

Review

Stigma among tuberculosis patients: A bibliometric analysis and scoping review

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Received 10 October 2024, Revised 28 October 2024, Accepted 19 December 2024

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Abstract: *Background* — Tuberculosis (TB) is a priority health problem on the global health agenda. TB programs face challenges with delays in diagnosis and treatment. Perceived stigma can prevent people from seeking testing, accessing health services and treatment. *Objective* — To review and document the existing evidence on the impact of stigma on TB prevention and control efforts. *Methods* — The study used a scoping review method, which follows PRISMA as a guideline. Articles were identified in the Scopus database. The search was conducted on September 1, 2024. The study also employed bibliometric analysis using VOSviewer software version 1.6.20. *Results* — A total of 31 articles on stigma in TB patients published in 2020-2024 were reviewed: 18 articles (58.06%) were related to access to health services, 8 articles (25.81%) dealt with medication adherence, and 5 articles (16.13%) were about provisioning TB preventive therapy. Studies on stigma in TB cases still dominate in cases involving adults, effect of gender issue, TB-HIV links, and are related to health awareness, attitudes and behavior. *Conclusion* — This study provides evidence on the impact of persistent community stigma, which is a barrier to TB elimination efforts. Stigma discourages TB patients from seeking health care, affects their medication adherence and provision of TB preventive therapy.

Keywords: tuberculosis, stigma, medication adherence, latent tuberculosis infection.

Cite as Cahyani F, Dewi A. Stigma among tuberculosis patients: A bibliometric analysis and scoping review. *Russian Open Medical Journal* 2025; 14: e0209.

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Introduction

Tuberculosis (TB) remains a global health problem that must be resolved. In 2022, around 1.3 million deaths from TB were reported. India, Indonesia, and China are the top three countries that account for the majority of TB cases in the world. Several other countries (Philippines, Pakistan, Nigeria, Bangladesh and the Democratic Republic of Congo) also have TB problems and contribute to two-thirds of the worldwide TB cases. TB programs face problems related to delays in disease diagnosis and treatment [1, 2].

The mortality rate from TB is quite high (about 50% in people with untreated TB). In fact, with the treatment currently recommended by the World Health Organization (4-6 months of tb treatment), nearly 85% of TB patients can be cured. The role of government is to ensure that everyone who needs treatment for TB or is infected with TB can receive it [1]. However, one of the challenges in eliminating TB is stigma. Stigma is the identification of negative traits that classify a person as different and deserving isolation from the community [3]. Stigma towards TB cases causes people with TB symptoms to not seek treatment for fear of being thrown out, fired from their jobs, ostracized from social life, or evicted from their homes [2, 4]. A study conducted in Nigeria showed public perceptions of TB. A total of 64.3% of respondents said that people with TB should not work, and 23.3% of respondents looked down on people with TB. In fact, 16.2% of respondents said that they would not go to a health facility for treatment if they had TB [4]. According to a study conducted in the

Philippines, the most common stigmas were discrimination (52.9%) and fear of transmission (85.6%) [5].

The study identified TB stigma as one of the determinants that causes TB patients to not take their medication regularly or even stop taking it. Patients who experience TB stigma are 2.7 times more likely to be nonadherent to their medications compared with patients who experience no stigma whatsoever [6]. TB stigma is also experienced by people receiving TB preventive therapy who have latent infection [7].

TB stigma affects the success of TB control. Patients who feel stigmatized by the surrounding community will be reluctant to come to health facilities for examinations and treatment [4]. One of the studies on TB stigma through a scoping review was conducted by Foster et al. The study analyzed the existing literature on TB stigma reduction efforts based on stigma manifestations and assessed interventions at different social levels, such as individual, interpersonal, organizational, community and political [8]. Given the complexity of TB stigma, this study aims at analyzing and documenting the existing evidence on the impact of stigma on TB control programs, case detection through screening and diagnosis, and standard treatment. The results are expected to strengthen stigma reduction efforts through appropriate interventions and will be useful for developing a comprehensive strategy to end TB by 2030. This study also uses bibliometrics to provide a comprehensive picture of the research and identify emerging research topics.

Materials and Methods

This study used a scoping review method with the Arksey and O'Malley approach [9]. The steps were as follows: (1) to identify research questions to be investigated, (2) to choose databases as sources of research, (3) to screen relevant studies, (4) to collate relevant data, and (5) to provide a synthesis of knowledge based on the above steps. We attempted to investigate what is the available evidence on the impact of stigma on efforts aimed at TB prevention and control. With this research question in mind, we tried to find out whether there is evidence to suggest that stigma (1) affects reluctance and delays in accessing health services, (2) influences nonadherence to antitubercular medications, and (3) causes refusal of TB preventive therapy.

The data for this study were retrieved online using the Scopus database (<https://scopus.com>) and accessed on September 1, 2024. Scopus is a large bibliographic database that contains citations and abstracts of scientific journal articles from a wide range of fields. Researchers, scientists, and professionals around the world often use Scopus to search for scientific materials [10].

