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Scoping review: Adherence in TB journey, its challenges and sustainability

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Abstract: This systematic scoping review proposed examining issues connected to TB medication non-adherence among TB patients over a long time in South Africa. Wide electronic databases and online digital libraries were searched, including medical informatics (Google Scholar, PubMed Central, Web of Science and MEDLINE) by means of the keywords: ‘TB medication non-adherence, TB non-adherence and interventions, digital health strategy to end TB, program, management of TB, control, and sustainability to medication’. Various studies envisioned to address TB medication non-adherence in developing nations and South Africa among TB help seekers from 2010 to date were incorporated in data extraction. Twenty-eight innovative articles were altogether reviewed. Articles not written in English were all excluded. Factors that contributed to non-adherence were identified and discussed. Those factors linked with TB medication non-adherence were socioeconomic factors: patients-health care facilities, stigmatization, distance to facilities, poverty, lack of social support, and poor workers’ communication. Behavioural factors include smoking, getting improved some weeks into medication, drugs, improper communication on TB treatment are problems linked with non-adherence alongside additional factors. Digital interventions like the DOT, SMS, and Video reminders were identified, and the sustainability approach to long-term TB medication adherence during the TB journey was mentioned. Some digital interventions have been in use but have various limitations therefore, an innovative intervention that will be patient-centred and sustained over a long period of time to support the End TB goal is suggested in South Africa and sub-Sahara Africa.

Keywords: Iceberg theory, Long-term, Non-adherence to medication, Sustained support, TB journey, TB patients

Introduction

Tuberculosis (TB) is a contagious disease that has been recognized by mankind for thousands of years. Although curable, it remains a reality affecting the lives of many hackathon patients, their relatives and is still a significant challenge in public health care (WHO, 2017). The adherence to medication regimens has been identified as one of the most significant challenges in addressing the spread and reoccurrence in and amongst the risk population (WHO, 2015, 2017). According to WHO, 1.5 million individuals have died from tuberculosis (including 214 000 people with HIV) in 2020. TB is the world's 13th biggest cause of mortality and the second leading infectious killer (behind HIV/AIDS). Also, an anticipated 10 million people globally will have contracted TB. There are 5.6 million men, 3.3 million women, and 1.1 million children in the country. Tuberculosis is seen in all countries and in all age groups. TB, on the other hand, is both treatable and

avoidable (Migliori et al., 2020). In the year 2020, the 30 nations with the highest TB burden would account for 86% of new TB cases. China, Indonesia, the Philippines, Pakistan, Nigeria, Bangladesh, and South Africa account for two-thirds of the total (Migliori et al., 2020). Moreover, TB occurrence is decreasing at a rate of roughly 2% per year globally, with a total reduction of 11% between 2015 and 2020. This was more than halfway to the End TB Strategy's goal of a 20% reduction in TB cases between 2015 and 2020 (Migliori et al., 2020). According to the most recent national TB patient cost survey statistics, nearly one in every two TB-affected households faces costs that exceed 20% of their household income. By 2020, the entire planet has not reached the goal of 0% TB patients and their families incurring devastating losses as a result of the disease. Thus, support in low- and middle-income countries (LMICs), which accounted for 98 percent of recorded tuberculosis cases, is far insufficient. In 2020, spending was US\$ 5.3 billion, only around half (41%) of the global objective (Migliori et al., 2020). One of the United Nations Sustainable Development Goals is to end the tuberculosis epidemic by 2030. (SDGs).

In South Africa for year 2019, the World Health Organization (WHO) predicted that 360,000 cases of active tuberculosis will be diagnosed. This equates to a rate of 615 per 100,000 people (Migliori et al., 2020). Based on South Africa statistics in 2017, the first national tuberculosis analysis and reporting began, with evaluation results received in 2020. The survey revealed that the number of persons living with tuberculosis in South Africa is significantly higher than previously estimated. It also revealed that many persons with tuberculosis are undiagnosed and untreated (SA survey, 2021). Around 80% of South Africa's population is infected with tuberculosis bacteria, the vast number of which have latent TB instead of active TB disease. The age group 30-39 years old living within suburbs and rural villages had the highest incidence of primary infection, estimated at 88 percent (Hopkins, Doherty, & Gray, 2018) (SANAC, 2021). Tuberculosis is the top cause of death in South Africa. In 2019, 58,000 individuals died from tuberculosis. It's anticipated that 36,000 of them were HIV-positive (Migliori et al., 2020).

