

Results of professional interventions to improve medication adherence based on health beliefs and important determinants of tuberculosis medication: a systematic review

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Abstract. – OBJECTIVE: Nonadherence to tuberculosis (pulmonary TB) medication poses a serious threat to the increase in new cases, prevention of transmission, and control of pulmonary TB. The health behavior of patients with pulmonary TB regarding medication adherence is an extremely important issue to investigate. This review aimed to identify the available literature on professional interventions and important determinants for improving adherence to pulmonary TB medication based on a health belief model (HBM).

MATERIALS AND METHODS: To identify the determinants and professional treatment outcomes that affect adherence to pulmonary TB medication improvement, the following electronic databases were searched: MEDLINE, PROQUEST, EBSCO, SCOPUS, Web of Science, and Google Scholar. This review was carried out following the preferred reporting items for systematic reviews and meta-analyses (PRISMA) guidelines. The full texts were reviewed if they met the following inclusion criteria (1) the articles were written in English, (2) relevant, and (3) the publication years of the studies ranged from 2015 to 2022.

RESULTS: A total of 2,322 pieces of literature met the screening criteria: 47 articles met the full-text review criteria, 39 articles were excluded because they did not meet the inclusion criteria, and eight articles were reviewed. Perceived susceptibility, perceived severity, perceived obstacles, perceived benefits, and self-efficacy are determinants of patient health beliefs that contribute to medication adherence. Psychological counseling, pulmonary tuberculosis education, motivational interviews, and hypnosis are all effective professional interventions for improving medication adherence.

CONCLUSIONS: Perceived susceptibility, perceived severity, perceived obstacles, perceived benefits, and self-efficacy were the key determinants for improving adherence to pulmonary TB medication. The finding suggests a professional

intervention for patients to improve medication adherence and psychological counseling, pulmonary tuberculosis education, motivational interviews, and hypnosis to improve medication adherence.

Key Words:

Counseling, Health belief model, Medication adherence, Self-efficacy, Hypnosis, Tuberculosis.

Introduction

Since the 1980s, effective pulmonary tuberculosis (pulmonary TB) treatment has been available. Nevertheless, pulmonary TB remains a public health issue that has become a serious problem worldwide. According to the (WHO, 2020)¹, an estimated 10 million people become ill with pulmonary tuberculosis worldwide, with 5.6 million men, 3.2 million women, 1.2 million children, and 1.4 million people dying of TB in 2019. WHO further reported that India, China, the Philippines, Pakistan, Nigeria, Bangladesh, and South Africa accounted for 87% of all TB cases. In 2019, the incidence of pulmonary TB in Indonesia was 316 per 100,000 population, with around 845,000 people suffering from TB. An estimated 92,700 people die from pulmonary tuberculosis, or about 11 people per hour¹. Furthermore, the impact of pulmonary TB on death can have implications for the quality of health status, mental health disorders, and disruption of the patient's recovery process, which are then followed by complications that extend the length of social and economic care². Countries around the world have made efforts to control the pulmonary TB epidemic to reduce the emergence of new cases, increase the cure rate, and reduce the death rate

of pulmonary TB. However, the implementation of pulmonary TB epidemic control programs in countries around the world continues to highlight the treatment success gap. The success rate of TB treatment in several areas in the world is the following: Africa (78.0%), particularly East Africa (28.0%)³, America (75.9%), Asia (81.6%), Europe (79.7%), and Oceania (83.9%)⁴. The causes of pulmonary TB treatment failure are a lack of political commitment and funding, insufficient organization of TB services and case management, and distance between the house and healthcare service units, with people living in rural areas with limited healthcare infrastructure⁵⁻⁹.

Tuberculosis is nearly always curable if the patient receives effective and continuous anti-TB treatment. Drug adherence has been identified as an important dimension in pulmonary TB control and treatment programs, with non-adherence to anti-TB drugs posing a significant risk to program success. Patient adherence is an obstacle and challenge to tuberculosis medication during the first 6-8 months of treatment^{10,11}. Medication adherence is a measure that refers to the completeness with which participants or patients follow medical instructions¹². The challenges of an effective TB treatment are adherence to medication, loss of income during treatment, additional treatment costs, and transportation to pulmonary TB clinics. Anti-TB drug resistance is caused indirectly by patients' nonadherence to their medication¹³. The resistance can impede the patient's recovery. Re-medication and drug resistance are significant risk factors for treatment failure, and older age is a significant risk factor for pulmonary TB mortality¹⁴. Treatment results are impacted by resistance to anti-TB medications, especially rifampin and multidrug resistance¹⁵.