The keywords used were *tuberculosis* and *stigma*, and they were limited to the last 5 years of publication only. The initial search yielded 297 articles published in 2020–2024. We limited the literature to be further analyzed to articles published in journals that reached the final stage of publication, were written in English, and to open access publications. The subtopics were limited to *medicine, multidisciplinary, social studies, nursing, and psychology*. We then screened all relevant studies by title and abstract and removed irrelevant studies. All articles were exported to Mendeley software.

A total of 31 articles were downloaded and analyzed. The literature search algorithm is shown in [Figure 1](#).

The downloaded articles were analyzed according to the objectives of the study. The analysis was conducted using Microsoft Excel software. Three topics were identified from the analysis. These topics were considered relevant to the research questions of this scoping review.

This study also applied bibliometric analysis using VOSviewer version 1.6.20 software. Bibliometric analysis is a statistical approach that analyzes scientific publications, citations, and research patterns. Bibliometric analysis aims to identify research trends; obtain information on collaborations between researchers, as well as other collaboration networks; and collect information on research gaps to generate research ideas [11].

Results and Discussion

General comments

We reviewed 31 articles published in 2020 (6), 2021 (6), 2022 (8), 2023 (7), and 2024 (4). Presence of articles on stigma in TB patients indicate that stigma is still an interesting topic to investigate. The publication trend fluctuated over the period from 2020 to 2024: 6 articles were published in each of 2020 and 2021 implying a steady level of conducted studies; in 2022, there was an increase up to 8 articles, reflecting an elevated interest or urgency in research on stigma in TB; in 2023, the number of publications slightly declined to 7 articles; finally, in 2024 there are published 4 articles, although the year is not over yet and here is a possibility of more articles to come.

A total of 4 studies were conducted in Uganda; 3 studies each in Nigeria and China; 2 studies each in Indonesia, Cambodia, the Philippines, South Africa and Brazil; and 1 study each was conducted in Ghana, Iran, Kenya, Nepal, Mozambique, the Netherlands, Malaysia, Pakistan, Thailand, Ethiopia, and Eastern Europe and Central Asia combined.

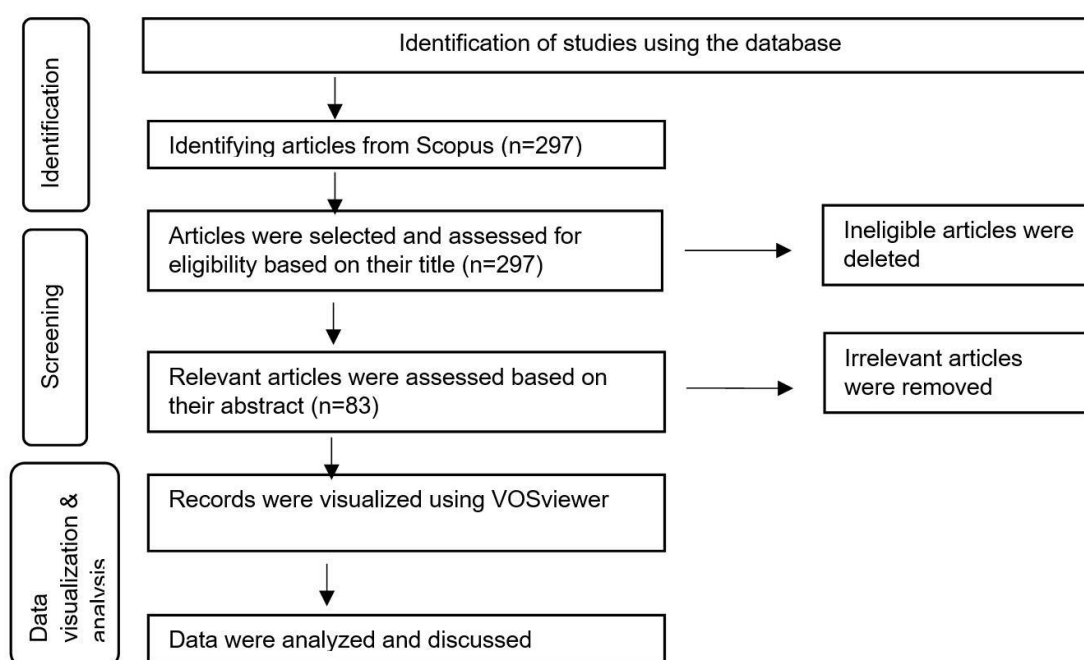


Figure 1. PRISMA flowchart.

The effect of stigma on access to health services

TB stigma is the negative perception and discrimination experienced by TB patients and TB survivors in the form of social and psychological stigma. It can worsen the patient's condition as they become embarrassed and afraid to seek medical care. Of the 31 articles reviewed, 18 articles (58.06%) were related to healthcare accessibility, emphasizing people's ability to access and utilize healthcare services. Stigma in the form of discrimination or negative judgment from the social environment can lead to shame, low self-esteem, and social isolation in patients. This often makes patients hesitant or reluctant to disclose their condition and avoid necessary medical treatment. Misunderstandings about the modes of TB transmission and negative perceptions of TB patients are stigmas that create barriers to accessing healthcare, thereby resulting in slower diagnosis of TB and poor adherence to treatment. Even after full recovery, stigma associated with TB still exists [3, 12]. People thought that TB was caused by spiritual attacks, that dust was the main cause of TB, and that people were easily infected because of certain blood types. These misconceptions led to several stigmas, including reluctance to visit the homes of people with TB, refusal to eat with TB patients, and prohibiting TB patients from attending social events.

