SYSTEMATIC REVIEW

The Effect of Reminder System and Audio-visual Education to Improve Treatment Adherendce on Pulmonary Tuberculosis Patients: A Systematic Review

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ABSTRACT

Introduction: Due to higher transmission rates, expenses associated with pulmonary tuberculosis control initiatives, and its role as a key contributor to relapse and medication resistance, poor adherence to pulmonary tuberculosis treatment poses a serious risk to the public's health. This study looked at how audio-visual instruction and reminder systems could help pulmonary tuberculosis patients adhere to their treatment regimens. **Methods:** Using online databases Scopus, Science Direct, PubMed, and ProQuest, systematic reviews of publications published during 2018-2022 were looked up using the keywords Reminder System AND Audio-visual AND Treatment Adherence AND Pulmonary Tuberculosis. Patients with pulmonary tuberculosis made up the study's population. JBI Guidelines are used to evaluate and describe the efficacy of the approach. Explicit reporting components were handled by PRISMA rules. A descriptive analysis using a narrative method was employed to analyze the data. **Results:** 12 articles from 128 identified records were kept after applying the inclusion and exclusion criteria. Audio-visual instruction can improve a patient's level of understanding, perception, and adherence. Because it is intended to be integrated into routine tuberculosis care, reminder systems promote adherence to treatment and shorten the time to treatment beginning. Both interventions are practical, simple to use, and successful at increasing patients with pulmonary tuberculosis' adherence to their prescribed treatments. **Conclusion:** The variety of audio-visual instruction and reminder systems, the majority of which have been shown to increase pulmonary tuberculosis patients' adherence to treatment.

Keywords: Audio-visual education; Pulmonary Tuberculosis; Reminder system; Treatment Adherence.

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INTRODUCTION

One of the top ten causes of death worldwide and the most common infectious disease is still tuberculosis (TB). According to estimates, 40% of TB patients in underdeveloped nations do not follow their prescribed treatment plans (1). Although many nations have used the Directly Observed Treatment Short-Course (DOTS) strategy to control the disease to lower the rate of treatment failure, relapse, and drug resistance, the prevalence of tuberculosis remains high as a result of poor treatment compliance (2). Patient characteristics, such as patient knowledge, desire, and trust in their therapy, influence non-adherence to TB treatment. (3). In 2018 According to the WHO Global Tuberculosis Report, India, China, and Indonesia are the three nations with the highest frequency of instances, with India having a 27.1 percent rate, China having a 9.6 percent rate, and Indonesia having an 8.3 percent rate according to data for 2019 (3). In 2017 in Indonesia, it is estimated that the incidence TB of all cases is 842,000 or 319 cases / 100,000 population with an estimated incidence of Multidrug-Resistant/rifampin-resistant (MDR / RR-TB) 23,000 cases (3).

According to Spirit (2016), one of the major factors contributing to the rise in TB incidence is the poverty experienced by community groups in developing countries, failure of TB programs due to inappropriate management (diagnoses and drug guidelines that are not up to standard, failure to cure cases that have been diagnosed and demographic changes due to a growing global population increase). A poor home environment, lack of good ventilation facilities, poor lighting in the room, the density of occupancy in the house, and building materials in the house can affect the high incidence of TB.

One of the main factors influencing the outcome of TB treatment is patient adherence (4). The good immune system, attitude, and behavior of TB patients regarding transmission, dangers, and methods of treatment are individual factors that influence efforts to control TB disease (5). Non-adherence to TB treatment due to inappropriate treatment can lead to immunity to TB bacterial infection. against Anti-TB Drugs (OAT) called MDR-TB(3). Patient confidence is also a factor that affects the adherence of TB patients. Lack of information about pulmonary tuberculosis, drug side effects, forgetting to take medication, being away from home, missing an appointment date, lack of transportation costs, a lack of social support, poor communication between patients and medical professionals, and a lack of medication supplies all contribute to the high incidence and mortality of pulmonary tuberculosis (6).

