



Research Article

Use of e-Counseling to Enhance Adherence of Patient Tuberculosis: A Systematic Review

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ABSTRACT

Electronic health, or e-Health, can revolutionize the clinical management of tuberculosis (TB) through enhanced treatment efficiency and effectiveness, among other benefits. Regarding TB, this may entail teleconsultation, which allows medical professionals to speak with TB specialists remotely, or telemonitoring, which allows patients to be remotely monitored using digital technology. This paper aims to determine the effectiveness of tele-counseling in enhancing adherence to patient tuberculosis.

We used the Scopus database, Science Direct, Ebsco Host, and PubMed for English published between 2018 and 2023: the Joanna Briggs Institute guidelines assessed eligibility, PRISMA quality, and a checklist to guide this review. The articles have case-control, quasi-experimental, mixed method studies, and randomized control trials (RCT). E-counseling was included in the analysis if they focused on tuberculosis and were excluded if unrelated to other disease areas.

Fifteen articles that could be used in this review were found. The majority of the population were adults. Results of the review showed that most m-Health apps support tuberculosis treatment. There are numerous ways that electronic counseling, or "e-counseling," may improve adherence to TB treatment.

This study illustrated how m-health might improve patient comprehension and adherence. The five goals of the World Health Organization (WHO) e-Health framework are being met using more e-Health treatments to treat TB. Among the technology interventions demonstrated to have a significant, positive effect on disease outcomes are smartphone apps, mobile voice conversations, SMS, and instructive films.

Keywords: E-counseling; m-Health; tuberculosis; patient adherence

INTRODUCTION

The World Health Organization (WHO) predicted that there will be 9.9 million cases of tuberculosis (TB) worldwide as of 2021 (WHO, 2022). The number of new TB cases reported globally in 2020 is represented by this number. The prevalence of TB varies significantly by region and nation; it is crucial to remember. The WHO South-East Asia Area came in second with 22% of the global incidence. The WHO also predicted that TB would kill 1.5 million people in 2020,



ranking it among the top 10 killers globally. Although it primarily affects the lungs, TB is a dangerous infectious disease that can damage other body organs (Zarova et al., 2018). When infected people cough, sneeze, or talk, the *Mycobacterium tuberculosis* bacteria that causes it spreads through the air and causes the disease. Antibiotics can be used to treat TB, but therapy can be time-consuming and difficult.

Easier access to care, more accessible patient-provider communication, and improved treatment efficiency and effectiveness are just a few ways that e-Health, also known as electronic health, has the potential to completely transform the clinical management of tuberculosis (TB) (Gashu et al., 2020). Following are a few e-Health applications in treating tuberculosis: Electronic Medical Records (EMRs), which eliminate the need for paper-based records by enabling healthcare professionals to access and manage patient data electronically (Weni et al., 2018). EMRs can increase the precision and thoroughness of patient data, lower the chance of mistakes, and enhance provider coordination. A WHO conceptual framework for digital health in the fight against tuberculosis included elements for electronic-based patient education.

Mobile health, or m-Health, uses portable electronics like smartphones to enhance healthcare delivery. Regarding TB, mHealth can involve teleconsultation (healthcare providers can consult with TB specialists remotely) or telemonitoring (patients can be observed remotely utilizing digital technologies). M-Health can be utilized in the clinical care of tuberculosis to assess patient progress, remind patients to take their medications, and give educational resources (Coombes & Gregory, 2019). Using technology, such as phone conversations, video conferences, and instant messaging, to deliver counseling services to individuals is known as tele-counseling. Due to its accessibility, practicality, and flexibility, tele-counseling has recently grown in popularity (Gras, 2018). Many issues, such as relationship issues, stress and anxiety, addiction, and mental health issues, can be addressed with tele-counseling. This paper aims to determine the effectiveness of tele-counseling in enhancing adherence to patient tuberculosis.