The gap in access to TB diagnostic and treatment services is caused by social stigma [13]. TB stigma is also associated with economically and socially vulnerable groups, such as the poor and lower social classes. Other vulnerable groups for TB include people at high risk of health problems and discrimination, such as prisoners, refugees, and people living with HIV/AIDS. Minority groups that are small in numbers in society are also at risk of TB-related stigma. This has an unpleasant impact on daily life, such as at home, at work, in health care settings, and in the community [14].

We found 2 articles that link knowledge to stigma in TB patients. Knowing that TB can be cured will increase confidence in accessing services and allow more people to receive treatment. Treated TB patients are expected to have reduced stigma and be able to re-engage with the community knowing that their disease is no longer infectious. A statistically significant association was found between knowledge and stigma among respondents ($P < 0.001$). The higher the level of knowledge of respondents, the less likely they were to express stigma towards people with TB [4]. Poor community knowledge about TB causes stigma, which leads to social isolation of TB patients [15].

A study among TB patients in urban Uganda found that 52% had high stigma towards TB [14]. Stigmatization of TB patients is especially noticeable in terms of social isolation and refusal of employment [4]. This stigma influences help-seeking behavior, such as refugee groups in Pakistan who receive care late because they do not directly access health facilities but instead use informal health services and self-medicate [16]. Research in South Africa found that TB patients and their families feared transmission of TB and being identified as HIV positive. TB patients avoid stigma when seeking treatment by avoiding settings that may be stigmatizing [17].

Stigma is considered a major barrier to accessing health services, both diagnostic and treatment services for TB. TB patients sometimes face mistreatment such as physical or psychological abuse from their families. These TB patients can be stigmatized by different groups [18]. Patients provide fake phone numbers to avoid being contacted by health workers due to the

stigma of having TB as having HIV [19]. Barriers to accessing TB services are associated with gender stigma, showing mixed results across countries [20]. TB stigma and gender are closely linked and influenced by social norms, gender roles and access to health services. Gender plays an important role in how stigma influences patients' perceptions of themselves, treatment and acceptance by society. To address TB stigma, interventions should consider gender in public awareness campaigns and treatment strategies, ensuring that men and women receive the right support to overcome stigma and access the health services they need [21].

TB stigma is not only present among TB patients and the community, but also among health workers. Internalized TB stigma results in low utilization of health facilities for TB screening and treatment [22]. However, studies in Malaysia found no association between delays in treatment and delays in health services with stigma [23].

The effect of stigma on medication adherence

Nonadherence to antitubercular medications may lead to additional problems in TB treatment. Drug resistance may occur, there is still a potential risk of transmission and aggravation of the patient's clinical condition, which can even lead to death [24]. We reviewed 8 articles that discussed treatment adherence. Social stigma may have a significant impact on treatment adherence, especially for those suffering from chronic diseases such as TB and HIV/AIDS. A study by Du et al. in China showed that stigma was associated with the willingness of TB patients to take their drugs regularly according to the prescribed dose and time ($p < 0.01$) [25]. Strong social stigma towards patients and their families may lead to detection and treatment failure [5]. A total of 15% of TB patients discontinued treatment for about two months due to stigma [24]. Results of a stigma score measurement conducted among 204 TB patients in Uganda showed that more than half had stigma, which is a major social factor associated with treatment adherence [13]. Stigma leads to patients with drug-resistant TB stopping treatment due to depression [26]. However, other studies showed that TB stigma, especially in patients with drug-resistant TB, was not associated with treatment adherence [27].

TB treatment is time-consuming and must be administered consistently to be effective. Patients must take their antitubercular medications as prescribed, and even if symptoms improve or are absent, patients must complete the entire treatment course to prevent drug resistance. Medication supervision is necessary to ensure that TB patients take their medications regularly. One of the challenges in medication adherence is related to TB stigma. Changes in urine color due to TB drugs make patients embarrassed and reluctant to continue treatment [28].

In addition to the side effects of these medications, the personal protective equipment worn by health workers creates a new stigma among TB patients. TB patients feel that health workers discriminate against them because the counselors wear N95 masks during consultations. Patients believe that their disease is incurable, and the staff is perceived as disrespectful to patients. This leads to patients feeling humiliated and reluctant to return to health facilities, as well as discontinuing treatment [6].

The effect of stigma on tuberculosis prevention

A total of 5 articles discussed the impact of stigma on the provision of TB preventive treatment. The effectiveness of TB

preventive therapy is largely dependent on stigma, which often takes the form of negative perceptions and discrimination against people with TB. This stigma can impact various aspects of a patient's life, including the provision of TB treatment [29].