Because it is linked to higher transmission rates, morbidity, and costs for pulmonary TB control programs, poor adherence to pulmonary TB treatment poses a serious risk to the public's health. It is also thought to be a major factor in relapse and drug resistance (7). Interventions that have previously existed to improve adherence to TB treatment are SMS (8–11), electronic medicine to guide the differential management of TB patients at the community level (12), mobile applications (13), 99 DOTS communication technology, educational videos (14), medication event monitoring system (MEMS) (15), and photos of health facility TB treatment (16). Various strategies were carried out to support TB treatment adherence, including counseling, education to patients and health workers, psychological interventions, reminders, medication companions, support from peers, and providing incentives, but non-adherence problems are still found in TB patients (17). Health beliefs or beliefs influence health behavior (18) mentioned that the provision of health education can improve adherence and reduce delays in treatment in TB patients. In the current era of increasingly advanced technological developments, health education through audiovisual or video can facilitate the process of delivering information. According to research (11) video or audiovisual educational instruction can be just as successful as face-to-face instruction. The use of video-based education is also effective for increasing compliance in carrying out actions or procedures (19). The use of audio-visual media aims to maximize all five senses so that the material or information obtained is more easily accepted by TB patients.

Information received through hearing and sight will be processed through a thought process so that awareness and understanding arise about the importance of medication adherence. Providing education with audiovisual media can also facilitate the delivery of information and can lead to satisfaction for those who receive it. In addition to audiovisual education, another intervention that supports medication adherence in pulmonary TB patients is mHealth which consists of the design and delivery of short messages to provide adherence support to patients using HIV and pulmonary TB treatment (20). Reminder-based mHealth offers information about services to support patients in making better decisions, adhering to medical advice, receiving better health care, and serving as a reminder and treatment monitoring tool. Reminder messages are a way to help TB eradication campaigns and can provide special solutions by utilizing new technologies made possible by technological advancement. The benefits of the Reminder message are as a reminder to take medication, a reminder to schedule the next visit, and education about pulmonary TB, patients can also report directly about the conditions and conditions experienced by the patient during treatment. The author did a systematic study under the heading The Effect of Reminders System and Audio-Visual Education to Improve Treatment Adherence on Pulmonary Tuberculosis Patients based on the description given above.

METHODOLOGY

Source
The "Preferred Reporting Items for Systematic Reviews and Meta-Analysis" group (PRISMA) developed the standards for this systematic literature. The PRISMA study protocol establishes eligibility standards before starting the literature search and data capture process and describes each element of the systematic review.

Formulation of the research question
The creation of the research questions utilizes PICOS. P=Population, I=Intervention, C=Comparison, O=Outcome, and S=Study Design made up PICOS. Based on these guidelines, studies need to cover five key areas in the review: pulmonary tuberculosis patients (Population), Whatapps reminders and audio-visual education (Intervention), adherence to treatment for tuberculosis (Outcome), quasi-experimental studies, randomized control and trial, experimental study, qualitative research, and cross-sectional studies, mixed methods study (Study Design). Table I figures PICOS.

Eligibility Criteria
Papers published in English, articles addressing pulmonary tuberculosis patients, the use of WhatsApp reminders, and audio-visual education on

tuberculosis medication adherence are the selection criteria for this review. Other inclusion criteria were used in this study to address the research issue, however, only publications written in English were chosen for publishing.

Information Sources
The authors searched for articles relevant to the February 2022 study using the Scopus, PubMed, and Web of ScienceDirect databases. The reference lists that were provided with the articles were also browsed for a more thorough analysis of the chosen subject.

Search Strategy
Search relevant articles using keywords according to Medical Subject Heading (Mesh) and using Boolean operators AND and OR. So the authors use the research keywords ("reminder system") AND ("education") AND ("Audiovisual" OR "Video-Audio Media") AND ("Medication Adherence") AND Tuberculosis. Research designs during the last five years (2018-2022) that were published in English and open-access journals include quasi-experimental studies, randomized control and trial studies, experimental studies, qualitative research and cross-sectional studies, and mixed method studies.