Kanabus argued that there are many control programmes for TB designed by WHO, not only has the disease remained uncontrolled, but it is rather having a huge challenge of nonadherence to medication leading to drug resistant cases (Curto, Einav, Finkelstein, Levin, & Bhattacharya, 2019; Kanabus, 2017). Factors contributing to medication nonadherence in South Africa include socioeconomic factors, Behavioral factors, Patient related factors, Healthcare system problem, treatment complexity, Lack of knowledge of the disease and treatment (Tola et al., 2015). Controlling tuberculosis is crucial (DiStefano & Schmidt, 2016). Meanwhile, appropriate adherence treatment is needed in controlling TB, impediments to adherence varied and substantial. Health establishes an emergent field with promises to deal with such barriers. Hence, there will be an improvement in individual and population health and the health system's effectiveness (DiStefano & Schmidt, 2016). Medication non-adherence is a costly, multifaceted, and common issue that causes meagre treatment results and absorbs healthcare funds in developing countries. Moreover, non-adherence is hard to measure precisely, and solutions to alleviate it have not been successful (Dayer, Heldenbrand, Anderson, Gubbins, & Martin, 2013). The article adds to the importance of policymaking in developing nations, also necessary for education improvement, enlightenment or awareness development on the effect of TB non-adherence in our communities and the global world, most notably in the world of digital intervention and sustainable development goals (SDGs). This systemized scoping review aims to answer the research question on how the existing literature can help to constitute a framework for sustained adherence to medication over a long term to support the End TB goal.

Factors Disrupting Adherence in TB patients

Several epidemiological research works have discovered links to adherence, often investigating the issue from a biomedical viewpoint. The framework of TB patients has sometimes been expressed as patients receiving treatment are expected to obey instructions of the health care staff. Non-adherence occurs when patients do not follow the rules of medication. This method shows why the behavioural factor is multifaceted and is

determined by many issues involving patient health beliefs, socio-cultural background, and individual illness experience (WHO, 2003, 2017).

Patient-related issues - Age, gender and ethnicity are associated with various backgrounds such as beliefs and knowledge on issues. Adequate knowledge about TB and accepting the efficacy of the medication often determines whether the patient will adhere to medication or not. Also, cultural belief supports using traditional treatment against allopathic medicine. Some TB patients have altered mental states triggered by abuse, psychological stress, and depression that could play a part in non-adherence behaviours. Numerous patients' access to the health provider is mainly based on distance and unavailability of transportation alongside their health condition. A study revealed that even though the aim was for a DOT devotee to stop over at the health seekers home rather than the patient trekking to the devotee's house. This showed difficulty for TB patients with severe symptoms. Another study noted that admission to health services improved in cities than in rural areas. Patients and health providers admitted that non-adherence occurred once the distance from patients' homes was too far from the closest clinic. Patients' whose homes are closer to the hospital would frequently attend. The time needed to show for DOT often affect the capability to focus on other daily activities. In other studies, patients believed that private physicians were more reachable (da Silva Garrido et al., 2012; Habteyes Hailu, Azar & Shojaeizadeh, 2015; Ifebunandu & Ukwaja, 2012; Maruza et al., 2011; Naidoo et al., 2013; Yao et al., 2011).

Structural and economic issues – TB typically affects people who are difficult to access, such as the poor, the homeless, and the unemployed. Ineffective economic support and unsafe living environments are added factors that bring about an adverse situation for non-adherence in TB patients. Numerous studies specified that having TB had a negative effect on work (Munro et al., 2007). Studies advised that patients could not disclose their TB status for fear of job loss. Further work-related matters comprised trouble in getting sick-leave for treatment; fear of requesting cash to procure TB medications, along with fear of dismissal or losing a job (Munro et al., 2007). Struggles from work and treatment, with the concealed costs of treatment, leading to expenditures surpassing incomes may well lead people into poverty (Gust et al., 2011; Habteyes Hailu et al., 2015; Maruza et al., 2011; Naidoo et al., 2013; Tadesse, Demissie, Berhane, Kebede, & Abebe, 2013).

Health care delivery problem – The clinical organization of services such as poor communication, lack of expertise, inflexibility in the operating hours are linked with a patient support system that affects medication adherence. Most ambulances that serve as health care support for TB patients might lack the skills necessary for long-term supervision strategy with patients. Therefore, self-management is not enabled, and medication follow-up is irregular. Difficulties arising from healthcare facilities comprised of queues, long waiting times, inconvenient appointment times, lack of privacy and the poor maintenance of hospitals. Many studies described that patients had stress in getting into health facilities for treatment because of inconvenient operating hours and staff absence. Patients and healthcare workers listed poor TB medication accessibility at healthcare centres (Munro et al., 2007). For instance, one study stated that some health care staff traded TB medications that could be offered free of charge (Habteyes Hailu et al., 2015; Kebede & Wabe, 2012; Tachfouti et al., 2013; Vijay et al., 2010).