To improve TB case detection in the community, one of the key elements that needs to be implemented in high TB burden countries is contact investigation. Stigma is a barrier to contact investigation and will impact the provision of TB preventive therapy. When TB is diagnosed, all close contacts are tested for new cases and latent TB infection. If a close contact tests positive for TB, the person is treated for TB. If the test results are negative, close contacts who are at high risk of developing TB will be treated with TB preventive drugs. The provision of preventive therapy is hampered by the stigma that exists in the community. Because they feel healthy and have no complaints, most close contacts are unwilling to receive TB preventive therapy. They believe that only sick people can take medication [30].

Two articles present research findings showing the relationship between knowledge and TB stigma in the provision of TB preventive therapy. Increasing public knowledge about TB has a positive impact on awareness regarding the importance of treatment as a preventive measure against developing TB disease. This encourages close contacts of TB patients to accept preventive therapy. However, TB stigma weakens the relationship between knowledge and willingness to accept preventive treatment. Stigma makes people refuse TB preventive treatment and not continue treatment. Lack of knowledge about TB and TB preventive therapy, as well as misinterpretation of latent infection as TB disease, stigmatize people who are reluctant to seek medical care. Therefore, appropriate education is needed to overcome stigma in order to encourage vulnerable groups to accept TB preventive treatment [31, 32].

One study linked stigma and gender with TB preventive therapy. Perceived stigma was positively associated with behavior related to acceptance of the TB preventive treatment. The association was moderated by gender, with men perceiving TB stigma as being associated with preventive treatment acceptance. Developing gender-specific strategies is needed to increase TB preventive therapy acceptance [21].

TB-HIV stigma is also an issue that prevents HIV-affected children and adolescents from initiating and completing TB preventive therapy [29]. However, a Brazilian study showed different results: 90% of respondents had accessed health services for latent TB infection [15].

Some important points discussed in different studies are systematically summarized in [Table 1](#). The level of confidence was

determined using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach, which is a system for assessing the quality of evidence and the strength of recommendations [33]. There are three levels of confidence: high, moderate, and low.

[Appendix 1](#) shows that stigma continues to be a major issue in TB prevention and control efforts. We found 18 studies related to access to TB services that consistently yielded similar results, which implies a high level of confidence. The conducted studies demonstrate that stigma makes people reluctant to come to a health facility because they are worried about being recognized by the surrounding community, which could inevitably affect their social life [18].

Overall, there is evidence with similar and consistent results across all the main points of this review, yielding results with a high level of confidence. This shows that stigma is one of the barriers to achieving the goal of ending TB in 2030. Therefore, efforts to reduce stigma must be comprehensive.

Greater efforts are needed to eliminate stigma in TB programs. Knowledge has been shown to reduce stigma around TB, which affects people in accessing health services. Improving community literacy on TB is a solution to overcome this problem [4]. Therefore, there is a need to build the capacity of human resources of TB health care providers to provide quality and effective counselling. Training should be provided regularly to provide correct information about TB [6]. Support from family members, friends, empowerment of TB survivors, and community engagement are important parts of encouraging TB patients to seek immediate treatment and providing education to reduce stigma [12, 34]. Integrating TB and HIV programs is a way to reduce stigma as TB stigma is exacerbated by HIV stigma [14].

Bibliometric analysis

We analyzed 31 articles using VOSviewer software version 1.6.20. From the VOSviewer analysis, a visualization of the interconnected keyword network of the 31 articles was obtained. The interconnected information shows the profile of Scopus publications on TB stigma that affects TB prevention and control efforts.

VOSviewer analyzes data from Scopus and creates visualization maps based on bibliometric data using keywords. Based on the results of the index keyword-based analysis, we can see two clusters that display the topics of TB stigma. Each cluster has a different number of items (17 altogether) and this difference can be seen in the VOSviewer network visualization.

Table 1. The main points of the review

Main points	References	Ordinal number of the study	Confidence level	Information
Stigma causes reluctance and delays in accessing health services	[17], [4], [12], [34], [18], [3], [20], [19], [13], [22], [23], [35], [16], [36], [37], [38], [15], [2]	18	high	All studies conclude that stigma can prevent a person from accessing health services for examination, resulting in delays in diagnosis and treatment.
Stigma influences noncompliance with taking antitubercular medication	[28], [6], [5], [25], [24], [14], [26]	7	high	Of 8 conducted studies, only one showed that stigma had no effect on treatment compliance. Treatment compliance plays an important role in improving patient recovery and reducing mortality [1].
Stigma causes refusal of tuberculosis preventive therapy	[21], [31], [30], [29], [32]	5	high	All studies suggest that stigma has a negative impact on acceptance of preventive therapy.

