PREVENTION OF TUBERCULOSIS PATIENT TRANSMISSION: SCOPING RIVEW

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Abstract

Backgrounds; Tuberculosis (TB), caused by the bacteria Mycobacterium tuberculosis complex, is one of the oldest known diseases and remains a leading cause of death worldwide**; Objectives**; Combining information from existing literature to provide a description of preventing tuberculosis transmission. **Methods**; The method used was basic electronic data retrieval from sources such as PubMed, ScienceDirect, and Wiley **Results;** The study found that effective TB transmission prevention approaches involve adherence to treatment, education and use of PPE, consideration of social and environmental factors, as well as the use of technology and natural methods such as sunlight. **Conclusions**; The review identifies effective TB transmission prevention approaches, including adherence to treatment, education, use of PPE, and addressing social and environmental factors. Innovative solutions such as SVOT technology and sun exposure also play an important role. Integrating these strategies can improve TB control efforts in the community.

Keywords*: TB Prevention Strategies 1; Treatment Adherence s 2; Innovative Solutions*

BACKGROUND

Tuberculosis, caused by the bacterial complex Mycobacterium tuberculosis, is one of the oldest diseases known to be a leading cause of death worldwide (Natarajan et al., 2020). Worldwide, there is a significant recovery in the number of people diagnosed and treated with tuberculosis by 2022. However, tuberculosis is still the second leading cause of death in the world after COVID-19 and global treatment goals have failed or fallen short of their targets: in 2018-2022, treatment of tuberculosis in all ages 40 million was achieved 34 million (84%), in children 3.5 million was achieved 2.5 (71%), treatment of MDR/RR-TB was targeted at 1.5 million was achieved 825,000 (55%) and treatment of TDR/RR-TB in children was targeted at 115,000 was achieved only 21,600 (19%). Worldwide, the number of people newly diagnosed with tuberculosis is reported to be 7.5 million in 2022. This is greater than the pre-COVID baseline of 7.1 million people in 2019, up from 5.8 million people in 2020 and 6.4 million people in 2021, and may include the number of people diagnosed with tuberculosis in previous years (World Health Organization (WHO), 2023).

TB in humans is mainly caused by M. tuberculosis. This bacterium is considered a genetic clonal pathogen that has co-evolved with humans due to its ability to manipulate and subvert immune responses. TB is a major public health problem due to the airborne transmission of M. tuberculosis from person to person (Gonzalo-Asensio et al., 2017). In 2005 the CDC published revised guidelines to prevent the spread of TB in healthcare settings. These guidelines recommend that all healthcare settings have a TB infection control programme to ensure prompt detection, isolation, and treatment of people suspected or confirmed of having TB. After administrative controls, environmental controls form the second line of defence in a TB control programme, respiratory protective equipment is the last line of defence in a TB control plan, providing the final barrier against the spread of TB and finally health workers themselves are critical to the goal of eradicating the spread of TB. They are particularly equipped to be advocates for change by raising awareness (Swaminathan et al., 2021).

A previous review conducted by (Martinez et al., 2021) focussed on the Risk of Tuberculosis in Children After Close Exposure i.e. preventive therapy used was not uniform and adherence to therapy was not assessed, thus affecting the interpretation of the effectiveness of preventive therapy. Another review (Luciano & Roess, 2020) many of the studies included in this review had small sample sizes and inadequate research designs, which reduced the statistical power and validity of the findings in addition selection bias may have occurred because most studies recruited subjects from health facilities, which may not be representative of the wider population in rural and poor areas that rarely access health services. Based on these phenomena, this study aims to combine information from existing literature to provide a description of the prevention of tuberculosis transmission. Therefore, the research question is what factors can be used to prevent the transmission of tuberculosis.

METHODS

Protocol registration

We used the Scoping Review Frameworks by Arkey and O'Malley. For the literature search, three databases were searched followed by a manual search of the reference lists of papers on relevant topics.