Selection Process
When looking for articles from 2018 to 2022 that were published in English. A total of 128 articles were found after searching via four databases. After that, the duplicates were removed (N=6). The study includes twelve of the one hundred twenty-two articles (122). Each database yielded the following number of articles: WEB of Science yielded 15, PubMed yielded 87, Scopus yielded 9, and ScienceDirect yielded 11. To summarize the selection of papers for the study, the PRISMA 2020 Flow Chart was used, as seen in Fig. 1.

Quality Appraisal
The critical appraisal used The Joanna Briggs Institute (JBI) in quasi-experimental studies, randomized controlled trials, and cross-sectional studies to analyze the methodology of each study (N=12). The checklist for quasi-experimental studies was 9 questions, randomized controlled trials had 13 questions and cross-sectional studies had 8 questions. The assessment criteria used scores of "yes", "no", "not clear", and "not applicable". Each question with a "yes" score will earn one point and all other scores will earn zero points. The results of these scores are then added up, if the research score is 50% in the critical appraisal, which is the limit point that has been determined and agreed upon by the researcher, it will be included in the inclusion criteria. Scores < 50% were excluded because they were considered low quality to

avoid bias on the validity of the results and review recommendations. Finally, twelve studies scored higher than 50% and could be used to perform data analysis.

RESULTS

Four databases were searched, yielding a total of 128 articles. Then the duplicates were removed (N=6), from these results, there were 122 articles for the title and abstract screening. 105 articles were disqualified because they didn't adhere to the requirements, including not discussing TB treatment, using interventions other than a reminder system and audio-visual education, and not discussing medication adherence and study designs that did not meet the criteria. It was found that 17 full-text articles were reviewed for eligibility. A total of 5 articles were excluded so that there were articles that were assessed for quality.

Twelve articles met the requirements for systematic review. The research methods used in this study were RCT (5 studies), cohort (3 studies), exploratory sequential design (1 study), quasi-experimental (1 study), and prospective feasibility study (1 study). This research was conducted in several countries, namely Australia (1 study), China (2 studies), Indonesia (2 studies), India (2 studies), Africa (2 studies), Korea (1 study), Uganda, Tibet (1 study), and India (1 study). All selected studies discussed improving TB treatment adherence through a reminder system or audio-visual education. Table II features the characteristics of articles during the study selection.

Description of intervention
Adherence to TB treatment is crucial for obtaining favorable treatment outcomes. Failure to finish therapy can result in recurrence and the establishment of multidrug-resistant TB, which can spread the disease further (21). Treatment completion is crucial for patients as well as society as a whole to stop the spread of disease. The following interventions can be used to increase TB treatment compliance. A short messaging service will be used as the first intervention (SMS) (15,16). Even though mobile phone use has significantly increased over the past ten years. Everyone may not own a smartphone with a messaging program other than SMS, such as WhatApps or Hangout, but it is a fact. The answer to this issue is a straight forward SMS service that can send patients their actual findings while maintaining their privacy. The second intervention is EMM (electronic medication monitor). This intervention was designed using a plastic box set and an electronic module. Each TB patient's study kit was configured by the nurse to deliver medication reminders at the same time each day, as determined by the patient. When the device is

Table I : PICOS

Criteria	Inclusion	Exclusion
Population	Pulmonary TB patient	Not a patient with pulmonary TB
Intervention	*Whatapps reminder* and Audiovisual education	Besides WhatsApp reminder and Audiovisual education
comparison	There is not any	
Outcome	TB treatment adherence	Does not discuss TB treatment adherence
Study Design	Quasy-experimental studies, randomized control and trial, experimental study, qualitative research and cross sectional studies, mixed methods study,	Systematic review, literature review
Publication years	2018-2022	Before 2018
Language	English	Other than English