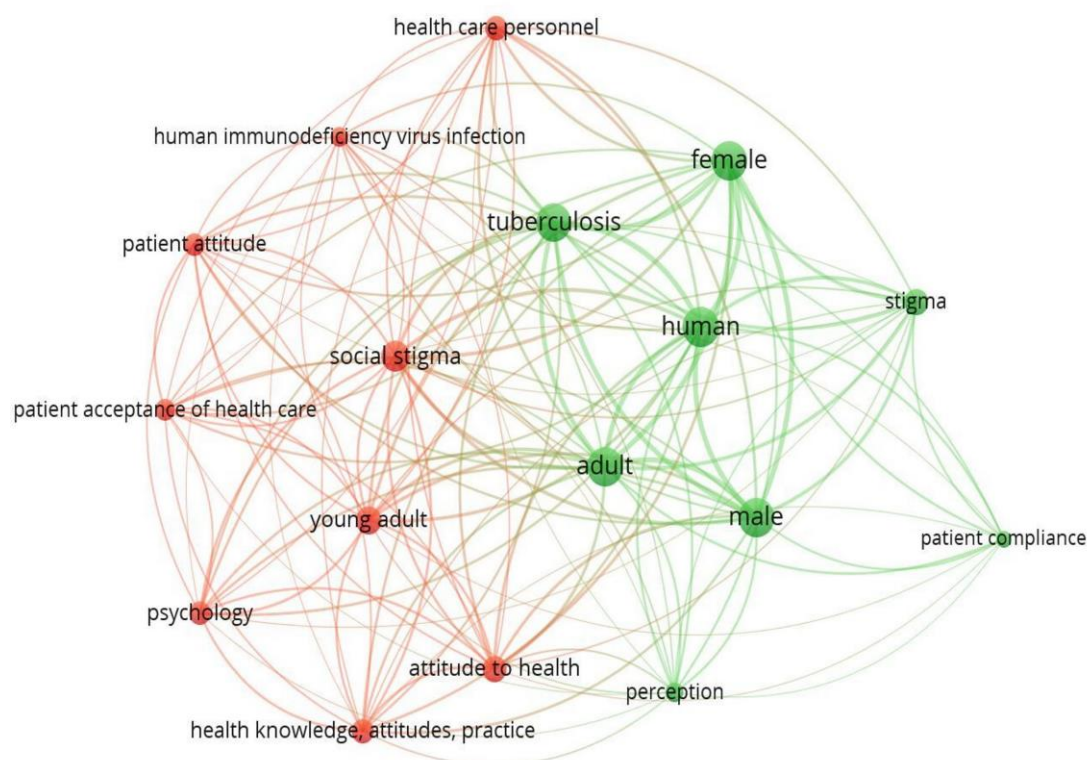


Figure 2. Network visualization of stigma among tuberculosis patients.

[Figure 2](#) demonstrated the relationship with the index keywords. The keywords are divided into clusters. Cluster 1 consists of 9 items, viz.: social stigma; attitude to health; health knowledge, attitudes, practice; young adult; health care personnel; psychology; patient acceptance of health care; patient attitude; and human immunodeficiency virus infection. Cluster 2 comprises 8 items, viz., human; adult; female; tuberculosis; male; stigma; perception; and patient compliance.

The cluster index keywords are color-coded color in [Figure 2](#): cluster 1 is shown in red, while cluster 2 is shown in green. The size of each circle indicates the frequency of occurrence of the keyword: the larger the size, the more frequently the keyword is used. The thickness of each line shows the strength of the relationship between keywords. In cluster 1, 9 items are interrelated in describing the relationship between social stigma in adults and psychological factors that affect the acceptance of health services. Social stigma in HIV infection can hinder treatment-seeking behavior. Knowledge, attitudes, and behavior affect social stigma in the community. In cluster 2, 8 items are interrelated in describing the relationship between stigma and these items that can hinder patient compliance with TB treatment.

Looking at the items above, we can see that stigma research in TB cases continues to be dominated by adult cases, gender impact, TB-HIV relationship, and is linked to health knowledge, attitudes and behavior.

Conclusion

This study provides evidence that stigma continues to affect TB prevention and control efforts. Stigma makes TB patients feel ashamed, afraid, and reluctant to seek medical care; it impacts

adherence to medications and provision of TB preventive therapy. Greater efforts are needed to address stigma in TB control programs through community-based TB literacy and ongoing education. Capacity building of TB health care providers is needed to enable them to provide quality and effective counselling. Support from family, friends, empowerment of TB survivors, communities, along with community engagement, play an important role in efforts to end TB by 2030.

Research on TB stigma should continue by identifying potential research gaps that can be the focus of future studies.

Acknowledgments

We would like to thank all participating parties for their cooperation, contribution and support regarding this study. We hope that it will benefit the wider community in the efforts to eradicate tuberculosis worldwide.

Conflict of interest

None declared by the authors.

