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REVISIONES

Instruments and Assessment Tools to Evaluate Knowledge on Tuberculosis

Instrumentos y herramientas de evaluación sobre conocimientos de tuberculosis

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ABSTRACT:

Introduction; Insufficient knowledge about tuberculosis (TB) attempts against programs to control this disease and lead to mistaken behaviors in caring for the patient's health, the care provided by TB control programs, and caring for the patient's family and the community.
Objective: The work sought to describe the scientific production of instruments and assessment tools on knowledge about TB, available for the health staff, patients, the community, and families.
Methodology: An integrative search was carried out in four databases (Embase, Science Direct, Redalyc, and Biblioteca Virtual de la Salud-BVS), with the following inclusion criteria: full-text articles (in English, Spanish, or Portuguese), published between August 2010 and August 2015.
Results: The study included 42 articles, systematized in Excel for each of the study populations. Systematization permitted evidencing greater scientific production in Latin America and Africa and research aimed at assessing knowledge by the health staff and the community. Of the 42 articles selected, only five used instruments with some type of validation and were subjected to reliability tests through Cronbach's alpha coefficient.
Conclusions: The results permitted identifying the need to conduct research that includes the design and validation of instruments, as well as the evaluation of knowledge by patients and the families.

Keywords: Tuberculosis, Knowledge, Instruments for the Management of the Scientific Activity, Review (DeCS).

RESUMEN:

Introducción: Los insuficientes conocimientos sobre la tuberculosis atentan contra los programas de control de esta enfermedad y provocan comportamientos erróneos en el cuidado de: la propia salud de

los pacientes, la atención brindada por los programas de control de la tuberculosis (TB), la familia al paciente y la comunidad.
Objetivo: Describir la producción científica de instrumentos y herramientas de evaluación sobre conocimientos en TB disponible para el personal de salud, el paciente, la comunidad y la familia.
Metodología: Búsqueda integrativa en cuatro bases de datos (Embase, Science Direct, Redalyc y Biblioteca Virtual de la Salud-BVS), con los siguientes criterios de inclusión: artículos *full text* (en inglés, español o portugués), publicados entre agosto de 2010 y agosto de 2015.
Resultados: Se incluyeron 42 artículos, que se sistematizaron en una base en Excel por cada una de las poblaciones de estudio. La sistematización permitió evidenciar mayor producción científica en Latinoamérica y África e investigaciones dirigidas a la evaluación de conocimientos al personal de salud y la comunidad. De los 42 artículos seleccionados, solo 5 utilizaron instrumentos con algún tipo de validación y fueron sometidos a pruebas de confiabilidad con alfa de Cronbach.
Conclusiones: Los resultados permitieron identificar la necesidad de desarrollar investigaciones que incluyan el diseño y la validación de instrumentos, así como la evaluación de conocimientos de los pacientes y las familias.

Palabras clave: Tuberculosis; Conocimientos; Instrumentos para la Gestión de la Actividad Científica; Revisión (Fuente DECS-BVS).

INTRODUCTION

Tuberculosis (TB) is an infectious disease of global distribution; its easy transmission, favored by the precarious living conditions of individuals exposed to it, make TB one of the principal diseases of interest in public health, placing it as the second cause of death globally due to infectious diseases [(1)]. In addition, the goal established to reduce to 50% the prevalence and mortality due to TB globally has not been reached [(2)].

According to the *Global Tuberculosis Report 2016*, in 2015, 10.4-million people contracted TB and 1.4-million died because of it [(1)]. In Colombia, for 2015, the National System of Public Health Surveillance (SIVIGILA, for the term in Spanish) was notified, during week 52, of 12,918 cases of TB in all forms, which represented a 2.0% increase in notifications with respect to week 52 for 2014 [(3)]. For epidemiological week 03 of 2016, 577 cases of TB were reported in all its forms, with pulmonary TB having the highest presence, with 85.6% of the total number of cases [(4)]. Bogotá, for 2015, reported an incidence of 12.6 TB cases per 100,000 inhabitants [(3)].

Hence, to achieve compliance with the Sustainable Development Objectives (SDO), which stipulate the eradication of TB by 2030 [(5)], it was established that programmatic actions must continually be strengthened to prevent and control TB globally [(6)] starting with education to enhance knowledge about TB by all the population. Thus, identifying knowledge about TB by health workers, patients, families, and the community is indispensable, given that a high level of knowledge reveals a favorable process in health education that contributes in the global management of the disease, diminishes the disease's active transmission and favors early and timely diagnosis, as well as early onset of treatment and adherence to such [(7,8)].

