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Telemedicine Adoption in Developing Economies: A Systematic Review on the Enablers and Barriers

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Abstract

Telemedicine's adoption has been effective in certain contexts despite being controversial in certain settings because of its tendency to cause misdiagnosis and concerns about data privacy. This study aimed to synthesize the research findings on the factors leading to the adoption of telemedicine among developing economies. The study utilized Preferred Reporting Items for Systematic Reviews and Meta-Analysis methodology to analyze 27 related literature and the Unified Theory of Acceptance and Use of Technology to map out the factors considered enablers and barriers in adopting telemedicine. Results showed that performance expectancy, effort expectancy, social influence, and facilitating conditions were significant predictors. However, the study also underscored that the lack of information and communications technology support, lack of resources, lack of organizational effectiveness, lack of quality care, lack of motivation, lack of trustworthiness, and lack of user satisfaction were predominant hindrances at both individual and organizational levels. This analysis on the enablers and barriers of telemedicine adoption hopes to contribute strategic recommendations that practitioners in public health, decision-makers in global health policy, technology developers, and future research may explore to expand the existing knowledge on the optimal adoption of telemedicine in developing economies.

Keywords: barriers, enablers, technology adoption, telehealth, telemedicine

Introduction

Advancements in technology have paved the way for more innovative means of delivering health services. Using information and communications technology (ICT), telemedicine provides remote healthcare services to patients as it diversifies its delivery and improves patient access to health professionals in the communities.[1,2] Telemedicine is categorized as either clinical or non-clinical based on its application. The clinical application of telemedicine encompasses the diagnostics, treatment management, and other medical modalities involving patient care, while non-clinical application involves continuing medical education, medical meetings not involving patient care, and management or administrative conferences.[2,3] Discussions on telehealth initially started with the use of telephones to lessen unnecessary clinic consults and later progressed to the diagnosis and management of patients via radio.[4] Advancements in technology and telecommunication gave rise to the modernization of telemedicine, allowing healthcare providers to monitor patients with chronic illnesses remotely.[4] The incorporation of telemedicine in the global healthcare unit has been associated with increased quality of patient care, better access to health services, and better patient outcomes.[4]

The COVID-19 pandemic presented a challenge to health professionals in providing patient care, controlling and preventing diseases, and delivering health services during lockdowns and limited face-to-face interactions. The shift of paradigms from face-to-face consults to teleconsultations during the COVID-19 pandemic prompted specialized fields to expand their telemedicine services to connect patients with the healthcare team.[4-8]

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Before the pandemic, patients and health professionals hesitated to use telemedicine due to a preference for in-person consultations and the belief that healthcare technology was unnecessary and inferior to personal clinic visits. The resistance of users to change has also hindered the adoption of telemedicine in the pre-pandemic years,[4,5,8,9] indicating that numerous factors affect telemedicine adoption. Conversely, the use of digitized media has exponentially proliferated during the onset of the pandemic, and an increase in virtual visits was observed. The mandate for physical and social distancing has exposed disparities in healthcare access, prompting health professionals and patients to adopt telemedicine and recognize its cost and time-saving benefits.[7-9]

In developing economies such as Pakistan and Iran, the lack of government and financial support often results in poor healthcare delivery services. This further prevents developing economies from investing funds towards the establishment of telemedicine.[5,8] In 2020, driven by the COVID-19 pandemic, discussions on the opportunity and applications of telemedicine in a national interest vastly emerged.[10,11,12] However, due to a lack of technological infrastructure, support, and experienced health professionals, institutionalization and maintenance of telemedicine programs have been proven difficult.[10,11,13,14] These challenges have caught the attention of researchers who want to understand developing economies' struggles in adopting telemedicine.

There is also inadequate research on the comprehensive synthesis of telemedicine adoption among developing economies whose ICT infrastructure and healthcare systems are not as established as those in developed economies. This study aimed to synthesize research findings pertinent to telemedicine deployment by conducting a comprehensive review of telemedicine adoption and identifying factors influencing its adoption by intended users. This study contributes significantly to telemedicine by providing a comprehensive and in-depth review of telemedicine implementation in developing economies. By focusing on pre- and post-adoption phases, this study offers valuable insights that will enhance understanding among academic and information systems researchers, support public health practitioners, and inform decision-makers in public health policy. This ultimately leads to a broader goal of equitable healthcare access.