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Appendix 1. Summary of publications regarding stigma in tuberculosis patients

##	Title of the article	Year	Country	Topic	Objective	Method	Study sample	Results
1	A qualitative exploration into the presence of TB stigmatization across three districts in South Africa [17]	2023	South Africa	Access to health services	To explore the TB stigma in communities across South Africa	Qualitative	31 people with TB, 12 close contacts	TB stigma is driven and maintained by fear of the disease coupled with an understanding of the TB/HIV duality. A person's unique understanding of how stigma affects seeking treatment
2	Tuberculosis stigma: Assessing tuberculosis knowledge, attitude and preventive practices in Surulere, Lagos, Nigeria [4]	2021	Nigeria	Access to health services	To assess TB stigma based on knowledge, attitudes, and prevention practices among individuals in urban areas	Quantitative	317 people	Knowledge has been found to reduce TB stigma, reinforcing the need to improve community TB literacy. This can influence care-seeking behavior and lead to better outcomes
3	Behavioural barriers and perceived trade-offs to care-seeking for tuberculosis in the Philippines [35]	2022	Philippines	Access to health services	To investigate barriers to seeking medical care from a behavioral science perspective	Qualitative	116 TB patients, families, communities, pharmacists, health care providers	Barriers to TB treatment seeking are influenced by several factors, one of which is the expectation of stigma, discrimination and exclusion
4	Perceptions, attitudes, experiences and opinions of tuberculosis associated stigma: A qualitative study of the perspectives among the Bolgatanga Municipality people of Ghana [12]	2022	Ghana	Access to health services	To explore perceptions, attitudes, experiences, and opinions about TB-related stigma among adults infected and not infected with TB	Qualitative	6 female TB patients, 7 male TB patients, and 6 people not infected with TB	Men with TB have greater autonomy in decision-making about seeking treatment vs. women with TB. The latter are further stigmatized by late diagnosis and treatment, so they are seen as a burden rather than an asset. TB patients are stigmatized because community members not infected with TB are reluctant to come into close contact with them
5	Characterizing and measuring tuberculosis stigma in the community: A mixed-methods study in Cambodia [34]	2020	Cambodia	Access to health services	To characterize, measure, and explore the determinant of TB stigma among TB infected people in Cambodia	Mixed method	31 TB patient	A total of 56% and 51% of participants experienced self-stigma and community-perceived stigma
6	Barriers and facilitators to accessing tuberculosis care in Nepal: A qualitative study to inform the design of a socioeconomic support intervention [18]	2021	Nepal	Access to health services	To identify socioeconomic barriers and drivers to accessing TB services in Nepal	Qualitative	21 TB patients, 13 stakeholders, and 20 TB health professionals	Perceived socioeconomic barriers to accessing TB services: poor TB knowledge and advocacy; high food and transportation costs; loss of income and stigma
7	Perceptions of stigma among pulmonary tuberculosis patients in Thailand, and the links to delays in accessing healthcare [3]	2023	Thailand	Access to health services	To examine the relationship between TB stigma and delay in seeking medical care among patients with pulmonary TB	Mixed method	300 people	Participants who reported higher levels of TB stigma showed longer patient delays ($p < 0.001$). Qualitative data support the notion that perceptions of TB as a stigmatizing disease contribute to delays in seeking care
8	Gender-related factors associated with delayed diagnosis of tuberculosis in Eastern Europe and Central Asia [20]	2022	Georgia, Kazakhstan, Moldova, and Tajikistan	Access to health services	To explore gender-related factors by collecting and analyzing qualitative information	Qualitative	86 focus group discussion respondents and 21 focus groups (227 participants)	In two countries, women were more likely to experience stigma than men, and this was a barrier to seeking care
9	Patient and health system level barriers to and facilitators for tuberculosis treatment initiation in Uganda: A qualitative study [19]	2022	Uganda	Access to health services	To identify patient-level and health system-level barriers and drivers to initiating TB treatment in Uganda	Qualitative	31 patients, 10 health managers and 38 healthcare workers)	At the patient level, notable barriers include long waiting times for sputum analysis results and lack of transportation funds to return to health facilities (physical opportunity); limited knowledge of TB (psychological ability) and stigma (social opportunity)
10	Knowledge and stigma of latent tuberculosis infection in Brazil: Implications for tuberculosis prevention strategies [15]	2020	Brazil	Access to health services	To assess knowledge of TB disease and latent tuberculosis infection across Brazil and examine its association with TB stigma and incidence	Quantitative	1,532 people	A significant proportion of this representative sample of Brazilian population is aware of latent TB infection and is willing to seek treatment for it. However, such knowledge is associated with TB-specific stigma
11	Barriers and gaps in	2023	Iran	Access to	To investigate barriers to	Qualitative	3 policy makers from	Several barriers to TB treatment include