Conversely, scientific literature evidences that lack of knowledge can determine mistaken and wrong behaviors in health care, leading to stigmatizing and isolating the patient, delaying diagnosis and treatment of TB, and favoring poor adherence to treatment [(9)], which is why the disease is still transmitted [(10)]. Consequently, it is fundamental for the health staff, patients, the community, and families to have adequate knowledge about TB.

Regarding knowledge by the health staff, literature indicates that they must be suitable, adequate [(11)], and solid [(12)] to ensure success of TB prevention, diagnosis,

surveillance, and control. Sufficient knowledge by the health staff guarantees adequate training and guidance to individuals with the disease, their families, and communities, which permits ensuring success of the anti-tuberculosis treatment [13].

With respect to knowledge by patients with TB, literature shows that poor knowledge promotes transmission and infection of the disease to their relatives and their community [13] because false beliefs are raised about it and because of their fear of being stigmatized. This causes patients with TB to hide their disease, self-medicate, and generate drug-resistant TB due to their abandoning or suspending treatment [14]. Knowledge by families of patients with TB permit placing this disease in the first place in health care and in the most significant microstructure in decision making in relation to the health/disease process of the person with TB, which is why knowledge by the family is indispensable to provide adequate care and acquire prevention measures against the transmission of the disease [15,16].

Similarly, studies on the community state that it is important to assess its knowledge, given that it is a decisive factor to mitigate TB infection [17,18]. In spite of sufficient scientific evidence on knowledge about TB, Yukselturk & Dinc [19] highlight the importance of validating measurement instruments to evaluate knowledge about TB, given that in literature no reliable instruments are found that can be replicated and used for other studies. Due to the aforementioned, this study sought to describe the scientific production of instruments and assessment tools on knowledge by patients, health staff, families, and the community on TB, during the period from August 2010 to August 2015, to report the most recent scientific literature on the theme.

It is important to highlight that this study will bear in mind some concepts, like: 1) *assessment instruments:* those with psychometric characteristics that give them support, reliability, and validity [20], which lets them be culturally relevant, within a given historical place and moment [21]; 2) *assessment tools:* those surveys and questionnaires, among others, that permit developing activities like scoring, measuring, correcting, classifying, certifying, and examining the level of appropriation of new knowledge [22].

METHODOLOGY

An integrative review was conducted with the following phases: 1) definition of the objective; 2) definition of inclusion criteria; 3) search for studies in databases and selection of studies according to the inclusion criteria; 4) critical evaluation of the studies; 5) categorization of the studies selected, and 6) data analysis [23].

The search was conducted in nine databases; however, four providing the highest number of articles were selected: BVS (Virtual Library on Health), Embase, Science Direct, and Redalyc (Figure 1). In the databases mentioned, the study used the *Health Sciences Descriptors* (DeCS) and *Medical Subject Headings (*MeSH) to form the search strategies according to the database: 1) Tuberculosis AND knowledge AND Questionnaires (Embase, Science Direct, and BVS) and 2) Tuberculosis AND knowledge AND Instruments for Management of Scientific Activity (Redalyc).

Article selection was carried out according to the following inclusion criteria: year of publication comprised between August 2010 and August 2015; articles in Spanish, English, and Portuguese; articles from primary research in full text, and studies that

included instruments or tools to assess knowledge about TB in any of the four populations object of study (person with TB, family, community, health staff).

