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Original Research

Impact of telepharmacy on patients' outcome during COVID-19: a systematic literature review

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Abstract

Background: Coronavirus disease (COVID-19) continues to be a major global public health issue. COVID-19 is highly contagious, and numerous mitigation strategies have recently been implemented to prevent the spread of this disease. Pharmacists utilize telecommunication technology to provide patient care services, thus increasing patient access to pharmaceutical services. There was a scarcity of evidence regarding the impact of telepharmacy on patient outcomes during COVID-19. Therefore, the aim of this study was to summarize the available research evidence on the impact of telepharmacy on patient outcomes during COVID-19. **Methods:** A systematic literature search was conducted between January 2020 to September 2022 in Ovid MEDLINE, Ovid Embase, and Cochrane Central Register of Controlled Trials, using appropriate terms on telepharmacy, COVID-19, and patient outcomes. Only studies that investigated the impact of telepharmacy on patient outcomes during COVID-19 were included. A systematic literature search was conducted between January 2020 to September 2022 in Ovid MEDLINE, Ovid Embase, and Cochrane Central Register of Controlled Trials, using appropriate terms on telepharmacy, COVID-19, and patient outcomes. Only studies that investigated the impact of telepharmacy on patient outcomes during COVID-19 were included. **Results:** A total of three studies were included in the review. The telepharmacy services were offered via virtual anticoagulation clinic, retail community telepharmacy through information technology tools, and RxLive® telepharmacy program. All studies included in the review demonstrated that the provision of telepharmacy services during COVID-19 had an overall positive impact on the patient outcomes such as a reduction in the rates of hospitalisation and medication-related problems and maintaining the international normalized ratio values within the therapeutic range. **Conclusion:** This review provides evidence that telepharmacy services have been successful in improving patient outcomes during the COVID-19 pandemic, including reductions in medicines-related problems and hospitalisation rates. As the pandemic continues, there is an urgent need to further expand telepharmacy services, using modern communication technologies such as televideo, especially for patients living in remote areas. There is a need to conduct further pre-post-intervention studies to address this gap.

Keywords: telepharmacy; Saudi Arabia; coronavirus disease; patient outcomes; medication

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INTRODUCTION

Coronavirus disease (COVID-19) continues to be a major global public health issue. The virus is highly contagious, and some mitigation strategies have been implemented to prevent its spread. This comprises imposing local or national lockdowns, social distancing, wearing masks, travel restrictions, and reduction of patient follow-up schedules.[1,2] Reduction of patient follow-up appointments is one of the main preventative measures for COVID-19 and consequently, communication between patients and healthcare providers is compromised.[3]

The relationship between a healthcare provider and a patient has a crucial role in the overall outcome of the patient. One of the most important strategies in enhancing patient communication with their healthcare provider during COVID-19 is using telehealth. Telehealth is defined as the "use of electronic information and telecommunication technologies to support and promote long-distance clinical health care, patient and professional health-related education, public health and health administration".[4] Telepharmacy is one type of telehealth and is a concept that refers to a method used in pharmacy practice in which a pharmacist utilizes telecommunications technology

to oversee pharmacy-related services.[5] The pharmaceutical services provided through telepharmacy include prescription drug review, drug information services, drug monitoring, and patient counseling.[6]

The COVID-19 epidemic has considerable impact on the provision of pharmaceutical care. In the pharmaceutical care service, the logistic procedures and patient counseling contribute to high-quality pharmacotherapy and are affected.[7] Without proper counseling vulnerable patient groups such as the elderly and those with limited health and literacy are at increased risk of drug-related problems.[8] Advances in telepharmacy over the past 2 decades enabled pharmacy professionals to easily adapt their practice models to use during the pandemic.[9] Telepharmacy has been successfully implemented within community pharmacy settings through the creation of remote dispensing sites.[10] The use of telepharmacy is promoted during the COVID-19 epidemic to facilitate instructions and teach back.[11] Thus, telepharmacy can be a potential alternative during the COVID-19 pandemic in which the community is required to practice social distancing and reduce routine visits to healthcare facilities.[12] The most observed telepharmacy initiatives were virtual consultations, medicines home delivery, and patient education.[13] Therefore, we aimed to document the available research evidence on the impact of telepharmacy on patient outcomes during the COVID-19 pandemic.