Table II : The characteristics of articles during study selection

No	Study (first author & years)	Country	Study design & sample	Intervention	Length of follow up
1	Protocol of a parallel group Randomized Control Trial (RCT) for Mobile-assisted Medication Adherence Support (Ma-MAS) intervention among Tuberculosis patients (19)	Australia	RCT Experiment group: 93 Control group: 93	**Objectives:** Develop an SMS intervention on TB treatment adherence in a systematic manner with evidence-based theory and conduct trials with robust measurement methods **Contents:** SMS intervention for TB treatment adherence **Activities:** The intervention group will receive daily SMS and weekly phone calls regarding daily drug intake and visit reminders. While the control group only received standard care **Duration:** intervention was carried out for 2 months	2 months
2	Using electronic medication monitoring to guide differential management of tuberculosis patients at the community level in China (20)	China	Quantitative-Cohort Experiment group: 169 Control group: 154	**Objectives:** evaluated acceptance of the EMM among health care workers and patients while implementing the device for differential TB patient management at the community level. **Content :** use of electronic medicine to guide the differential management of tuberculosis patients at the community level **Activities:** The EMM is designed to accommodate 1 month of anti-TB drugs for once-daily fixed-dose combination tablets (FDC). The patient is monitored monthly by the doctor, if 20-50% of the dose is missed twice or 50% of the dose is missed once, the patient is switched to DOT **Duration**: 1 month	1 month

No	Study (first author & years)	Country	Study design & sample	Intervention	Length of follow up
3	Preparing short message service reminders to improve treatment adherence among tuberculosis patients in Sleman District, Indonesia (15)	Indonesia	An exploratory sequential design Experimental group: 60 Control group: 60	**Objectives:** explore the feasibility of using short message service reminders (SMS) via mobile phones to improve medication adherence in TB patients **Content**: SMS to improve TB treatment adherence **Activities:** Qualitative data were collected to explore the receipt and request of SMS reminders among TB patients and to identify appropriate short messages. Then followed the posttest to measure the effectiveness of SMS reminders on medication adherence **Duration:** 56 days	56 days
4	Evaluation of Mobile Application for the Management of Tuberculosis Patients in Tianjin During 2019–2020 (18)while universal implementation of directly observed therapy (DOT	China	prospective-cohort study Experimental group : 1284 Control groups:-	**Objectives:** see the effect of mobile applications on the management of TB patients **Contents:** the use of mobile applications for the management of TB patients **Activities:** data is downloaded from the tuberculosis doctor application and TB information management system (TBIMS) and combined with the TBIMS notification number **Duration**: 3 months	3 months
5	Protocol for a randomized controlled trial to evaluate the effectiveness of improving tuberculosis patients' treatment adherence via electronic monitors and an app versus usual care in Tibet (21)	Tibet	RCT Experimental group: 150 Control group: 150	**Objectives:** evaluated the effectiveness of using a new electronic monitor (e-monitor) and smartphone application to improve medication adherence among pulmonary TB patients in Tibet **Contents:** use of new electronic monitors (e-monitors) and smartphone applications to improve medication adherence among pulmonary TB patients **Activities:** the intervention group will receive treatment through an e-monitor that has automatic voice reminders, and record medication adherence data and share it via a cloud connection to health workers. **Duration:** 6 months	6 months