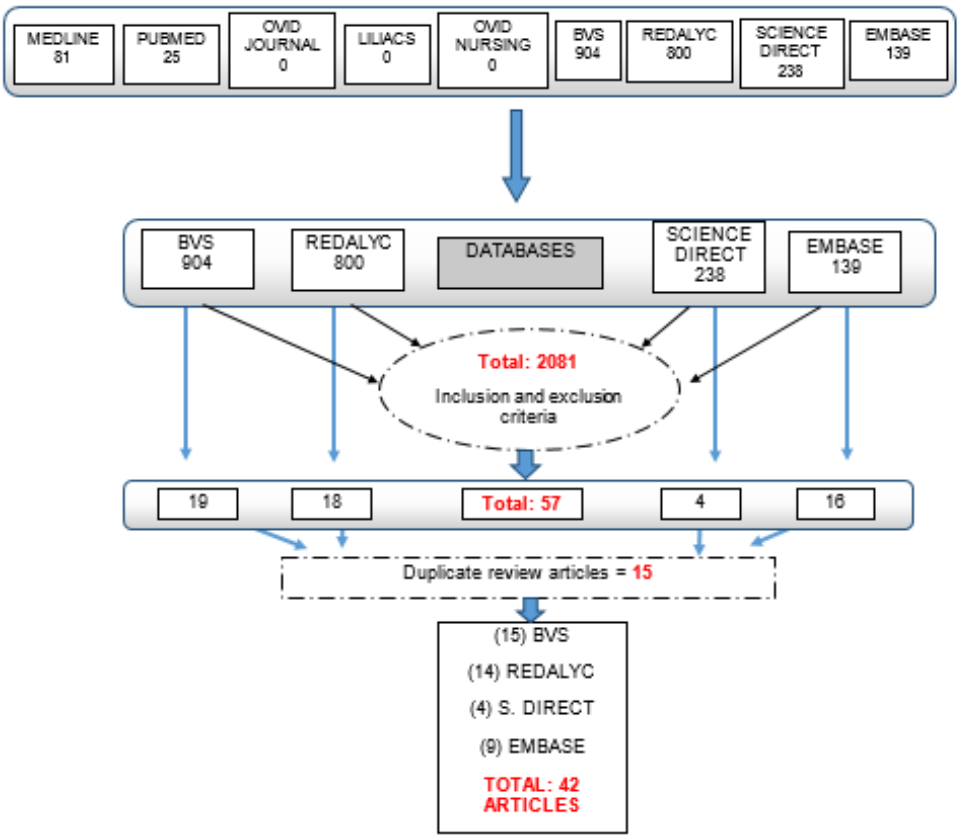
Upon identifying and selecting the articles, these were subjected to evaluation, a phase that used the Scottish Intercollegiate Guidelines Network (SIGN) evidence levels of classification in independent manner to determine the methodological quality of the articles [24].

After the critical evaluation of the articles, a second reading was performed to categorize the dimensions assessed on knowledge in the instruments or tools found in relatives, health staff, patients, or community. For this purpose, a database was constructed in Microsoft Excel for each study population, which permitted the respective description of the scientific production of instruments or assessment tools of knowledge about TB by each of them.

RESULTS

The search in nine databases produced 57 articles, which were reduced to 42 after excluding 15 articles that did not comply with the inclusion criteria: one had no exact description of an instrument or tool to assess knowledge, another was not within the period stipulated, and 13 were in two databases at the same time. Figure 1 presents the results of the search in the number of articles found (Figure 1).

Figure 1. Diagram of the integrative search conducted.



Source: Elaborated by the authors.

The Integrative Review included 42 articles, which are listed in Tables IV, V, VI, and VII, grouping the principal data of the studies: name of the article, year, authors, type of study, country, instrument or tool used to assess knowledge, variables of the instrument or too, and type of validity and reliability in each of the articles.

The following show the most significant percentages in the characterization of the scientific production found:

Table I evidences that the highest scientific production was found in the health staff on the assessment of knowledge about TB through instruments or assessment tools.

Table I. Percentage of production by categories

Category	Percentage
Health staff	52.3%
Community	26.1%
Patients	19.4%
Family	2.3%

Source: Elaborated by the authors.

Table II identifies Latin America as the continent with the most scientific production on knowledge about TB.

Table II. Production by continents

Country	Percentage
Latin America	47.6%
Africa	26.10%
Asia	14.20%
Europe	9.5%
Oceania	2.3%

Source: Elaborated by the authors.

Table III shows that of the Latin American countries, Brazil is the country with the most scientific production on assessment of knowledge about TB.

Table III. Production in Latin America

Country	Percentage
Brazil	38.10%
Colombia	23.80%
Peru	23.80%
Cuba	10%

Source: Elaborated by the authors.

With respect to the type of study used in the research reviewed, 90.5% is quantitative-type research (92.1% are cross-sectional descriptive studies, 5.3% are prospective studies, and 2.6% are quantitative studies of cases and controls), 7.1% are mixed studies, given their qualitative and quantitative characteristics, and only 2.3% are qualitative studies.

