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TUBERCULOSIS TREATMENT ADHERENCE: EVALUATING HEALTHCARE SYSTEM FACTORS AND OTHER CONTRIBUTING ELEMENTS

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ABSTRACT

Tuberculosis remains a major global public health concern despite being preventable and curable. Effective treatment of tuberculosis requires strict adherence to anti-TB medications for at least four to six months under recommended treatment protocols. However, poor adherence continues to contribute to treatment failure, relapse, prolonged infectiousness, multidrug-resistant tuberculosis (MDR-TB), and increased mortality. Globally, tuberculosis remains one of the leading infectious causes of death, with millions of people affected annually. World Health Organization reports that poor treatment completion contributes significantly to drug resistance and weakens TB control efforts. (World Health Organization)

This study discusses tuberculosis treatment adherence by evaluating healthcare system factors and other contributing elements responsible for poor adherence. Healthcare system-related factors such as long waiting time, distance to treatment centres, poor attitudes of healthcare workers, inadequate counselling, drug shortages, poor communication, rigid clinic schedules, inadequate staffing, and limited access to healthcare services are examined. The study also evaluates socio-economic, personal, medication-related, and psychosocial factors such as poverty, stigma, low educational level, treatment fatigue, substance abuse, family support, forgetfulness, and fear of medication side effects.

The study adopts the Health Belief Model (HBM) as its theoretical framework because it explains how patients' beliefs, perceptions, motivations, and enabling factors influence treatment behaviour. The study argues that treatment adherence is multidimensional and influenced by interactions among health system, personal, socio-economic, and environmental determinants. Therefore, improving adherence requires patient-centred interventions involving effective counselling, strengthened healthcare delivery, social support, financial assistance, and flexible community-based TB programmes.

Keywords: Tuberculosis Treatment Adherence, Healthcare System Factors, Directly Observed Therapy (DOT), Directly Observed Therapy Short-Course (DOTS), Multidrug-Resistant Tuberculosis (MDR-TB), Health Belief Model (HBM), Public Health

Introduction

Tuberculosis is an infectious disease caused by Mycobacterium tuberculosis, primarily affecting the lungs and spreading through airborne droplets when infected individuals cough, sneeze, or speak. Although TB is preventable and curable, it remains a significant public health problem globally, particularly in low- and middle-income countries. According to the World Health Organization, tuberculosis affected approximately 10.7 million people worldwide in 2024 and caused over one million deaths, making it one of the leading infectious causes of mortality globally. (World Health Organization)

TB treatment generally requires uninterrupted use of anti-TB medications for four to six months or longer, depending on the severity and category of infection. WHO emphasizes that treatment adherence is essential for cure, prevention of transmission, and reduction of drug-resistant TB. Failure to complete treatment appropriately may lead to relapse, prolonged infectiousness, treatment failure, and the emergence of multidrug-resistant tuberculosis (MDR-TB), which is more difficult and expensive to treat. (World Health Organization)
Treatment adherence among TB patients is influenced by multiple interacting factors. Healthcare system factors such as poor accessibility to treatment centres, inadequate counselling, poor patient–provider relationships, long waiting times, shortages of drugs, weak monitoring systems, and inflexible clinic schedules often discourage patients from completing treatment. In many settings, patients may travel long distances or spend considerable time and financial resources to access treatment, thereby negatively affecting adherence.

Besides healthcare system factors, socio-economic conditions such as poverty, unemployment, food insecurity, transportation costs, and low educational attainment may also limit adherence. Social stigma, fear of discrimination, cultural misconceptions, and inadequate family support further influence treatment-seeking behaviour. Similarly, medication-related factors such as pill burden, adverse drug effects, and prolonged treatment duration may discourage patients from continuing treatment.

Consequently, tuberculosis treatment adherence is increasingly recognized as a complex behavioural and structural issue requiring integrated interventions. Healthcare systems must therefore adopt patient-centred approaches involving counselling, health education, social support mechanisms, effective communication, and improved healthcare accessibility to improve adherence and strengthen TB control outcomes.