Adherence to anti-TB medication is a critical issue to investigate. Many factors influence adherence to the treatment, including health beliefs, knowledge, and perceptions about TB. Patient adherence to anti-TB medication is determined by perceived threats, benefits, obstacles, and self-efficacy. It has also been reported¹⁶ that self-literacy is the most responsible for the variation in therapy adherence. This includes a sizable proportion. Non-adherence to TB treatment is influenced by forgetfulness, fear of drug side effects, a one-hour wait time during health services, and long distances to health facilities¹⁷. To prevent the failure of the pulmonary TB treatment program in the current era of the health revolution, health promotion efforts are important to educate people with pulmonary TB about

the importance of medication adherence. Patient adherence to anti-medication therapy needs to be increased in order to reach the intended therapeutic goal. A patient-centered approach to pulmonary TB treatment using a health belief-based adherence intervention package tailored to patient needs and values leads to improved pulmonary TB treatment outcomes¹⁸. The objective of this literature review is to assess the role of perceived susceptibility, severity, obstacles, benefits, and self-efficacy in TB treatment adherence. The review evaluates the available literature on professional interventions and important determinants of medication adherence in patients with pulmonary TB using a health belief model. The following issues are guiding the systematic review of the literature:

1. What are the important factors that determine the adherence of pulmonary TB patients to treatments based on the health belief model?
2. What are the professional interventions that improve medication adherence based on the health belief model in pulmonary TB treatment?

Materials And Methods

Data Source Collecting Strategies

The following electronic databases were used in the search: MEDLINE, PROQUEST, SCOPUS, Web of Science, and Google Scholar. We looked for medical subject heading (MeSH) terms such as "health belief model", "medication adherence", and "tuberculosis". Before searching, all authors reviewed the proposed search term list and made any necessary changes. We examined the reference lists of eligible articles and relevant reviews to identify additional articles not indexed in the searched database. We consulted with expert librarians about our draft search strategy, which combined MeSH and text terms related to pulmonary TB. The publication years of the studies ranged from 2015 to 2022.

Eligibility Criteria

The full texts were then reviewed to ensure they met the inclusion criteria as follows: (1) the articles are based on novel research that has been reviewed and written in English, and (2) the articles aim to investigate the important determinants of model-based medication adherence of TB patients, and (3) the studies employed a prospective, longitudinal, cross-sectional, or retrospective design in

patients with pulmonary TB. If any predictor was found to have increased adherence, randomized and non-randomized prospective comparative studies of the intervention would be included.

Data Extraction

This literature review follows the preferred reporting items for systematic reviews and meta-analyses (PRISMA) guidelines¹⁹. The steps taken include (1) removing duplicates, (2) self-checking the title, abstract, and keywords, as well as discarding irrelevant articles based on the inclusion criteria, and (3) examining titles and abstracts that meet the inclusion criteria and are appropriate.

Results

Searching and Screening Results

A keyword search of an electronic database yielded 2,322 articles, 1,772 of which were found after screening for duplication. Following that, 1,520 articles were discarded because they were unrelated to the title and abstract. A total of 47 articles fulfilled the full-text review criteria. A total of 39 articles were excluded due to non-compliance with the inclusion criteria, and eight²⁰⁻²⁷ articles were reviewed, namely six research^{20,23-27} results from Asia, and two^{21,22} from Africa. The number of samples used in each article varied between 39 and

698. The studies included confirmed TB patients aged over 18. Figure 1 shows the search results and screening of studies examined in the review.

