

Factors Influencing Directly Observed Treatment Short Course Compliance Among Tuberculosis Patients: A Literature Review

Kaur Manpriya

Associate Professor, Government College of Nursing, Patiala

ABSTRACT: Tuberculosis (TB) is a communicable disease caused by *Mycobacterium tuberculosis*. The disease primarily affects the lungs and causes pulmonary tuberculosis. Tuberculosis bacilli can infect almost any part of the body, including the lymph glands, joints, and bones, called extrapulmonary tuberculosis. This review article aimed to determine the factors influencing compliance with DOTS in patients with tuberculosis. By identifying significant technical, self-motivational, economic, physical, social, psychological factors and sociodemographic factors, this review article offers valuable insights for developing more effective, patient-centered strategies to improve treatment adherence and ultimately enhance tuberculosis control efforts.

KEYWORDS: Factors, compliance, Directly Observed Treatment Short Course (DOTS), tuberculosis.

INTRODUCTION

Tuberculosis (TB) is one of the most important diseases in the history of humanity and remains an extraordinary burden on human health. The Greek term 'pthe-sis' was used by Hippocrates to describe the wasting disease, later known as tuberculosis. The term 'tuberculosis' was introduced in the early 19th century, derived from the tubercles characterized in the study of the pathological features of the disease. Robert Koch in 1882 first described about the tubercle bacilli as the cause of tuberculosis. Robert Koch received noble prize for his efforts.(Park K)

TB remains a major public health challenge worldwide, with India bearing the highest burden of the disease. India accounts for 27% of global TB cases. In 2022, India reported an estimated 2.82 million new TB cases and estimated TB deaths reported as 23 deaths per 100,000 population. (Source Global TB report 2023)

Various factors influence how effectively individuals adhere to tuberculosis (TB) treatment, which in turn affects the treatment's success. Younger individuals, those with lower body weight, and patients with a history of TB often struggle with treatment adherence. Additionally, health conditions such as diabetes and lung disease complicate adherence to treatment regimens (Koo et al., 2020).

Social and environmental elements also play a crucial role. Medicaid support contributes to positive treatment outcomes, but financial stressors like income loss, unemployment, and food insecurity increase stress and hinder adherence. Proximity to healthcare facilities is beneficial, as shorter travel distances facilitate treatment follow-up (Gebreweld et al., 2018; Koo et al., 2020). Understanding TB treatment is vital, as many patients discontinue treatment prematurely, mistakenly believing they are cured. This indicates a lack of awareness about the necessity of completing the full treatment course. Uncertainty about treatment duration and the consequences of early discontinuation also contribute to poor adherence (Gebreweld et al., 2018).

Psychosocial factors, such as stigma, insufficient family and social support, and feelings of hopelessness due to economic pressures, adversely affect adherence. In contrast, strong family support, offering both emotional and practical help, boosts medication adherence and enhances patients' quality of life by increasing motivation and confidence (Castelnuovo, 2010; Gebreweld et al., 2018; Lutfian et al., 2024).

Healthcare-related aspects, including patient satisfaction with professional care, time spent with healthcare providers, technical competence, accessibility, and overall patient-provider interaction, significantly impact compliance. Long waiting times and drug availability issues negatively affect adherence, whereas positive communication and attitudes from healthcare workers act as facilitators (Gebreweld et al., 2018; Nezenega et al., 2013). Interventions designed to improve adherence include psychological support and behavioral therapy, which have been shown to enhance motivation, treatment completion, and cure rates. (Buchman & Cabello, 2017; Janmeja et al., 2005; Pradipta et al., 2020).

Factors Influencing Directly Observed Treatment Short Course Compliance Among Tuberculosis Patients: A Literature Review

OBJECTIVE:

To determine the factors influencing compliance to DOTS among tuberculosis patients.