MATERIAL AND METHODS

Information Sources and Search Strategy

We used the Scopus database, Science Direct, Ebsco Host, and PubMed for English published between 2018 and 2023. The data used in this study were secondary data obtained from previous research results and not from direct observation. The secondary data sources were obtained as journal articles of national and international repute with a predetermined theme. The Joanna Briggs Institute standards were employed to seek appropriate PRISMA quality and a checklist to direct this review. Keyword search using the term MeSH. The specific keywords used to search the article were *e-Health OR m-Health AND e-Counseling OR Tele-Counseling AND Tuberculosis OR Communicable Disease AND Patient Adherence*.

Study Eligibility and Selection Criteria

In this section, reviewers select the articles obtained based on predetermined keywords. Previously, reviewers made the PICOT format as an indicator for the assessment of the suitability of the article. Articles embraced for the content of this scoping view were selected based on the following inclusion/exclusion filtrations (The PICOT criteria can be seen in Table 1). We included articles published in the English language that had a focus specifically on m-health or tele-counseling.

Study Characteristic

Based on the results of the reviews that have been carried out, it is known that most of the research designs used case-control, quasi-experimental, mixed method studies, and randomized

control trials (RCT). The studies included in this systematic review came from research in various countries such as Germany, Sweden, Italy, Switzerland, Norway, and Ghana, but most of them come from Europe. Based on the results of the review, many m-Health apps support tuberculosis treatment.

Study Populations/ Participants

Studies comprised tuberculosis patients. Age, gender, ethnicity, morbidities, level of education, and occupation will all be considered in our review of the participants. Most of the study population is in the adult group. As for the participants, we exclude the older adults.

RESULTS AND DISCUSSION

Search Results

Based on the results of the literature search, 1,512 articles that match keywords with article details were obtained from the Scopus database (n = 246), Science Direct (n = 309), Ebsco Host (n=107) and PubMed (n = 850). From a total of 1,012 articles found, article duplication checks were then carried out, and 540 of the same articles were found so that they were excluded from the search results, and 476 articles were left. Reviewers then conducted screening based on title (n = 476), abstract (n = 72), and full text (n = 15) adjusted to the theme. Based on the eligibility screening against the inclusion and exclusion criteria, 15 articles that could be used in this review were found (see Figure 1 for details of the search process).

Main Topic

Several articles about video-directly observed therapy (VDOT) were discussed in the ten articles. More than half of these studies focused on adherence for Tuberculosis patients (Sazali et al., 2022).

Interventions/ Technologies

Studies describing digital health interventions that use the internet (e.g., mobile devices like smartphones, sensors, or wearables with WIFI; computer-based solutions that use cellular services; cloud systems to store/ allocate health data; or wireless medical devices) and Bluetooth (e.g., mobile devices like smartphones, sensors, or wearables) to address at least one crucial public health function will be included. (1) make health care easier to access, (2) permit communication between healthcare professionals or between healthcare professionals and patients, (3) encourage good health, (4) gather data in a way that allows for their secondary use in public health research, or (5) permit digital surveillance of public health emergencies (Lee et al., 2020).

Every digital health initiative that does not meet one of the five inclusion criteria above will be disregarded since, by our definition, they do not represent digital public health (Navin et al., 2018). Studies should focus not only on individuals (as is the case for digital health interventions) but also on groups of people to be considered (e.g., communities). Studies explaining the installation of a nation's national digital surveillance system and the widespread acceptance of online consultations in a public health system are two examples of this type of research (Margineanu et al., 2022).

General Aims and Significance

The PRISMA-ScR (Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews) reporting standards are used in this study to explain the process for a scoping review (Tricco et al., 2018). As far as we know, an assessment with the vast breadth outlined above has yet to be done. We will highlight the traits they share and the geographic regions

they cover regarding population health.

An earlier study examined the function of mobile phones in HIV-TB care and found that they had a favorable impact on drug compliance (Thekkur et al., 2019). Findings point to the viability of implementing telemedicine-based diagnosis in current practice, particularly in areas lacking TB expertise.