METHODS

This systematic review's findings were reported using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guideline.[14]

A systematic literature search was conducted from January 2020 to September 2022 in Ovid MEDLINE, Ovid Embase, and Cochrane Central Register of Controlled Trials. The search included relevant keywords such as "telepharmacy," "telemedicine," "telehealth," "pharmaceutical care services," "virtual," "coronavirus disease," "COVID-19," "COVID," "patient outcomes," "hospitalization," "outcomes," and "health outcome." Only studies that examined the impact of telepharmacy on patient outcomes and were published post-January 2020 were reviewed, and citations in reviews and original research studies were examined as well. The primary focus was on the impact of telepharmacy on patient outcomes during COVID-19. We included studies published in English and excluded reviews, protocols, and studies that did not assess the impact of telepharmacy on patient outcomes during COVID-19. Furthermore, we conducted citation analysis in Web of Science and Google Scholar to identify the prospective citing of references of the selected literature.

Study screening and selection

Two researchers (D.S.A and S.A) independently screened the title, abstract, and full text of each potentially relevant study for determining their eligibility. A third researcher (A.F) resolved any discrepancy, and we followed the approach of consensus decision-making.

Inclusion and exclusion criteria

We restricted our selection to studies that specifically investigated the impact of telepharmacy on patient outcomes during the COVID-19 pandemic, and excluded review studies, case reports, case series, and studies published in languages other than English.

Data extraction and synthesis

Two researchers (A.F and S.A) independently reviewed and extracted the data from the final eligible studies. Figure 1 depicts the study selection process and citation analysis.

Quality assessment

We critically appraised the quality of all eligible studies and selected Joanna Briggs Institute (JBI) as a metric for quality assessment in this review. One reviewer (S.A) used the JBI Critical Appraisal Checklist to assess the quality of the cross-sectional and cohort studies. We did not exclude studies based on the quality assessment.

RESULTS

A total of 6994 studies were identified via three databases. We removed 800 duplicate studies and screened 6194 studies to ascertain their eligibility for inclusion. Seventy studies were eligible for the full-text analysis. Subsequently, sixty-seven studies were eliminated as they did not meet the inclusion criteria. We did not find any potential study from the citation analysis. Lastly, three studies that investigated the impact of telepharmacy on patient outcomes during COVID-19 were included in this review (Figure 1).

Overview of the included studies

Table 1 illustrates the qualitative summary of the studies. A quantitative summary of the included studies based on gender, mean age (years), sample size, study duration, outcome measures, significant association (positive or negative), and statistical tests, is detailed in Table 2. The studies were conducted in Saudi Arabia,[15] United Arab Emirates,[16] and the United States (Table 1).[17] There were two cross-sectional studies,[15,16] and one was a cohort study.[17] The sample size ranged from 270 to 29, 125 patients. The study duration ranged from 3 to 12 months. The telepharmacy services were a virtual anticoagulation clinic,[15] retail community telepharmacy via information technology tools,[16] and RxLive® telepharmacy program.[17] The model of communication used to implement telepharmacy included virtual clinic service, video conferencing software, phone calls, and social media platforms. All studies included in the review showed that the implementation of telepharmacy during COVID-19 had an overall positive impact on the patient outcome such as a reduction in the rates of hospitalisation and medication-related problems and maintaining the INR values within the therapeutic range (Table 2).

Methodological quality of studies

Most studies (n = 2, 67%) were of moderate quality based on the JBI checklist. The quality of the remaining one study was found to be high (Supplementary Tables S1 and S2).