With regard to the strategies to assess the reliability of the instruments used to measure the level of knowledge, these are divided into three parameters: articles that base their reliability on a pilot test (26.2%), articles using expert evaluation to test their reliability (9.5%), and research that apply Cronbach's alpha coefficient (7.1%). Some of the scientific research used more than one parameter to provide reliability to the instrument or method; 2.4% used the pilot test and expert evaluation, 2.4% were based on the three parameters (expert evaluation, pilot test, and Cronbach's alpha coefficient), and 4.8% did so through expert evaluation and Cronbach's alpha coefficient. Finally, it is worth highlighting that 47.6% of the studies do not specify the development of the methodological procedures of reliability used in the instruments or assessment tools.

Another important aspect was the type of validity assigned to the instruments and assessment tools. For this purpose, two forms of validation were used [(20)]: the first is the construct validation, seen in 33.3% of the articles; the second is the content validity, which corresponds to 40.5% of the articles. In 28.2%, no validity of any type is noted.

The dimensions of the instruments or tools in common in the scientific production selected are sociodemographic characteristics of the study population (age of participants, gender, occupation, etc.), causes, diagnosis, signs and symptoms, prevention, treatment, and transmission of the disease.

The following present information compiled with respect to the instruments and tools used to assess knowledge on tuberculosis, discriminated by the different categories of patients, family, health staff, and communities.

Instruments and assessment tools on knowledge of TB by patients

Quantitative-type studies are prevalent in the patient category with an evidence level of 3, according to the SIGN classification [24]. Most studies had no strategy to measure reliability and content validity is the most-often used in all the articles found. Finally, among the dimensions used in the instruments or tools to assess knowledge, there is the mode of TB transmission, and most consider that knowledge about TB by patients is low (Table IV).

Table IV. Scientific production of instruments and assessment tools on knowledge of TB by patients

NAME/YEAR	COUNTRY	TYPE OF STUDY	INSTRUMENTO OR TOOL	VALIDITY	RELIABILITY	LEVEL OF EVIDENCE	VARIABLES ASSESSED
Patient´s Knowledge and Attitude towards Tuberculosis in an Urban Setting / 2012. [7]	Bangladesh	Quantitative, descriptive, cross-sectional	Instrument: Structured questionnaire	Content	Expert evaluation	3	Causes, mode of disease transmission, source of information, symptoms, treatment.
Tuberculosis patients' knowledge and beliefs about tuberculosis: a mixed methods study from the Pacific Island nation of Vanuatu / 2014. [22]	Vanuatu	Descriptive study with qualitative and quantitative methods	Method: Semi-structured survey with open and closed questions	Not evidenced	No type	3	Cause, mode of transmission diagnosis and treatment.
Tuberculosis in a developing country – how much patients know about disease / 2012. [5]	Serbia	Quantitative prospective	Instrument: 2 questionnaires	Content	Expert evaluation	3	1st questionnaire: Causes, mode of transmission, clinical symptoms and treatment. 2nd questionnaire sociodemographic characterization of patients.
Assessment of Patients' Knowledge, Attitude, and Practice Regarding Pulmonary Tuberculosis in Eastern Amhara Regional State, Ethiopia: Cross-Sectional Study / 2013. [14]	Ethiopia	Quantitative descriptive Cross-sectional	Instrument: Previously validated structured questionnaire	Construct	No type	2+	Sociodemographic characteristics. Transmission, causes, symptoms and treatment
Knowledge and acceptability of patient-specific infection control measures for pulmonary tuberculosis / 2013. [23]	South Africa	Quantitative prospective	Instrument: Structured questionnaire	Construct	Pilot test	3	Transmission of TB, control measures of the transmission of TB.

Gender Differences in the interpretation of Experiences of Patients with Tuberculosis in Medellín, Colombia / 2015. [V]	Colombia	Qualitative study, founded theory	Method: Semi-structured interviews	Not evidenced	No type	2-	Signs and symptoms, transmission, diagnosis, care during the disease.
Level of tuberculosis among patients in a waiting ward. "Punchauca" health center, Carabayllo, Lima, Peru / 2010. [V]	Peru	Cross-sectional, quantitative, descriptive study	Instrument: Interviews	Content	No type	2+	Transmission, clinical manifestations, treatment, types of tuberculosis, risk factors.
The impact of knowledge and attitudes on adherence to tuberculosis treatment: a case-control study in a Moroccan region / 2012. [VI]	Morocco	Quantitative. Design cases and controls	Instrument: Questionnaire	Content	Pilot test	2++	Causes and symptoms of TB, and open questions on factors of noncompliance with the anti-TB treatment.