Table 1:. FACTORS INFLUENCING DOTS COMPLIANCE

SNO.	FACTORS INFLUENCING DOTS COMPLIANCE
1	Self-motivational factor
2	Physical factor
3	Technical factor
4	Social factor
5	Economical factor
6	Psychological factor

FACTORS INFLUENCING COMPLIANCE TO DOTS- In this review article, the factors affecting a patient's ability to complete DOTS therapy were identified as technical, self-motivational, economic, physical, social, psychological and socio-demographic.(Table 1)

1. Self-motivational factor:- It referred to those factors including willing to take treatment, take doses as per prescription, follow all instructions given by health personnels, take medications daily, coming to hospital for treatment by own without being encouraged etc.
2. Physical factor:- It referred to those factors including relief from symptoms, any impairment in daily activity, any side-effect of medication and other health problem etc .
3. Technical factor :- It referred to those factors including availability of drugs to nearby health centre(PHC,CHC, Sub-centre, Dispensary, ASHA), medicine available, DOTS centre opening time is convenient etc.
4. Social factor:- It referred to those factors including changes in behaviour of families and friends, disclosed TB status to family and friends, facing social stigma due to TB, appropriate health personnel behavior etc.
5. Economical factor:- it referred to those factors including how much amount spend on travelling, out of pocket expenditure on DOTS treatment, unemployment due to disease and treatment and expenditure to diet etc .
6. Psychological factor:- It referred to those factors including any psychological impact on mental health, disturbing daily life etc.
7. Socio-demographic factors- It referred to those factors including the characteristics of a TB patient that can influence behaviors and preferences , including variables such as age, gender, education,income etc.

Self-motivational factors: The primary reason for the non-compliance among illiterate patients was their lack of understanding regarding the consequences of discontinuing treatment. To enhance compliance in these patients, it is essential to educate them about various aspects of the disease, about the DOTS program, the importance of completing treatment, and self-motivation, which were identified as the top five reasons for good compliance with DOTS (Upadhaya S., 2019). A systematic review found that patient education combined with counseling increased cure rates by 16% and reduced default rates by 13%, indicating that knowledge enhancement positively impacts patients' motivation to adhere (Müller et al., 2018). Further, a qualitative study in Ghana identified insufficient knowledge about TB as a barrier to adherence, underscoring how lack of understanding can reduce motivation and increase default risk (Appiah et al., 2023). In addition to education and digital tools, social support systems reinforce self-motivation by providing emotional encouragement and practical assistance during treatment. Studies suggest that family support and community involvement contribute to sustained motivation in patients undergoing DOTS, helping them to overcome challenges related to stigma, side effects, or logistical difficulties (Appiah et al., 2023; Mafigiri et al., 2011). The psychological well-being of patients, including depression and stigma reduction, also correlates with improved adherence, highlighting the importance of addressing mental health to sustain motivation (Khachadourian et al., 2020).

Physical factor: Medication-related nausea, feelings of isolation, and fatigue from taking pills impacted patients' adherence and motivation (Shruddha et al. 2025). Tb patients (31.9%) experienced adverse drug reactions. The most common issue was gastrointestinal reactions (41.4%), which included symptoms like nausea, vomiting, loss of appetite, stomach pain, diarrhea, abdominal discomfort followed by liver damage (20.5%), allergic reactions (15.9%) such as skin rash and fever, joint pain (10.6%), elevated uric acid levels (7.3%), dizziness or headaches (6.6%), blurred vision or hearing loss (4.0%), edema (3.3%), and feelings of weakness or drowsiness (3.3%)(Chen S et al., 2021) . The reasons for patients discontinuing treatment, such as feeling better and deciding not to continue, as well as stopping due to medication side effects (Upadhaya S., 2019).

Factors Influencing Directly Observed Treatment Short Course Compliance Among Tuberculosis Patients: A Literature Review

Technical factor: Effective management, financial support, access to healthcare, and Information, Education, and Communication (IEC) through media such as television and radio are essential. Accessibility and availability of healthcare infrastructure, particularly DOTS centers, are pivotal factors influencing tuberculosis (TB) treatment adherence and compliance. (Upadhaya S., 2019). Studies have shown that geographic distance to DOTS centers and transportation difficulties significantly affect patients' ability to attend treatment sessions consistently. For instance, in the Ashanti region of Ghana, long distances to treatment centers, transportation costs, and difficulty accessing public transport were identified as key barriers to TB treatment adherence (Appiah et al., 2023). Similarly, in South India, patients residing in rural areas reported major challenges such as long travel distances and inconvenient timings at government DOTS facilities, which directly impacted their adherence to the regimen. In contrast, patients receiving DOTS from private practitioners, who offer greater flexibility and closer proximity, experienced fewer barriers (Yellappa et al., 2016).