No	Study (first author & years)	Country	Study design & sample	Intervention	Length of follow up
6	A pilot project: 99DOTS information communication technology-based approach for tuberculosis treatment in Rajkot district (22)	India	Pilot project Experimental group: 197 Control group: 150	**Objectives:** evaluate treatment adherence rates and treatment outcomes 99DOTS information communication technology (ICT) based approach to TB management **Contents:** 99DOTS communication technology based approach to TB treatment **Activities:** 99DOTS is a low-cost mobile-based technology that allows **Duration:** 19 months	19 months
7	The Effect of Javanese Language Videos with a Community Based Interactive Approach Method as an Educational Instrument for Knowledge, Perception, and Adherence amongst Tuberculosis Patients (23)	Indonesia	Quasi-experimental Experimental group: 62 Control group: 60	**Objectives:** This study aims to determine the effect of regional language educational videos on the level of knowledge, perception and adherence of TB patients **Contents:** the effect of regional language education videos on the level of knowledge, perception and compliance of TB patients **Activities:** Researchers conducted a need assessment and education plan on the respondents. Respondents were given a questionnaire to test the level of knowledge and perception. After the 30th day the researchers conducted a post test **Duration:** 1 month	1 month
8	SMS reminders to improve adherence and cure of tuberculosis patients in Cameroon (TB-SMS Cameroon): A randomized controlled trial (24)	Africa	Rct Experimental group: 136 Control group: 142	**Objectives:** evaluate the effectiveness of SMS reminders to improve TB treatment adherence **Contents:** use of SMS reminders for TB treatment adherence **Activities:** patient receives SMS reminder **Duration:** 5 months	5 months
9	Medication Event Monitoring System for Infectious Tuberculosis Treatment in Morocco: A Retrospective Cohort Study (25)	Korea	A Retrospective Cohort Study Experimental group: 206 Control group: 141	**Objectives:** Effectiveness of the Medication Event Monitoring System (MEMS) for TB control **Contents:** use of MEMS for TB control **Activities:** Researchers conducted a MEMS intervention in the intervention and control groups and then compared the results **Duration:** 1 month	1 month

No	Study (first author & years)	Country	Study design & sample	Intervention	Length of follow up
10	Use of Smartphone-Based Video Directly Observed Therapy (vDOT) in Tuberculosis Care: Single-Arm, Prospective Feasibility Study (14)	India	Prospective Feasibility Study Experimental group: 13 Control group: 12	**Objectives:** assessing the feasibility and acceptability of Vdot for adherence monitoring in high TB settings **Contents:** Vdot for compliance monitoring in TB settings **Activities:** prospective Vdot pilot implementation. Adherence measure (proportion of prescribed dose observed via video). This platform allows patients to record and transmit treatment videos. **Duration:** 17 months	17 months
11	Digital adherence technology for tuberculosis treatment supervision: A stepped-wedge cluster-randomized trial in Uganda (26)	Uganda	cluster-randomizedtrial Experimental group: 233 Control group: 232	**Objectives:** assessing the effectiveness digital technoogy for tuberculosis treatment supervision **Content :** use photos of health facility TB treatment **Activities:** Staff at each health facility took photos of health facility TB treatment registers and uploaded the photos monthly to a secure server **Duration :** 8 months	8 months
12	Treatment initiation among tuberculosis patients: the role of short message service (SMS) technology and Ward-based outreach teams (WBOTs) (16)tuberculosis (TB	south Africa	RCT Treatment group: 104 SMS Intervention: 105 WBOT Intervention: 105	**Objectives:** assessing the effectiveness of short message service (SMS) technology and environment-based outreach teams (WBOT) in improving TB treatment initiation **Contents:** use of SMS and WBOT for TB treatment **Activities:** Respondents were divided into 3 groups, namely standard of care, SMS intervention, and WBOT intervention. Then the results of the three groups were compared **Duration:**19 months	19 months

connected to a computer, the doctor can obtain data from the EMM management system and the EMM logs every time the patient opens the device, certifies that the patient has taken his or her medication, and so forth. Patients with TB must go to the designated hospital every month for follow-up exams, a doctor's review of EMM data and medication adherence, and to pick up anti-TB medications for the month after (12). Video DOT is the third intervention (vDOT). As a patient-centered substitute for live DOT, vDOT was established, allowing for remote pill monitoring via digital video recording. With the help of patient-recorded video, a new smartphone-based method called vDOT enables remote care monitoring (21). Both synchronous technology, like Skype and Facetime, and asynchronous technologies, where recorded videos are uploaded and digitally saved for later review, have been used to create vDOT. The fourth intervention is a mobile application. This application is a tuberculosis assistant that can provide reminders about drug use and review, question and answer consultations, patient forums, and communication with doctors (13).