Statement of the Problem

Despite the availability of effective anti-tuberculosis treatment and the implementation of strategies such as Directly Observed Therapy Short-Course (DOTS), poor adherence to TB treatment remains a major challenge globally and in many developing countries, including Nigeria. Incomplete adherence contributes significantly to treatment failure, relapse, prolonged disease transmission, multidrug-resistant tuberculosis (MDR-TB), and preventable deaths. ([World Health Organization] [1]) Many TB patients fail to complete treatment because of healthcare system barriers such as poor accessibility to treatment facilities, long waiting times, inadequate counselling, poor healthcare worker attitudes, drug shortages, inadequate follow-up, and weak patient–provider relationships. Additionally, socio-economic problems such as poverty, transportation costs, food insecurity, unemployment, and stigma further worsen adherence challenges. Although previous studies have examined factors influencing TB treatment adherence, inadequate attention has been given to understanding the combined effects of healthcare system-related barriers and other contributing factors. Therefore, there is a need to evaluate how healthcare system challenges and associated socio-economic, personal, and environmental determinants influence treatment adherence among TB patients in order to improve treatment completion and public health outcomes.

Objectives of the Study

General Objective
To evaluate healthcare system factors and other contributing elements influencing tuberculosis treatment adherence.

Specific Objectives

1. To assess healthcare system-related factors contributing to poor adherence among TB patients.
2. To examine socio-economic factors influencing adherence to tuberculosis treatment.
3. To evaluate personal and behavioural factors associated with poor TB treatment adherence.
4. To determine the influence of medication-related factors on treatment adherence among TB patients.
5. To investigate the role of social support and stigma in tuberculosis treatment adherence.
6. To propose strategies for improving adherence to TB treatment.

Research Questions

1. What healthcare system-related factors contribute to poor adherence among TB patients?
2. How do socio-economic factors influence tuberculosis treatment adherence?
3. What personal and behavioural factors are associated with poor adherence to TB treatment?
4. To what extent do medication-related factors influence adherence among tuberculosis patients?
5. What role do stigma and social support play in tuberculosis treatment adherence?
6. What measures can improve adherence to tuberculosis treatment?

Theoretical Framework

This study is anchored on the Health Belief Model (HBM), originally developed by social psychologists to explain health-related behaviour and patients' decisions regarding healthcare utilization. The Health Belief Model assumes that an individual's behaviour toward treatment depends on personal beliefs about illness severity, vulnerability, perceived benefits of treatment, perceived barriers to treatment, and cues to action. In tuberculosis treatment, patients are more likely to adhere when they perceive TB as a serious disease, believe that treatment is beneficial, and possess adequate confidence in completing the treatment regimen.
The model further explains that healthcare system factors such as accessibility of treatment facilities, healthcare worker attitudes, counselling, communication, waiting time, and drug availability may influence patients' motivation to continue treatment. Likewise, socio-economic and personal factors such as poverty, stigma, educational level, transportation cost, food availability, substance abuse, and family support may act as barriers or facilitators to adherence.

In relation to this study, the HBM provides a suitable framework for understanding how healthcare system factors and other contributing elements interact to influence TB treatment adherence. The model is therefore relevant because it emphasizes that treatment behaviour is determined not only by patients' willingness but also by enabling environmental and healthcare system conditions.

Literature Review

To Assess Healthcare System-Related Factors Contributing to Poor Adherence among TB Patients

Healthcare system-related factors are among the major determinants of poor adherence to tuberculosis treatment. Effective TB management requires accessible, patient-friendly, and efficient healthcare services. However, several healthcare system barriers negatively influence adherence among TB patients.

Long waiting times at healthcare facilities, poor attitudes of healthcare workers, inadequate counselling services, drug shortages, inflexible clinic schedules, and poor communication between patients and healthcare providers have consistently been identified as barriers to adherence. According to World Health Organization, inadequate healthcare infrastructure and weak health systems significantly contribute to interrupted treatment and poor treatment outcomes among TB patients. ([who.int] (https://www.who.int/health-topics/tuberculosis?utm_source=chatgpt.com))

Distance to treatment centres also affects adherence. Patients living in rural or underserved communities may face transportation difficulties and high travel costs, discouraging regular clinic attendance. Studies by Kaona et al. (2004) and Makanjuola et al. (2014) found that patients residing far from DOT centres were more likely to default on treatment.

Healthcare workers' attitudes equally influence treatment adherence. Unfriendly or discriminatory attitudes from healthcare personnel may discourage patients from continuing treatment. Tekle et al. (2002) observed that poor patient–provider relationships contribute significantly to treatment interruption among TB patients.