Determinant Factors Influencing Adherence to Pulmonary TB Medication Based on a Health Belief Model

Based on the health belief model, there are five determinants of drug consumption adherence in the medication of pulmonary TB patients: perceived vulnerability, severity, obstacles, benefits, and self-efficacy. Three^{20,23,25} pieces of the literature identified an important determinant of adherence to anti-tuberculosis treatment, namely the level of perceived severity. One study²⁵ identified that susceptibility factors and perceived severity influence the level of treatment compliance in pulmonary TB patients. Five studies^{20-22,25,27} identified factors of perceived benefits and barriers that have an influence on the level of treatment compliance. Two studies^{23,27} revealed that an important determinant of anti-tuberculosis treatment adherence is self-efficacy.

Professional Interventions that Improve Pulmonary TB Medication Adherence Based on a Health Belief Model (HBM)

Five articles^{20,21,24-26} showed that professional interventions, including pulmonary TB education, psychological counseling, motivational interviews,

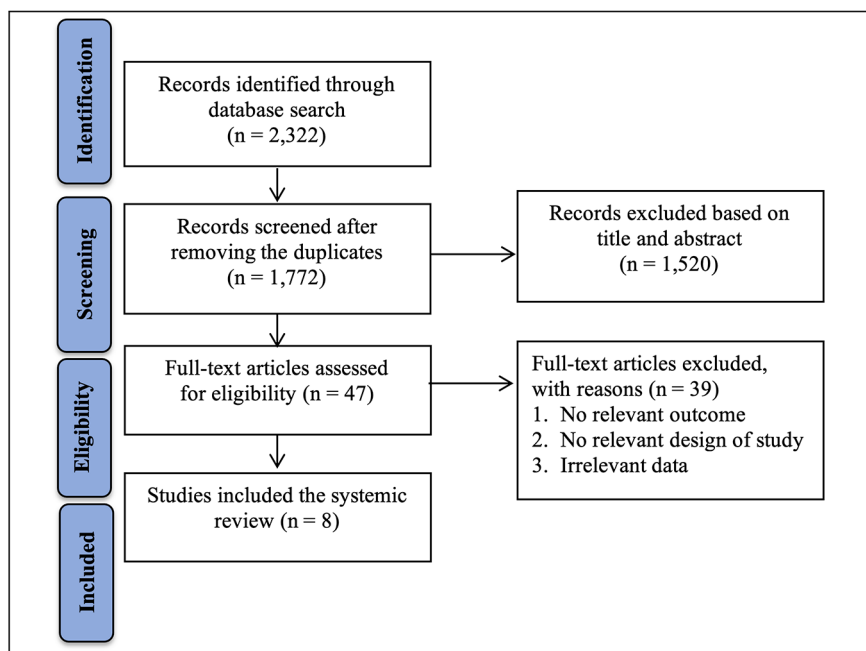


Figure 1. Search and study selection results.

and hypnosis, help improve adherence to HBM-based pulmonary TB medication. Two papers^{20,25} were found to be related to HBM-based education in improving pulmonary TB treatment adherence. The results of the study by Jadgal et al²⁰ showed that educational interventions could improve cognitive skills significantly from 6.10 to 6.88, the level of perceived severity increase from 11.08 to 12.19, the perceived benefits increase from 11.48 to 12.23, and educational interventions can reduce perceived barriers significantly from 17.52 to 16.68.

Meanwhile, the results of the study by Patricia et al²⁵ showed an average difference among several factors before and after the education interventions [knowledge (0.333; $p = 0.000$), perceived vulnerability (0.538; $p = 0.000$), perceived severity (0.564; $p = 0.000$), perceived benefits and obstacles (5.025; $p = 0.000$), and the driving perception (5.025; $p = 0.000$)].

The paper by Tola et al²¹ is a professional intervention article related to HBM-based psychological counseling in improving pulmonary TB medication adherence. The findings of this study show a significant difference in non-adherence between the intervention and control group [adjusted odds ratio (AOR) = 0.31, 95% CI (0.18-0.53; $p < 0.001$)]. Another article²⁶ was found to be related to an HBM-based motivational interview intervention used to improve pulmonary TB medication adherence. The study concluded that medication adherence is 4.5 times higher [adjusted risk ratio (ARR) = 4.51; $p = 0.018$] and medication success is 3.8 times higher (ARR = 3.81; $p = 0.038$) in the intervention group compared to the control group. A communication motivation model based on HBM is effective in improving medication adherence and success in TB patients. Among the articles retrieved, one²⁴ discusses HBM-based hypnosis interventions for improving pulmonary TB medication adherence. The findings of this study suggest that hypnotherapy interventions improve adherence to TB medication by increasing health-related perceptions and beliefs about HBM. Table I provides a summary of the eight studies²⁰⁻²⁷ examined in the review.