Table III features the characteristic of including the study (Title, country, study design, sample,
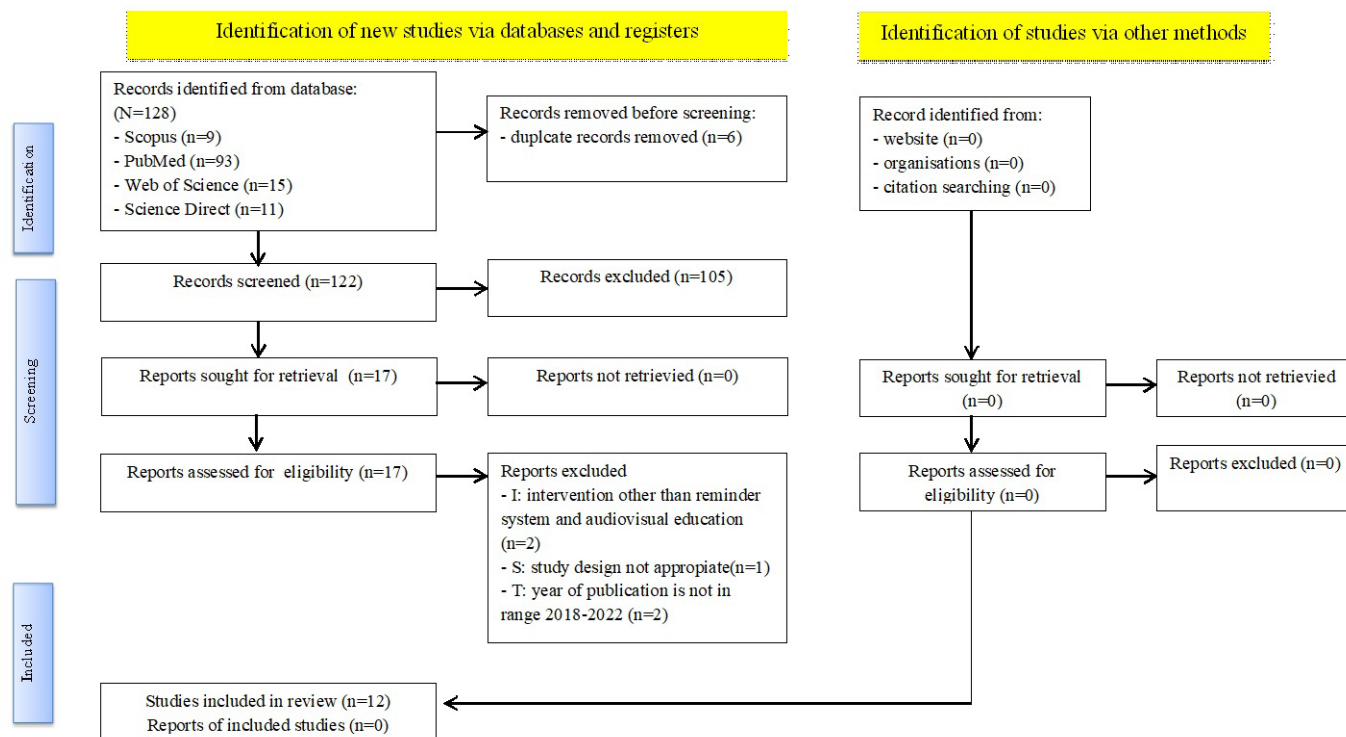
Figure 1 : PRISMA 2020 flow diagram.

intervention, and also the length of follow-up).