Method

This systematic review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) methodology to determine qualified related literature that will serve as the basis for future scientific work and Venkatesh's Unified Theory of Acceptance and Use of Technology (UTAUT) to determine the behavior of users towards telemedicine adoption. The procedures used in identifying, selecting, processing, and interpreting information for the structured review were to critically assess the overall validity and reliability of the study. The 2020 PRISMA was utilized similarly to the previous review study on COVID-19, wherein the literature was mined to narrow the qualified articles used in this study (Figure 1).[10-11,15] Several keywords (including "Telemedicine*," OR "Telemedicine in developing economies*," OR "Telemedicine in developing economies during COVID-19*") were searched to determine the relevant articles. These words were often used by other researchers, and approximately 153,000 results were found using these search terms on Google Scholar.[5,13,14,15-18]

As this study serves as an overview of the pre- and post-adoption of telemedicine, only papers in English and published within the past 12 years (2013–2024) were included in the search and produced 17,600 results. The total number of publications was further reduced to 9,040 by limiting the study's focus to reviewed articles, thus yielding 152 articles. These were then stored in a Google Drive-created literature bank after matching the phrase to the article's abstract, title, or keywords. A journal assessment matrix in a tabular form was used as a tool to filter the journals by profiling their title, year, authors, hypotheses, problem statements, objectives, methodologies, results, and the merits of the researchers with regard to their respective journal to form a directory of qualified articles. The relevance of each article to the study's goals was then considered while choosing the 60 papers that were afterward categorized according to their themes. Moreover, upon verifying that each paper should be indexed in both Scopus and Web of Science (WoS) Journals, only 27 articles identified technology users as either patients, health professionals, or both.

The 27 journal articles were then profiled by the authors to create an overview of their backgrounds in the study. A ground-up approach was utilized through inductive coding. The codes were derived from filtering each journal article, starting with the abstract and then the conclusion, results, discussions, methodology, and introduction. Thematic groupings were created based on the data presented in the articles. This led to many groups, including telemedicine in the COVID-19 pandemic, telemedicine: healthcare professional perspective, organizational roles and barriers and implications on telemedicine adoption, ethical and legal issues in telemedicine, telemedicine in rural areas, and patient-centric telemedicine. To address the bias in conducting systematic reviews, a comprehensive literature search was done

utilizing multiple databases. More than two independent reviewers screened the studies for inclusion, extracted the data, and assessed for quality. Limitations of the study were reported.