Behavioural issues – Lack of patient satisfaction from the health provider is an important factor in non-adherence. Proper relationships are challenging to build where health care workers are overworked, lack knowledge about TB, staff are not adequately supervised in their duties which happens in nations with a high TB burden. The relationship created by patients with the treatment worker may affect adherence. Several articles showed that poor workers' tracking and ill-treatment, including rebuking a patient for being absent during his/her appointments, caused non-adherence. In disparity, further studies observed the optimistic influence of improved patient-provider contact on adherence (Habteyes Hailu et al., 2015; Kulkarni et al., 2013; Naidoo et al., 2013; Sendagire, Van der Loeff, Kambu, Konde-Lule, & Cobelens, 2012; Tachfouti et al., 2013).

Treatment complexity – Many medications need to be taken. However, their venomousness and added side-effects linked with the use might limit the continuation of medication. The altered mental state of patients can affect medication adherence. Asymptomatic patients are more likely not to adhere to treatment (WHO, 2003, 2017). Some studies emphasized how treatment demands might influence patient approaches concerning the treatment and their behaviour towards adherence. Patients may become tired of administering medicines (Allen, 2006; Gleissberg, 2001; San Sebastian & Bothamley, 2000), suspend medication based on lengthened treatment (Allen, 2006; Matebesi, 2004; Watkins, Rouse, & Plant, 2004), the number of pills (Jaiswal et al., 2003), or fear of drugs or painful injections (Pushpanathan, Walley & Wright, 2000) as identified by both patients and providers (Hailu et al., 2015; Munro et al., 2007; Muture et al., 2011).

Knowledge, towards TB treatment -The named researchers (Garrido et al., 2012; Naidoo et al., 2013; Tadesse et al., 2013; Tola et al., 2015) focused on the effect that patients' knowledge of treatment, duration of treatment and the subsequent result that avoidance had on treatment adherence. Patients and adherence adapted poorly to the lengthening time of treatment, and these are regarded to be enabled where patients are made to understand the reason for finishing treatment procedures. From the result gathered from a study on adherence to prophylaxis, it was described that non-adherence is common with patients who had less knowledge on TB as a deadly disease but are more mindful of its likely contrary effects caused by its treatment. Patients' cultural beliefs about treatment efficiency, both negative (Munro et al., 2007) and positive, might influence adherence. TB patients often ask questions on the effectiveness of the drugs or assume that injections can cure them and query the rationality of diagnostic tests that are not well-thought-of as classy enough for a disease so dangerous as TB (Munro et al., 2007). Belief in medication efficacy is linked to patients' assurance in the medical system in certain instances, public-based treatment strategies improved self-confidence in members of the community that TB has a cure (Munro et al., 2007). Another study highlighted that patients choose to see traditional healers when there are not enough knowledge on the treatment provided (Amuha, Kutwabami, Kitutu, Odoi-Adome, & Kalyango, 2009; Bagchi, Ambe, & Sathiakumar, 2010; Castelnovo, 2010; Cramm, Finkenflügel, Möller, & Nieboer, 2010; Elbireer, Guwatudde, Mudioppe, Nabbuye - Sekandi, & Manabe, 2011; Gebremariam, Bjune & Frich, 2010; Hasker et al., 2010; Widjanarko, Gompelman, Dijkers, & van der Werf, 2009; Xu et al., 2009).

Understanding of disease and awareness of wellness – Previous studies from our findings stated that health-seekers halted medication because they felt being healed or due to a reduction in symptoms (Munro et al., 2007). Certain studies showed that patients who could feel worse than before medication or have seen no development in their health state might interject treatment. A research work carried out in The Gambia stated that immigrants came to the country to obtain TB treatment and reverted as soon as they improved (Harper, Ahmadu, Ogden, McAdam, & Lienhardt, 2003). Lack of understanding and awareness of wellness process could be connected to patients' commencements of recovery and the aetiology of TB. Medication non-adherence was reported according to observations on TB as an illness; some did not accept that they had been infected, they only sought for cure on the TB signs and terminated treatment by the time it reduced (Ayisi et al., 2011; Elbireer et al., 2011; Gebremariam et al., 2010; Hasker et al., 2010; Kittikraisak et al., 2009; Sagbakken, Frich, & Bjune, 2008; Vijay et al., 2010).

Factor type characterizes the classification of prompting issues based on comparing related factors as seen in the previous studies. This mode of grouping allows the formation of a category, sometimes in a pyramid, to help separate the terms. Factors that serve as barriers to adherence to TB medication can be described in Table 1 below.