Accessibility issues are closely linked with higher default and loss-to-follow-up rates. A case-control study in Papua, Indonesia, found that difficult access to healthcare—manifested as problems with distance, travel costs, and frequent residence changes—was significantly associated with non-adherence during tuberculosis treatment (Ruru et al., 2018). These infrastructural challenges underline a critical need for decentralized and accessible TB treatment services, especially in rural and underserved areas.

Innovation in digital adherence technologies also targets infrastructure limitations. For example, a mobile app intervention integrating gamified real-time video-observed therapy significantly improved medication adherence among TB patients in Malaysia, reducing the need for physical attendance at DOTS centers (Abas et al., 2024). Community-based DOTS strategies have also been studied as alternatives that mitigate access issues. A qualitative study in urban Uganda found that home-based DOTS, with treatment supervision by family members or community supporters, provided continuity of social support and enabled higher treatment success compared to traditional facility-based DOTS (Mafigiri et al., 2011). Limited healthcare infrastructure characterized by distant, poorly distributed DOTS centers creates significant barriers to treatment adherence. Geographic distance, transportation costs, and inconvenient facility locations elevate default rates, especially among vulnerable rural populations. Addressing these challenges requires a multi-pronged approach involving decentralization of services, leveraging digital adherence tools, and community-based strategies to enhance accessibility and patient compliance with tuberculosis treatment (Abas et al., 2024; Appiah et al., 2023; Bahrainwala et al., 2020; Mafigiri et al., 2011; Ruru et al., 2018; Yellappa et al., 2016).

Social factor: Robust family support is associated with a 55% reduction in the probability of mental health problems. Among healthcare providers, strong support was identified as a protective factor against depression, lowering the risk by 56% (Kanjana Konsaku.,2025) . Chen S et al (2021) discovered that patients experiencing severe family dysfunction were four times more likely to suffer from psychological distress compared to those with healthy family dynamics. A well-functioning family provides patients with more positive emotional experiences, enhancing their life satisfaction and confidence in treatment, thereby diminishing psychological distress.

Economical factor: The significant influence of socioeconomic factors on the prevalence of MDR-TB has been highlighted. Critical elements such as low income, poor housing conditions, and inadequate ventilation play a substantial role in increasing the risk of MDR-TB (R Raja Yamini.,2024). Economic challenges and unemployment were prominent issues among the study participants. Financial difficulties not only caused emotional stress but also frequently delayed seeking medical treatment (Shraddha et al., 2025).

Psychological factor: Emotional distress among TB patients, especially during the initial phases of diagnosis and treatment. Stigma was a major factor, leading participants to conceal their diagnosis and withdraw socially. Stigma and social isolation further compound psychological distress and thereby affect compliance (Shraddha et al., 2025). Qualitative data underline that the stigma associated with TB can foster fears and concealment, undermining adherence. Mental health symptoms such as depression and anxiety subsequently reduce patients' engagement with DOTS programs, highlighting the need for integrated psychological support within TB care (Sethi et al., 2019).

Moreover, personalized interventions that include counseling services have demonstrated enhanced medication adherence by addressing patient-specific psychological needs. Education combined with counseling leads to improved cure rates and reduced treatment default, partly by mitigating psychological barriers and enhancing patients' understanding and coping mechanisms (Müller et al., 2018; Pradipta et al., 2020).

Psychological factors such as depression, stigma, low motivation, and fear critically influence DOTS compliance. Integrating psychological assessment, mental health support, behavior modification therapies, and counseling into TB treatment programs is essential to improve patient adherence and overall treatment success (Janmeja et al., 2005; Müller et al., 2018; Sethi et al., 2019).