Discussion

Belief in the Perceived Severity of Pulmonary TB

The perceived severity of pulmonary TB patients was found to be an independent determining factor that influenced medication adherence

or increased behavior in taking medication detailed in three studies^{20,23,25}. This finding could be related to the very low perceived severity, which may have occurred because patients regularly using the drug immediately felt better after taking it. Components that are thought to improve tuberculosis treatment behavior largely depend on the perceived level of severity of pulmonary tuberculosis disease. A person with a strong sense of severity will take good care of himself, including undergoing TB treatment as prescribed.

The results of this review are consistent with the findings of several other studies²⁸⁻³⁰. Previous research²⁸ has found that the significantly increasing perceptions of disease susceptibility encourage people to take COVID-19 prevention measures. Furthermore, adherence was found to be significantly and positively related to patients' beliefs about the severity of the disease that should be prevented or treated ("disease threat"). The objective severity of a patient's disease condition, as well as their awareness of it, can predict adherence. Higher patient adherence is also linked to poorer health²⁹. Another finding³⁰ explained a significant correlation between complication-prevention behavior and perceived severity, vulnerability, and inhibition, as well as severity and complication-prevention behavior.

Belief in Perceived Pulmonary TB Susceptibility

The study by Patricia et al²⁵ discovered that the belief in perceived susceptibility was an independent determining factor that affected adherence to pulmonary TB medication. One can speculate that these findings are interrelated; the greater the perceived risk of pulmonary TB disease, the more likely the patient is engaged to adopt healthier behaviors. The greater the patient's risk of pulmonary TB disease, the more encouraged the patient is to reduce the risk or susceptibility. The findings of this study²⁵ are consistent with those of several other studies³¹⁻³⁵. Previous research³¹ has found that the factors underlying medication adherence are the perceived health and risk of non-adherence to pulmonary TB medication, although the patients admitted that they intended to cancel medication due to health concerns. Other studies³² found that the higher the patients' perceptions of susceptibility and threat, the better the practice in preventing pulmonary TB. It was further explained that the stronger their beliefs, the less impact vulnerabilities and threats have on them. Furthermore, previous research³³ reported that perceived

Table I. Summary studies.