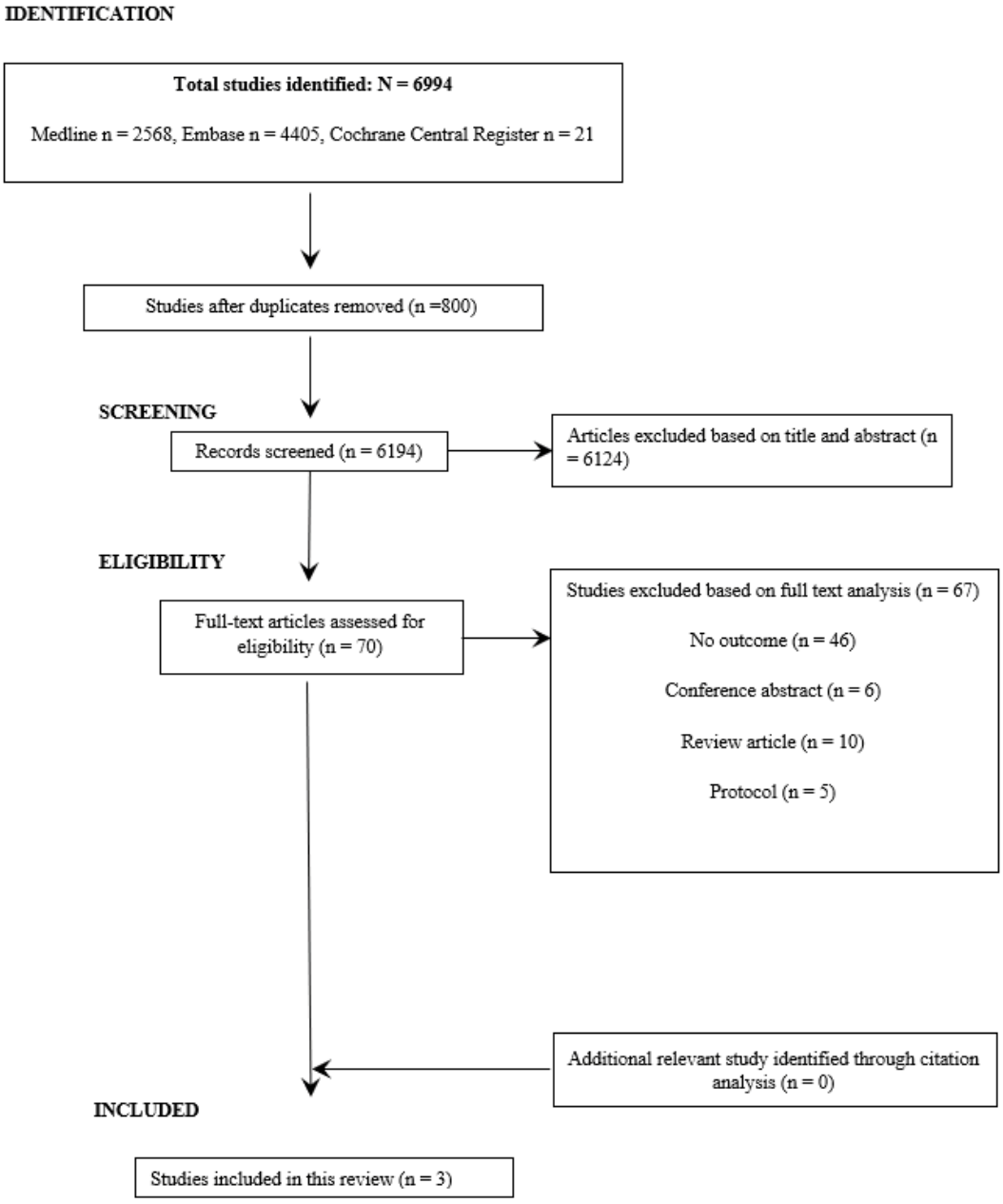

Figure 1. PRISMA Flow diagram of the study selection process and citation analysis

Table 1. The qualitative summary of included studies

Author, year, country	Study design	Model of communication	Population studied	Intervention	Description of intervention	Effect on outcome/Key findings
Al-Ammari M et al., 2021, Saudi Arabia[15]	Prospective cross-sectional study	Virtual Clinic	Adult patients with comorbidities who were prescribed an anticoagulant	Virtual anticoagulation clinic	Clinical Pharmacist led virtual clinic provided tele health services regarding anticoagulation with the follow up of labs (INR, TTR) and managing patients.	The mean percentage of overall INR values in the range was 59.39% ± 32.84. The median satisfaction score was 32 (IQR 28–36) of a maximum score of 40