Those who reside in remote or rural locations or who find it difficult to receive conventional in-person counseling due to mobility challenges, hectic schedules, or social stigma will find tele-counseling especially helpful (Margineanu et al., 2022). Also, it is a good choice for those who would rather receive counseling in the comfort and privacy of their own home. In general, tele-counseling provides a practical and efficient method for people to receive counseling and assistance, and it is anticipated to gain popularity over the next several years.

There are numerous ways that electronic counseling, or "e-counseling," may improve adherence to TB treatment: TB patients can receive counseling and support remotely through e-counseling, eliminating the need to visit a clinic or medical facility (Akamike et al., 2021). Patients who reside in rural or difficult-to-reach places or have mobility challenges may find this especially helpful. E-counseling can be customized to the requirements and preferences of the TB patient specifically, offering individualized support that is sometimes difficult to provide in face-to-face therapy. Due to stigma, disclosure anxiety, or other hurdles, TB patients may not otherwise seek counseling services. E-counseling, however, can expand access to counseling services.

Strengths

An excellent methodology for mapping broad, interdisciplinary topics like digital public health is a scoping review, which was chosen as the method. There is less chance of missing publications because the search is conducted in the three central databases for issues related to digital public health (Scopus database, Science Direct, Ebsco Host, and PubMed). To ensure consistency, we also thoroughly explained our study identification procedure, including the inclusion criteria. The review adhered to the PRISMA-ScR checklist to guarantee that this study had the highest caliber and transparency possible, explicitly designed for scoping reviews (Tricco et al., 2018).

E-counseling can help healthcare professionals keep a closer eye on the development of TB patients, spot any obstacles to treatment adherence, and offer prompt treatments to remove these obstacles. E-counseling can provide TB patients the power they need to manage their care and achieve better health results (Akamike et al., 2021). By offering patients easy, individualized, and accessible support, e-counseling can increase adherence to TB therapy.

Table 1. PICOT Criteria

Criteria	Inclusion	Exclusion
Population	Adults	Elderly
Intervention	m-Health or tele-counseling	Not discuss about m-Health or tele-counseling
Comparison	Application	No application
Outcome	To monitor patient adherence	Related to other disease areas
Study design and publication type	Case-control, quasi-experimental, mixed method studies, randomized control trials (RCT)	Cross-sectional, article review
Publication year	Post 2018	Pre 2018
Language	English	Language other than English

The results of the study article selection can be illustrated in the PRISMA Figure 1 below:

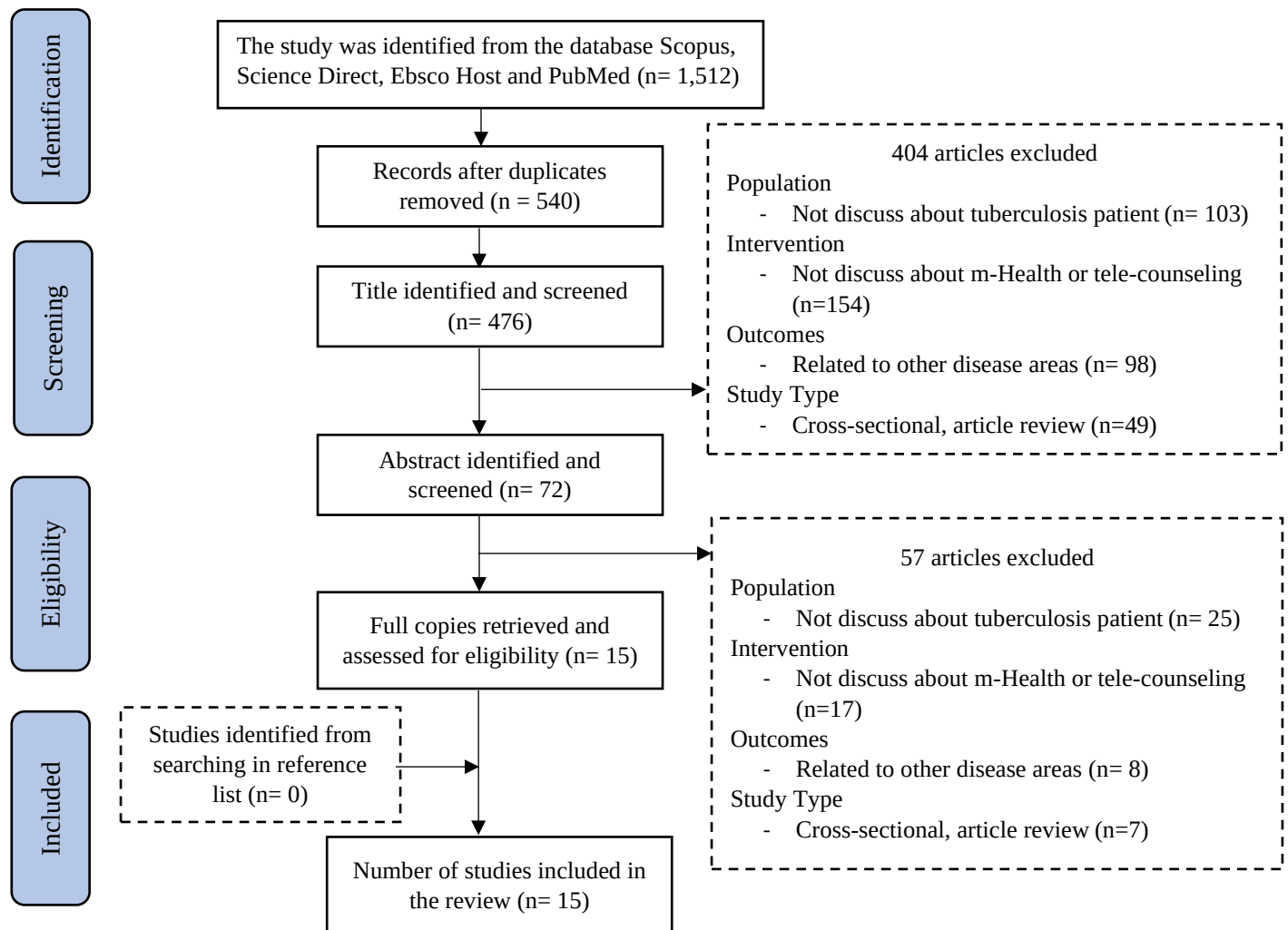


Figure 1. Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA)

Table 2. Characteristics of Articles

No.	Author and Year	Study Design	Study Population	Intervention
1	(Manyazewal et al., 2023)	A multicentre, randomized controlled trial	Adults (≥ 18 years)	Digital medication event reminder and monitor (MERM)
2	(Manyazewal et al., 2022)	A multicenter randomized controlled trial	Adults aged ≥ 18 year	SELFTB, a digital medication event reminder and monitor device for patients with tuberculosis
3	(Sazali et al., 2022)	Randomized trial	Adults	VDOT/ video observed therapy
4	(Burzynski et al., 2022)	A randomized noninferiority trial	Aged 12 years and older	Electronic directly observed therapy (DOT)
5	(Sekandi et al., 2021)	An exploratory, qualitative, cross-sectional study with an exit survey	Adults age 30-35 years	VDOT as an alternative method to monitor adherence
6	(Sekandi et al., 2021)	A randomized controlled trial	Adults ages 20-35 years	Video directly observed therapy (VDOT)
7	(Thekkur et al., 2019)	A mixed-methods study	Adults age 30-44 years	99DOTS, an innovative, technology-enabled, adherence support tool

No.	Author and Year	Study Design	Study Population	Intervention
8	(Park et al., 2019)	A retrospective cohort study	Adolescence age 14-17 years	Medication Event Monitoring System (MEMS)
9	(Kumar et al., 2019)	Exploratory study	Adults age 26-45 years	Video-based directly observed treatment, an alternative to conventional in-person DOT
10	(Story et al., 2019)	Randomized controlled superiority trial	Adolescence aged 16 years or older	Video-observed therapy (VOT), live video call (synchronous VOT) between the patient and observer
11	(Do et al., 2019)	Longitudinal study	Adults age 30-45 years	Video Directly Observed Therapy (VDOT), (making phone calls, taking pictures, recording videos, text messaging, internet and email use on the phone)
12	(Gras, 2018)	Randomized control trial	Adults	Virtual hospital, the IT platform enabled teleconsultations and contacts with the pharmacy for sending the triple-drug therapy by mail upon patient's request
13	(Lam et al., 2018)	An implementation study	Adults age 22-45 years	Video Directly Observed Therapy (VDOT), videoconferencing to remotely monitor patients on treatment for active TB
14	(Garfein et al., 2018)	Prospective study	Adults age ≥ 18 years	VDOT + fraction of expected doses observed (FEDO)
15	(Meyer et al., 2018)	Randomized controlled trial	Adults	Short message service (SMS), one-time text message