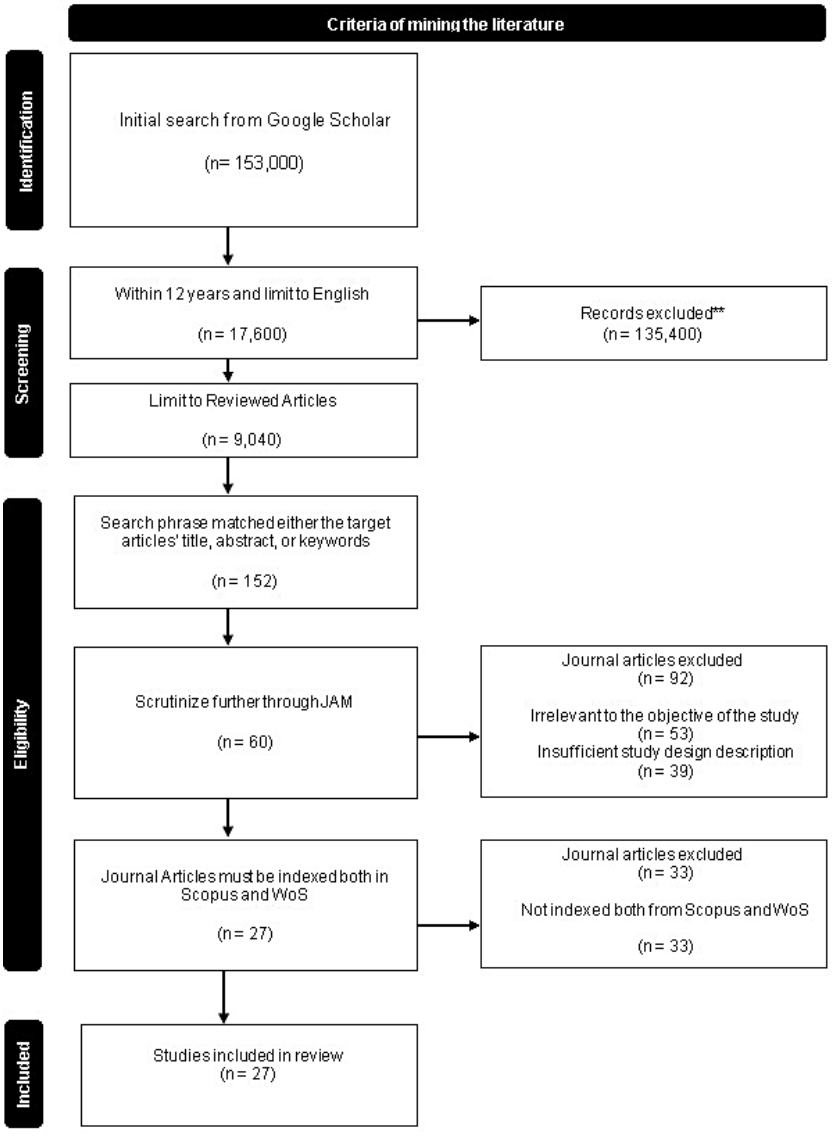

Figure 1. PRISMA Flowchart

After tallying the papers assigned to each thematic group, it was determined that several studies used Venkatesh's UTAUT.[10,16-18] However, these studies had not been synthesized. The UTAUT model was used to link the synthesized factors specified in the discussion section of each article. These factors were then grouped by identifying the enablers and barriers influencing telemedicine adoption. This was done by analyzing each discussion section of the research articles, storing enablers and barriers in separate boxes, and linking them in relation to the adoption of telemedicine. The UTAUT model is reliable and valid in the context of telemedicine systems since the model has been tested in numerous studies across various populations and technologies, showing consistent results and maintaining its key constructs, which are performance expectancy, efforts expectancy, social influence, and facilitating conditions that reinforce its applicability and robustness.[16-18]

After profiling and identifying the determinant factors for adopting telemedicine, the third goal of this study was to establish the gaps to develop potential research topics for future use. To address these gaps, inductive coding was performed by identifying patterns, themes, and categories in textual data to analyze the recommendation section of each research. This process was done to identify the common limitations of previous studies.[19] Mind mapping, a visual brainstorming technique for organizing and structuring ideas, was used to categorize the identified recommendations

into themes.[19] Mind mapping involves creating a diagram of interconnected concepts, words, or phrases that all relate to a central idea following the limitations explicitly stated by authors in their journals. This served as a guide for formulating possible future research topics which are needed to be further explored and are deemed to be both relevant and valuable in the field of telemedicine.[19-20] In examining the 27 journal articles, the authors focused on the conclusion section. The outcome of the results might depend on the conclusion section if the study's limitations and recommendations were specified.

Results

The determinant factors mentioned in most articles that influenced the intention and use of telemedicine among developing economies were performance expectancy, effort expectancy, facilitating conditions, and social influence. These determinant factors were noted to be of significance as they impacted users' behavior positively towards the use of telemedicine in seven studies reflecting the same results (Figure 2).[16-18,21-24] Demographic variables such as age, sex, experience, and voluntariness of use significantly impacted these factors, so healthcare organizations should consider them when targeting and promoting telemedicine services, as they may influence the effectiveness of key constructs.