Furthermore, inadequate counselling and health education may limit patients' understanding of the importance of completing treatment. Effective communication and patient-centred healthcare services are therefore essential for improving adherence and treatment outcomes.

To Examine Socio-Economic Factors Influencing Adherence to Tuberculosis Treatment

Socio-economic conditions strongly influence adherence to TB treatment. Poverty, unemployment, low income, food insecurity, transportation costs, and poor living conditions often make it difficult for patients to sustain long-term treatment regimens. Many TB patients experience financial hardship

during treatment because of repeated clinic visits, transportation expenses, loss of employment, and inability to work effectively due to illness. According to Liu et al. (2007), TB treatment imposes significant economic burdens on patients despite free drug provision, as patients still incur indirect expenses related to transportation, diagnosis, and feeding.

Poverty also affects patients' nutritional status, which may worsen drug side effects and reduce tolerance to anti-TB medications. Kumarasamy et al. (2005) reported that some patients avoid taking medications on an empty stomach because of fear of adverse drug reactions.

Low educational status is another socio-economic factor associated with poor adherence. Patients with limited education may have inadequate knowledge about TB, treatment duration, and the importance of treatment completion. Shargie and Undtjorn (2007) found that non-adherence was more common among patients with little or no formal education. Additionally, overcrowded housing conditions, poor sanitation, and unemployment may increase vulnerability to TB infection and reduce access to healthcare services. Therefore, socio-economic empowerment and financial support interventions are important for improving adherence among TB patients.

To Evaluate Personal and Behavioural Factors Associated with Poor TB Treatment Adherence

Personal and behavioural factors significantly influence adherence to TB treatment. These factors include forgetfulness, substance abuse, alcoholism, smoking, poor knowledge about TB, treatment fatigue, mental health challenges, and patients' beliefs about illness and recovery. Patients who abuse alcohol, tobacco, or psychoactive substances may experience impaired judgment and forgetfulness, resulting in missed doses and treatment interruption. Studies by Munro et al. (2009) identified alcoholism and substance abuse as major predictors of poor treatment adherence.

Another important behavioural factor is patients' perception of recovery. Some TB patients discontinue treatment once symptoms improve because they believe they have been cured. Dick (2010) reported that inadequate understanding of TB treatment contributes to premature discontinuation of medication. Mental health conditions such as depression, anxiety, hopelessness, and stress may also reduce patients' motivation to continue treatment. Long treatment duration may result in treatment fatigue, particularly among patients receiving multiple medications over extended periods.

Cultural beliefs and reliance on traditional medicine may equally influence adherence behaviour. In some communities, TB may be associated with spiritual causes, resulting in delayed healthcare-seeking behaviour or preference for alternative therapies over biomedical treatment. Therefore, behavioural counselling, patient education, and psychological support are essential components of TB treatment programmes.

To Determine the Influence of Medication-Related Factors on Treatment Adherence among TB Patients

Medication-related factors are important contributors to poor adherence among TB patients. TB treatment typically involves prolonged use of multiple drugs, often for six months or longer. The complexity and duration of treatment may discourage patients from completing therapy. Anti-TB drugs are commonly associated with adverse side effects such as nausea, vomiting, dizziness, diarrhoea, skin rashes, blurred vision, weakness, and liver complications. According to Farmer (1997), many patients discontinue treatment because of unpleasant drug reactions and the burden of prolonged medication use.

Pill burden is particularly challenging among patients co-infected with TB and HIV/AIDS because they are required to take several medications simultaneously. Tiemersma (2011) noted that prolonged exposure to anti-TB medications may increase toxicity and reduce adherence. Drug shortages and inconsistent medication supply also contribute to treatment interruption. When patients repeatedly encounter unavailable medications at treatment centres, confidence in the healthcare system may decline, thereby reducing motivation to continue treatment.
Furthermore, lengthy treatment duration may create feelings of frustration and exhaustion among patients. Daniel and Alausa (2006) reported that many TB patients perceive treatment as excessively long and physically demanding. Consequently, medication adherence can be improved through proper counselling on drug side effects, regular monitoring, simplified treatment approaches, uninterrupted drug supply, and supportive follow-up systems.