Author(s)	Country	Design	Variable(s)	Result(s)
Jadgal et al ²⁰ 2015	Iran	Quasi-experimental	Education, behavior, HBM	The intervention affected cognitive skills, which increased from 6.10 to 6.88 in promoting pulmonary TB behavior. Following the intervention, all behavioral skills increased significantly from 2.08 to 2.88. The perceived severity increased from 11.08 to 12.19, the perceived benefit increased from 11.48 to 12.23, and the perceived inhibition decreased significantly. The educational intervention increased the patient's knowledge and behavior regarding the initiative for acid-fast bacillus pulmonary TB.
Tola et al ²¹ 2016	Ethiopia	Cluster randomized control trial	Psychological intervention, education, HBM-based adherence	Psychological counseling and educational intervention resulted in significant differences about non-adherence between the intervention and control group [(adjusted odds ratio (AOR) = 0.31, 95% CI (0.18-0.53), $p < 0.001$)].
Tola et al ²² 2017	Ethiopia	Cross-sectional	Sociodemographic characteristics, HBM, adherence	Perceived obstacles/benefits were shown to be a significant direct negative effect regarding TB medication adherence ($\beta = 0.124$; $p = 0.032$). In addition, signs to action ($\beta = -0.68$, $p \leq 0.001$) and psychological distress ($\beta = 0.08$, $p < 0.001$) showed a significant indirect effect on TB medication adherence through perceived obstacles/benefits.
Azizi et al ²³ 2018	Iran	Cohort study	Determinants of adherence, pulmonary TB medication, HBM	Perceived threat factors, benefits, obstacles, and self-efficacy accounted for 42% of the variance in therapy adherence. The strongest predictor of adherence was found in self-efficacy. HBM is a suitable model for predicting therapy adherence in TB patients.
Prasetya et al ²⁴ 2018	Indonesia	Randomized controlled study (RCT)	Hypnosis, adherence, HBM,	Hypnotherapy is effective in increasing adherence to TB medication, by increasing perceptions and beliefs related to health on HBM.
Patricia et al ²⁵ 2020	Indonesia	Quasi-experimental	The educational model of belief, knowledge, and perception	There is a difference in the average increase in knowledge and perception of adherence before and after an educational intervention. The paired <i>t</i> -test resulted from the evaluation values for each variable: knowledge ($p = 0.000$), perceived vulnerability ($p = 0.000$), perceived severity ($p = 0.000$), perceived benefits and obstacles ($p = 0.000$), and perceived drivers ($p = 0.000$).
Parwati et al ²⁶ 2021	Indonesia	The randomized posttest-only control group	HBM-based motivation, adherence	When compared to the control group, medication adherence was 4.5 times higher (ARR = 4.51, $p = 0.018$) and treatment success was 3.8 times higher (ARR = 3.81, $p = 0.038$) in the intervention group. A communication motivation model based on HBM is effective in increasing TB patients' adherence and medication success.
Gebre-mariam et al ²⁷ 2021	Malaysia	Cohort Study	Determinants of adherence, pulmonary TB medication, HBM	The results revealed that having co-factors in medication [adjusted odds ratio (AOR) = 3.51, 95% confidence Intervals (CI) (1.15, 10.75)], difficulty taking TB medication on a regular basis [AOR = 0.07, 95% CI (0.01, 0.31)], perceived benefit [AOR = 3.45, 95% CI (1.07, 11.08)], and perceived self-efficacy [AOR = 0.22, 95% CI (0.07, 0.63)] were independently associated with adherence to anti-TB.

vulnerability has a significant direct effect on adopting healthy behaviors. Belief in disease medication is an important determinant of chronic disease adherence. Concerns about medicine safety and long-term effects predict nonadherence to chronic obstructive pulmonary disease-independent medication³⁴. Medication adherence was significantly related to concern about the potential side effects of taking medication³⁵.

Belief in Perceived Benefits and Obstacles

Four studies^{20,23,25,27} recorded that pulmonary TB patients' perceptions of benefits and obstacles were independent determinants that motivated medication adherence. The findings might be related to the perceived benefits and obstacles that patients feel, which can encourage them to do things that can lead to a better or positive impact, even if there are obstacles to carrying out these activities. Patients are more driven to reduce the obstacles they face, such as the duration and side effects of pulmonary TB medication, and to take advantage of excellent healthcare support facilities (*via* consultation, mass media, and recommendations from friends) if the benefits outweigh the challenges they face. The findings of this review are consistent with the results of several previous studies³⁶⁻³⁸. Previous research³⁶ has found that patients who experience psychological barriers and stress are independently associated with nonadherence to TB medication. Furthermore, previous research³⁷ has revealed that low medication adherence in TB patients is influenced by a variety of complex benefits and obstacles, such as sociodemographic characteristics (older patients have higher medication adherence), medication (patients who do not follow the doctor's recommendations to take medication, have a history of TB medication, experience unwanted drug reactions, and require medication supervision due to low adherence), and patient knowledge about TB (patients who have better knowledge of TB and do not consume alcohol tend to show higher medication adherence). Perceived obstacles at the individual or institutional level can prevent health workers from adhering to and comprehending TB prevention strategies³⁸. The perceived benefit of health workers adhering to infection prevention guidelines when managing respiratory infectious diseases is that they are motivated to do so because they are afraid of infecting themselves or their families, or because they feel responsible for their patients, workplace culture, and the involvement of all staff when implementing infection prevention guidelines.