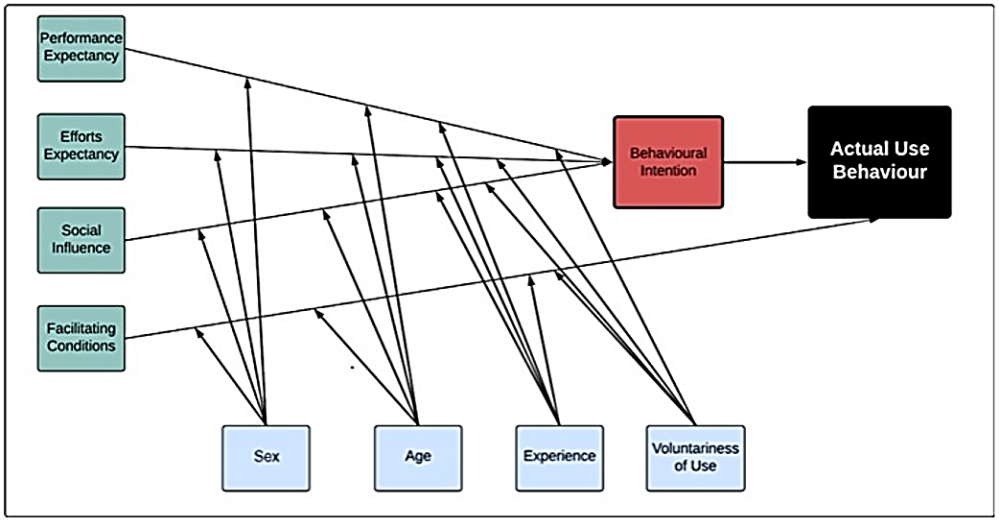

Figure 2. The Unified Theory of Acceptance and Use of Technology Developed by Venkatesh

This study identified four primary enablers (Table 1): performance expectancy and effort expectancy, having the highest count of seven, facilitating condition, and social influence. Performance expectancy is one's belief that using a particular technology will help them achieve their desired goals. Effort expectancy is concerned with the perceived convenience and ease of use of technology, while social influence reflects the extent to which one perceives the opinions of others regarding technology use. Facilitating conditions focuses on the perception of the availability of organizational support and technical infrastructure.

Table 1. Enablers of Telemedicine Technology Adoption in Developing Economies

Enablers	References	Count	Enablers	References	Count
Performance Expectancy	[16], [17], [18], [21], [22], [23], [24]	7	Attitude	[17], [27], [28]	3
Effort Expectancy	[16], [17], [18], [21], [22], [23], [24]	7	Computer self-efficacy	[17], [18]	2
Facilitating Condition	[16], [17], [18], [21], [22], [24]	6	Awareness	[19], [23]	2
Social Influence	[16], [17], [18], [21], [22]	5	Information Quality, System Quality	[17]	1
Self-Efficacy	[18], [20], [24], [27]	4	Service Quality	[17]	1
Perceived usefulness and perceived ease of use	[24], [25], [27], [28]	4	Perceived Vulnerability, Perceived Severity Response Efficacy	[17]	1
Legal and Ethical Concern	[25], [26], [30]	3			
Policy and Standard	[25], [26], [30]	3	Perceived Behavioral Control	[29]	1
Software Standards, National Policies, Data Security, Information and Communication Technology	[25], [26], [30]	3	Plasticity	[29]	1
Information Security	[25], [26]	2	Technological Characteristic	[18]	1
Information Privacy	[25], [26]	2	Task Characteristics	[18]	1
Information Policy	[25], [26]	2			

The determinant factors were further broken down into five enablers that have been shown to influence one's behavior toward adopting the technologies used in telemedicine. These enablers, as shown in Table 1, are as follows: self-efficacy, perceived usefulness and ease of technology use, legal and ethical concerns, policy and standard of practice, which involves information policy, information security, information privacy, software standards, national policies, data security, ICT, and user attitude.

Telemedicine has been gaining significant attention in the global healthcare sector, where it plays an essential role in improving healthcare access and outcomes. It is considered a complicated and multifaceted issue among developing economies as it is influenced by factors at the individual and organizational levels, as shown in Table 2. Several studies conducted in different developing economies have investigated the factors that acted as barriers to telemedicine. There were seven identified most common barriers to telemedicine adoption: lack of ICT support, lack of resources, lack of organizational support, lack of quality care, lack of staff motivation, lack of trustworthiness, and lack of user satisfaction. This review found that the lack of ICT support, including insufficient infrastructure, government assistance, training, and technical support, significantly hinders the adoption of telemedicine technologies because it restricts the users' capacity to utilize the said technologies.