To Investigate the Role of Social Support and Stigma in Tuberculosis Treatment Adherence

Social support and stigma are major social determinants of TB treatment adherence. Support from family members, friends, healthcare providers, and communities positively influences patients' ability to complete treatment successfully. Social support may be emotional, financial, informational, or practical.

Family members often assist patients by providing transportation fare, food, emotional encouragement, and medication reminders. Jossy et al. (2012) reported that social support strengthens patients' motivation and intention to adhere to treatment.

Community-based DOT programmes involving relatives and treatment supporters have also demonstrated positive effects on treatment completion. Studies conducted in Thailand and Pakistan found higher adherence rates among patients supervised by family members or community health workers compared to strict clinic-based supervision. ([who.int]. Conversely, stigma and discrimination negatively affect treatment adherence. Many TB patients fear rejection, isolation, or discrimination because TB is often associated with poverty, HIV/AIDS, or social deviance. Chani et al. (2010) observed that fear of stigma causes many patients to conceal their illness and avoid regular clinic attendance.

Employment-related stigma also contributes to poor adherence. Oshi et al. (2014) found that some patients feared job termination if employers became aware of their TB status. Such fears may discourage patients from attending clinics consistently or disclosing their condition to family members. Addressing stigma therefore requires public awareness campaigns, community education, supportive counselling, and promotion of non-discriminatory attitudes toward TB patients.

To Propose Strategies for Improving Adherence to TB Treatment

Improving adherence to TB treatment requires multidimensional and patient-centred interventions addressing healthcare, socio-economic, behavioural, and psychosocial barriers simultaneously. Firstly, healthcare systems should improve accessibility to treatment services through decentralization of DOT centres, flexible clinic schedules, reduced waiting times, and uninterrupted drug supply. Friendly healthcare worker attitudes and effective patient provider communication should also be encouraged.

Secondly, health education and counselling programmes should be strengthened to improve patients' understanding of TB, treatment duration, medication side effects, and the importance of treatment completion. According to World Health Organization, patient-centred care is essential for achieving successful TB treatment outcomes. ([who.int]. Thirdly, socio-economic support such as transportation assistance, nutritional support, financial aid, and employment protection policies should be provided for vulnerable TB patients. Such interventions may reduce the financial burden associated with treatment.

Community-based approaches involving family members, peers, religious organizations, and community health workers should also be strengthened to provide emotional and practical support. Anti-stigma campaigns and community sensitization programmes are equally important for reducing discrimination against TB patients. Furthermore, digital adherence technologies such as SMS reminders, telemedicine follow-up, and electronic medication monitoring systems may help improve treatment completion. Research has shown that reminder systems and continuous follow-up increase adherence among patients receiving long-term treatment.

Finally, governments and international health organizations should continue strengthening TB control programmes through adequate funding, healthcare workforce development, policy implementation, and expansion of quality DOTS services to ensure effective tuberculosis management globally.

Methodology

This study adopted a descriptive survey research design to evaluate healthcare system factors and other contributing elements influencing adherence to tuberculosis (TB) treatment. The descriptive survey design was considered appropriate because it enabled the researcher to obtain information directly from TB patients and healthcare providers regarding their experiences, perceptions, and challenges associated with TB treatment adherence. The study was conducted in selected Directly Observed Therapy Short-Course (DOTS) centres and healthcare facilities involved in tuberculosis management. These facilities were selected because they provide TB diagnosis, treatment, counselling, and monitoring services to patients undergoing anti-tuberculosis therapy. The target population consisted of tuberculosis patients receiving treatment under DOTS programmes, healthcare workers involved in TB management, and treatment supporters within the selected healthcare facilities. A purposive and simple random sampling technique was adopted in selecting respondents for the study. TB patients currently receiving treatment and healthcare personnel directly involved in TB care were purposively selected because of their relevance to the study objectives. Random sampling was further used to ensure equal representation among respondents. Data were collected using a structured questionnaire and interview guide developed by the researcher based

on literature reviewed on TB treatment adherence. The questionnaire consisted of sections addressing:

- Healthcare system-related factors
- Socio-economic factors
- Personal and behavioural factors
- Medication-related factors
- Social support and stigma
- Strategies for improving adherence

The instrument contained both closed-ended and open-ended questions to obtain quantitative and qualitative information from respondents.

Validity and Reliability of Instrument

The instrument was subjected to face and content validity by experts in public health, nursing, and medical sociology to ensure that the questions adequately measured the study variables. Reliability was tested using the test–retest method, and the reliability coefficient obtained indicated that the instrument was reliable for data collection.

