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Strategies for the evaluation of tuberculosis contacts: An integrative literature review

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***Abstract*— *Objective**: To analyze the trends in the literature on the strategies used to assess the contacts of patients diagnosed with tuberculosis (TB). **Methodology**: This is an exploratory and qualitative study, based on an Integrative Literature Review (IRL), consisting of 6 stages. Applying the appropriate filters, resulted in 540 articles, in which 14 were selected using the exclusion criteria, in which articles that portrayed and explored the evaluation of TB contacts, latent tuberculosis, as well as the challenges in implementation were prioritized actions for this disease. **Results**: it was categorized into the following topics: Self identification of contacts about the disease, care and transmission; The importance of contact tracing and the role of health professionals on TB transmission. **Conclusion**: the importance of evaluating TB contacts with a view to disease control was highlighted. Thus, it is important to emphasize that the health professional has an enormous responsibility towards this public, and with the community in general, being necessary to always be seeking new knowledge in order to improve their health practices and ensure that their professional attitudes towards contacts make it possible to optimize the identification and investigation of TB contacts.*

I. INTRODUCTION

Tuberculosis (TB) is an infectious disease caused by the bacteria Mycobacterium tuberculosis, which mainly affects the lungs, but can affect other organs and tissues. It is among the top ten causes of death from a single infectious agent worldwide, in addition to being the leading cause of death among people living with HIV. (Teixeira, Samico, Martins, 2020; Silva, Melo, Migliori, 2020; WHO, 2021).

A quarter of the world's population is infected with M. tuberculosis, and in 2020, about 9.9 million people became ill with TB in the world, and in Brazil, in 2020, 66,819 new cases of TB were reported, which corresponded to an incidence coefficient of 31.6 cases/100,000 inhabitants (Brazil, 2019; WHO, 2021). The North region of the country, in 2020, had the highest TB incidence rate, with 43.0/100,000 inhabitants, above the national average and

placing Pará as the third state in the burden of the disease (Távora, et al, 2021; BRASIL, 2021).

In the municipality of Ananindeua-PA, it was observed that one of the problems for TB surveillance and care is related to the shame and fear of revealing the disease to the family, which consequently contributes to the worsening of the health status of the patient. individual, as well as for the transmission of the pathogen to their relatives. In addition, studies point out that in home visits carried out by nurses, another problem found is directed to the living conditions of this population, in which they live in unhealthy conditions, where, in most houses, there is only one window to ventilate the entire house (Brito, 2020).

It should be noted that the Brazilian Ministry of Health recommends that 100% of identified contacts be examined and that treatment for Latent Tuberculosis Infection (LTBI) be initiated in order to reduce the risk of illness. The intensification of the evaluation of contacts is among the actions proposed by the National Tuberculosis Control Program (PCNT), as well as among the strategies of the plan End TB proposed by the World Health Organization (WHO).

It is pointed out that living with a bacilliferous TB patient, the exposed person's susceptibility and the intensity of contact are factors that contribute to illness from TB. According to the Brazilian Ministry of Health (2019) 3.5% to 5.5% of family members or close contacts of a person with TB had the previously undiagnosed disease. It is understood that people in the same household share the same socioeconomic conditions and, often, the same life habits, in which they contribute to the illness, thus, the evaluation of contacts is fundamental for the early diagnosis, as well as for the reduction of disease transmission. In this context, the proper evaluation of the contacts of the person with TB represents an effective and low-cost way to detect the disease early, contributing to the interruption of the chain of transmission and the propagation of microbial resistance. It is noteworthy that this assessment is a challenge for health services, due to the resistance of family members to attend the service and the lack of appreciation given to this procedure by professionals (Lima, Schwartz, Cardozo Gonzáles, et al, 2013).