Table 2. Barriers to Telemedicine Technology Adoption in Developing Economies

Barriers	References	Count	Barriers	References	Count
Lack of ICT support	[6], [7], [8], [9], [28], [33], [34], [35], [36], [37]	10	Social Risk	[9], [32], [36], [38]	4
Lack of Resources	[6], [7], [8], [9], [28], [33], [34], [35], [36], [37]	10	Legal and Ethical Concerns	[25], [26], [30], [37]	4
Lack of organizational support	[6], [7], [8], [9], [20], [33], [35], [36], [37]	9	Times Risk	[9], [32], [38]	3
Lack of Quality Care	[6], [7], [8], [9], [28], [33], [34], [35]	8	Technology Risk	[9], [32], [38]	3
Lack of staff motivation	[6], [7], [8], [9], [28], [33], [34], [35]	8	Resistance	[28]	1
Lack of Trustworthiness	[6], [7], [8], [9], [28], [33], [34], [35]	8	Threat	[28]	1
Lack of user Satisfaction	[6], [7], [8], [9], [28], [33], [34], [35]	8	Controllability	[28]	1
Financial Risk	[19], [20], [29], [36], [38], [39]	6	Reduced Autonomy	[28]	1
Government Support	[19], [20], [21], [30], [37]	5	Anxiety	[28]	1
Policy Standard	[20], [25], [26], [36], [37]	5	Cost	[28]	1
Security Privacy Risk	[9], [32], [34], [38]	4			

Discussion

Enablers of Telemedicine Adoption

Self-efficacy refers to the user's confidence in an individual's capacity to complete certain activities or use new technology. This significantly and directly influenced one's behavioral intention to adopt telemedicine.[17,18,25,26] This implies that the higher the level of self-efficacy, the more individuals are likely to accept the adoption of telemedicine. Furthermore, the strongest factors influencing the behavioral intention of individuals in terms of usage are perceived usefulness and ease of use since these reflect the users' beliefs on the usefulness and ease of the technology.[27,28,29] The result aligns with previous studies using the Technology Acceptance Model (TAM).[29] This study highlighted the need for the healthcare sector to simplify telemedicine systems to enhance user navigation, self-efficacy, and perceived usefulness. This simplification also includes offering training, technical support, and clear benefits communication. Understanding user needs can improve the effectiveness of telemedicine in delivering coordinated quality care.

The findings also indicated that legal and ethical issues, such as concerns on policy and standard practice, encompassing the following: information policy, information and data security, information privacy, software standards, national policies, and ICT, significantly influence the behavioral intention of using telemedicine services.[19,20,27,30] The legal and ethical concerns surrounding the rapidly evolving field of telemedicine included potential risks and liabilities related to privacy breaches, data security, and compliance with regulations, which health professionals might not fully understand and may approach cautiously. Health professionals are less likely to use technology when they perceive high

legal and ethical risks but are more accepting when safety nets are communicated; similarly, patients are less likely to trust and adopt systems with data privacy concerns, indicating that policies on data security directly affect user behavior. These factors are also included in three journal articles discussing how the lack of policy and standard of practice governing telemedicine could pose barriers to its adoption.[12,29,30] With client care being a highly specialized and individualized process, ensuring that data security and privacy are at the highest standards is crucial in healthcare to avoid errors and misdiagnosis.

Attitude was another influential determinant for using telemedicine. This result was similar to previous studies which revealed that users' attitudes toward technology significantly impact their intentions of use.[17,28,32] Individuals with positive attitudes toward technology are more likely to adopt telemedicine as they perceive it as useful and easy to use. These individuals are also influenced by social norms and others' perceptions, boosting their intention to use it. Moreover, factors influencing one's attitude are information and system quality, service quality, perceived vulnerability, severity, and response efficacy. Among these, service quality had the strongest influence.[17] Healthcare organizations prioritize service quality in telemedicine to enhance user satisfaction and support growth, as users are less likely to engage if they encounter technical issues or poor customer service. This ensures reliable equipment, regular maintenance, and efficient assistance can improve user attitudes.