Managing respiratory infectious diseases can be challenging when it comes to adhering to infection prevention guidelines. Healthcare workers may feel uncertain about how to follow locally-specific guidelines that are dynamic and do not correspond with national or international guidelines. They may also feel overworked and exhausted due to the requirement of wearing personal protective equipment. Additionally, they may receive insufficient training regarding the infection and how to wear protective equipment and may lack enough space to isolate patients³⁹.

Challenges and obstacles that health workers experienced in treating COVID-19 patients in hospitals in Indonesia include finding it difficult to work with personal protective equipment (PPE), offline COVID handling training, and the use of PPE that is not implemented evenly for all health workers, physical fatigue and exhaustion, psychological problems, difficulties in conducting education and health assessments for patients and families, and limited resources to overcome the COVID-19 pandemic. It was further explained⁴⁰ that the perceived benefits related to information obtained from research on strategies for treating COVID-19 patients could contribute to better preparedness for hospitals and health workers to face the COVID-19 pandemic.

Perceived Self-Efficacy

Two studies^{23,27} reported that pulmonary TB patients' self-efficacy was the most important determinant of medication adherence. This finding may be related to self-confidence, which can affect one's cognitive processes in making quality decisions, setting practical goals, and making plans to overcome obstacles and challenges in pulmonary TB medication. A person with high self-efficacy for a given task will be resilient and persistent in the face of setbacks, whereas someone with low self-efficacy for the task will disengage or avoid the situation. Everyone is endowed with potential; therefore, each individual must believe in his or her ability⁴¹. Adherence to pulmonary tuberculosis treatment is highly dependent on optimal self-efficacy. Self-efficacy has been identified⁴² as a significant predictor of current health behavior, future health behavior, and change in health behavior. The findings of this literature review are consistent with those of previous research⁴³⁻⁴⁶. Several previous studies⁴³ found that patients with high levels of self-efficacy for medication management were more compliant with general diet, exercise activities,

and medication taking. Self-efficacy is a multi-dimensional, dynamic, and contextual concept formed by prior experience, knowledge gained, family empowerment, professional support, and emotional state. It impacts cognitive processes by influencing quality decisions, setting realistic goals, and devising strategies to overcome obstacles and challenges. Increased self-efficacy and intention to complete pulmonary TB preventive therapy can be achieved by empowering patients to make informed decisions about how they receive TB preventive therapy⁴⁴. Self-efficacy is a significant predictor of healthy behavior adherence⁴⁵. Medication adherence behavior is related to self-efficacy and self-expectation⁴⁶.

Educational Professional Intervention

The outcomes reported in the studies by Jadgal et al²⁰ and Patricia et al²⁵ reviewing pulmonary TB educational interventions revealed a significant difference in the HBM-based non-adherence rate between the intervention and control groups. These findings suggest that educational interventions are effective in building a health belief model by taking into account perceived disease severity, perceived susceptibility, perceived benefits, and reduced perceived obstacles before and after the educational intervention. One can speculate that this finding is related to providing education to pulmonary TB patients, which may have an impact on their perception of the severity of their disease so that it can be an important informational factor in motivating them to increase adherence to pulmonary TB treatment.

The findings of this review are not novel and are consistent with the results of several other studies⁴⁷⁻⁵⁵. Previous studies⁴⁷ found that the intervention group had a significantly higher average increase in pulmonary TB treatment adherence than the control group. HBM-based education programs can improve medication adherence in elderly hypertensive individuals by changing their beliefs. The mean scores of perceived susceptibilities, perceived severity, perceived self-efficacy, and prevention behaviors increased significantly in the intervention group, while the mean scores of perceived obstacles decreased significantly after the intervention. However, this increase was significantly greater in the intervention group than in the control group⁴⁸. Individual and group educational interventions, such as phone calls, message reminders, and reading materials, are commonly used as supportive methods to increase adherence⁴⁹. The use of HBM-based educational