Source: Elaborated by the authors.

Instruments and assessment tools on knowledge of TB in the health staff

The health staff had the highest scientific production, with mostly quantitative-type studies and 2+ level of evidence prevailing, according to the SIGN classification [24]. To evaluate reliability, it was found that the majority of the studies (18 of 22) do not use any strategy to measure such; however, it must be highlighted that four of the instruments used Cronbach's alpha coefficient and content validity content, which is the type of validity used in most studies from this category. With respect to the dimensions used in the instruments or tools to assess knowledge, we find the treatment. It was noted that the level of knowledge by the health staff about TB was low (Table V).

Table V. Scientific production of instruments and assessment tools on knowledge of TB by the health staff

NAME / YEAR	COUNTRY	TYPE OF STUDY	INSTRUMENT OR TOO	VALIDITY	RELIABILITY	LEVEL OF EVIDENCE	VARIABLES ASSESSED
Knowledge about tuberculosis in health workers in a location of Bogota, D.C / 2011. (V)	Colombia	Quantitative, descriptive	Instrument: Structured questionnaire	Construct	Pilot test	3	Staff characterization on TB: etiology, prevention, control, bacteriological diagnosis, time of transmission, DOTS/TAES treatment scheme, biosecurity components.
Knowledge about anti-tuberculosis treatment among nurses at tuberculosis clinics / 2013. (18)	Turkey	Quantitative, descriptive, cross-sectional	Instrument: Questionnaire	Content	Expert evaluation and pilot test	3	Sociodemographic characteristics, anti-tuberculosis treatment and symptoms of TB. Anti-tuberculosis treatment.

Tuberculosis infection control in rural South Africa: survey of knowledge, attitude and practice in hospital staff / 2011. (*)	South Africa	Cross-sectional, quantitative	Instrument: Questionnaire	Content	No type	3	Symptoms of TB, modes of transmission of TB and prevention of TB at the work place.
Evaluation of Primary Health Care service participation in the National Tuberculosis Control Program in Qalyubia Governorate, Egypt / 2015. (*)	Egypt	Quantitative, cross-sectional	Instrument: Questionnaire	Construct	No type	2-	Causal agent, propagation methods, clinical condition, essential steps in primary diagnosis.
Knowledge of and attitudes toward tuberculosis of Turkish nursing and midwifery students / 2011. (48)	Turkey	Descriptive study	Method Tool: Questionnaire	Not evidenced	No type	2-	Control of tuberculosis, diagnosis, treatment, and practices surrounding tuberculosis.
Knowledge, attitudes, and practices regarding tuberculosis in workers from the health sector in priority municipalities from the Colombian Pacific coast / 2014. (*)	Colombia	Descriptive, cross-sectional study	Instrument: Structured questionnaire	Content	Pilot test	2+	Forms of transmission, seriousness of the disease, diagnosis, treatment.
Educational intervention in health care workers on contacting respiratory tuberculosis symptomatic patients / 2015. (*)	Colombia	Descriptive, cross-sectional study	Tool: Evaluation tool for diagnosis and post-test	Not evidenced	No type	2-	Contacting respiratory tuberculosis symptomatic patients.
Knowledge as a factor in vulnerability to tuberculosis among nursing students and professionals / 2012. (*)	Brazil	Study quantitative descriptive	Instrument: Questionnaire	Construct	No type		Transmission, forms of prevention and biosecurity measures, diagnosis and pre-concepts on the disease.