DISCUSSION

The purpose of this study is to determine how the Reminder System and Audio-Visual Education affect patients with pulmonary tuberculosis adherence to therapy. Three digital technologies are advised by the most recent WHO treatment recommendations for drug-susceptible TB: short messaging service (SMS), electronic medication monitoring (EMM), and video-observed treatment (VOT) (22). The SMS intervention is discussed in the first. The test results reveal that there is statistically a significant difference in the percentage of medication adherence in TB patients who receive SMS messages against those who do not, or that SMS reminder short messages promote medication adherence for TB patients (8,9). The findings of this study are consistent with those of earlier studies that sent messages by SMS. Text messages via cell phones have become a powerful tool with the potential to change a person's behavior, health promotion activities, and support for health services are widely available, cheaply, and quickly. Sending reminder messages via cell phones is more effective than no message reminders to remind the patient's presence at health care facilities (20).

The nature of the message (short, easy to grasp, and casual), motivational qualities (inviting and positive remarks), and language that show respect (respect, use Mr./Mrs./Miss and avoid "TB patients") are some tips for creating brief communications (9). Motivational messages, recurring reminders, and educational messages are all included in the messages created as reminders. The right message should inspire and persuade the recipient that TB can be healed during the initial stage when the patient feels dejected and hopeless. The negative stage is the second stage. Information on side effects and how to manage them is conveyed in the message. Trust is the third stage. At this point, the message is focused on frequent treatment and transmission prevention. After intensive care, the fourth phase is pessimism or low desire, necessitating the suppression of information on ongoing and regular therapy (9). The results showed that the reminder system improved TB treatment adherence. The reminder system is built by installing the SMS gateway application program on the PC (8), recording all communications, and arranging daily communication. A daily reminder message is then automatically sent to all TB patients' telephones (9).

Second, the EMM (electronic medication monitor) intervention. EMM is now the most accessible, cost-effective, and scalable solution in environments with low resources and may be implemented without internet or mobile broadband connectivity. When compared to the SAT, the EMM significantly lowers the frequency of missed doses. Patients with TB and medical professionals demonstrate great user performance, acceptance, and happiness with EMM (12). The EMM was created to keep an eye on medication compliance throughout the one-month FDC regimen. An electronic module and a plastic enclosure are included in the parts of the device. Each patient uses the electronic modules for about

US$5 and they are reusable for at least three patient cycles (each patient is treated for up to 6 or 8 months). Each TB patient's study kit was configured by the nurse to deliver medication reminders at the same time each day, as determined by the patient. The doctor can obtain information from the EMM management system when the device is connected to a computer. The EMM logs every time the patient opens the device, indicating the patient has taken his or her medication. Every month, TB patients must go to the designated hospital for follow-up exams, doctor reviews of EMM data and medication adherence, and collection of anti-TB medications for the upcoming month. If less than 20% of dosage was missed, the patient received counseling based on the medication adherence statistics from the preceding month. The frequency of home visits by the village doctor rises if 20 to 49 percent of pills are missing (once every 7 days for the remainder of the treatment). Once a dosage of 50% is missed, the patient is shifted to DOT for the remaining portion of the treatment (12).

Community physicians were obliged to check the health state and track the usage of EMM in patients who participated in the EMM study once every 10 days during the intense phase (the first two months of therapy) and once a month during the follow-up phase. The reading on the EMM's tiny LED panel demonstrates how frequently the patient is taking doses. Additionally, district-designated hospital staff periodically submit EMM data to the online EMM information management system (EMMIMS) so that health workers at all levels can learn about the treatment adherence of TB patients in their jurisdiction. The third intervention is vDOT (Video Direct Observed Therapy). Asynchronous and synchronous technologies, including Skype and FaceTime, as well as technologies that allow recorded videos to be uploaded and digitally preserved for later inspection, have both been used to implement vDOT. Patients can capture and transmit treatment videos through the platform's patient-facing mobile app. Additionally, the user interface asks patients to report side effects brought on by medications (by checking the relevant symptoms from a pre-populated list). Patients can examine treatment progress and monitor adherence using the calendar tool. A tablet or smartphone with a camera that has at least intermittent connection to Wi-Fi or cellular data is required to use the software. Medical staff can evaluate treatment videos on the platform's provider section using a mobile browser on a desktop, laptop, tablet, or smartphone. Patients who report adverse treatment effects are told about them by the providers.