interventions is an effective strategy to promote foot self-care behavior in older adults⁵⁰. Education to increase medication adherence can come from information/advertising campaigns tailored to the age level and other supporters, as well as from the size of a problem⁵¹. An educational intervention based on HBM construction is able to significantly increase perceived vulnerability, perceived severity, perceived usefulness, cues to action, self-efficacy, and behavior of the intervention group⁵². A lack of protective equipment and assistive devices is the most significant impediment to implementing precautionary behavior based on HBM. Other findings⁵³, however, show the opposite conclusion. A previous study⁵² found that the average perceived inhibition score in the experimental group was not significantly different from that of the control group on the strategy for preventing urinary tract infections in women. Educational intervention based on the health belief model, which includes constructs of perceived vulnerability, perceived severity, perceived inhibition, and self-efficacy scores, has increased and is capable of promoting hypertension prevention behavior among the Iranian University of Medical Sciences staff. Health education interventions based on HBM are effective in promoting health beliefs (except for perceived obstacles) and health behaviors in women with urinary tract infections. In a study⁵⁴, the HBM-based educational intervention, including perceived vulnerability, service perception, perceived benefit, perceived self-efficacy construction (except cues to action), and earthquake preparedness, increased in the intervention group. HBM-based education should be implemented, with a greater emphasis on action cues for earthquake preparedness. In another study⁵⁵, when compared to the control group, an effective HBM-based educational program was able to increase knowledge, perceived vulnerability, perceived severity, perceived benefits, perceived obstacles, self-efficacy, internal cues to action, nutrition, and walking performance in the intervention group.

Psychological Counseling Professional Intervention

A study²¹ reported on psychological counseling intervention, in which there was a significant difference in the level of non-adherence based on HBM between the intervention and control groups. These findings suggest that psychological counseling can significantly reduce medication non-adherence in the intervention group. Psychological counseling is used to assist patients

in dealing with anxiety and depression. With psychological counseling, patients will feel more guided and supported by related parties. With psychological counseling, patients will feel more guided and supported by related parties. These conclusions are not new and are in line with the findings of several other studies^{56,57}. Previous studies⁵⁶ have found that group counseling based on the quality of life has a significant positive impact on stress severity and life satisfaction among family caregivers of people who use drugs. There was a significant difference in perception scores before and after counseling in the perception of severity in prevention, vaginal discharge susceptibility, benefits in prevention, obstacles to preventive actions, encouragement to act, and total HBM scores in several previous studies⁵⁷. The Health Belief Model-based counseling program is effective in increasing young female students' perceptions of severity, vulnerability, benefits, obstacles, and encouragement to act in preventing vaginal discharge (leucorrhea)⁵⁷.

Structured counseling based on HBM is effective in improving medication adherence in TB patients, with interventions lasting two weeks to six months⁵⁸. Non-adherence to medication is common in patients suffering from depression⁵⁹. Non-adherence to TB treatment is associated with psychological distress⁶⁰. Providing psychosocial support to multidrug-resistant tuberculosis (MDR)-TB patients significantly reduced the level of non-adherence to medication⁶¹. Furthermore, physician education significantly reduced the cumulative non-adherence rate between the intervention and control groups⁶². Also, it was reported⁶³ that there was an increase in TB treatment adherence rates after interventions directed with a focus on "counseling through improved communication between health workers and patients".

Interview Motivational Professional Intervention

The results of the analysis presented in the article by Parwati et al²⁶ about the psychological counseling intervention have revealed a significant difference in the average increase in the level of adherence to taking medication based on HBM between the intervention and control groups.

These findings indicate that the motivational interview intervention in developing a health belief model considers the perceived severity of illness, perceived vulnerability, perceived benefits, and barriers before and after the intervention. One can speculate that providing

motivational interviews to pulmonary TB patients can overcome the triggers of pulmonary TB medication obstacles originating from the HBM construct, resulting in correct thoughts and perceptions of medication. The outcomes of this literature review are not novel and are in line with the findings of several other studies⁶⁴⁻⁶⁹. Previous research⁶⁴ has shown that after receiving an interview motivation intervention, medication adherence increased significantly in the intervention group compared to the control group. Motivational treatment measures based on client-centered interviews effectively promote medication adherence, lower mean blood pressure, and increase self-efficacy and intrinsic motivation in hypertensive patients. There was a significant average difference in medication adherence after a motivational interview intervention for two months⁶⁵. Medication adherence, self-efficacy, and motivation to change improved significantly after patients received motivational interviews⁶⁶. A motivational interview intervention for people with schizophrenia improved medication adherence, reduced symptom severity, and re-hospitalization, and improved functioning and insight into illness and/or treatment over a six-month medium-term follow-up period⁶⁷. When there is a decline in adherence at each step of behavior modification, motivational interviewing has shown beneficial results in medication adherence and treatment effectiveness⁶⁸.