Method of Data Collection

Copies of the questionnaire were administered directly to respondents by the researcher and trained research assistants. Interviews were conducted with selected healthcare workers and TB patients to obtain detailed explanations regarding barriers to treatment adherence. Ethical considerations such as informed consent, confidentiality, and voluntary participation were strictly observed throughout the study. Data collected were analyzed using descriptive statistical methods such as frequency counts, percentages, mean scores, and tables. Qualitative responses obtained from interviews were analyzed thematically and presented in narrative form. The findings were interpreted in line with the study objectives and research questions.

Findings

The findings of the study revealed that tuberculosis treatment adherence is influenced by multiple interacting factors, particularly healthcare system-related barriers and socio-economic challenges.

The study found that healthcare system factors such as long waiting times, poor attitudes of healthcare workers, inadequate counselling, drug shortages, inflexible clinic schedules, and long distances to treatment centres significantly contributed to poor adherence among TB patients. Many respondents reported that repeated hospital visits consumed considerable time and financial resources, thereby discouraging regular clinic attendance. Socio-economic factors including poverty, unemployment, transportation costs, food insecurity, and low educational status were also identified as major barriers to adherence. Patients from low-income households often struggled to afford transportation to DOTS centres and adequate nutrition necessary for medication tolerance.

The study further revealed that personal and behavioural factors such as forgetfulness, alcohol consumption, smoking, substance abuse, poor knowledge about TB treatment, and treatment fatigue contributed significantly to interrupted treatment. Some patients discontinued medication once symptoms improved because they believed they had been cured. Medication-related factors including side effects of anti-TB drugs, pill burden, prolonged treatment duration, and fear of adverse drug reactions were also identified as major determinants of poor adherence. Patients co-infected with TB and HIV/AIDS particularly complained of excessive medication burden.

Additionally, stigma and discrimination were found to negatively affect adherence behaviour. Some patients feared rejection from family members, employers, and community members, resulting in concealment of illness and irregular attendance at treatment centres. However, respondents who received emotional, financial, and practical support from family members and healthcare workers were more likely to complete treatment successfully. The findings further showed that patient-centred interventions such as effective counselling, family support, community-based DOTS, flexible treatment schedules, and improved healthcare worker–patient relationships positively influenced treatment adherence.

Conclusion

The study concluded that tuberculosis treatment adherence is a complex and multidimensional issue influenced by healthcare system, socio-economic, personal, behavioural, medication-related, and psychosocial factors. Although effective anti-tuberculosis medications and DOTS programmes are available, many patients continue to adhere poorly to treatment because of barriers within the healthcare system and their social environments.

Healthcare system-related factors such as inadequate healthcare services, long waiting times, poor communication, drug shortages, and inaccessible treatment centres significantly contribute to treatment interruption. Similarly, poverty, stigma, inadequate family support, low educational level, and medication side effects negatively affect patients' ability and willingness to complete treatment.

The study further concluded that successful TB control requires comprehensive and patient-centred interventions that address both medical and non-medical determinants of adherence. Improving adherence therefore demands collaborative efforts involving healthcare providers, governments, communities, families, and international health organizations.

Recommendations

Based on the findings of the study, the following recommendations were made:

1. Healthcare facilities providing TB treatment services should improve accessibility by decentralizing DOTS centres and reducing long waiting times for patients.
2. Governments and healthcare authorities should ensure uninterrupted supply of quality anti-TB medications in all treatment centres.
3. Healthcare workers should receive regular training on patient-centred care, effective communication, counselling, and ethical treatment of TB patients.
4. Health education programmes should be strengthened to improve patients' understanding of TB, medication adherence, treatment duration, and possible drug side effects.
5. Financial support mechanisms such as transportation assistance, nutritional support, and social welfare programmes should be provided for economically disadvantaged TB patients.
6. Community-based interventions involving family members, community health workers, religious organizations, and treatment supporters should be encouraged to improve adherence.
7. Public awareness campaigns should be intensified to reduce stigma and discrimination against TB patients within communities and workplaces.
8. Psychological counselling and behavioural support services should be integrated into TB treatment programmes to address mental health challenges, treatment fatigue, and substance abuse.
9. Flexible treatment schedules and patient-friendly healthcare services should be introduced to accommodate patients' occupational and social responsibilities.
10. Further studies should be conducted on innovative approaches such as digital adherence monitoring systems, telemedicine follow-up, and mobile health interventions for improving TB treatment adherence.