According to Lima, Schwartz, Cardozo Gonzáles, et al (2013) evidence and strategies in the practice of evaluating contacts of people with TB, through the execution of evaluation protocols, follow-up of patients and their contacts should be carried out through the basic care, in view of the decentralization that the PNCT provides for this condition. In view of the above, the guiding question was defined as “What strategies are used to evaluate the contacts of patients undergoing TB treatment based on scientific evidence in the period from 2011 to 2021?” As a research objective, we propose to describe, based on a integrative literature review, which strategies should be used to assess the contacts of patients undergoing TB treatment.

II. METHODOLOGY

This is an exploratory and qualitative study, based on an Integrative Literature Review (RIL), consisting of 6 steps: 1) Establishment of a hypothesis or research question: What strategies are used to assess the patient's contacts with TB based on scientific evidence from 2011 to 2021?; 2) Sampling or literature search; 3) Categorization of studies; 4) Evaluation of studies included in the review; 5) Interpretation of results; 6) Synthesis of knowledge or presentation of the review (MARCONI, LAKATOS, 2017).

According to Silva and Fossá (2015), bibliographical research is one of the best ways to start a study, as it seeks similarities and differences between the articles found in the reference bases, thus contributing to a deeper understanding of the theme already investigated. The objective of this review method is to point out gaps in knowledge that need to be filled and the need to carry out new studies.

To carry out the research, the following databases were used¸ namely: Latin American and Caribbean Literature in Health Sciences (LILACS), Medical Literature Analyzes and Retrieval System (MEDLINE) and Bibliographic Database Specialized in the area of Nursing (BDENF). Descriptors and keywords: Tuberculosis; Prevention and control; Latent Tuberculosis. The descriptors were searched by crossing with the Boolean AND operator connector in the field of descriptors in the Virtual Health Library in Brazil to build the search strings.

The inclusion criteria are complete texts online in Portuguese, English and Spanish; articles published from 2011 to 2021, whose publications were in the databases; The descriptors proposed for the scientific search were used. And as exclusion criteria, articles that were repeated in the databases and outside the bibliographic review period were adopted.

After the electronic search, we used the PRISMA flowchart, which serves as a support document for explaining and elaborating how it was produced following the style used in other orientations (Figure 1). A pre-selection was carried out, with a thorough reading of the titles and abstracts of the articles, with the intention that they comply with the established inclusion criteria. 540

articles were found at the first moment, one of which was excluded due to duplicity and after reading the title and abstract, 509 of these publications were excluded, resulting in 30 articles for reading in full, 16 of these publications that were outside the theme were excluded. After evaluating the surveys of the articles, these were analyzed using an instrument adapted from URSI (2005).

The instrument was presented, consisting of several methodological evaluation axes, which was adapted for this research, with two axes and their respective subdivisions, the first: Axis 1 Profile of productions, Axis 2 Results in evidence.

For data analysis of the content proposed by Bardin, which includes 3 phases: 1) pre-analysis, which is the organization of the preconceived idea and establishes direction for the interpretation of collected information; 2) Exploration of the material, where it categorizes information from texts, interviews, allocating, for example, in paragraphs according to related themes and 3) Treatment of results, inference and interpretation, consisting of interpreting and mastering all the collected content (BARDIN , 2016).

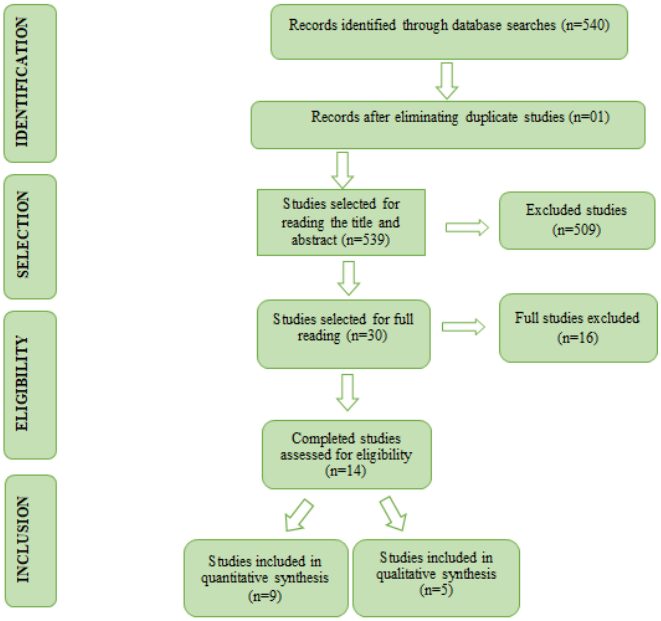

Figure 1: *Flowchart on the study selection procedure, identification and eligibility for analysis. Belém-PA, Brazil, 2011 to 2021*