Significant influence was also observed between perceived vulnerability, perceived severity, response efficacy, and users' attitudes toward adopting telemedicine.[17] Moreover, the previous studies revealed that computer self-efficacy, task technology fit, and technology characteristics significantly influence an individual's intention to adopt telemedicine.[17,18] This implies that if users believed telemedicine was a great fit for their needs and had higher levels of computer self-efficacy, the higher the chance they would use telemedicine services. Consequently, those users who lacked confidence in their abilities to use telemedicine technology were less likely to utilize telemedicine services. This suggests that factors such as perceived vulnerability, perceived severity, reaction efficacy, computer self-efficacy, task technology fit, and technology characteristics should be greatly considered when providing telemedicine services. Nevertheless, with the formulation of a policy and standard of practice, these factors can be readily addressed.[27,30,33]

Another important aspect of the result on the intention of using telemedicine systems is the positive impact of subjective norms. This result agrees with a previous study, which has shown that social influences, the perceptions of what others think or do, significantly affect users' intentions to adopt a technology.[25] Those who perceive that other users found telemedicine beneficial are more likely to adopt it. Moreover, if health professionals perceive that their colleagues are using telemedicine systems, they may be more likely to adopt it themselves to keep up with the latest developments in the field.[27] The remaining factors, such as perceived behavioral control, plasticity, technological character, perceived behavioral control, technological characteristics, and task characteristics, were also associated with the determinants that influence the adoption of telemedicine.[18,32]

Perceived behavioral control is the person's sense of control over the actions necessary to use a technology. This indicates that higher perceived behavioral control increases the likelihood of adopting telemedicine, while plasticity—an individual's adaptability to new ideas—also influences usage and attitudes. Additionally, technological characteristics like ease of use, accessibility, and functionality are crucial, as positive impressions of these features enhance adoption while negative perceptions hinder it.[29] Last, task characteristics are the users' actions in accomplishing a task using technology. Certain task characteristics like consultation for chronic diseases and client education align well with telemedicine's capabilities and advantages, facilitating its adoption and success.[18] Overall, the enablers of telemedicine adoption among developing countries should be optimized, maximized, and supported to meet users' needs.

Barriers to Telemedicine Adoption

Health professionals have difficulty integrating and efficiently employing telemedicine technology due to deficient resources such as funds, personnel, and equipment. The government plays a crucial role in providing resources and infrastructure, establishing policies, and developing educational programs by planning carefully and implementing telemedicine efficiently.[26,30,35] Difficulties securing financial support can lead to low patient satisfaction and efficiency, further obstructing adoption. Another barrier that hinders the adoption of telemedicine is the lack of organizational effectiveness. It refers to the absence of clear policies, procedures, and guidelines in the organization that support telemedicine. A lack of organizational effectiveness can hinder telemedicine implementation due to confusion and inconsistency.

The lack of quality care provided through telemedicine was also considered a barrier. Poor-quality services may cause hesitancy among users of telemedicine technology. This barrier covered the lack of defined clinical protocols, privacy, and security measures. Another barrier that hindered the adoption of telemedicine was the lack of staff motivation. This factor can be linked to employees' disengagement because of their reluctance to change, inexperience, and inadequate training.[6,34] This can result in a lack of satisfaction in the technology system, which can contribute to decreased quality of care and patient dissatisfaction. This barrier encompasses difficulty accessing telemedicine services and negative experiences with the technology. Furthermore, issues on security and privacy can lead to a lack of trustworthiness in the technology and system used.[9,38] Additionally, lack of trustworthiness can lead to limited patient engagement in the program, low adoption and utilization by health professionals.

Other factors considered hindrances to telemedicine adoption were insufficient financial, human, or technological resources available. It was also found that technology and security and privacy risks can deter users from adopting telemedicine in developing economies.[9,31] Uncertain privacy and security in telemedicine can lead to data privacy issues, patient safety concerns, and reduced quality of care, which may limit adoption and access to healthcare services. Additionally, social risk—shaped by the opinions of leaders, family, and peers[38]—affects the intention to adopt telemedicine, encompassing worries about quality, effectiveness, privacy, and security.

