the health system of countries and provided valuable perspectives to policymakers and planners.

Conclusion

Health specialists held positive and promising attitudes toward telemedicine. Telemedicine awareness, knowledge, and skill among health professionals is above-moderate and desirable.

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