III. RESULTS AND DISCUSSIONS

According to Table 1, 14 articles were selected, predominantly in English (92.85%), with quantitative, qualitative, observational, systematic review, analytical, cohort and descriptive methods; the highest number of publications occurred in 2014 and 2020 with 3 publications. No articles from the year 2021 were found with the descriptors used in national and international journals.

Table 1 – Characterization of studies regarding title, authors, year, database method and main results, 2011 to 2021.

Title	Author/Year	Method/Database	Main results
1- Tuberculosis: knowledge and adherence to prophylactic measures in contact individuals in the city of Recife, Pernambuco, Brazil	TEIXEIRA AQ et al (2020)	Quantitative, descriptive study/LILACS	TB contacts have little or no knowledge about the disease (they are unaware of the form of transmission, the need to be evaluated and to perform the requested tests), low adherence to primary health care and the active search for contacts is still inefficient.
2- MDR/XDR-TB management of patients and contacts: Challenges facing the new decade. The 2020 clinical up date by the Global	MIGLIORIA et al (2020)	Non-systematic literature search/MEDLINE	Eliminate challenges in combating TB, especially in cases of multidrug-resistant TB. Tracking latest information on contacts and management of LTBI in MDR-TB contacts while providing guidance on

Tuberculosis Network			post-treatment functional assessment and rehabilitation of TB sequelae and infection control.
3- Is the EU model for contact investigation applicable to high TB burden settings?	ZELLWEGER JP (2020).	Quantitative study/MEDLINE	The implementation of preventive therapy in screening for people at higher risk of developing TB, that is, the reduction of future TB cases, is now considered one of the activities capable of helping to reduce the prevalence of TB. This implies that the search for infected contacts and TB prevention must be carried out in parallel with diagnostic and curative activities.
I. 4- KNOWLEDGE, ATTITUDES AND PRACTICES ON TUBERCULOSIS TRANSMISSION AND PREVENTION AMONG AUXILIARY HEALTHCARE PROFESSIONALS IN THREE BRAZILIAN HIGH-BURDEN CITIES: A CROSS-SECTIONAL SURVEY	TRAJMAN et al, (2019).	Cross-sectional, quantitative study/MEDLINE	Knowledge among auxiliary health professionals about the transmission and prevention of TB has significant gaps. These knowledge gaps were notably related to the management of LTBI, including how to recognize it and prevent progression to active TB through treatment.
5- Acceptance of Chemo-prophylaxis for Latent Tuberculosis Infection among High School/College Student Contacts of Tuberculosis Patients in Shanghai, China	LI Yang et al, (2018).	Cross-sectional study/MEDLINE	Students' knowledge about TB transmission and treatment and chemoprophylaxis. The three most reported reasons for wanting to receive LTBI prophylaxis were: to prevent active TB; concern about spreading to other students in case of reactivation; and constant contact with TB patients. However, some refused chemoprophylaxis believing the risk of active TB to be low.
6- Close contact interferon-gamma response to the new PstS1(285–374): CPF10: a preliminary 1-year follow-up study	ARAÚJO LS et al, (2017).	Analytical Study/MEDLINE	Follow-up during the period of one year in recruits in the city of Rio de Janeiro, and as a result they obtained low IFN-g reactivity to all antigen stimuli during the entire follow-up, except in one participant.
7- Knowledge about tuberculosis	SALAMEL FM et al,	Observational cross-sectional	It aimed to unravel what is called a cascade of contacts and