Table 1: Factors that serve as barriers to adherence to TB medication

References	Socioeconomic	Behavioral	Health system problem	Condition and Therapy	Analytical result
Hasker et al 2010	Lack of food, homelessness, transportation problem, Joblessness, stigma related,	No knowledge on TB, Fear of stigma, lack of motivation	Poor communication, unfriendly staff, uneducated staff		Lack of basic amenities leads to socioeconomic factor, knowledge and stigma affect behavior of patients.
Sagbakken et al., 2008	Lack of food, Joblessness, lack of social support,	Lack of adequate knowledge, no motivation,			Social amenities, knowledge and motivation are needed for adherence
Naidoo et al., 2013	Lack of food, transportation problem, low education, age, gender, joblessness, stigma related	Lack of knowledge, alcohol consumption, lack of exercise, smoking of cigarette, psychological stress	Untrained staff, unfriendly health workers		Basic amenities, social network, stigma, and knowledge is required to support adherence
Gebremariam et al., 2010	Lack of food Finance, homelessness, low education, joblessness, Lack of social support, stigmatization,	Lack of Knowledge, fear of stigma, lack of motivation			Social support and fear of stigmatization, belief also affect adherence
Amuha et al., 2009	Lack of food	No belief, no motivation, drug abuse	Poor communication, Unavailability of a drug, no proper appointment time		Belief, knowledge, and social support is required
Tadesse et al., 2013	Lack of food, financial issues, basic amenities, Employment problem, stigma related,		Distance from healthcare centers, transport cost, lack of communication,		Finance, fear of stigma are components of factors
Muture et al., 2011	Lack of food, financial issues, location, low education, joblessness, stigma related,	Fear of stigma, lack of self-efficacy, abuse of substance, smoking of cigarette, wrong diet, lack of exercise	Drug unavailability poor communication, unconvective appointment time, uneducated staff, unfriendly health workers		Basic amenities Fear of stigma Social network, Adequate health facilities Demographic, and lack of social support
Maruza et al 2011	Lack of food, low education, age, gender,	Alcohol consumption, abuse of drug, smoking, wrong diet, lack of exercise			
Kittikraisak et al., 2009	Lack of food, income class	Lack of motivation, self-efficacy, & belief			Knowledge and belief
Gust et al., 2011	Financial issues, gender, age,	Alcohol and drug abuse	Transport to health centers, unfriendly health workers		Finances, and Lifestyle
Kulkarni et al., 2013	Financial issues, low education, age, joblessness,	Lack of TB knowledge, smoking of cigarettes, wrong diet, drug abuse	Lack of Social network, distance problem		Basic amenities, knowledge, and no social support
Bagchi et al 2010	Finance, transportation problem, basic amenities, Joblessness,	Fear of stigma, alcohol consumption, drug abuse, wrong diet, lack of exercise	Distance from healthcare centers		Stigma related, Social network and finances
Cramm et al., 2010	Income class, Low education,	Fear of stigma, alcohol consumption,			Lifestyle, low education

Kebedee & Wabe (2012)	Financial issues, Transportation problem,	Lack of knowledge, lack of motivation	Unfavorable appointment time, poor communication from staff to patients, unfriendly staff	Lack of Basic amenities
Garrido et al 2012	Finance, low education,	Lack of TB knowledge, alcohol consumption, drug abuse	Transportation to health centers	Knowledge level, social support
Elbireer et al., 2011	Income class, homelessness, knowledge, joblessness, stigma related, lack of social network,	Lack of TB knowledge, fear of stigma,	No proper communication to patients, lack of health education for staff, transport cost	Basic amenities, Finances and untrained health workers
Widjanarko et al., 2009		Fear of stigma, lack of motivation,	Unfavorable appointment time, poor communication, no proper health education,	No health education, stigma related
Yao et al., 2011	Homelessness, Basic amenities, low education,	Lack of motivation,		Belief, Basic amenities
Tachfounti et al., 2013	Low education, gender, age	Lack of knowledge, no motivation, belief, lack of exercise, wrong diet, drug abuse	Transportation cost	Lifestyle, belief, finances
Vijay et al., 2010	Low education, Unemployment	Lack of TB knowledge, fear of stigma, lack of motivation, drug abuse	Unfavorable appointment time, long queue, untrained staff, unfriendly health workers	No knowledge, lifestyle, Lack of skilled staff
Xu et al., 2009	Knowledge, stigma related,	Fear of stigma, lack of motivation,	Lack of adequate support from health workers	
Ifebunandu & Kingsley (2012)	Age, gender,		Transportation cost, distance from health care centers	
Castelnuovo 2010	Psychological, Social network,	Lack of motivation, no belief		Psychological issues, belief
Ayisi et al., 2011	Poverty	Lack of motivation, drug abuse, alcohol consumption, smoking, lack of exercise	Lack of expertise, Transport cost	
Sendagire et al., 2012		Lack of belief, no motivation, alcohol consumption,	Lack of expertise	
Munro et al., 2007	Adverse side effect on work, Age, gender, ethnicity, social amenities	Stigma related issue, lack of supervision at work	Untrained staff, Unfriendly staff Distance to health facilities	Altered mental state, Complex treatment dosage, Asymptomatic patients, adverse side effects Side effects on work and health, belief, stigma related
Habteyes et al., 2015	Age, gender, ethnicity	Lack of patient satisfaction	Healthcare delivery problem	Complex treatment dosage, Asymptomatic patients, adverse side effects Knowledge, belief
Matebesi, 2004	Homelessness	Fear of stigma		Lengthen treatment, adverse side effect
Allen, 2006	Unemployed, poverty			Lengthen treatment, adverse side effect
Watkins et al., 2004	Homelessness, Poverty,			Too long treatment period, Basic amenities