On the other hand, financial risk is still significant compared to other risks like the cost of technology investment, operating costs, and uncertainty around revenue generation.[13,38,40] Government support is essential for reducing anxiety and costs, alleviating perceived threats, and enhancing perceived controllability in telemedicine. Effective implementation of telemedicine relies heavily on governmental assistance and regulation. Without financial incentives for providers and established laws on security, privacy, and reimbursement, adoption rates will decline, creating uncertainty and challenges that hinder the growth of telemedicine. Consequently, the role of government support and regulation in promoting telemedicine cannot be overstated. A study conducted in Ethiopia found that reduced autonomy, anxiety, and costs of the ICT infrastructure were the cognitive sources of resistance because of increasing perceived threat and reduced perceived controllability.[29] Lastly, perceived risk, resistance to technology, and technological anxiety are significant barriers to telemedicine adoption.[5,7,8]

Common Limitations of the Journal Articles

Results indicated that some common limitations were encountered in telemedicine research due to the practical constraints. Results from studies in a single country may not be generalizable with others due to cultural, socioeconomic, and technological differences.[6,18,21,38] This underscored the need to consider the population's background when evaluating study findings, as neglecting this can make the results unsuitable for decision-making in different contexts. The cross-sectional studies cannot capture changes over time, potentially failing to reflect past developments or predict future trends.[18,29] Additionally, online surveys may bias results toward individuals with internet access[18,32] and may not represent the entire population, affecting validity and applicability.[32,35] Finally, high age heterogeneity among respondents limits generalizability, as different age groups may have varying attitudes toward telemedicine. Consequently, the findings may not accurately represent all age groups, thus limiting their practical applications to decision-makers in government and healthcare.

The authors recommend several future studies to improve the limitations of this current study. First, the UTAUT model may be replicated in other developing economies to generalize the result and evaluate the consistency of the results across different cultures and socioeconomic groups.[17,18,39] Second, any disparities between public and private telemedicine providers may be included in the study.[6,26] Third it is recommended to improve the representativeness of the sample population and enhance the generalizability of the UTAUT model through the use of a systematic and random-based sampling approach with a larger sample size.[18,32,35,38] Therefore, using a larger sample size would test the validity and generalizability of the findings and thereby accurately reflect the population.

A longitudinal design is recommended to examine how telemedicine adoption evolves and how crises influence it and to provide insights into changing user attitudes and behaviors.[18,29] Additionally, investigating adoption processes globally, considering the country of origin and culture, and the role of plasticity in technology acceptance could enhance understanding.[32] Finally, employing alternative methods to establish causal relationships between variables would deepen insights into the mechanisms that drive telemedicine, thereby improving the validity and generalizability of the findings through an acceptance model and various research techniques. This study's results do not fully represent all reviewed articles due to a lack of specific future research suggestions. Hence, future research should explore and expand upon the

findings to better understand the phenomenon.

Conclusion

While telemedicine in developing countries presents significant challenges, such as individual and organizational barriers and concerns regarding policies, information security, and privacy, it also offers opportunities for enhancing healthcare delivery. By fostering self-efficacy, ensuring user-friendly technology, and maintaining high standards of care comparable to in-person visits, telemedicine can be effectively integrated into healthcare systems, ultimately ensuring patient safety and improving clinician connectivity.

Abbreviations

ICT: information and communications technology; PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analysis; UTAUT: Unified Theory of Acceptance and Use of Technology; WoS: Web of Science.

Ethics Approval and Consent to Participate

The study did not involve human participants.

Competing Interest

All authors report no competing interests.

Availability of Data and Materials

Data are available upon request to the authors.

Authors' Contribution

All authors contributed to the completion of this paper. Conceptualization, design, and search: ZM and LCV; analysis and interpretation of results: AI, RC, SLAC, FTO, ABE, and MLP; draft manuscript preparation: ZM and LCV; revision of the manuscript: AI, RC, SLAC, FTO, ABE, and MLP. All authors reviewed and approved the final version of the manuscript.

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