Eligibility criteria

Inclusion criteria

1. Articles focusing on tuberculosis
2. Articles on prevention of transmission
3. Articles including quantitative studies

4. English language articles
   Inclusion criteria
1. Rivew article
2. Published before 2014
   Research studies

Initial searches were conducted using electronic databases, namely, PubMed, Scaindirec, and Wiley. The search used the words tuberculosis OR TB OR pulmonary TB as prombel, AND transmission prevention OR preventing transmission AND community health care OR primary AND care. The article search filtered articles from the last 10 years, research studies, titles and abstracts, and English articles.

Study selection

Selection and inclusion of papers for this review involved a two-stage process: abstract and title screening; and full text reading to select eligible articles for final inclusion.

Data extraction, analysis and synthesis

Once the articles were eligible for inclusion, they were analysed using the Elicit application. And collected information on characteristics including the study, such as: author's name, country of study, study design, study objectives and sample. The transmission prevention characteristics evaluated in the included studies were collected and used to gather information on outcomes. A previous review conducted by (Martinez et al., 2021) focussed on the Risk of Tuberculosis in Children After Close Exposure i.e. preventive therapy used was not uniform and adherence to therapy was not assessed, thus affecting the interpretation of the effectiveness of preventive therapy. Another review (Luciano & Roess, 2020) many of the studies included in this review had small sample sizes and inadequate research designs, which reduced the statistical power and validity of the findings in addition selection bias may have occurred because most studies recruited subjects from health facilities, which may not be representative of the wider population in rural and poor areas that rarely access health services. Based on these phenomena, this study aims to combine information from existing literature to provide a description of the prevention of tuberculosis transmission. Therefore, the research question is what factors can be used to prevent the transmission of tuberculosis.

RESULTS AND DISCUSSION

The total search included 258 articles from three databases. After filtering for duplication, 198 articles remained. Selection based on abstract and title led to the exclusion of 113 articles, leaving 85 articles. Of these 85 articles, 113 were removed in the exclusion process, leaving 26 articles that had been considered after reading the entire text. Finally, 6 articles were included in the final analysis.

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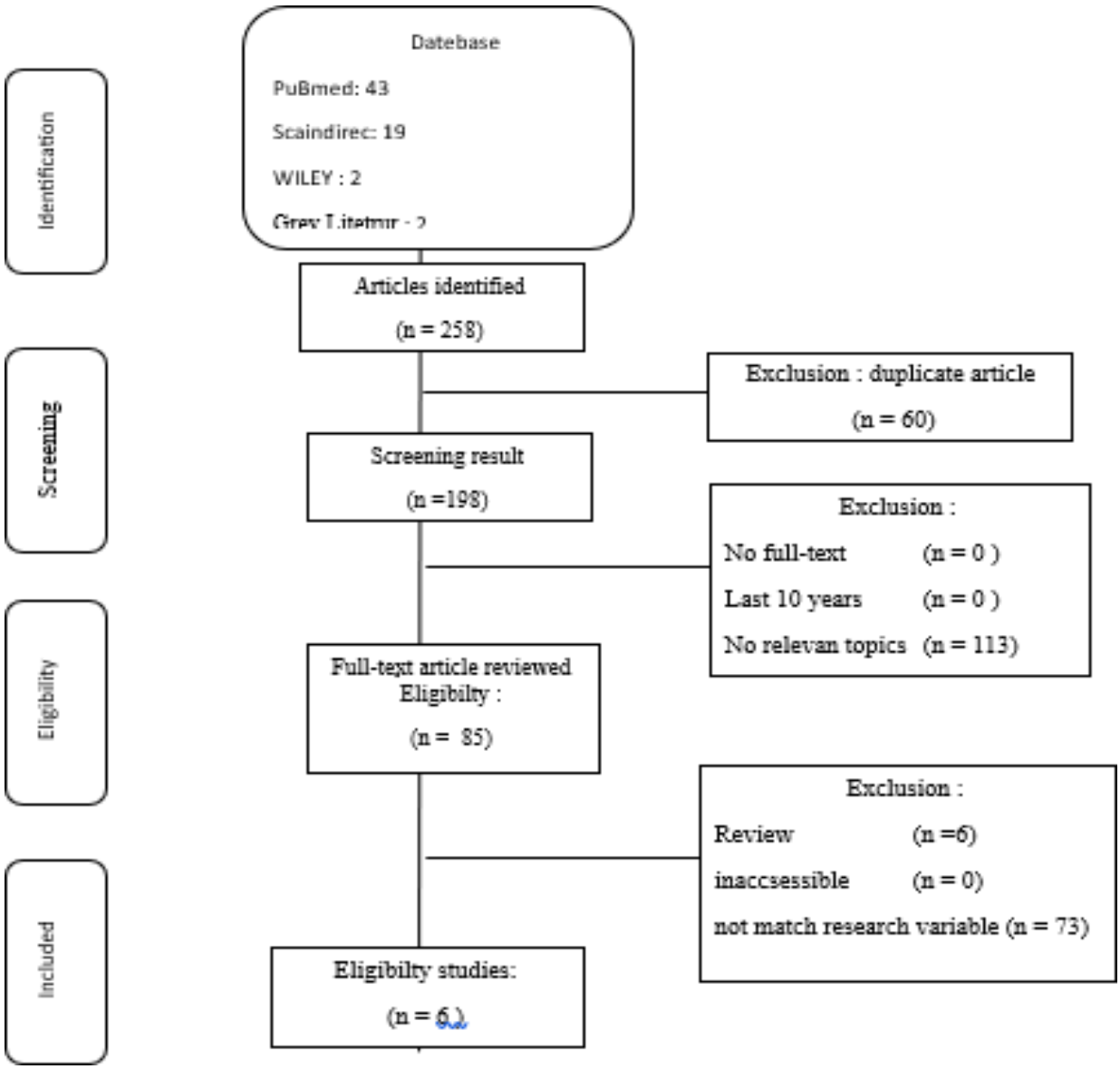