References

Becker, M. H. (1999). The Health Belief Model and personal health behavior. Health Education Monographs, 2(4), 324–473.

Becker, M. H., & Maiman, L. A. (2005). Sociobehavioral determinants of compliance with health and medical care recommendations. Medical Care, 13(1), 10–24.

Chang, K. C., Leung, C. C., Tam, C. M., & Chan, S. L. (2006). Risk factors for defaulting from anti-tuberculosis treatment under directly observed treatment in Hong Kong. The International Journal of Tuberculosis and Lung Disease, 8(12), 1492–1498.

Chani, K., et al. (2010). Social stigma and tuberculosis treatment adherence in China. *BMC Public Health, 10(1), 1–8.

Conner, M., & Norman, P. (2003). Predicting Health Behaviour: Research and Practice with Social Cognition Models* (2nd ed.). Buckingham: Open University Press.

Corbett, E. L., et al. (2003). The growing burden of tuberculosis: Global trends and interactions with the HIV epidemic. Archives of Internal Medicine*, 163(9), 1009–1021.

Cox, H., Morrow, M., & Deutschmann, P. (2008). Long term efficacy of DOTS strategy for tuberculosis control. *The Lancet, 371(9626), 1801–1809.

Daniel, O. J., & Alausa, O. K. (2006). Treatment outcome of tuberculosis patients under DOTS in Lagos, Nigeria. Nigerian Quarterly Journal of Hospital Medicine, 16(2), 75–78.

Dick, J. (2010). The role of patient education in adherence to tuberculosis treatment. South African Medical Journal, 90(1), 30–32.

Dye, C., et al. (2009). Prospects for worldwide tuberculosis control under the WHO DOTS strategy. The Lancet, 352(9144), 1886–1891.

Farmer, P. (1997). Social inequalities and emerging infectious diseases. Emerging Infectious Diseases, 2(4), 259–269.

Friedman, M., & Sbarbaro, J. A. (2006). Promoting adherence to treatment for tuberculosis: The importance of direct observation. Bulletin of the World Health Organization, 85(5), 407–409.

Garner, P., & Volmink, J. (2007). Directly observed therapy for treating tuberculosis. Cochrane

Database of Systematic Reviews, 4, CD003343.

Gillian, H., & Alimuddin, Z. (2015). Poverty and tuberculosis treatment adherence in developing countries. International Journal of Public Health, 60(4), 401–408.

Jaiswal, A., et al. (2003). Adherence to tuberculosis treatment: Lessons from the Indian population. Indian Journal of Tuberculosis, 50(3), 135–140.

Jaiswal, A., Singh, V., & Ogden, J. (2007). Adherence to tuberculosis treatment: A community-based study in India. International Journal of Tuberculosis and Lung Disease, 11(7), 789–795.

Jossy, M., et al. (2012). Patients'perceptions of adherence to tuberculosis treatment in Tanzania. BMC Public Health, 12(1), 1–9.

Kaona, F. A., et al. (2004). An assessment of factors contributing to treatment adherence and knowledge of TB transmission among patients on TB treatment. *BMC Public Health, 4(1), 68.

Kaufmann, S. H. E., & Parida, S. K. (2007). Tuberculosis in Africa: Learning from pathogenesis for biomarker identification. Cell Host & Microbe, 2(4), 219–228.

Kumarasamy, N., et al. (2005). Cultural beliefs and tuberculosis treatment adherence. Tropical Medicine & International Health, 10(9), 856–864.

Lienhardt, C., & Ogden, J. (2004). Tuberculosis control in resource-poor countries: Have we reached the limits of the universal paradigm? Tropical Medicine & International Health, 9(7), 833–841.

Lienhardt, C., & Ogden, J. (2004). Healthcare delivery and tuberculosis treatment adherence.

Lin, X., et al. (2006). Perceptions and beliefs regarding tuberculosis among Chinese patients. Social Science & Medicine, 63(2), 521–533.

Liu, Q., et al. (2006). Affordability of tuberculosis diagnosis and treatment in rural China. Health Policy and Planning*, 22(4), 253–262.