Factors Influencing Directly Observed Treatment Short Course Compliance Among Tuberculosis Patients: A Literature Review

Socio-demographic factors- Several risk factors for MDR-TB, including the level of education, monthly family income, the number of windows in a home, repeated TB diagnoses, attitudes towards TB, self-care behaviors, and limited health literacy (Leeka N et al., 2025). Kumar A (2024) found that successful treatment outcomes were statistically significantly associated with females, younger individuals, the absence of comorbidities, cases of extra-pulmonary TB, smear-negative pulmonary TB, and new TB patients. R Raja Yamini (2024) determined that behavioral factors such as passive smoking and a history of previous TB treatment also play a significant role in increasing risk. Gopi et al. (2007) found that non-adherence to DOTS was more prevalent among illiterate individuals, with a rate of 39%. Similarly, Upadhaya S (2019) indicated that patients with higher education levels showed better compliance rates compared to those who were illiterate.

DISCUSSION

This discussion section interprets the findings of review article, which aimed to identify the factors influencing DOTS compliance among tuberculosis patients. Overall, the review article identified technical, self-motivational, economic, physical, social, psychological factors and sociodemographic factors as a significant determinants of compliance, with varying degrees of influence. Rohit and Dr. Reena Jairus (2017), who found that factors such as the distance and timing of the center, weather, skipping and forgetting medicine, treatment duration, timely receipt of medicine, and health worker visits/calls when unable to visit the DOTS center were influential for DOTS compliance. The high mean compliance score of 94.75% for technical factors. Another study by Akash et al. (2020) indicated that 76.16% of non-compliance with DOTS therapy was due to transportation factors, 68.80% was due to factors related to healthcare facilities, and 70.16% was due to a lack of time.

Similar findings were reported by S. Ashutosh (2022), who identified self-assistance and motivation (92.4%) as effective factors influencing compliance with DOTS therapy, followed by IEC assistance (91.67%) and the Nikshay Poshan Yojna (29.6%), which offers financial support to patients to meet their nutritional needs. The mean compliance score for economic factors was 81%. A study conducted by Rohit and Dr. Reena Jairus (2017) suggested that economic factors such as traveling costs, free medicine, diet, daily earnings, or absence from school/college, and government support were highly influential factors for compliance with DOTS. The mean compliance score for economic factors was 60.4%.

Research by P. Dayalal and P. Nikhil (2019) indicated that factors such as the distance to the DOTS center, work commitments, travel costs, social isolation, and drug unavailability influenced compliance with DOTS. Conversely, a study by Ishrat K, et al. (2022) identified that non-compliance was primarily due to drug side effects (70%), insufficient family support (76.67%), lack of awareness (86.67%), disease-related stigma (93.33%), financial constraints (13.33%), and drug unavailability at the center (6.67%). Additionally, males were more likely to be non-compliant with DOTS therapy, with drug side effects being the predominant reason for non-compliance. Study by Akash et al. (2020), which reported that 75% of non-compliance was attributed to the side effects of DOTS therapy. Similarly, research by Mittal C. & Gupta S. (2011) identified medication side effects, time constraints, and lack of awareness as primary reasons for non-compliance. Supporting this finding, S. Akash et al. (2020) suggested that 79.50% of non-compliance was due to factors related to discrimination and stigma. Another study by the Eastern Mediterranean Health Journal (2013) corroborated these findings, indicating that patients who felt shame about TB and feared information leakage were more likely to default. Additionally, psychological factors, such as anxiety, sleep disturbances, and the perception that DOTS disrupts daily life, were identified as influential in non-compliance, with a mean compliance score of 60%. Similar findings were reported by Harshavardhan A. (2022), who concluded that compliance remains a major factor in the treatment of tuberculosis and suggested that healthcare professionals can play a significant role in addressing this issue through effective counseling and providing proper instructions to patients about tuberculosis treatment, particularly when patients perceive improvement and feel that treatment is no longer necessary.

This review article's findings have significant implications for improving compliance with DOTS. Healthcare providers should focus on enhancing interventions that strengthen patient self-motivation through personalized counseling and education. The Government of India (GoI) is making considerable efforts to maintain quality diagnostic facilities and actively identify new cases, aiming not only to eliminate TB but also to prevent the emergence of MDR TB. Family support and cost considerations also play a role in adherence to TB treatment. Family support is crucial as it helps patients overcome the social stigma associated with the disease, and a supportive family can motivate patients to complete their treatment. The cost factor is less significant since the treatment is free, and the GoI provides travel and diet allowances. Future research should investigate the effectiveness of targeted interventions based on these factors, with a particular focus on reducing the impact of social stigma and psychological distress on patient adherence.