The app is used to record videos. The video (or untransmitted component) stays encrypted on the device if internet access is lost or blocked while recording or uploading videos; all videos are automatically transferred to a secure server when the connection is reestablished (Wi-Fi or mobile data). The video is automatically removed from the smartphone's memory after transmission. Encrypted patient data is thus only present on the device between the time of video capture and the time of Web upload. The video (or untransmitted component) stays encrypted on the device, and all movies are automatically uploaded to a secure server when connectivity is restored. Providers can access uploaded data via a secure Web interface to review submitted videos and monitor therapy progress (Wi-Fi or mobile data). The smartphone memory is immediately cleaned out after the video has been transmitted. Encrypted patient data is thus only present on the device between the time of video capture and the time of Web upload.

The video (or untransmitted component) stays encrypted on the device, and all movies are immediately uploaded to a secure server when connectivity is restored. Providers can evaluate submitted videos and track treatment progress via a secure Web interface (Wi-Fi or mobile data). The video is automatically removed from the smartphone memory after transmission. Therefore, only during the time between video capture and Web upload does encrypted patient data stay on the device. The video (or untransmitted component) stays encrypted on the device, and all movies are immediately uploaded to a secure server when connectivity is restored. Providers can evaluate submitted videos and track treatment progress via a secure Web interface (Wi-Fi or mobile data). The video is automatically removed from the smartphone memory after transmission. Therefore, only during the time between video capture and Web upload does encrypted patient data stay on the device (21).

The mobile application is the fourth intervention. Both the Tuberculosis Assistant Application and the Tuberculosis Doctor Application are included in the application. For TB patients, there is the Tuberculosis Assistant app, which can offer reminders regarding medication use and review, Q&A sessions, patient forums, and doctor communication. A management doctor terminal that includes a web system and a mobile application is called the Tuberculosis Doctor Application. Doctors may instantaneously engage with patients, view medication feedback, respond to inquiries from patients, send messages, and regularly push health information (13). Applications for mobile health are used to manage chronic conditions. Even in places with few resources, MA&D is accessible and economical because of its comparatively low price and straightforward operation. The numerous interventions to enhance the care of TB patients are described in the presentation above. The ability of a

patient to finish their therapy indicates that they are adhering to their prescription regimens well.

Even so, the potential of SMS as a medium for delivering information to patients cannot be ignored. Increased access to mobile phones and the use of SMS, even the internet can be a means to deliver short health messages to many people without being limited by time and space. In addition, this method can also provide immediate feedback and support when patients need it.

The use of audiovisual media has also proven to be effective in increasing patient adherence in carrying out treatment. Audio-visual interventions can help patients to improve medication adherence and avoid drug withdrawal because if it occurs it can have a bigger impact, namely drug resistance or better known as Multi-Drug Resistance.

Recommendation
Further research with RCT designs, sound methodologies, and appropriate interventions still needs to be conducted to answer these questions effectiveness of the Reminders System And Audio-Visual Education to Improve Treatment Adherence in Pulmonary Tuberculosis Patients.

Research strengths and limitations
This review's thorough examination of the several research strategies carried out to increase TB patient treatment adherence is one of its strongest points. However, it's important to take into account the restriction of only including materials written in English. This can make it difficult for relevant articles to be found in other languages for the review.

CONCLUSION

The evaluation includes a variety of audio-visual instruction and reminder systems, the majority of which have been shown to improve patients with pulmonary tuberculosis treatment compliance. The findings justify the national TB control program's continued expansion of locally created, inexpensive, and high-quality devices.

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