Pushpanathan et al., 2000. Jaiswal et al 2003	unemployment Poverty, Joblessness Poverty, unemployment	Lack of flexibility in appointment time	Fear of drugs, Painful injections Too much medication to take	Psychological related
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Table 1 shows the factors that lead to non-adherence in TB patients. The researcher analyzed the factors based on components and elements that eventually resulted in the above factors. The components and elements were observed by other researchers as the components of medication non-adherence.

Methodology

This section expounds in using a systematized literature review approach or procedure to carry out a scoping review on TB medication non-adherence in a long-term patient journey. According to Fink, a literature review is defined as an unambiguous, systematized, and dependable approach of evaluating, identifying, and synthesizing the current completed and documented work carried out by scholars, practitioners, and researchers (Fink, 2019). Moreover, this involves carefully collecting data by evaluating, identifying, and synthesizing (Fink, 2019), which impacts the integrity of work done (Hart, 2018; Jahoor, 2019). This definition shows that following a systematic approach while doing a scoping review will be efficient (Colquhoun et al., 2014). As posited by Colquhoun et al., a scoping review is a way of knowledge synthesizing that reports an exploratory research question intended to map vital concepts, kinds of evidence, and gaps in related research to a definite field through systematically selecting, searching and synthesizing previous understanding. This review describes the building of a theoretical framework to guide succeeding research (Okoli & Schabram, 2010). Relevant articles in the subject of study were collected and investigated by a systematic literature review. The systematic method aided the purpose of this research process (Seuring & Müller, 2008) that helps in contributing to current literature (Okoli & Schabram, 2010).

The systematic scoping review was facilitated by accessing an academic library that supports several online databases and a digital library in medical informatics and software engineering. The multidisciplinary academic databases used are Wiley Online Library, IEEE Xplore, Web of Science, PubMed, Science Direct, Scopus, Springer, Google Scholar, ACM, and expert referrals. Health-related databases searched include Embase, BMC, MEDLINE, and Global health. Keywords and phrases used in data retrieval are ‘TB medication non-adherence, ‘TB non-adherence and interventions’, digital health strategy to end TB, program, management of TB, control, and sustainability to medication. In addition, the researcher incorporated studies that investigated non-adherence to precautionary or therapeutic TB treatments that explained the perception of health-seekers and health care providers. Publications only written in English were considered in this study from 2000 to December 2020; articles that define the programs, procedures, or interventions in TB medication non-adherence control from public health perception aim to decrease the occurrence death rate. Exclusion criteria are: (1) Policy/Strategy papers the likes of bulletin items and magazines are disqualified from this study; (2) articles relating to biological, clinical, and epidemiological non-interventional research work; (3) articles that do not relate to TB are all exempted. The search was modified to include studies carried out in South Africa and other developing nations to suggest the current state of the research literature on non-adherence and intervention.

Data analysis and selection

A systematized review is a reiterative approach that presents a steady flow of information in a flow chart, as shown below:

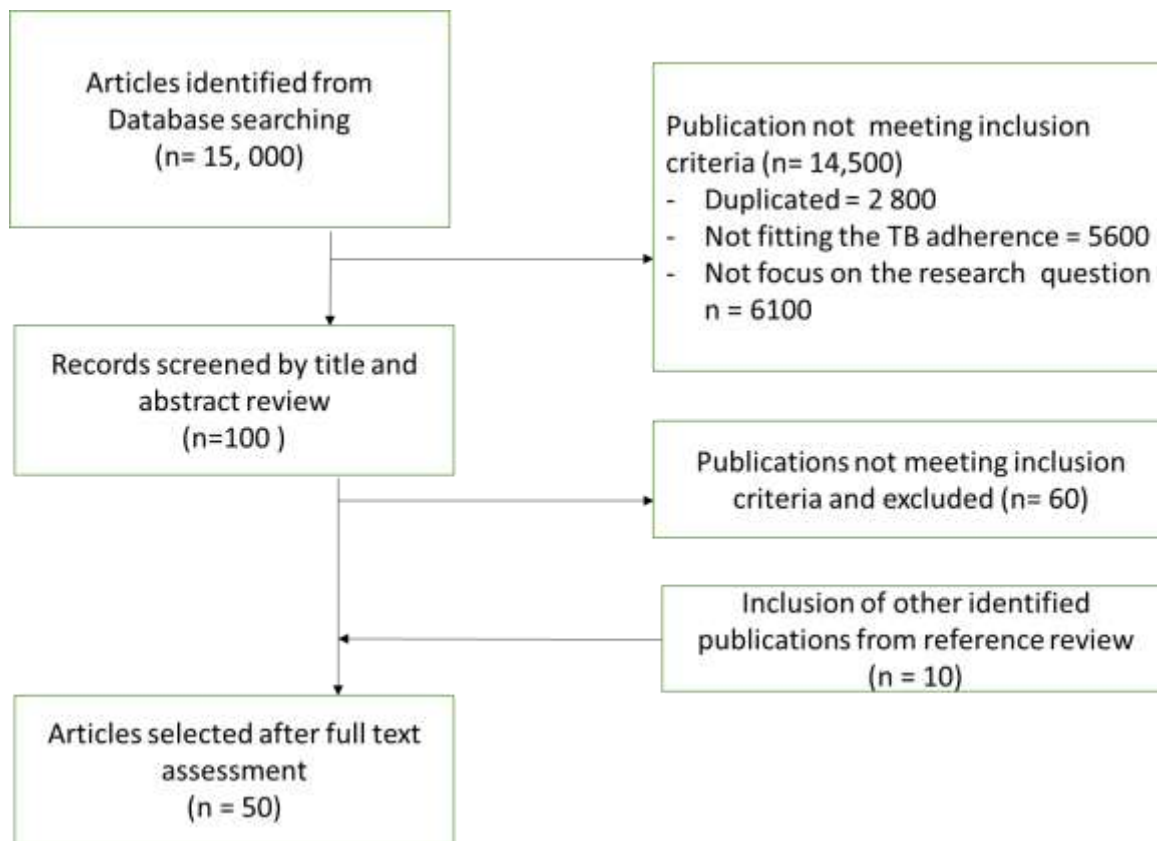


Figure 7: Number of articles used during this systematic review

The twenty-eight articles feature TB non-adherence from a global perspective, studies from South Africa and other developing nations and articles focusing on long term care.

TB Patient pathway

A disease such as TB requires a long-term treatment that cannot be measured just by refining diagnosis and treatment adherence in healthcare centers. TB needs a vigorous facility through which private and public health centers work together to support each other. A health system is required to alert patients with suggestive TB symptoms (Identify presumptive TB patient). Such a system would have efficient mechanisms at hand to ensure early detection (diagnose TB patients), treatment instigation (Enroll TB patients), and completion with adequate referrals to professionals in the right sector, as described in Figure 1. Information needs to be provided to patients' families clearly to understand the process and risk involved in non-adherence so that a better outcome is achieved (Bhattacharya Chakravarty et al., 2019). This initial stage is the awareness state to prepare the potential patient for treatment, but patients do not understand the details of what the medication period entails. Therefore, the long-term medication phase is not properly managed by the patients.