Ibrahim OM et al., 2020, United Arab Emirates[16]	Prospective cross sectional observational study	Video conferencing software, phone calls and social media websites to deliver services.	COVID-19 probable and confirmed patients	Retail community tele-pharmacy	Telepharmacy was introduced to compare the rate of pharmacist interventions and MDE's across community pharmacies with and without tele-pharmacy	Rates of MDE's and their subcategories, prescription related errors and counselling errors across pharmacies between groups improved from 15.81% to 19.43% and 9.35% to 10.42% respectively.
Erik Hefti et al., 2022, United States[17]	Retrospective, double-arm cohort study	Rx Live Telepharmacy platform	Adult outpatient population with comorbidities	RxLive® telepharmacy program	Rx Live Telepharmacy program (via telephone or televideo) was introduced to increase adherence, improve medication management review, optimize pharmacotherapy, and bridge potential gaps that form between providers and patients and decrease ADR's resulting in hospitalizations.	Pharmacist-provided pharmacotherapeutic care has been shown to reduce ADRs, improve patient education, and improve medication adherence, reducing the likelihood of unaddressed medication problems that persist and could ultimately lead to hospitalization.

INR, International Normalized Ratio; TTR, Time in therapeutic range; MDEs, Medication Dispensing Errors; ADR's, Adverse Drug Reactions; COVID-19, coronavirus disease 2019.

Table 2. The quantitative summary of included studies

Author, year, country	Study design	Study duration	Sample size	Mean age (years)	Gender (female%)	Relevant outcome(s)	Outcome measures		Significant association (+/-)	Statistical Tests
							Control / Pre	Intervention / Post		
Al-Ammari M et al., 2021, Saudi Arabia[15]	Prospective observational study	3 months	270	58.96 ± 18.43 year	58.9%	Effects on INR, TTR, Patient Satisfaction, Resource Utilization	NA	INR in therapeutic range 60% of the time, And TTR > 50% Reduction (>70%) in cost of coaguchek and nursing (>80%)	+	Independent sample t-test, Two tailed test
Ibrahim OM et al.,2020, United Arab Emirates[16]	Prospective Cross-sectional Observational study	4 months	52 pharmacies 29,125 patients	NA	NA	Rates and types of pharmacist interventions and MDE's	Rates of MDEs (19.43%) Counselling errors (10.42%)	Rates of MDEs (15.81%) Counselling errors (9.35 %)	+ +	Chi square, Fisher Exact Test
Erik Hefti et al.,2022, USA[17]	Retrospective, double-arm cohort study	1 year	3,782	75 years	NA	Reduction In hospitalization rate	Non- access group +40.2%	Access group +12.9%	+	Two tailed Student's t-test

NA, Not Applicable; HbA1c, Glycated Hemoglobin; ANOVA, Analysis of Variance Test; INR, International Normalized Ratio; TTR, Time in therapeutic range; MDEs, Medication Dispensing

DISCUSSION

The main goal of this review was to understand the impact of telepharmacy on the health outcome of the patients during the COVID-19 pandemic. Although telepharmacy is not a new concept in pharmacy practice, only a few studies have been conducted during the pandemic. Moreover, there is a scarcity of summarized evidence showing the impact of providing pharmaceutical services via telepharmacy. This review found that telepharmacy is effective in providing care for patients during the COVID-19 pandemic when direct care is not possible. In this review, all studies included reported that the implementation of telepharmacy during the COVID-19 had

an overall positive impact on the patient outcomes such as reduction in the rates of hospitalisation and medication-related problems and maintaining International Normalized Ratio (INR) values within the therapeutic range.

The provision of telepharmacy services via RxLive® reduced the incidence of hospitalisation among outpatient population.[17] RxLive® is a novel telepharmacy service which utilizes advanced telecommunication technology to deliver pharmaceutical care.[17] The Pharmacist-led RxLive® program reduces drug-related harms and improves patient education and medicine adherence, thus lowering the episodes of hospitalization.[17,18] The provision of telepharmacy service via anticoagulation clinic helps to maintain INR values within the therapeutic value.[15] Telepharmacy anticoagulation clinic has been as effective as face-to-face interactions between patients and healthcare providers.[15,19] A recent review reported that telepharmacy anticoagulation clinic reduced the occurrence of bleeding and hospitalization.[19]

Telepharmacy can be used as an alternative healthcare method in providing pharmacist care, such as support with drug management for chronic conditions. However, several factors must be considered for the success of pharmaceutical services. Building trust is recommended between the pharmacist and the patient for efficient telepharmacy visits and the patient should provide consent prior to the initiation of this service.[20] Governmental interventions, such as relaxation of regulations and messaging to relieve patient tension is vital to overcome some of the challenges.[21,22] In addition, appropriate legislation, and prescribing protocols, especially for controlled medications are crucial to allow such services via telepharmacy.[23]