Adherence and knowledge of health professionals related to precautions for aerosols / 2015. (*)	Brazil	Cross-sectional, observation study	Instrument: Structured questionnaire	Content	Expert evaluation		Diagnosis and transmission of tuberculosis; precaution measures for aerosols.
Factors related to knowledge on Tuberculosis and its influence on the Nursing intern during patient care / 2014. (*)	Peru	Quantitative, descriptive study	Instrument: Questionnaire	Content	Expert evaluation, subjected to Cronbach's alpha		Prevention measures, control, and follow up of cases, treatment, and infection mechanism.
Assessment of knowledge on tuberculosis control in family physicians from the municipality of Ciego de Avila / 2014. (*)	Cuba	Observational descriptive study	Instrument: Survey	Content	Pilot test		Objectives of the National program on tuberculosis control, functions of the family physician, surveillance of the disease, behavior to follow in case of tuberculosis.
Medical interns' knowledge of tuberculosis and DOTS strategy in northern Islamic Republic of Iran / 2010. (*)	Iran	Cross-sectional study	Instrument: Questionnaire	Construct	Cronbach's alpha (0.85)		Sociodemographic data Significance of the DOTS acronym, Description of the DOTS concept, significance of the MDR-TB expression, mode of transmission, symptoms, dx tests, treatment, treatment categories, definition of treatment failure.
Knowledge about tuberculosis among undergraduate health care students in 15 Italian universities: a cross-sectional study / 2014. (*)	Italy	Multi-centric study	Instrument: Questionnaire	Content	Cronbach's alpha (0.83) and pilot test		General knowledge on the disease of tuberculosis. Etiological agent, vaccines, detection methods, personal experiences, practices related to tuberculosis, sociodemographic characterization.
Knowledge of Nursing aides on Family health in Tuberculosis / 2013. (*)	Brazil	Descriptive, prospective study	Instrument: Structured questionnaire	Construct	No type		Characterization of the staff Diagnostic tests, prevention, symptoms, treatment), dissemination media, professional obligations.
Family health staff knowledge concerning the health needs of people with tuberculosis / 2012. (*)	Brazil	Qualitative interviews of closed questions and guiding questions	Tool: Interviews	Not evidenced	No type		Profile of health professionals, conceptions on TB, health needs, characterization of care.
Knowledge of community health agents on tuberculosis, their control measures and directly observed treatment / 2015. (*)	Brazil	Quantitative, cross-sectional study	Instrument: Semi-structured questionnaire	Content	No type		Generalities of tuberculosis, control measures, strategy of the directly supervised short treatment.
Knowledge, experiences, and attitudes of medical students in Rome about tuberculosis / 2013. (*)	Rome	Quantitative, cross-sectional study	Instrument: Questionnaire	Content	Pilot test		Attitudes and experiences, knowledge on the epidemiology and prevention, diagnosis, treatment.

A cross sectional study of knowledge and attitudes towards tuberculosis amongst front-line tuberculosis personnel in high burden areas of Lima, Peru / 2013. (*)	Peru	Quantitative, cross-sectional study	Instrument: Questionnaire	Construct	No type		Epidemiology and transmission of tuberculosis, diagnosis of TB, treatment of tuberculosis.
Health care workers' knowledge and attitude towards TB patients under Direct Observation of Treatment in Plateau state Nigeria / 2011. (*)	Nigeria	Cross-sectional, descriptive study	Instrument: Questionnaire	Construct	No type		Sociodemographic characteristics Type of formation received by tuberculosis control services. Knowledge of the tuberculosis control services. Management and factors of patients, associated to the treatment result.
Russian healthcare workers' knowledge of tuberculosis and infection control / 2010. (*)	Russia	Cross-sectional, descriptive study	Instrument: Questionnaire	Content	Cronbach's alpha (0.618)		Process of the disease, treatment (six questions), infection control (seven questions).

Source: Elaborated by the authors.

Instruments and assessment tools on knowledge of TB by the community

For this category, the results revealed that all the studies are quantitative type with 2+ level of evidence prevailing, according to the SIGN classification [24]. Only one article, conducted in Colombia in Zenú communities, had an instrument with content validity and Cronbach's alpha coefficient as reliability method. Even so, construct validation prevailed in most of the articles using the pilot test and expert evaluation as reliability method. Mode of transmission was found as the most-assessed dimension, and it is noted that the level of knowledge about TB by this population is low (Table VI).