Figure 1. Flowchart of literature search

Table 1. Articles on behaviour to prevent tuberculosis transmission

Author year	Title	Objective	Findings	Prevention of transmission
(Pan et al., 2019)	Adolescent tuberculosis is associated with exposure to tuberculosis in classrooms and	to quantify the risk of having active TB between adolescent students exposed to classroom and/or dormitory room	Exposure to the index TB case in a dorm room significantly increased the risk of active TB diagnosis, with a 3.5-fold	The way to prevent transmission in this paper is to take into account the additional risk of TB transmission due to
	dorm rooms in Guangxi, China.	contacts of index active TB cases and adolescents from control classrooms, and to evaluate the additional risk of TB transmission caused by dormitory room exposure in addition to classroom exposure. The authors emphasise the importance of considering dorm room exposure in planning TB prevention and control in boarding school.	increased risk compared with being a classmate/non-roommate of the index case. The population-attributable fraction showed that 44% of adolescent new TB in the community was attributable to exposure to classmates/non-roommates of the index case and 41% was attributable to exposure to classmates and dorm roommates of the index TB case.	exposure in dormitory rooms in planning TB prevention and control programmes in pesantren, and consider reducing class size and dormitory room size to reduce the number of students exposed to TB.
Chen et al., 2020)	The advantage in privacy protection by using synchronous video observation treatment improves treatment adherence among patients with latent tuberculosis infection.	assessmentof satisfaction with the SVOT programme and its impact on treatment adherence and completion rates.	that satisfaction with synchronous video observed treatment (SVOT) programmes is superior to conventional in-person DOT(CDOT) programmes, leading to higher treatment completion rates and lower withdrawal rates among patients with latent tuberculosis infection (LTBI). Concerns with privacy violations by DOT programmes were identified as a strong barrier to LTBI treatment adherence.	LTBI management (an action taken to prevent the development of active TB) to stop TB transmission and the important role of adherence to therapy in LTBI treatment efficacy.