CONFLICT OF INTEREST: None

Factors Influencing Directly Observed Treatment Short Course Compliance Among Tuberculosis Patients: A Literature Review

REFERENCES

- 1) Park, K. Park's Textbook of Preventive and Social Medicine (21st ed.). M/S Banarsidas Bhanot Publishers.
- 2) World Health Organization. (2023). Global Tuberculosis Report 2023. <https://www.who.int/teams/global-programme-on-tuberculosis-and-lung-health/tb-reports/global-tuberculosis-report-2023>
- 3) Rohit, R., & Jairus, R. (2017). Determine the factors influencing DOTS compliance among tuberculosis patients of selected DOTS centers of Ludhiana, Punjab. *International Journal of Development Research*, 7, 13771–13774. <https://www.jornalijdr.com/determine-factors-influencing-dots-compliance-among-tuberculosis-patients-selected-dots-centers-ludhiana-punjab>
- 4) Castelnuovo, B. (2010). A review of compliance to anti tuberculosis treatment and risk factors for defaulting treatment in Sub Saharan Africa. *African Health Sciences*, 10 (4). <https://doi.org/10.4314/ahs.v10i4.63835>
- 5) Gebreweld, F. H., Wahd, N. G., Gezae, M. M., Simel, L. L., Kifle, M. M., Ghebreyesus, S. S., Mengsteab, Y. T., & Gebremicheal, F. E. (2018). Factors influencing adherence to tuberculosis treatment in Asmara, Eritrea: a qualitative study. *Journal of Health, Population and Nutrition*, 37 (1). <https://doi.org/10.1186/s41043-017-0132-y>
- 6) Janmeja, A. K., Das, S. K., Chavan, B. S., & Bhargava, R. (2005). Psychotherapy Improves Compliance with Tuberculosis Treatment. *Respiration*, 72 (4), 375–380. <https://doi.org/10.1159/000086251>
- 7) Koo, H.-K., Min, J., Kim, H. W., Lee, J., Kim, J. S., Park, J. S., & Lee, S.-S. (2020). Prediction of treatment failure and compliance in patients with tuberculosis. *BMC Infectious Diseases*, 20 (1). <https://doi.org/10.1186/s12879-020-05350-7>
- 8) Lutfian, L., Azizah, A., Wardika, I. J., Wildana, F., Maulana, S., & Wartakusumah, R. (2024). The role of family support in medication adherence and quality of life among tuberculosis patients: A scoping review. *Japan Journal of Nursing Science : JJNS*, 22 (1). <https://doi.org/10.1111/jjns.12629>
- 9) Nezenega, Z. S., Gacho, Y. H., & Tafere, T. E. (2013). Patient satisfaction on tuberculosis treatment service and adherence to treatment in public health facilities of Sidama zone, South Ethiopia. *BMC Health Services Research*, 13 (7). <https://doi.org/10.1186/1472-6963-13-110>
- 10) Pradipta, I. S., Houtsma, D., Van Boven, J. F. M., Alffenaar, J.-W. C., & Hak, E. (2020). Interventions to improve medication adherence in tuberculosis patients: a systematic review of randomized controlled studies. *NPJ Primary Care Respiratory Medicine*, 30 (1). <https://doi.org/10.1038/s41533-020-0179-x>
- 11) S Ashutosh (2024). Assess The Factors Influencing Compliance to DOTS Therapy Among Tuberculosis Patients Under National Tuberculosis Elimination Program at DOTS Center, KGMU, Lucknow (INDIA). *African Journal of Biomedical Research*. 27, 35 (Sep. 2024), 590–595 . DOI: <https://doi.org/10.53555/AJBR.v27i35.2058>.
- 12) C, Harshavardhan et al. "Factors Affecting Treatment Compliance among Tuberculosis Patients at Dots Centre after Introduction of Daily Regimen and Fixed Dose Combination." *The Journal of the Association of Physicians of India* 70 4 (2022): 11-12 . Corpus id- 248298535
- 13) Ishrat khan, Alex james and Minu Pargaien. A cross sectional study to assess factors influencing non-compliance to Dots therapy in patients with tuberculosis in selected DOTS centre of Haldiwani, Uttarakhand[internet] IJCAR, 2022,11,07,1186 to 1190. Available from <http://dx.doi.org/10.24327/ijcar.2022.1191.0265>
- 14) Akash S. Patel, Virsha Hun and Adithya. An exploratory study to identify factors affecting non-compliance to DOTS therapy among TB patients at selected DOTS centre Vadodara. *IJPHR*, 2020,11,13-17.
- 15) Mittal, C., & Gupta, S. (2011). Noncompliance to DOTS: How it can be Decreased. *Indian journal of community medicine : official publication of Indian Association of Preventive & Social Medicine*, 36(1), 27–30. <https://doi.org/10.4103/0970-0218.80789>
- 16) Mn, E., Elhoseeny, T.A., & Am, M. (2013). Factors affecting defaulting from DOTS therapy under the national programme of tuberculosis control in Alexandria, Egypt. *Eastern Mediterranean health journal = La revue de sante de la Mediterranee orientale = al-Majallah al-sihhiyah li-sharq al-mutawassit*, 19 2, 107-13 . DOI <https://doi.org/10.26719/2013.19.2.107>
- 17) Shruddha et al. *Int J Community Med Public Health*. 2025 Oct;12(10):4415-4421 <http://www.ijcmph.com> DOI:<https://dx.doi.org/10.18203/2394-6040.ijcmph20252936>
- 18) Konsaku, K., Luangwilai, T., & Ong-Artborirak, P. (2025). Factors Associated with Mental Health Problems Among Tuberculosis Patients Attending Tertiary Care Hospitals in the Bangkok Metropolitan Region, Thailand: A Hospital-Based Survey. *Clinics and Practice*, 15(3), 43. <https://doi.org/10.3390/clinpract15030043>