Table VI. Scientific production of instruments and assessment tools on knowledge of TB in the community

NAME	COUNTRY	TYPE OF STUDY	INSTRUMENT OR TOOL	VALIDITY	RELIABILITY	LEVEL OF EVIDENCE	VARIABLES ASSESSED
Knowledge and perception about tuberculosis in the municipality of Habana Vieja / 2012. (52)	Cuba	Quantitative, cross-sectional study	Instrument: Structured survey	Content	No type	3	Etiology, symptoms and modes of transmission.
Assessment of Knowledge towards Tuberculosis among general population in North East Libya / 2012. ([1])	Libya	Quantitative, cross-sectional study	Instrument: Pre-validated questionnaire	Content	Expert evaluation	3	Sociodemographic characterization, causes, symptoms, transmission, factors that contribute to transmission, diagnosis, treatment and prevention of TB.
A public–private partnership model to reduce tuberculosis burden in Akwa Ibom State – Nigeria / 2015. ([1])	Nigeria	Descriptive study	Instrument: Questionnaire	Not evidenced	Pilot test	2-	Sociodemographic characterization, transmission, diagnosis and treatment, prevention measures.
Tuberculosis-related knowledge is associated with patient outcomes in shantytown residents; results from a cohort study, Peru / 2015. (51)	Peru	Observational descriptive study	Instrument: Questionnaire	Construct	No type	2-	Sociodemographic characterization, generality of the disease, transmission and treatment.

Evaluation of knowledge of cattle breeders on bovine tuberculosis and implications for its control / 2014. ([1])	Portugal	Descriptive study	Instrument: Questionnaire	Construct	No type	3	Transmission, clinical manifestations, control measures.
Knowledge about tuberculosis in community health agents in Tacna, Peru / 2012. ([1])	Peru	Descriptive, non-probabilistic study	Instrument: Survey	Construct	No type	3	Definition of the disease, diagnosis, treatment, prevention measures.
Knowledge, attitudes, and practices on tuberculosis Zenú indigenous people and inhabitants of a Colombian rural zone / 2013. ([1])	Colombia	Cross-sectional, descriptive study	Instrument: Survey	Content	Expert evaluation via Cronbach's alpha.	2+	Generalities of the infection, organs affected transmission, factors and risk groups, signs and symptoms.
Community knowledge, attitude, and practices towards tuberculosis in Shinile town, Somali regional state, eastern Ethiopia: a cross-sectional study / 2014. ([1])	Ethiopia	Cross-sectional study	Instrument: Standardized questionnaire	Construct	Pilot test	3	Sociodemographic characterization, signs, symptoms, mode of transmission, prevention methods.
Knowledge and attitude of key community members towards tuberculosis: mixed method study from BRAC TB control areas in Bangladesh / 2015. ([1])	Bangladesh	Mixed method. Qualitative and quantitative	Instrument: Questionnaire of the quantitative survey	Not evidenced	Pilot test	3	Signs and symptoms, transmission, prevention and treatment of tuberculosis.
Community's knowledge, attitudes and practices about tuberculosis in Itang Special District, Gambella Region, South Western Ethiopia / 2013.(50)	Ethiopia	Cross-sectional study	Instrument: Structured questionnaires	Construct	Expert evaluation	3	Cause of tuberculosis, symptoms, mode of transmission of tuberculosis, risk factors, identification of individuals with high risk of TB.
Knowledge, Attitudes, and Practice of Tuberculosis among Maasai in Simanjiro District, Tanzania / 2010. ([1])	Tanzania	Mixed exploratory-descriptive study	Tool: Structured test-type questionnaire	Not evidenced	Pilot test	3	What is tuberculosis, signs and symptoms, causes, treatment, prevention, and transmission

Source: Elaborated by the authors.

Instruments and assessment tools on knowledge of TB by the family

In this case, we found the lowest scientific production, given that only one qualitative-type article was found, which has no validated evaluation instrument, but does have an evaluation tool. The dimensions assessed in this case are the mode of transmission, treatment, and control of the disease, and knowledge was considered high in this study for this population (Table VII).

Table VII. Scientific production of instruments and assessment tools on knowledge of TB by the family

Author / Year	Country	Type of study	Instrument or Tool	Validity	Reliability	Level of Evidence (sign)	Variables Assessed
Moreira *et al*., (2012)	Brazil	Descriptive, Cross-sectional study	Tool: Questionnaire	Not Evidenced	Pilot test	2+	Transmissibility period after the onset of treatment, appropriate treatment

							period (duration), the concern of contracting TB

Source: Elaborated by the authors.

DISCUSSION AND APPLICATIONS IN HEALTH

This study evidenced the existence of a large amount of scientific production in Latin America and Africa, which agrees with the presence of the high prevalence and incidence of TB in these parts of the world. In light of the aforementioned, the WHO [25] mentions the need to conduct studies regarding knowledge about TB to achieve control of the disease through educational actions.