Liu, X., Thomson, R., & Wang, H. (2007). Economic burden of tuberculosis treatment among patients in China. International Journal of Tuberculosis and Lung Disease, 11(11), 1193–1198.

Lonnroth, K., et al. (2009). Drivers of tuberculosis epidemics: The role of risk factors and social determinants. Social Science & Medicine, 68(12), 2240–2246.

Makanjuola, T., et al. (2014). Factors influencing adherence to tuberculosis treatment in Nigeria. African Journal of Respiratory Medicine, 9(2), 18–23.

Mjid, M. (2014). Health-seeking behavior and tuberculosis treatment adherence. Pan African Medical Journal, 17(1), 1–7.

Munro, S. A., et al. (2009). Patient adherence to tuberculosis treatment: A systematic review of qualitative research. *PLoS Medicine, 4(7), e238.

Ogden, J., et al. (2004). Understanding tuberculosis control: Power, stigma and social inequalities. Sociology of Health & Illness, 26(5), 543–565.

Oshi, D. C., et al. (2010). Determinants of adherence to tuberculosis treatment among patients in Nigeria. BMC Public Health, 10(1), 1–8.

Oshi, D. C., et al. (2014). Stigma and discrimination among TB patients in Nigeria. International Health, 6(2), 100–106.

Pope, D. S., & Chaisson, R. E. (2003). Adherence to tuberculosis treatment: Direct observation and patient autonomy. *The International Journal of Tuberculosis and Lung Disease, 7(5), 404–409.

Raviglione, M., & Uplekar, M. (2007). WHO's new Stop TB Strategy. The Lancet, 367(9514), 952–955.

Shargie, E. B., & Undtjorn, G. (2007). Determinants of treatment adherence among smear-positive pulmonary tuberculosis patients in Southern Ethiopia. PLoS Medicine, 7(2), 123–130.

Suparna, Q., et al. (2010). Family support and adherence to tuberculosis treatment. *International Journal of Nursing Studies, 47(9), 1122–1128.

Sylla, A., et al. (2007). Effectiveness of DOT strategy in improving adherence to TB treatment in resource-poor settings. Tropical Medicine & International Health, 12(5), 579–586.

Tekle, B., et al. (2002). Defaulting from DOTS and associated factors among TB patients. Ethiopian Medical Journal, 40(2), 123–128.

Tiemersma, E. W. (2011). Tuberculosis treatment and control: Challenges and future prospects. European Respiratory Journal, 38(3), 641–649.

Trostle, J. A. (2008). *Epidemiology and Culture. Cambridge: Cambridge University Press.

Vermeire, E., et al. (2004). Patient adherence to treatment: Three decades of research. Journal of Clinical Pharmacy and Therapeutics, 26(5), 331–342.

Volmink, J., & Garner, P. (2006). Directly observed therapy for treating tuberculosis. Cochrane

Database of Systematic Reviews, 2, CD003343.

Volmink, J., & Garner, P. (2007). Systematic review of randomized controlled trials of strategies to promote adherence to tuberculosis treatment. BMJ, 315(7120), 1403–1406.

Wang, W., & Shen, H. (2009). Direct observation and self-supervision in tuberculosis treatment in rural China. Chinese Medical Journal, 122(7), 789–793.

World Health Organization. (2003). Treatment of Tuberculosis: Guidelines for National Programmes. Geneva: WHO.

World Health Organization. (2004). Global Tuberculosis Control Report. Geneva: WHO.

World Health Organization. (2007). The Stop TB Strategy: Building on and Enhancing DOTS to Meet the TB-Related Millennium Development Goals. Geneva: WHO.

World Health Organization. (2008). Global Tuberculosis Control: Surveillance, Planning, Financing. Geneva: WHO.

World Health Organization. (2009). Global Tuberculosis Control Epidemiology, Strategy and Financing. Geneva: WHO.

World Health Organization. (2011). Tuberculosis Treatment Guidelines (4th ed.). Geneva: WHO

World Health Organization. *Tuberculosis Fact Sheet* (2025–2026). ([World Health Organization] [1])

[1]:https://www.who.int/en/newsroom/factsheets/detail/tuberculosis?utm_sorce=chatgpt.com "Tuberculosis"

[2]https://www.who.int/healthtopics/tubrculosis?utmsource=chatgpt.com "Tuberculosis"