Factors Influencing Directly Observed Treatment Short Course Compliance Among Tuberculosis Patients: A Literature Review

- 19) Upadhyay S, Upadhyay N. A study of compliance to DOTS among tuberculosis patients attending a district hospital, Uttar Pradesh. *Int J Community Med Public Health* 2019;6:3018-23. DOI: <http://dx.doi.org/10.18203/2394-6040.ijcmph20192845>
- 20) Gopi PG, Vasantha M, Muniyandi M, Chandrasekharan V, Balasubramaniam R. Risk factor for Non adherence to directly observed treatment (DOTs) in a rural tuberculosis unit, South India. *Indian J Tuberc*. 2007;54(3):66-70.
- 21) Chen Xu Chen, Ruiheng Wu, Jia Xu, Jiawei Wang, Mingcheng Gao, Yunting Chen, Yuanping Pan, Haoqiang Ji, Yuxin Duan, Meng Sun, Liang Du and Ling Zhou. *BMC Infectious Diseases* (2021) 21:563
<https://doi.org/10.1186/s12879-021-06284-4>
- 22) Leeka Neon et al. *Journal Of Clinical Tuberculosis And Other Microbacterial Diseases* 40(2025)100549
DOI- <https://doi.org/10.1016/j.jctube.2025.100549>
- 23) Kumar A et al (2024) Factors determining successful treatment outcome among notified tuberculosis patients in Belagavi district of North Karnataka, India. *Clinical Epidemiology and Global Health*, Volume 25, 101505
DOI- <https://doi.org/10.1016/j.cegh.2024.101505>
- 24) Abas, S. A., Ismail, N., Zakaria, Y., Yasin, S. M., Ibrahim, K., Ismail, I., Razali, A., Sherzkawi, M. A., & Ahmad, N. (2024). Enhancing tuberculosis treatment adherence and motivation through gamified real-time mobile app utilization: a single-arm intervention study. *BMC Public Health*, 24(1). <https://doi.org/10.1186/s12889-023-17561-z>
- 25) Appiah, M. A., Kamau, E. M., Kye-Duodu, G., Arthur, J. A., Dako-Gyeke, P., Gborgblorvor, D., & Asampong, E. (2023). Barriers to tuberculosis treatment adherence in high-burden tuberculosis settings in Ashanti region, Ghana: a qualitative study from patient's perspective. *BMC Public Health*, 23(1). <https://doi.org/10.1186/s12889-023-16259-6>
- 26) Bahrainwala, L., Kahn, J. G., Small, P. M., Grandjean Lapierre, S., Knoblauch, A. M., Andriamiadanarivo, A., Fair, E., Rakotosamimanana, N., McKinney, J., & Diab, M. M. (2020). Drones and digital adherence monitoring for community-based tuberculosis control in remote Madagascar: A cost-effectiveness analysis. *PLOS ONE*, 15(7), e0235572. <https://doi.org/10.1371/journal.pone.0235572>
- 27) Mafigiri, D. K., Mcgrath, J. W., & Whalen, C. C. (2011). Task shifting for tuberculosis control: A qualitative study of community-based directly observed therapy in urban Uganda. *Global Public Health*, 7(3), 270–284. <https://doi.org/10.1080/17441692.2011.552067>