transmission and prevention and perceptions of health service utilization among index cases and contacts in Brazil: Understanding losses in the latent tuberculosis cascade of care	(2017).	study/MEDLINE	what are the steps for losses to occur, as well as to assess the degree of knowledge of these contacts about care and transmission.
8- Improving tuberculosis contact tracing: the role of evaluations in the home and workplace	DUARTE R; NETO M; BARROS H, (2012).	Analytical comparative study/MEDLINE	Importance of tracking TB contacts, and people who have recently acquired the disease, in order to eliminate the disease. They perform a comparison of screening data that reveal that there is a greater decrease in serious cases if there is early screening.
9- Tuberculosis clinical units improve contacttracing	BRUGUERAS et al, (2016).	Observational Study/MEDLINE	It verified the impact of the clinical picture of TB in units that track TB contacts. Where it was observed that the creation of clinical units was able to track a greater number of contacts and significantly increased the number of adherence to treatment. Thus, they concluded that there was an organizational advance in this screening, and adherence to early treatment of TB contacts.
10- Tuberculosis Contact Investigations United States, 2003-2012.	KAI H YOUNG, et al (2016)	Observational cross-sectional study/MEDLINE	Improving contact investigation activities to ensure completion of treatment by contacts recently infected with *M. tuberculosis* is essential to achieving the goal of eliminating TB.
11- Risk Assessment of Tuberculosis in Contacts by IFN-Î³ Release Assays. A Tuberculosis Network European Trials Group Study.	JEAN-PIERRE ZELLWEGER et al (2015)	Descriptive cross-sectional study/MEDLINE	The present study analyzes IGRA results and the effect of preventive chemotherapy on TB progression rates in recent contacts.
12- Age-specific risks of tuberculosis infection from househ old and Community exposures	JONATHAN L. ZELNER et al. (2014)	Analytical study/MEDLINE	This study presents a new approach for estimating age-specific infection risks (ROI) from household and community

and opportunities for interventions in a high-burden setting			sources in Lima, Peru.
13- Yield of tuberculosis contact investigations in Amsterdam: opportunities for improvement.	ROSA SLOOT et al (2014)	Observational study/MEDLINE	This study determines the coverage and throughput of contact investigation, assesses compliance with guidelines, and identifies opportunities for improvement.
14- Risk for tuberculosis in child contacts. Development and validation of a predictive score.	PEI-CHUN CHAN et al (2014)	Cohort study/MEDLINE	This study aims to develop and validate a simple and easy-to-use predictive score for TB risk, using data routinely available during contact investigation.

The analysis of the literature revealed that it is possible to formulate three categories from the main results. Thus, the following categories were developed: i) Self identification of contacts about the disease, care and transmission; ii) The importance of contact tracing; iii) Role of health professionals in combating TB transmission.

Category 1: Self identification of contacts about the disease, care and transmission

Contacts of TB cases report that they know that the disease is serious, that it has a cure and treatment, however, they are unaware of the form of transmission and the symptoms, which shows that knowledge about TB is insufficient, even if someone in the family is infected (Teixeira et al., 2020).

Thus, information about TB becomes indispensable for recovering knowledge about the health-disease process in order to reduce social stigmas and demystify the disease. It is even possible to influence the most common practices and attitudes of contacts of patients with TB and the investigation of obstacles that distance them from prophylactic consultations (Tourinho, Oliveira, Silva et al, 2020).

Tourinho, Oliveira, Silva et al (2020) also point out that TB contacts are unaware of the form of TB transmission and the need to be evaluated and to carry out the tests requested because they are inserted in social inequalities, often, possibly empowering them it will bring with it individuals who are more aware of TB, contributing to the early detection of cases, as well as to accountability, participation in the process and reduction of the incidence of TB by interrupting the chain of transmission of the disease.