Author year	Title	Objective	Findings	Prevention of transmission
(Lozano-Díaz et al., 2021)	Latent tuberculosis infection in medical students in Northeast Mexico.	determine the rate of latent tuberculosis infection (LTBI) among medical students at a private Medical School in Monterrey, Mexico, and to assess the association between lack of knowledge and use of personal protective equipment (PPE) with the prevalence of LTBI among medical students.	The prevalence of latent tuberculosis infection (LTBI) is higher among medical students in their final years of medical school compared to those in their first few years, and this is associated with low levels of knowledge about LTBI and low use of appropriate personal protective equipment (PPE).	use ofpersonal protective equipment (PPE) to prevent nosocomial transmission of tuberculosis.
(Al-Sahafi et al., 2021)	Treatment outcomes in tuberculosis patients in Jeddah, Saudi Arabia: Outcomes of directly observed community mobile outreach Project Treatment, Short Course (DOTS), compared with standard facility-based DOTS: A randomised controlled trial.	to test the impact of a new treatment strategy for TB patients, customised to reduce default rates, and to improve patient treatment outcomes. The results showed that the new community mobile outreach team method was effective in improving treatment success rates and was well received by the patients themselves.	The mobile outreach DOTS approach is an effective and acceptable strategy for treating TB patients, with a high overall treatment success rate of 97% compared to 76% in patients not treated by the mobile team.	refers to efforts to prevent tuberculosis transmission through the implementation of a new treatment strategy involving mobile outreach teams in the community.
(Lwin et al., 2020)	Prevalence and determinants of TB infection in	to estimate the prevalence of TB infection and identify	Men,married individuals, those who use wood and charcoal	refers to the level of knowledge and

Author year	Title	Objective	Findings	Prevention of transmission
	arural population in northeastern Myanmar	factors associated with TB infection in rural communities in Shan State, Myanmar.	as the main source of energy for cooking, and those with low knowledge of TB prevention and care have a greater chance of contracting TB.	attitude towards TB prevention and care.
Elfi Cut Mutia, 2022)	Factors associated with the prevention and control behaviour of pulmonary tuberculosis in RW 3 Sawangan Lama Urban Village, Depok City.	to compare the effect of direct and indirect sunlight exposure on the number of surviving Mycobacterium tuberculosis cells.	This studyaims to compare the effect of direct and indirect sunlight exposure on the number of surviving Mycobacterium tuberculosis cells, measured using the drop plate method.	sunlight to inhibit growth and kill bacteria.

RESULTS AND DISCUSSION

This review identified six articles focusing on preventing Tuberculosis (TB) transmission, with key findings covering a range of factors and approaches. The articles highlighted the importance of environmental, technological, and behavioural management in TB prevention. Exposure in dormitory rooms, for example, was found to significantly increase the risk of active TB diagnosis, suggesting that measures to reduce the size of dormitory rooms and classrooms should be prioritised. In addition, the use of technology such as Synchronised Video Observation Treatment (SVOT) was shown to be more effective in improving treatment adherence and completion rates compared to conventional methods, while also addressing patient privacy concerns.

Discussions also highlighted the importance of education and the use of personal protective equipment (PPE) among health workers. Studies have shown that the prevalence of latent TB infection is higher among medical students who lack knowledge about LTBI and use inadequate PPE. Therefore, more intensive education programmes and training in the proper use of PPE are needed to reduce the risk of nosocomial TB transmission. In addition, social and environmental factors, such as wood fuel use and marital status, should be considered in TB prevention strategies. Programmes tailored to local conditions will be more effective in controlling transmission.

Finally, research shows that exposure to sunlight can be an effective natural method in inhibiting the growth of Mycobacterium tuberculosis bacteria. It provides a cost-effective alternative for communities with limited resources and can be integrated in TB prevention programmes, especially in areas with high sun exposure. By combining these various approaches, TB prevention strategies can be more holistic and effective in reducing the risk of TB transmission in the community.

CONCLUSIONS

This review identified a range of approaches that are effective in preventing TB transmission. Adherence to treatment, education and use of PPE, as well as social and environmental factors play an important role in reducing the risk of TB transmission. Technologies such as SVOT and the use of natural methods such as sunlight offer innovative solutions in TB prevention efforts. Therefore, TB prevention strategies need to be adapted and integrated with these approaches to achieve more effective results in controlling TB transmission in the community.

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