The National Tuberculosis Elimination Program is actively working to eradicate tuberculosis by 2025, and m-Health offers a helpful way to speed up the process by providing medical support and ultimately encouraging healthier lifestyles (Turimumahoro et al., 2022). The care of numerous health problems, including HIV, cancer, tuberculosis, diabetes, hypertension, etc., has been made possible using mobile health technology (Needamangalam Balaji et al., 2022).

When patients are referred to peripheral health institutions for treatment, around one-third of tuberculosis (TB) patients in India who have been identified in tertiary hospitals need to be noticed. In order to address this, TB patients who received mobile voice call reminders upon diagnosis at a tertiary hospital would see a reduction in the proportion of "pretreatment loss to follow-up" (PTLFU) as compared to the traditional paper-based referral (Majella et al., 2021). The use of digital health technologies and adherence to them for managing tuberculosis has increased over the past few years, focusing on patient care and targeted supervision (Subbaraman et al., 2018).

The research considered for this review was mainly concerned with figuring out how effective mobile health interventions would be at encouraging patients with TB to follow up with their doctors and reminding them to take their medication as prescribed. A few studies also evaluated the effectiveness of telehealth interventions in supporting TB patients' adoption of a healthy lifestyle, including quitting smoking and drinking (Needamangalam Balaji et al., 2022). Voice calls, m-Health smartphone applications, and SMS are the most often used m-Health intervention types in the analyzed studies, followed by instructive films (Lee et al., 2020).

In contrast to inefficient patient-medical staff interaction, studies have shown optimistic results showing that good communication through m-Health applications enhances TB care (Margineanu et al., 2020). Better prognoses are made possible by smartphone applications that promote regular follow-up visits and assist in early diagnosis (Zhang et al., 2020). Mobile tele-

counseling interventions are effective at helping TB patients stop smoking, according to a randomized controlled experiment that was carried out in Goa (Fernandes et al., 2022). Furthermore, due to inadequate cell phone accessibility and cellular signal, the cell phone-based intervention 99DOTS is susceptible to non-adherence (Navin et al., 2018).

The availability, accessibility, and availability of m-Health technology, literacy, employment level, signal, and network coverage are essential aspects involved, even if the factors influencing adherence or non-adherence to m-Health interventions are not well understood (Santra et al., 2021). After careful investigation, it was discovered that patients preferred video-based Direct Observation Treatment (DOT), followed by SMS and phone conversations (Rao et al., 2022). The most inviting intervention is m-Health-related reminders that come in interactive text messages or human-assisted voice calls rather than completely automated ones (Asres et al., 2019).

It is recognized that Video Observation Treatment has an advantage over Direct Observation Treatment since it can be used after hours and without a provider appointment (Guo et al., 2020). In order to boost the application and usage of m-Health methods, it is crucial to nurture technology awareness through appropriate educational feeds and continual coaching from trained individuals (Choudhury et al., 2020).

CONCLUSION AND SUGGESTION

This study demonstrated the effectiveness of mobile health technology in enhancing patient understanding and adherence. More e-Health treatments are being used to treat TB, and many are made to achieve the five objectives of the World Health Organization (WHO) e-Health framework. These objectives are strengthening health systems, enhancing health outcomes, guaranteeing equity, and improving patient safety to advance patient-centered treatment.

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CONFLICT OF INTEREST

All authors declare that there exists no conflict of interest.

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