The vast majority of the studies found are from the health staff category, representing 52.3% of the total; nevertheless, it became important to detail the results reported by research, given that although this population mostly evaluates knowledge, these prove to be deficient to identify the pathology. This same result was evidenced by Laurenti *et al.,*[26] by mentioning that low levels of knowledge by the health staff exist due to the poor academic preparation on TB [27]. This permits reflecting upon the importance of continuing to enhance knowledge in the health staff [28,29] with constant training processes in health care institutions and undergraduate academic formation about TB [30].

Assessment of knowledge in the community occupies an intermediate level in scientific production; however, scientific evidence states that communities (especially indigenous and rural communities) are not populations of interest in research on TB, although they are highly vulnerable groups for continuous and early transmission of the disease [31].

Although most studies are related to the health staff, it is worth emphasizing another aspect noted, given that it was found that not many research works encompass knowledge about TB assessed in patients and families, representing 19.4% and 2.3%, respectively, of the total number of articles. Due to the scarce research knowledge by patients and families, it is possible to overlook the importance of correct knowledge they have about TB, to generate adherence to treatment and control transmission of the disease in the family and the community [32,33]. Added to the poor scientific production to assess knowledge about TB in patients, the articles revealed a low level of knowledge in this population, which generates a factor that negatively affects health interventions aimed at controlling TB[34]. The aforementioned poses a challenge for the different health disciplines to carry out new research that permit creating health care interventions that raise awareness in patients about their disease [28], and implementing educational processes as important aspects to prevent and control the disease [35].

Measuring knowledge about TB through instruments or assessment tools sets big challenges, given that not many of the studies found clearly reveal the validation processes of the instruments or the psychometric parameters assessed, and very few evidence some type of validation. Much lower still is the number of instruments (5 instruments) with Cronbach's alpha coefficient as reliability test, as a test that provides the instrument with greater reliability upon evaluating the correlations existing between each of the items [36] and, hence, Cronbach's alpha coefficient must be a tool that

offers precision to the instruments [37]. Thereby, lack of validation and of psychometric parameters are aspects that question the reliability of the results, given that it is indispensable that these be validated instruments to truly test the hypotheses proposed [38], measure what needs to be measured with trustworthy results [39] and without probability of bias [40,41].

The lack of clarity of the validation process of the instruments is because the studies found assessed knowledge about TB, but none introduced the design of a completely validated and reliable instrument that complies with all the psychometric parameters, as stated by Yukselturk *et al.,* [19] who indicated that no validated instruments exist that permit replicability of the instrument to other research.

With respect to the level of evidence of the scientific production found, it was noted that most of the studies belong to a level of evidence of 2+ and 3, according to the SIGN scale [24]. This showed that, although these are investigations that contribute to the development of knowledge about TB, studies with greater reach are needed that permit unveiling the creation and design of a validated instrument to assess knowledge about TB that provides reliable results verifiable with other studies[42]. The design of instruments aimed at the four study populations creates a challenge for future researchers, especially instruments for patients and families, given that they are the two populations with the least scientific production found and with no instrument validated.

Finally, the instruments must be validated and reliable for the results obtained, after the assessment of knowledge from the population, to guide in decision making in health and, thus, permit enhancing strategies and actions to improve the health conditions of patients and of the global population, managing to end TB, to be in agreement with the new SDO [5].

FINAL CONCLUSIONS

Tuberculosis is an easily transmitted disease associated to the precarious living conditions of people exposed to it and to poor knowledge about it. The comprehensive review evidenced the wealth of scientific production on TB, with knowledge being one of the most important themes to investigate. However, a rigorous search of the instruments and assessment tools on knowledge patients, health staff, the community, and families of patients have about TB indicated scarce scientific production, given that most studies on knowledge about TB have no type of instrument used or developed, and those that have it do not clearly evidence a validation process with psychometric parameters. The most frequently evaluated dimensions in the instruments were cause, prevention, mode of transmission, signs and symptoms, and treatment, which are themes that must be further enhanced in educational interventions.

Scientific production on instruments and assessment tools on knowledge of TB is mostly found among the health staff; thereby, identifying the need to carry out subsequent research that design an evaluation instrument on knowledge about TB to apply with patients and families. Lastly, research must be continually enhanced to assess knowledge about TB that permits making decisions in health to prevent, control, and eradicate TB.

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