Linked to the fact that the community has knowledge about TB, it can impact the results and corroborate the control of the disease, considering that the actions and practices related to the disease allow the empowerment of society and early identification of the signs and symptoms of TB, as well as the demand for health services to carry out disease prevention. Civil society also becomes an ally in this awareness process and needs to be clarified about the disease, understanding its co-responsibility in the process of disseminating knowledge and access to public health services. Thus, health education and guidance on TB prevention are essential to achieve the goals and strategies for controlling the disease (Carvalho, Ponce, Silva-Sobrinho et al, 2018).

Category 2: The importance of contact tracing

TB cases initially identified as new or recurrent, in a person of any age, in a specific household, are considered an index case. The importance of rapid diagnosis and initiation of early treatment of the index case is perceived, and this should be investigated to identify the people who will be considered contacts, that is, those who have contact with the case (Silva, Lima, Santos et al, 2018; Silva et al, 2021).

Thus, information about contacts and the type of relationship established should be listed and, whenever possible, a home visit should be carried out to better understand the circumstances and invite them to attend the Health Unit to be evaluated and, if If necessary, order tests such as chest X-ray, bacilloscopy and tuberculin skin test (TST) with Purified Protein Derivative (PPD) or Interferon-Gamma Release Assays (IGRA) (Teixeira, et al, 2020).

It should be noted that, for TB control, it is fundamental to interrupt the disease transmission chain, since each person with undiagnosed pulmonary TB tends to infect 10 to 15 people/year, and, of these, one to two become ill, maintaining transmission and disease at the endemic level (Guimarães, 2017).

Silva et al (2018) corroborate that the individual with active pulmonary TB, when coughing, sneezing or talking, releases droplets (Pflüger droplets) that transport the bacilli to the environment, the smaller these droplets (Wells nuclei), the longer they last remain in the air, and the greater the possibility that they are aspirated, inhaled by other people.

Despite TB being a curable disease, available free of charge in the Brazilian Unified Health System (SUS), Brazil is among the 30 countries with the highest TB burden in the world, due to the unstructured SUS, restricting access to health services to the population, unplanned urbanization, unhealthy practices and environments, since 2010, the PNCT recommends that TB contacts be controlled. Controlling contacts of TB cases is a strategy for preventing future illness (Silva, et al, 2018; Figueiredo Júnior, Sá, 2019).

Contacts that are not monitored and/or evaluated represent an important factor for the maintenance of TB, as they are more susceptible to developing the active disease in the future, perpetuating the disease transmission chain (Figueiredo Júnior, Sá, 2019; Mendes, 2018).

Thus, the contacts of the TB index case should be examined for symptoms of the disease and/or the TST must be performed, this test evaluates the in vivo cellular immune response against the antigenic extract of *Mycobacterium tuberculosis* and/or IGRA, an exam being implemented in the SUS, which also evaluates the cellular immune response, but in vitro. For those with symptoms of TB, specific tests should be performed, such as sputum smear microscopy, rapid molecular test (RMT) or culture; users who are asymptomatic should perform TST and chest X-ray. Those who are asymptomatic TST or IGRA positive and without signs of active TB on chest X-ray, treatment for LTBI is recommended (Casela, 2020; Silva, et al, 2018; Brasil, 2019).

Individuals living with TB have a high risk of infection and disease progression, especially when this contact is intense and/or continuous (Mendes, 2018). According to the study by Figueiredo Júnior and Sá (2019), among TB contacts, the most frequent type of contact between contacts and active TB patients was continuous, in addition to representing the highest frequency of positive TST, with the Parents group showing the highest frequency of positive TST with, followed by the Spouse group with a positive tuberculin skin frequency.

Given the above, screening for LTBI is recommended for all contacts of infected patients, regardless of age or comorbidity. LTBI is the period between the first contact with the bacillus and the development of active TB, that is, the individual is infected by the TB bacillus, but without manifestation of active disease. The detection of LTBI for the World Health Organization (WHO) means a strategy for TB control, since the detection of latent infection allows the initiation of drug treatment, preventing progression to active disease (Silva et al, 2021; Figueiredo Júnior, Sa, 2019).