This communication motivation model is a new strategy for TB patients undergoing long-term medication with complex problems to produce consistent self-efficacy and overcome medication adherence obstacles, thereby supporting medication success⁶⁹.

Because ambivalence is frequently an obstacle to action, motivational interviews encourage health workers to address patient ambivalence as the key to change. Patients understand that the treatment process requires support from within and from the social environment, as well as an intention and readiness to change, which encourages long-term self-efficacy to comply with treatment⁷⁰. With the HBM-based motivational interview model intervention, suggestions from others about illness (external cues) can provide cues for action, and cues can also arise internally, such as medication side effects, discomfort, or fatigue. Cues to act are one of the triggers for behavior changes⁷¹. Cues or triggers are required in the HBM model to induce participation in health behaviors. The

intensity of the cues required to elicit action varies depending on the individual's perceived vulnerability, severity, usefulness, and inhibition⁷². Interventions based on positive motivation models can improve self-management behavior for coronary heart disease, thereby improving quality of life and achievement⁷³.

Other findings⁷⁴, however, show the opposite conclusion. The motivational interview intervention was not significantly effective in increasing adherence to medication with specific thrombo-preventive agents for secondary stroke prevention.

Hypnosis Professional Intervention

The results of the psychological counseling intervention analysis detailed in the study by Prasetya et al²⁴ conclude that hypnotherapy improves tuberculosis medication adherence, health perceptions, and beliefs in HBM. It is estimated that this finding is correlated with hypnotherapy, which is believed to effectively increase adherence to directly observed treatment short-course (DOTS) TB medication by increasing health-related perceptions and beliefs in the health belief model. These findings suggest that posthypnotic hypnotherapy interventions increase perceived vulnerability, perceived severity, and perceived benefits, reduce perceived barriers, and increase self-efficacy. This modification to the HBM improves adherence to DOTS medication. The hypnotic phenomenon is attributed to the dissociation of the high-level control system. The findings support those of several other studies^{75,76}, signifying that the effect of hypnotherapy on decreasing the basal metabolic index and increasing serum leptin levels varies. Furthermore, after the hypnotherapy session, the body mass index (BMI) and serum leptin levels decreased significantly, while serum ADP (Adenosine diphosphate) and irisin levels increased significantly. These findings⁷⁵ suggest that hypnotherapy intervention in the treatment of obesity causes weight loss and significant changes in increasing serum leptin levels. Hypnotherapy intervention can improve quality of life and reduce physical symptoms of pain and fatigue, as well as psychological disorders in irritable bowel syndrome patients who are resistant to treatment⁷⁶.

Limitations

This literature review was so heterogeneous due to the inclusion of all study designs. Not all studies collect data in the same way, nor do they analyze data using the same definitions or timeframes.

Conclusions

Many factors affect adherence to taking pulmonary TB medication. Professional interventions and important determinants to improve adherence to pulmonary TB treatment are explained more fully through a systematic review of the literature. There is no information linking professional interventions and important determinants to improve health belief-based adherence. More evidence in this area contributes to higher treatment adherence rates in pulmonary TB patients. The health belief model should be used to prioritize important determinants and professional interventions to improve adherence, particularly around perceived vulnerability, perceived severity, perceived hindrance, perceived benefit and self-efficacy. Psychological counseling, pulmonary TB education, motivational interviews, and hypnosis are effective professional interventions to improve medication adherence. Improving adherence based on patient, family and community health beliefs is critical to reducing treatment failures and preventing pulmonary TB transmission.

Authors' Contributions

M Martono: conception, design, data collection, manuscript preparation, and critical revision. M Akhyar; EP Pamungkasari; A Lestari: conception, design, and approval of publication, critical revision.

Conflict of Interest

The authors declare no conflict of interest.

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