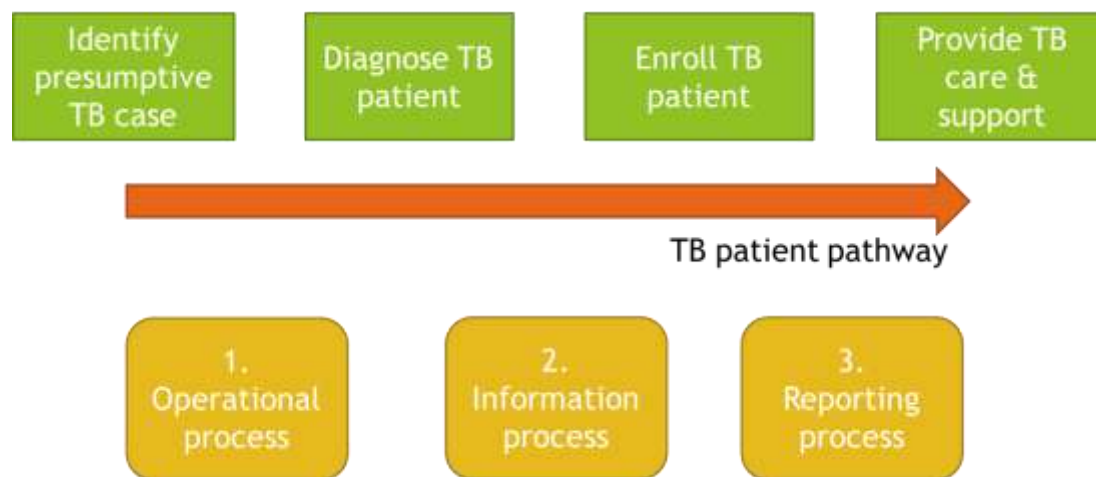


Figure 8: TB patient Journey (Adapted from WHO 2017).

TB patient pathway aid patients during the detection phase of TB symptoms, but the care and support needed while on medication is beyond the pathway illustrated above. Therefore, this paper will use iceberg theory to analyze the behavioural pattern that affects the patient in adhering to medication over a long period of time.

The Iceberg theory

The iceberg theory, according to Hemingway, is defined as the real intent of a writer not being noticeable from the surface, but the real part of the work is under the surface. The iceberg approach allows people who read to perceive the meaning from Hemingway's basic understanding. He further observed that the iceberg is one-eighth above the surface while the seven-eighth is below (Darzikola, 2013). Little of the circumstances around the iceberg is seen on the surface, but many other issues/ reasons are hidden underneath the iceberg that should be explored. Green suggests a socio-environmental model of health advancement where health and its security are construed in the context of the environmental system (Green & Marshall, 2005). Also, Hanson alongside other researchers. propose the injury iceberg adapted in this scoping review to analyze the factors affecting adherence to long-term medication in TB patients. Three dimensions/factors to the system are specified:

- The individual and their attitude.
- The physical environmental factor
- The societal, environmental factor.

The components and elements that constitute the factors are now discussed:

The intra-personal component is related to the individualities, skills, knowledge, experiences in life, behaviors, and attitude show how they relate in the society and environment (Hanson et al., 2005).

The **inter-personal** components refer to the direct physical environment and the social networks where the person lives the family, spouses, friends, and colleagues (Hanson et al., 2005).

The **organizational** components are the institutions surrounding the TB patients. Mostly, these are work-related places with goals and objectives to achieve and influence TB patients. These are the health facilities, clinics, private and public hospitals inclusive, and health caregivers, doctors, and nurses (Hanson et al., 2005).

A **community** consists of functional and structural terms. Its geographical and political borders define a community. A community could share cultural, demographic, ethnic, and social features in its functional state with its members. I have a sense of belonging and identity in norms and communication (Green, 2005; Hanson et al., 2005).

A **society** is a larger environment, being referred to as political borders, having the capacity to allocate resources, control the development of facilities to improve the lives of members of their community (Hanson et al., 2005).

The individual factor referring to the tip of the iceberg is just a part of the factors with components and various elements affecting adherence in TB patients. These factors could be the most visible components, but vital determining factors of their behaviour and environmental danger are concealed under the watermark. The

underlining factors unseen are more complex, and they are hard to change. Attempting to solve this factor alone (individual behaviour) would not yield a sustained outcome. Hanson and other researchers acknowledged that behavioural and health change is tough and probably unsuccessful when other social and cultural factors affect such change (Hanson et al., 2005). The socio-environmental factor emphasized the individual, the social and the physical environment. Each factor is built on deeper components and elements that contribute to non-adherence to medication in the long term. For adherence to TB patients, more attention needs to be paid to the components and elemental issues facing TB patients (Physical and societal environmental factors), as shown in Figure 2.