- 28) Ruru, Y., Matasik, M., Oktavian, A., Senyorita, R., Mirino, Y., Tarigan, L. H., Van Der Werf, M. J., Tiemersma, E., & Alisjahbana, B. (2018). Factors associated with non-adherence during tuberculosis treatment among patients treated with DOTS strategy in Jayapura, Papua Province, Indonesia. *Global Health Action*, 11(1), 1510592. <https://doi.org/10.1080/16549716.2018.1510592>
- 29) Yellappa, V., Narayanan, D., Battaglioli, T., Lefèvre, P., & Van Der Stuyft, P. (2016). Coping with tuberculosis and directly observed treatment: a qualitative study among patients from South India. *BMC Health Services Research*, 16(1). <https://doi.org/10.1186/s12913-016-1545-9>
- 30) Appiah, M. A., Kamau, E. M., Kye-Duodu, G., Arthur, J. A., Dako-Gyeke, P., Gborgblorvor, D., & Asampong, E. (2023). Barriers to tuberculosis treatment adherence in high-burden tuberculosis settings in Ashanti region, Ghana: a qualitative study from patient's perspective. *BMC Public Health*, 23(1). <https://doi.org/10.1186/s12889-023-16259-6>
- 31) Khachadourian, V., Van Den Boom, M., Harutyunyan, A., Davtyan, H., Truzyan, N., Thompson, M. E., Davtyan, K., & Petrosyan, V. (2020). People-centred care versus clinic-based DOT for continuation phase TB treatment in Armenia: a cluster randomized trial. *BMC Pulmonary Medicine*, 20(1). <https://doi.org/10.1186/s12890-020-1141-y>
- 32) Mafigiri, D. K., Mcgrath, J. W., & Whalen, C. C. (2011). Task shifting for tuberculosis control: A qualitative study of community-based directly observed therapy in urban Uganda. *Global Public Health*, 7(3), 270–284. <https://doi.org/10.1080/17441692.2011.552067>
- 33) Müller, A. M., Silva, D. R., Sbruzzi, G., Dalcin, R., De Tarso, P., & Osório, C. S. (2018). Interventions to improve adherence to tuberculosis treatment: systematic review and meta-analysis. *The International Journal of Tuberculosis and Lung Disease*, 22(7), 731–740. <https://doi.org/10.5588/ijtld.17.0596>
- 34) Janmeja, A. K., Das, S. K., Chavan, B. S., & Bhargava, R. (2005). Psychotherapy Improves Compliance with Tuberculosis Treatment. *Respiration*, 72(4), 375–380. <https://doi.org/10.1159/000086251>
- 35) Sethi, S., Khokhar, A., & Salodia, U. (2019). Depression among tuberculosis patients attending a DOTS centre in a rural area of Delhi: A cross-sectional study. *Indian Journal of Public Health*, 63(1), 39. https://doi.org/10.4103/ijph.ijph_109_18