##	Title of the article	Year	Country	Topic	Objective	Method	Study sample	Results
	tuberculosis care and treatment in Iran: A multi-center qualitative study [13]			health services	accessing TB health services (including confirmatory diagnosis, adherence to treatment, and relapse of pulmonary TB) from the perspectives of patients, clinicians, and policymakers		the Ministry of Healthcare, 12 provincial TB experts and doctors from the TB control program, and 33 patients diagnosed with TB	poor knowledge, lack of TB screening among at-risk patients by physicians, symptom similarities between TB and other lung diseases, low sensitivity of TB diagnostic tests, incomplete finding of cases and contact tracing, TB-related stigma, and low patient adherence due to long-term TB treatment. In addition, the COVID-19 pandemic is disrupting TB services and reducing TB case detection, care, and treatment services
12	How the HIV/TB co-epidemic-HIV stigma' syndemic impacts on the use of occupational health services for TB in South African hospitals: A structural equation modelling analysis of the baseline data from the HaTSaH study (Cluster RCT) [22]	2022	South Africa	Access to health services	To hypothesize that the association between HIV and TB and perceived HIV stigmatization by peers creates HIV-TB double stigma that increases internalized TB stigma and leads to low willingness to use occupational healthcare unit services for TB screening and treatment	Quantitative	820 health personnel	Higher levels of internal TB stigma ($\beta=0.421$ (screening) and $\beta=0.426$ (treatment) resulted in lower willingness to use occupational healthcare unit for TB screening (probit coefficient=-0.216) and treatment (probit coefficient=-0.160).
13	Factors associated with delay in tuberculosis management in Sarawak, Malaysia [23]	2022	Malaysia	Access to health services	To develop TB management in conditions of delayed diagnosis and treatment initiation among TB patients in Sarawak, Malaysia	Quantitative	724 patients	Statistically significant factors for delayed diagnosis were female gender, moderate family stigma ($p<0.01$), and repeated visits to health care facilities ($p<0.001$)
14	Sociocultural understanding of tuberculosis and implications for care-seeking among adults in the Province of Zambezia, Mozambique: Qualitative research [36]	2024	Mozambique	Access to health services	To explore factors influencing TB testing in Zambezia province of Mozambique	Qualitative	2 TB Program staff, 2 community TB service providers, and 19 community members	Stigma associated with HIV and TB also delays a search for medical care
15	Impact of protracted displacement on delay in the diagnosis associated with treatment outcomes: A cross-sectional study in internally displaced tuberculosis patients of Pakistan [16]	2021	Pakistan	Access to health services	To evaluate the relationship of determinants that are present after prolonged internal displacement of people with delays in TB diagnosis and treatment outcomes	Quantitative	391 TB patients	Multivariate regression analysis showed a statistically significant association ($p>0.05$) between TB patients aged 55 to 65 years (AOR, 2.66; 95% CI, 1.00-7.07), female patients (AOR, 2.42; 95% CI, 1.21-4.81), visiting informal health care providers (AOR, 8.81; 95% CI, 3.99-19.46), self-medication (AOR, 2.72; 95% CI, 1.37-5.37), poor knowledge about TB (AOR, 11.39; 95% CI, 3.31-39.1), and perceived stigma (AOR, 8.81; 95% CI, 3.99-19.4).
16	Determinants of delayed diagnosis and treatment of tuberculosis in Cambodia: A mixed-methods study [37]	2020	Cambodia	Access to health services	To examine the determinants of delayed TB diagnosis and treatment in Cambodia	Mixed method	721 TB patients	Seeking private medical care and self-medication before TB diagnosis, lack of perceived risk; threat, vulnerability and stigma, obtained qualitatively further explain the quantitative results
17	The contribution of stigma to the transmission and treatment of tuberculosis in a hyperendemic indigenous population in Brazil [38]	2020	Brazil	Access to health services	To identify the role of TB-related stigma and perceptions of TB in maintaining hyperendemic TB transmission in Guarani-Kaiowá communities	Quantitative	19 patients, 11 close contacts, and 23 community members	Stigma is a driver of treatment delays and continued TB transmission in the community. TB stigmatization is rooted in a poor understanding of TB transmission, partly due to misorientation by health services
18	"Their place is beyond the town's border": A qualitative exploration of stigma associated with tuberculosis in rural and urban areas of Lagos,	2021	Nigeria	Access to health services	To explore the perspectives of community members in rural and urban areas	Qualitative	86 rural and urban communities	There is a gap in community members' perspectives on understanding TB and its associated stigma. Understanding and misconceptions, reactions and responses to TB differ among community members in rural and urban