According to Dantas et al (2018), the vast majority of TB contacts identified with LTBI were never investigated, and there are losses that occur mainly in the first stages, which are: identification and investigation. It was noticed that there are many reports of active TB cases, but they could be avoided in Brazil if all contacts were investigated. He also states that the contacts would have liked to have been investigated and would undergo treatment for LTBI if prescribed, which represents, in this case, a missed opportunity.

One of the main reasons of the low rate of evaluation of TB contacts in Brazil is the lack of closer relations between the health team and the patient, which makes it necessary to train health professionals about their attitudes and health practices together with the TB patient (Dantas et al, 2018).

Category 3: Role of health professionals in combating TB transmission

TB has a method of prevention, through the treatment of LTBI, which is available in the SUS and which makes most deaths from the disease preventable. According to Trajman et al (2019), a quarter of the world's population has LTBI, which constitutes a reservoir for new TB cases and that contact tracing of TB index cases is an important task for Primary Health Care (PHC) services.

Less than 10% of people who need treatment for LTBI received the proper diagnosis, since obstacles to accessing healthcare, attitudes, practices regarding TB transmission/prevention, knowledge and beliefs are among the possible explanations for losses in the cascade contact care. This fact makes it difficult to properly control the disease (Trajman et al, 2019).

So far, there is no exam considered the gold standard for the diagnosis of LTBI, which is based not only on the result of a diagnostic test, but also on the exclusion of the active form of the disease, as well as, TST has limitations such as the need return of the patient to the health facility

to perform the reading, low sensitivity especially in immunocompromised individuals, low specificity, due to the possibility of false positive results in populations that have wide vaccination coverage with BCG vaccine, as well as cross-reaction with atypical mycobacteria (Silva et al, 2020; Castile, 2020).

Thus, the role of PHC is highlighted, considered the main gateway to health services in Brazil, and decentralizing the health actions of the PNCT to it. The Family Health Strategy (FHS) covers two thirds of the Brazilian population and is the largest public health system in the world. It is noteworthy that the FHS coverage has significant results that are associated with the successful treatment of active TB. It is emphasized that the FHS, the Community Health Workers (CHW), are auxiliary workers who live in the community and are trained for health tasks and responsible for home visits, being able to detect those individuals with respiratory symptoms, observe and directly administer TB treatment and call for the presence of TB contacts to be evaluated in the FHS (Guimarães, 2017).

The increase in FHS coverage and the development of active search, control and treatment actions for TB, combined with improvements in the laboratory network and the implementation of rapid diagnostic methods, it is possible to visualize a favorable scenario for the improvement of the current epidemiological situation of the disease (Guimarães, 2017).

Health teams, with the support of auxiliary workers have a very important role with the patient for TB control in Brazil, because when they adopt the necessary measures, they create a bond and increase the probability of cure. It is stated that the nurse must be a trained professional for TB control actions, in order to identify clinical, epidemiological and social information of suspects of the disease and take steps to clarify the diagnosis (Guimarães, 2017).

IV. CONCLUSION

The assessment of TB contacts is an important strategy for TB control, as through it it is possible to prevent new cases of active TB, carrying out the control and breaking the chain of transmission of the disease, and investigation of respiratory symptoms, to carry out and evaluation of TST and/or IGRA and treatment of LTBI, as the main form of prevention of active TB.

It is noteworthy that contacts who have contact with the TB case are more susceptible to infection by the bacillus, so it is essential to carry out the LTBI screening and start preventive treatment, but there are still some barriers to the implementation of this strategy, such as difficulty in diagnosing LTBI, awareness of the population to take contacts to health services for the evaluation of contacts, as well as feedback on reading the TST.

Thus, there is a need to carry out health education actions with professionals to answer questions, explain about the diseases and the main forms of prevention and raise awareness about the importance of evaluating contacts and train people for the application and reading of the tuberculin test and initiation of LTBI treatment. It is considered that the health professional has an enormous responsibility towards this public, and with the community in general, being necessary to always be seeking new knowledge in order to improve their health practices and ensure that their professional attitudes towards contacts allow optimizing identification and investigation of TB contacts.

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