There are many forms of telepharmacy used in the research studies reviewed, such as virtual clinic service, video conferencing software, telephone calls and social media platforms. The studies included in this review varied in the frequency and intensity of telepharmacy interventions. The majority of the telepharmacy services were conducted by telephone. This is because the telephone is still considered an effective communication model and is commonly used so that it can be accessed by almost everyone. A previous study reported the most observed telepharmacy initiatives such as virtual consultations, home delivery of medicines and patient education.[24]

This review is the first of its kind that examined the impact of telepharmacy during the COVID-19 pandemic on patient outcomes and was comprehensive as the electronic search was performed in three important databases. This study also has certain limitations. Meta-analysis was not conducted due to the heterogeneity of the included studies. Studies published in languages other than English were not included, which may have omitted pertinent studies. Nonetheless, citation analysis and hand-searching of all eligible studies were performed to eliminate the influence of factors (e.g., wrong indexing or inconsistent terms) that could affect the searching of keywords. Similarly, the citational analysis ensures that we did not overlook any relevant information for this study.

CONCLUSIONS

This review provides evidence that telepharmacy services have been successful in improving patient outcomes during the COVID-19 pandemic, including reductions in medicines-related problems and hospitalization rates. As the pandemic continues, there is an urgent need to further expand telepharmacy services, using modern communication technologies such as televideo, especially for patients living in remote areas. There is a need to conduct further pre-post-intervention studies to address this gap.

AUTHORS' CONTRIBUTION

All authors contributed to the study conception and design. Material preparation and data collection were performed by Dalal Salem Al-Dossari, Yahya Ali Laghbi, Abdullah Saud Almutairi, Meshal Mohammad Alsupail, Fuad Khulaif Alharbi, Mohammed Hamdan Alharbi, Saud Alotaibi, Anam Farooq, Sheraz Ali. The data extraction from the databases was performed by all authors. The first draft of the manuscript was written with equal contribution of all authors, and all authors commented and edited previous versions of the manuscript.

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Supplementary Table S1: Summary of the quality assessment for cross-sectional studies (n = 2)		
Critical appraisal checklist for cross-sectional studies	**Al-Ammari M et al., 2021, Saudi Arabia[1]**	**Ibrahim OM et al., 2020, United Arab Emirates[2]**
Were the criteria for inclusion in the sample clearly defined?	Yes	Yes
Were the study subjects and the setting described in detail?	Yes	Yes
Was the exposure measured in a valid and reliable way?	Yes	Yes
Were objective, standard criteria used for measurement of the condition?	Yes	Not clear
Were confounding factors identified?	NA	NA
Were strategies to deal with confounding factors stated?	NA	NA
Were the outcomes measured in a valid and reliable way?	Yes	Yes
Was appropriate statistical analysis used?	Yes	Yes
Study quality	Moderate	Moderate

Scores can range from 0 to 8, each question is given a single score for yes and 0 for no, unclear, and not applicable (NA)

High quality: score ≥7, Moderate quality: score 4-6, Low quality: score <4

Supplementary Table S2: Summary of the quality assessment for cohort studies (n = 1)	
Critical appraisal checklist for cohort studies	**Erik Hefti et al.,2022, United States[3]**
Were the two groups similar and recruited from the same population?	Yes
Were the exposures measured similarly to assign people to both exposed and unexposed groups?	Yes
Was the exposure measured in a valid and reliable way?	Yes
Were confounding factors identified?	Yes
Were strategies to deal with confounding factors stated?	Yes
Were the groups/participants free of the outcome at the start of the study (or at the moment of exposure)?	Not clear
Were the outcomes measured in a valid and reliable way?	Yes
Was the follow up time reported and sufficient to be long enough for outcomes to occur?	No

Was follow up complete, and if not, were the reasons to loss to follow up described and explored?	No
Were strategies to address incomplete follow up utilized?	No
Was appropriate statistical analysis used?	Yes
Study quality	High

Scores can range from 0 to 11, each question is given a single score for yes and 0 for no, unclear, and not applicable (NA)

High quality: score ≥7, Moderate quality: score 4-6, Low quality: score <4

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