##	Title of the article	Year	Country	Topic	Objective	Method	Study sample	Results
	Nigeria [2]							communities
19	"It is not easy": Experiences of people living with HIV and tuberculosis on tuberculosis treatment in Uganda [28]	2023	Uganda	Medication adherence	To identify the challenges faced by patients undergoing TB treatment	Qualitative	128 HIV TB patients	Drug adherence is affected by stigma (especially due to visible side effects such as 'red urine')
20	Nonadherence predictors to tuberculosis medications among TB patients in Gambella Region of Ethiopia [6]	2022	Ethiopia	Medication adherence	To identify factors influencing nonadherence to the treatment with antitubercular medications among patients in Gambella Region of Ethiopia	Quantitative	296 TB patients	Factors determining nonadherence to antitubercular medications among TB patients in Gambella Region during the study period were lack of counselling services and patient behavior (smoking, undermining the severity of TB disease, lack of trust in the results of regular medication intake and perceived stigma)
21	Exploring social stigma and awareness towards tuberculosis in a municipality in southern Philippines: A mixed-methods study [5]	2023	Philippines	Medication adherence	To examine the level of social stigma and awareness of TB among patients, their relatives, and the community in a municipality in the southern Philippines	Mixed method	244 participants (patient, family, community)	Patients and their relatives are better informed about the causes, treatment and management of TB than the community. This is due to the role of the family as the primary caregiver and the lack of general information and publicity about TB in the community. On the other hand, all three groups experience high levels of social stigma. Fear of infection and discrimination were identified as the main reasons and factors contributing to unsuccessful treatment
22	Determinants of tuberculosis treatment interruption among patients in Vihiga County, Kenya [24]	2021	Kenya	Medication adherence	To identify and describe factors that predict TB treatment discontinuation	Quantitative	291 TB patients	The reasons for treatment discontinuation were classified as follows: alcoholism, feeling better after starting treatment, stigma associated with TB, long distance to health facilities, lack of food, perception of TB-free status, and burden of taking pills
23	Determinants of medication adherence for pulmonary tuberculosis patients during continuation phase in Dalian, Northeast China [25]	2020	China	Medication adherence	To study treatment adherence rates among outpatients with pulmonary tuberculosis and prognostic factors based on the biopsychosocial medical model	Quantitative	564 TB patients	Adherence to treatment in TB patients is not very high and depends on sociodemographic characteristics, treatment factors, knowledge about TB, mental health and behavioral characteristics
24	Stigma among tuberculosis patients and associated factors in urban slum populations in Uganda [14]	2021	Uganda	Medication adherence	To determine the level of stigma and associated factors among TB patients in urban settings of Kampala, Uganda	Quantitative	196 TB patients	More than half (52%) of study participants had high stigma towards TB
25	Factors related to complying with anti-TB medications among drug-resistant tuberculosis patients in Indonesia [27]	2022	Indonesia	Medication adherence	To analyze factors affecting adherence to TB treatment in patients with drug-resistant TB in Indonesia	Quantitative	79 patients with drug-resistant TB	Health behaviors were positively associated with TB treatment adherence; while family support, TB stigma and knowledge were not
26	Workplace interventions to overcome stigma and depression in patients with multiple drug-resistant tuberculosis (MDR TB) [26]	2023	Indonesia	Medication adherence	To determine psychological influences on therapeutic success and medication adherence	Case report	1 case of drug-resistant TB	TWork-related psychosocial interventions are needed to address workplace rejection, resulting in depression and nonadherence to treatment
27	Gender-specific association between perceived stigma toward tuberculosis and acceptance of preventive treatment among college	2023	China	Preventive therapy for TB	To describe the acceptance of latent tuberculosis infection treatment among university students	Quantitative	1,547 students with latent tuberculosis infection	Acceptance of preventive treatment among university students with latent tuberculosis infection was low. Perceived stigma towards TB was directly associated with acceptance of preventive treatment

##	Title of the article	Year	Country	Topic	Objective	Method	Study sample	Results
	students with latent tuberculosis infection: Cross-sectional analysis [21]							
28	Influence of tuberculosis knowledge on acceptance of preventive treatment and the moderating role of tuberculosis stigma among China's general population: Cross-sectional analysis [31]	2024	China	Preventive therapy for TB	To describe the acceptance of latent TB infection treatment among university students	Quantitative	7,017 (general population)	The relationship between TB knowledge and acceptance of TB preventive therapy was mediated by TB stigma. In other words, TB stigma weakened the impact of TB knowledge on acceptance of TB preventive therapy (OR=0.994, 95% CI=0.991, 0.996)
29	Challenges of screening and investigations of contacts of patients with tuberculosis in Oyo and Osun States, Nigeria [30]	2024	Nigeria	Preventive therapy for TB	To identify challenges in screening and investigating patient contacts with TB in Oyo and Osun States, Nigeria	Qualitative	30 TB patients, close contacts and government staff dealing with TB	Most TB contacts who tested negative were reluctant to undergo TB preventive therapy due to their belief that only sick people should take medication. In addition, another gap in TB contact investigation is the hostility of TB contacts towards contact tracers during door-to-door screening of suspected TB cases due to the social stigma associated with TB
30	Facilitators and barriers to initiating and completing tuberculosis preventive treatment among children and adolescents living with HIV in Uganda: A qualitative study of adolescents, caretakers and health workers [29]	2024	Uganda	Preventive therapy for TB	To explore factors that facilitate and inhibit the initiation and completion of TB preventive treatment among children and adolescents (10-19 years old) living with HIV and caregivers of children under 18 years of age	Qualitative	10 health workers, 10 children and adolescents living with HIV, 10 caregivers	Barriers to initiating TB preventive treatment included stigma associated with TB and HIV, busy work schedules of caregivers and adolescents, reduced social support from parents and family, history of side effects of taken medications, high pill intake, fatigue, and the perception that they were not sick
31	Knowledge, attitudes, beliefs, and stigma related to latent tuberculosis infection: A qualitative study among Eritreans in the Netherlands [32]	2020	Netherlands	Preventive therapy for TB	To examine knowledge, attitudes, beliefs and stigma associated with latent tuberculosis infection (LTBI) among Eritrean asylum seekers and refugees in the Netherlands	Qualitative	Adult Eritrean asylum seekers and refugees: 26 and 31 residents during or after completion of latent tuberculosis infection treatment	Despite TB/LTBI education, culturally based misconceptions about TB transmission and prevention persist. Fear of TB infection is a reported (isolation and gossip) and expected (treatment non-disclosure and self-isolation) cause of stigma among latent tuberculosis infection treatment participants