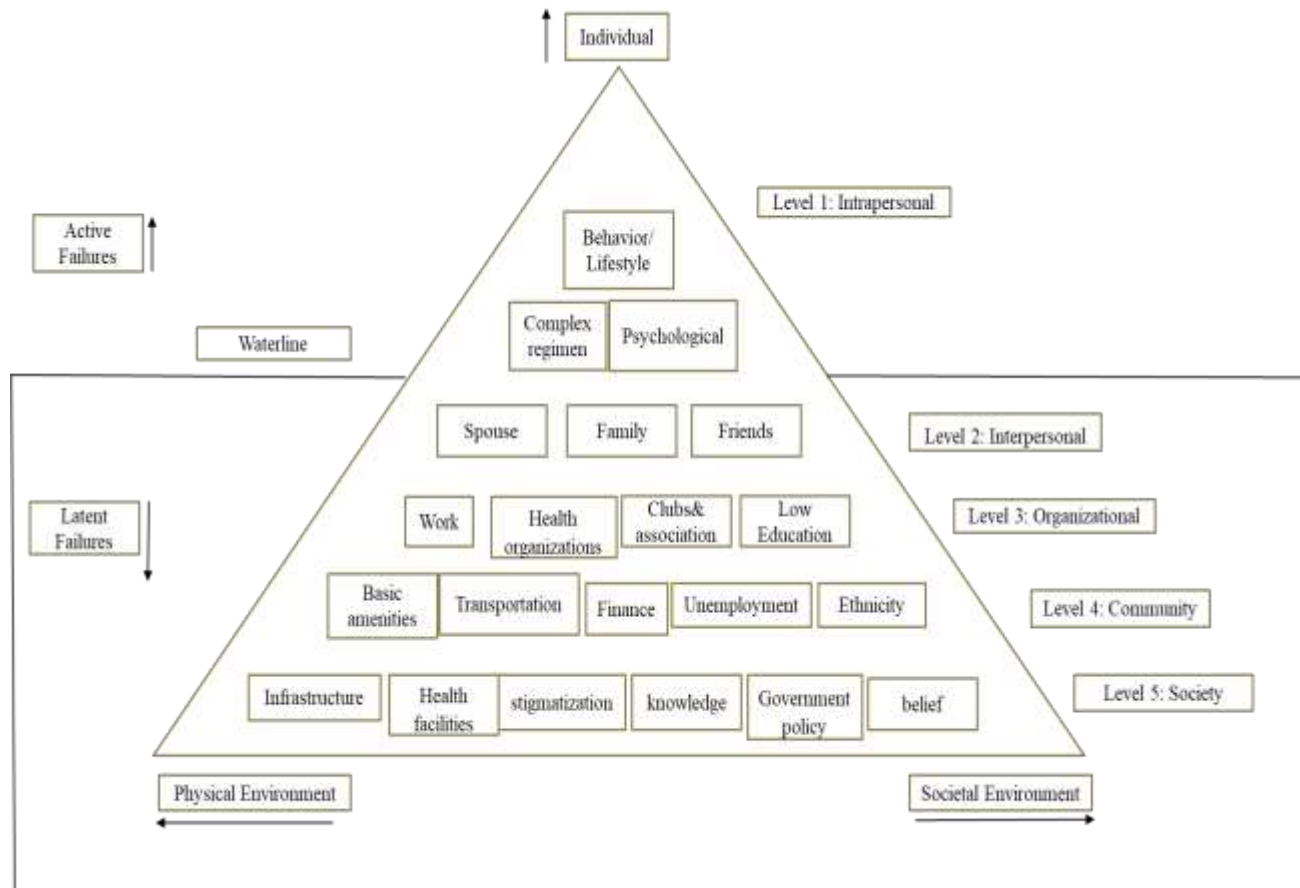


Figure 2: Application of iceberg injury in medication adherence for TB patients (Adapted from Hanson et al., 2005)

The iceberg theory explains the levels of components and their associated elements on how it affects adherence in TB patient behaviour.

Result and discussion

From the review findings, it was discovered that adherence to long term medication in TB patients is affected by many factors identified as Socioeconomic, Behavioural, patient-related, health facility-related and complex therapy/regimen. These factors are further affected by other components from patients' background, knowledge, and social status, and societal components also constitute non-adherence in TB patients. Stigma related issues made TB patients afraid, patients life experience is a major contributing factor too, poverty, joblessness, financial problem, and unfriendly health workers. According to the Iceberg theory, all factors would be unidentified by the behavioural pattern of patients but by carefully analyzing what underlining factors are and start by identifying each and then provide a solution that would be sustained. TB patient pathway has observed the initial phase of identifying a potential patient and initiating the treatment process for such individuals. TB care and support is the reality after the initial discovery, and the treatment period will last about six months which is a long time for patients to be on daily medication. Treatment adherence should be maintained for the patient to be cured to avoid the disease developing into a more complex drug resistance situation. Understanding how these factors interconnect over a period is significant for improving the research programme on discovering sustained health interventions.

This article has helped to search previous literature on various factors that affect treatment adherence and what more needs to be done for sustained adherence to medication over a long term to support the End TB goal.

Conclusion


In conclusion, this article assessed the level of adherence in TB patients receiving medication for a long-term period. Although previous literature highlighted factors affecting medication adherence, this review revealed additional components and elements that constitute more to patients' behaviour to non-adherence. Hence, to provide sustained support to TB patient medication adherence, the components and elements that result in non-adherence behaviour should not be overlooked. A sustained intervention can only be effective when strategies are developed to address these factors from the foundation and not only issues that appear through individual behaviour.

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